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TECHNICAL CORRIGENDUM 1

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Information processing systems — Open Systems Interconnection — File Transfer, Access and Management —

Part 4:
File Protocol Specification

AMENDMENT 4

TECHNICAL CORRIGENDUM 1

Systèmes de traitement de l'information — Interconnexion de systèmes ouverts — Gestion, accès et transfert de fichier —

Partie 4: Spécification du protocole de transfert de fichier

AMENDEMENT 4

RECTIFICATIF TECHNIQUE 1

Technical corrigendum 1 to International Standard ISO 8571-4:1988/Amd.4:1992 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology.*

Page 35

Subclause A.5.1

Add "ER-XFER-ENDING" to subclause A.5.1 "Class II error occurred while in transfer ending"

Page 39

Subclause A.5.4

Add the following specific action to subclause A.5.4 before action [200]:

"[80] Secure received data up to the last received checkpoint"

UDC 681.3:621.39 **Ref. No. ISO 8571-4:1988/Amd.4:1992/Cor.1:1995(E)**

Descriptors: data processing, information interchange, network interconnection, open systems interconnection, application layer, communication procedure, files, transfer, access, management, protocols.

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Page 40

Subclause A.5.5

Substitute predicate P99 in Subclause A.5.5 with:

"P99: The transfer service class or the transfer and management service class have been negotiated."

Page 45 and 47

Subclauses A.5.10 and A.5.12

Insert the detailed entry "3" in both the initiating and responding entity state tables (class 1 errors) at the intersection of column "RESTART", row "I-RESIN".

Append a new row with event "I-CHKIN" and detailed entry "18" in both the initiating and responding entity state tables (class 1 errors) at the intersection of column "RESTART", row " I-CHKIN".

	XFER	RESTART-PD	RESTART
I-CHKIN			18

Page 46 and 48

Subclauses A.5.11 and A.5.13

Add the new detailed entry "18" to A.5.11 and A.5.13 as follows:

18: [60],
P24: I-CHKRP,[61] ⇒ same state

Page 45 and 47

Subclauses A.5.11 and A.5.13

Insert "[80]" before "I-RESRP[79]" in detailed entry "3" in both A.5.11 and A.5.13 as follows:

^P40 [80], I-RESRP[79] ⇒ RESTART

Page 47

Subclause A.5.13

Substitute detailed entry "11" in the responding entity state table for class-I-errors (A.5.13) with:

11: I-DAERQ ⇒ same state
(remove [206])

Page 49

Subclause A.5.14

Append a new column "ER-XFER-ENDING" and a new row "I-TRECF" to the initiating entity state table (A.5.14). Add detailed entry number "13" to the intersection of the new row and column.

Insert detailed entry "7" into the initiating entity state table (A.5.14) row "L-ERROR3", column "INIT-PD".

Insert detailed entry "12" into the initiating entity state table (A.5.14) row "I-PABIN", column "INIT-PD".

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Page 49

Subclause A.5.15

Substitute the third, the fourth, and the fifth line of the detailed entry "1" in A.5.15 with the following lines:

P101 & P40 & P106:	L-HOLD,I-TRERQ	⇒ ER-XFER-ENDING
P101 & P40 & ^P106:	L-SUSPND, I-CANRQ [207]	⇒ CANCEL-PD
P101 & ^P40 & ^P106:	I-CANRQ[207]	⇒ CANCEL-PD
P101 & ^P40 & P106 & ^P104:	I-CANRQ[207],L-HOLD	⇒CANCEL-PD
P101 & ^P40 & P106 & P104:	L-HOLD	⇒ER-XFER-ENDING

Page 50

Subclause A.5.15

Add new detailed entry "13" to A.5.15:

^P99:	[63]	
P99:	[64]	
	[215],[206],[214],L-HOLD,I-CLORQ[211]	⇒ CLOSE-PD

Page 51

Subclause A.5.16

Add a new column "ER-XFER-ENDING" and a new row "I-TREIN" to the responding entity state table (A.5.16). Insert detailed entry number "18" to the intersection of the new row and column.

Page 51

Subclause A.5.17

Substitute the third line of the detailed entry 1 in A.5.17 with the following lines:

P101 & P40 & P106:	L-HOLD	⇒ER-XFER-ENDING
P101 & P40 & ^P106:	L-SUSPND, I-CANRQ[207]	⇒ CANCEL-PD

Page 52

Subclause A.5.17

Add detailed entry 18 to A.5.17:

^P99:	[63]	
P99:	[64]	
	[215],[214],[206],I-TRERP[211]	⇒ CLOSE-EX

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INTERNATIONAL STANDARD

ISO 8571-4

First edition
1988-10-01

AMENDMENT 2
1993-08-15

Information processing systems – Open Systems Interconnection – File Transfer, Access and Management –

Part 4 :
File Protocol Specification

AMENDMENT 2 : Overlapped access

Systèmes de traitement de l'information – Interconnexion de systèmes ouverts – Transfert, accès et gestion de fichiers –

Partie 4 : Spécification du protocole de fichiers

AMENDEMENT 2 : Chevauchement d'accès



Reference number
ISO 8571-4:1988/Amd.2:1993 (E)

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Foreword

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In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

Amendment 2 to International Standard ISO 8571-4:1988 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology.*

ISO 8571 consists of the following parts, under the general title *Information processing systems – Open Systems Interconnection – File Transfer, Access and Management*:

- *Part 1 : General introduction*
- *Part 2 : Virtual Filestore Definition*
- *Part 3 : File Service Definition*
- *Part 4 : File Protocol Specification*
- *Part 5 : Protocol Implementation Conformance Statement Proforma*

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Information processing systems – Open Systems Interconnection – File Transfer, Access and Management –

Part 4:
File Protocol Specification

AMENDMENT 2 : Overlapped access

0. Introduction

Clause 0 provides an introduction to this amendment. The text in this clause is not intended for inclusion in ISO 8571 part 4.

0.1 General

ISO 8571 part 4 provides specifications of the protocols that support the internal and external file service interfaces.

This amendment extends these protocol specifications to provide support for the services offered by overlapped access.

0.2 Rationale

The objective in introducing overlapped access is to allow more efficient access to structured files when a single initiator has a need to perform many reading and updating operations; the serial nature of the current FTAM data transfer services introduces a significant control overhead if the FADUs are small. In this context, an FADU is small if its transmission time is comparable with the time to complete a confirmed service on the association (the association's round trip delay).

0.3 Summary

The current design envelope that there should be at most one file selection per association and one file open per file selection is maintained. If access to more than one file is to be overlapped, more than one association is necessary, The overlapped access takes place within a constant set of presentation contexts established as at present when the file is opened, or previously.

Two different degrees of overlap have been identified. Firstly, requests for future accesses may be issued whilst a previously requested BDT action is in progress, allowing the creation of a queue of read and write requests. In general, PCI relating to a given BDT action may be overlapped with other BDT actions, subject to restrictions; this is called consecutive access. Secondly, read and write actions can be performed in parallel, so that both directions of data transfer are exploited at any one time. Requests are then taken from the queue whenever either direction of transfer becomes free. This is called concurrent access.

The transfer of a single FADU, specified in a single F-READ request has the same interpretation as in ISO 8571. The resultant effect on the virtual filestore of a set of overlapped requests using consecutive access shall be the same as that of the equivalent set of requests issued in series; the service provided is serializable. If concurrent access is used then the resultant effect of a set of write actions on the virtual filestore, is also serializable. However, due to the non-determinism introduced by the use of concurrent access, it is also possible that in some uses of the service, the data transferred as a result of a read action is not consistent with the current state of the file.

1. Scope

This amendment makes no additions to clause 1.

2. Field of application

This amendment makes no additions to clause 2.

3. References

This amendment makes no additions to clause 3.

4. Definitions and abbreviations

This amendment makes no additions to clause 4.

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Section one: General

5. Overview of the protocol

5.2 Services assumed by the basic file protocol

Amend table 1.

5.6 Protocol functional units

Add to end of list.

k) consecutive access functional unit

l) concurrent access functional unit

FTAM Functional Unit	Session Functional Unit	Presentation Functional Unit
Kernel(4)	Kernel Duplex Optionally: Resynch(1) Minor synch(2)	Kernel Duplex Optionally: Resynch(1) Minor synch(2) Context Management(3)
Recovery	Minor Synch Symmetric Synchronize (5)	Minor Synch Symmetric Synchronize (5)
Restart	Minor Synch Resynchronize Symmetric Synchronize (5)	Minor Synch Resynchronize Symmetric Synchronize (5)

NOTES

5 The Symmetric Synchronize functional unit is used when overlapped access is in use. Pending the specification of presentation symmetric synchronisation services, recovery mechanisms will not be available for use during overlapped access.

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Section two: Basic file protocol

6. State of the association provided

6.2 Additional state information

6.2.3 Next state indicator

Replace second sentence.

The defined values are the state names "initialised", "selected", "normal data transfer idle", "consecutive data transfer idle", "concurrent data transfer idle", and "unset".

6.2.5

Add as last paragraph:

In overlapped access, the bulk transfer number identifies the bulk data transfer that can be cancelled, restarted or recovered. Thus, the bulk transfer number is incremented only when there is an outstanding data transfer request and the previous data transfer cannot be cancelled, restarted or recovered. If an initiator and a responder have different bulk transfer numbers then it is the bulk data transfer associated with the smaller of the two numbers that is cancelled, restarted or recovered.

6.2.6 Transfer number

In overlapped access, the transfer number identifies the bulk data transfer within a sequence of transfers from one data transfer idle state to a next data transfer idle state within an open regime. It is set to zero at each data transfer idle state.

In concurrent overlapped access, two transfer numbers are maintained - one for reads and one for writes.

7. File protocol data units

This amendment makes no additions to clause 7.

8. File initiating entity actions

9. File responding entity actions

10. File general actions

This amendment makes no additions to clause 10.

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Section three: The basic bulk data transfer protocol

11. State of bulk data transfer activity

Re-label sub-clause 11.2.

11.2 Additional state of the entities (without overlapped access)

Replace first paragraph.

The following sub-clauses define the items of state information associated with the basic protocol entities for the purposes of bulk data transfer without overlapped access.

Add the following sub-clauses.

11.3 Additional state of the entities (with consecutive access)

The following sub-clauses define the items of state information associated with the basic protocol entities for the purposes of bulk data transfer with consecutive access.

11.3.1 Current Transfer Number

The current transfer number indicates the transfer number of the bulk data transfer procedure that is currently considered "in progress".

11.3.2 Start Bulk Transfer Number

The start bulk transfer number indicates the bulk transfer number of the first in a sequence of overlapped data transfers. The start bulk transfer number is used to calculate the bulk transfer number and transfer number for cancel, recover and restart.

11.3.3 Checkpoint identifier expected

The checkpoint identifier expected reflects the sequence of checkpoints within bulk data, and is reset by the start of the bulk data transfer, and by error recovery mechanisms. The value is incremented when a checkpoint is made. The value is an integer in the range 1 to 999998. Initially, the value is determined by the state of the association.

The checkpoint identifier expected applies only to FTAM regimes for which the use of the restart and/or recovery functional units have been successfully negotiated.

11.3.4 First next synchronisation point number

The first next synchronisation point number reflects the sequence of events in the supporting synchronisation services for a sender. The number is the serial number of the next session synchronisation point to be issued by the session service provider. The value is an integer in the range 0 to 999998. Initially on a newly created session connection, the value is 1.

The first next synchronisation point number applies only to FTAM regimes for which the use of the presentation symmetric synchronisation functional unit has been successfully negotiated.

11.3.5 Second next synchronisation point number

The second next synchronisation point number reflects the sequence of events in the supporting synchronisation services for a receiver. The number is the serial number of the next session synchronisation point to be issued by the session service provider. The value is an integer in the range 0 to 999998. Initially on a newly created session connection, the value is 1.

The second next synchronisation point number applies only to FTAM regimes for which the use of the presentation symmetric synchronisation functional unit has been successfully negotiated.

Table 5 - Protocol Data Units

Name	Carried by	Functional units
F-CHECK request (see note 2)	P-SYNC-MINOR request	recovery, restart
F-CHECK response (see note 2)	P-SYNC-MINOR response	recovery, restart

NOTES

1 The data value corresponds to an F-DATA request service primitive. There is no F-DATA request PDU as such.

2 If overlapped access is not in use then the F-CHECK request and response primitives are mapped directly onto the P-SYNC-MINOR request and response primitives, with no additional syntax.

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11.3.6 Synchronisation offset

The synchronisation offset is a constant established when a read or write bulk data transfer is initiated or recovered, which gives the difference between the checkpoint identifier expected and the next resynchronisation point number.

The synchronisation offset applies only to FTAM regimes for which use of the presentation symmetric synchronisation functional unit has been successfully negotiated.

NOTE - Except during the issue of a checkpoint, or performance of the restart procedure the value of the synchronisation offset is equal to the difference between the expected checkpoint number and the next synchronisation point number.

11.3.7 Outstanding Checkpoint counter

The outstanding checkpoint counter records the number of checkpoints which are unacknowledged.

11.3.8 Read/Write Indicator

The read/write indicator records whether the current bulk data transfer is to or from the initiator. The value is set upon the beginning of the data transfer regime. The defined values are "reading", "writing" and "unset". The initial value is unset.

11.3.9 Discard Indicator

The discard indicator is used to signal that data received during cancellation or before recovery is invalid and should be thrown away. If the recovery or restart functional units are selected and presentation resynchronisation functional unit has been successfully negotiated, it is used in conjunction with session resynchronisation to produce a recovery without user visibility of the error; otherwise it is used during the cancel phase. The defined values are "unset" and "set". Initially, the value is "unset".

11.3.10 Transfer Request Queue

The transfer request queue records the transfer number and transfer type (read or write) of all outstanding data transfers.

11.3.11 Transfer End Queue

The transfer end queue records the transfer numbers of all data transfers, already recorded on the transfer request queue, for which a transfer end PDU request or response has been issued.

11.3.12 Data End Queue

The data end queue records the transfer numbers of all data transfers, already recorded on the data request queue, for which a data end PDU has been issued or received.

11.3.13 Read and write checkpoint tables

The read and write checkpoint tables (two separate tables are kept) record checkpointing information for each ongoing bulk data transfer. The following information is kept for each currently active bulk data transfer: transfer number, bulk transfer number, checkpoint expected, synchronisation offset, and checkpoint counter. The size of the table is that of the transfer window negotiated when the file is opened.

11.3.14 Last transfer end confirm indicator

The last transfer end confirm indicator records the last transfer end received by the initiator. The last transfer end confirm received is sent to the responder on a transfer end request PDU. It is also included on cancel, recover and restart PDUs. The responder uses the information in removing items from the transfer end response queue and in the re-issuing of transfer-end response after a session resynchronisation in the direction of responder to initiator.

11.3.15 Last transfer end indication indicator

The last transfer end indication indicator records the last transfer end indication received by the responder. It is included on cancel, recover and restart PDUs. The initiator uses the information in the re-issuing of transfer end requests after a session resynchronisation in the direction of initiator to responder.

11.4 Additional state of the entities (with concurrent access)

The following sub-clauses define the items of state information associated with the basic protocol entities for the purposes of bulk data transfer with concurrent access.

11.4.1 Current Read Transfer Number and Current Write Transfer Number

The current transfer read number and the current transfer write number indicate the transfer numbers of the read and write data transfer procedures that are in progress.

11.4.2 Start Bulk Transfer Number

The start bulk transfer number indicates the bulk transfer number of the first in a sequence of overlapped data transfers. The start bulk transfer number is used to calculate the bulk transfer number and transfer number for cancel, recover, and restart.

11.4.3 Checkpoint identifier expected

The checkpoint identifier expected reflects the sequence of checkpoints within bulk data, and is reset by the start of the bulk data transfer, and by error recovery mechanisms. The value is incremented when a checkpoint is made. The value

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is an integer in the range 1 to 999998. Initially, the value is determined by the state of the association.

The checkpoint identifier expected applies only to FTAM regimes for which the use of the restart and/or recovery functional units have been successfully negotiated.

11.4.4 First next synchronisation point number

The first next synchronisation point number reflects the sequence of events in the supporting synchronisation services for a sender. The number is the serial number of the next session synchronisation point to be issued by the session service provider. The value is an integer in the range 0 to 999998. Initially on a newly created session connection, the value is 1.

The first next synchronisation point number applies only to FTAM regimes for which the use of the presentation symmetric synchronisation functional unit has been successfully negotiated.

11.4.5 Second next synchronisation point number

The second next synchronisation point number reflects the sequence of events in the supporting synchronisation services for a receiver. The number is the serial number of the next session synchronisation point to be issued by the session service provider. The value is an integer in the range 0 to 999998. Initially on a newly created session connection, the value is 1.

The second next synchronisation point number applies only to FTAM regimes for which the use of the presentation symmetric synchronisation functional unit has been successfully negotiated.

11.4.6 Synchronisation offset

The synchronisation offset is a constant established when a read or write bulk data transfer is initiated or recovered, which gives the difference between the checkpoint identifier expected and the next resynchronisation point number.

The synchronisation offset applies only to FTAM regimes for which use of the presentation symmetric synchronisation functional unit has been successfully negotiated.

NOTE - Except during the issue of a checkpoint, or performance of the restart procedure the value of the synchronisation offset is equal to the difference between the expected checkpoint number and the next synchronisation point number.

11.4.7 Outstanding Checkpoint counter

The outstanding checkpoint counter records the number of checkpoints which are unacknowledged.

11.4.8 Read Indicator and Write Indicator

The read indicator and the write indicator record whether or not there are read or write data transfers in progress. The defined values are "reading"/"writing" and "unset". The initial value is unset.

11.4.9 Discard indicator

The discard indicator is used to signal that data received during cancellation or before recovery is invalid and should be thrown away. If the recovery or restart functional units are selected and presentation resynchronisation functional unit has been successfully negotiated, it is used in conjunction with session resynchronisation to produce a recovery without user visibility of the error; otherwise it is used during the cancel phase. The defined values are "unset" and "set". Initially, the value is "unset".

11.4.10 Transfer Read Request Queue and Transfer Write Request Queue

The transfer read request queue and the transfer write request queue record the transfer numbers of all outstanding read and write data transfers.

11.4.11 Transfer End Read Queue and Transfer End Write Queue

The transfer end read queue and the transfer end write queue record the transfer numbers of all read and write data transfers, already recorded on the transfer request read (write) queue, for which a transfer end PDU request or response has been issued.

11.4.12 Data End Read Queue and Data End Write Queue

The data end read queue and the data end write queue record the transfer numbers of all read and write data transfers, all ready recorded on the transfer request read (write) queue, for which a data end PDU has been issued/ received.

11.4.13 Read and write checkpoint tables

The read and write checkpoint tables (two separate tables are kept) record checkpointing information for each ongoing bulk data transfer. The following information is kept for each currently active bulk data transfer: transfer number, bulk transfer number, checkpoint expected, synchronisation offset, and checkpoint counter. The size of the table is that of the transfer window negotiated when the file is opened.

11.4.14 Last transfer end confirm indicator

The last transfer end confirm indicator records the last

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transfer end read (write) received by the initiator. The last transfer end confirm received is sent to the responder on a transfer end request PDU. It is also included on cancel, recover and restart PDUs. The responder uses the information in removing items from the transfer end response queue and in the re-issuing of transfer-end response after a session resynchronisation in the direction of responder to initiator.

11.4.15 Last transfer end indication indicator

The last transfer end indication indicator records the last transfer end read (write) indication received by the responder. It is included on cancel, recover and restart PDUs. The initiator uses the information in the re-issuing of transfer end requests after a session resynchronisation in the direction of initiator to responder.

12. Bulk data transfer protocol data units

Amend table 5.

13. Bulk data transfer initiating entity actions

14. Bulk data transfer responding entity actions

15. Bulk data transfer sending entity actions

16. Bulk data transfer receiving entity actions

17. Bulk data transfer general actions

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Section four: The error recovery protocol

18. Protocol mechanisms

19. Specification of the error control protocol

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Section five: Abstract Syntax

20. Abstract Syntax Definition

20.3 ASN.1 Module Definition

Amend Figure 7.

Amend Figure 8.

Amend Figure 9.

Amend Figure 10.

21. Application Context Name

This amendment makes no additions to clause 21.

22. Conformance

This amendment makes no additions to clause 22.

```
ISO8571-FTAM  DEFINITIONS  ::=

BEGIN

   Functional-Units  ::= [4]  IMPLICIT  BIT  STRING
                  {  read                                ( 2),
                     write                               ( 3),
                     file-access                         ( 4),
                      limited-file-management            ( 5),
                      enhanced-file-management           ( 6),
                     grouping                            ( 7),
                     fadu-locking                        ( 8),
                     recovery                            ( 9),
                      restart-data-transfer              (10),
                      limited-filestore-management       (11),
                      enhanced-filestore-management      (12),
                     object-manipulation                 (13),
                     group-manipulation                  (14),
                     consecutive-access                  (15),
                     concurrent-access                   (16)  }

END
```

Figure 7 - FTAM regime PDUs

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```
ISO8571-FTAM DEFINITIONS ::=

BEGIN

  F-OPEN-request ::= SEQUENCE {
     processing-mode           [0] IMPLICIT BIT STRING
                                   { f-read       (0),
                                     f-insert          (1),
                                     f-replace         (2),
                                     f-extend          (3),
                                     f-erase           (4) } DEFAULT { f-read },
     contents-type             [1] CHOICE {
                 unknown       [0] IMPLICIT NULL,
                 proposed      [1] Contents-Type-Attribute },
     concurrency-control             Concurrency-Control OPTIONAL,
     shared-ASE-information     Shared-ASE-Information OPTIONAL,
     enable-fadu-locking       [2] IMPLICIT BOOLEAN DEFAULT FALSE,
     activity-identifier        Activity-Identifier OPTIONAL,
           - Only used in the recovery functional unit.
     recovery-mode             [3] IMPLICIT INTEGER
                 { none (0),
                   at-start-of-file (1),
                   at-any-active-checkpoint (2) } DEFAULT none,
     remove-contexts           [4] IMPLICIT SET OF Abstract-Syntax-Name OPTIONAL,
     define-contexts           [5] IMPLICIT SET OF Abstract-Syntax-Name OPTIONAL,
           - The following are conditional on the negotiation of the consecutive overlap or
           - concurrent overlap functional units.
     degree-of-overlap          Degree-Of-Overlap OPTIONAL,
     transfer-window           [7] IMPLICIT INTEGER OPTIONAL }

  F-OPEN-response ::= SEQUENCE {
     state-result         State-Result DEFAULT success,
     action-result             Action-Result DEFAULT success,
     contents-type             [1] Contents-Type-Attribute,
     concurrency-control       Concurrency-Control OPTIONAL,
     shared-ASE-information    Shared-ASE-Information OPTIONAL,
     diagnostic                Diagnostic OPTIONAL,
     recovery-mode                   [3] IMPLICIT INTEGER
                 { none (0),
                   at-start-of-file (1),
                   at-any-active-checkpoint (2) } DEFAULT none,
     presentation-action       [6] IMPLICIT BOOLEAN DEFAULT FALSE,
           - This flag is set if the responder is going to follow this response by a P-ALTER-CONTEXT
           -  exchange.
           - The following are conditional on the negotiation of the consecutive access or
           - concurrent access functional units.
     degree-of-overlap          Degree-Of-Overlap OPTIONAL,
     transfer-window           [7] IMPLICIT INTEGER OPTIONAL }
```

Figure 8 - File selection and file open regime PDUs

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```
F-RECOVER-request ::= SEQUENCE {
    activity-identifier                 Activity-Identifier,
    bulk-transfer-number                [0] IMPLICIT INTEGER,
          -- If concurrent access was in use then this parameter indicates the read bulk
          --  transfer.
    requested-access                Access-Request,
    access-passwords                Access-Passwords OPTIONAL,
    recovery-point                      [2] IMPLICIT INTEGER DEFAULT 0,
          -- zero indicates beginning of file point after last checkpoint indicates end of file
    remove-contexts                 [3] IMPLICIT SET OF Abstract-Syntax-Name OPTIONAL,
    define-contexts                 [4] IMPLICIT SET OF Abstract-Syntax-Name OPTIONAL,
          -- The following are conditional on the negotiation of overlapped access.
    concurrent-bulk-transfer-number     [7] IMPLICIT INTEGER OPTIONAL,
          -- conditional on use of concurrent access
    concurrent-recovery-point       [8] IMPLICIT INTEGER OPTIONAL,
          -- conditional on use of concurrent access. Zero indicates beginning of file
          -- point after last checkpoint indicates end of file
    last-transfer-end-read-response [9] IMPLICIT INTEGER OPTIONAL,
    last-transfer-end-write-response    [10] IMPLICIT INTEGER OPTIONAL }

F-RECOVER-response ::= SEQUENCE {
    state-result        State-Result Default success,
    action-result           Action-Result DEFAULT success,
    contents-type           [1] Contents-Type-Attribute,
    recovery-point          [2] IMPLICIT INTEGER DEFAULT 0,
          -- Zero indicates beginning of file; point after last checkpoint indicates end of file
    diagnostic          Diagnostic OPTIONAL,
    presentation-action     [6] IMPLICIT BOOLEAN DEFAULT FALSE,
          -- This flag is set if the responder is going to follow this response
          -- by a P-ALTER-CONTEXT exchange.
          -- The following are conditional on the negotiation of overlapped access.
    concurrent-recovery-point       [8] IMPLICIT INTEGER OPTIONAL,
          -- conditional on use of concurrent access. Zero indicates beginning of file; point after
          -- last checkpoint indicates end of file
    last-transfer-end-read-request  [9] IMPLICIT INTEGER OPTIONAL,
    last-transfer-end-write-request [10] IMPLICIT INTEGER OPTIONAL }

END
```

Figure 8 (continued) - File selection and file open regime PDUs

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Amend Figure 9.

```
ISO8571-FTAM DEFINITIONS ::

BEGIN

   F-READ-request ::= SEQUENCE {
      file-access-data-unit-identity  FADU-Identity,
      access-context                        Access-Context,
      fadu-lock                             FADU-Lock OPTIONAL,
            - The following is conditional on the negotiation of consecutive of concurrent access.
      transfer-number                       [0] IMPLICIT INTEGER OPTIONAL }

   F-WRITE-request ::= SEQUENCE {
      file-access-data-unit-operation [0] IMPLICIT INTEGER
                        { insert     (0),
                          replace    (1),
                          extend     (2) },
      file-access-data-unit-identity  FADU-Identity,
      fadu-lock                             FADU-Lock OPTIONAL,
            - The following is conditional on the negotiation of consecutive or concurrent access.
      transfer-number                       [1] IMPLICIT INTEGER OPTIONAL }

   F-TRANSFER-END-request ::= SEQUENCE {
      shared-ASE-information                Shared-ASE-Information OPTIONAL,
            - The following are conditional on the negotiation of consecutive or concurrent access.
      request-type                          Request-Type OPTIONAL,
      transfer-number                       [0] IMPLICIT INTEGER OPTIONAL,
      last-transfer-end-read-response [1] IMPLICIT INTEGER OPTIONAL,
      last-transfer-end-write-response      [2] IMPLICIT INTEGER OPTIONAL }

   F-TRANSFER-END-response ::= SEQUENCE {
      action-result             Action-Result DEFAULT success,
      shared-ASE-information    Shared-ASE-Information OPTIONAL,
      diagnostic                Diagnostic OPTIONAL,
            - The following are conditional on the negotiation of consecutive or concurrent access.
      request-type              Request-Type OPTIONAL,
      transfer-number           [0] IMPLICIT INTEGER OPTIONAL }

   F-CANCEL-request ::= SEQUENCE {
      action-result                         Action-Result DEFAULT success,
      shared-ASE-information                Shared-ASE-Information OPTIONAL,
      diagnostic                            Diagnostic OPTIONAL,
            - The following are conditional on the negotiation of consecutive or concurrent access.
      request-type                    Request-Type,
      transfer-number                       [0] IMPLICIT INTEGER OPTIONAL,
      last-transfer-end-read-request  [1] IMPLICIT INTEGER OPTIONAL,
      last-transfer-end-read-response [2] IMPLICIT INTEGER OPTIONAL,
      last-transfer-end-write-request [3] IMPLICIT INTEGER OPTIONAL,
      last-transfer-end-write-response      [4] IMPLICIT INTEGER OPTIONAL }

   F-CANCEL-response ::= SEQUENCE {
      action-result                         Action-Result DEFAULT success,
      shared-ASE-information                Shared-ASE-Information OPTIONAL,
```

Figure 9 - Bulk data transfer PDUs

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```
    diagnostic                          Diagnostic OPTIONAL,
          - The following are conditional on the negotiation of consecutive or concurrent access.
    request-type                  Request-Type OPTIONAL,
    transfer-number                     [0] IMPLICIT INTEGER OPTIONAL,
    last-transfer-end-read-request  [1] IMPLICIT INTEGER OPTIONAL,
    last-transfer-end-read-response [2] IMPLICIT INTEGER OPTIONAL,
    last-transfer-end-write-request [3] IMPLICIT INTEGER OPTIONAL,
    last-transfer-end-write-response    [4] IMPLICIT INTEGER OPTIONAL }

F-CHECK-request ::= SEQUENCE {
    checkpoint-identifier    [0] IMPLICIT INTEGER,
    transfer-number    [1] IMPLICIT INTEGER }

F-CHECK-response ::= SEQUENCE {
    checkpoint-identifier    [0] IMPLICIT INTEGER,
    transfer-number    [1] IMPLICIT INTEGER }

F-RESTART-request ::= SEQUENCE {
    checkpoint-identifier               [0] IMPLICIT INTEGER,
          - The following are conditional on the negotiation of consecutive or concurrent access.
    request-type                  Request-Type OPTIONAL,
    transfer-number                [1] IMPLICIT INTEGER,
    last-transfer-end-read-request  [2] IMPLICIT INTEGER OPTIONAL,
    last-transfer-end-read-response [3] IMPLICIT INTEGER OPTIONAL,
    last-transfer-end-write-request [4] IMPLICIT INTEGER OPTIONAL,
    last-transfer-end-write-response    [5] IMPLICIT INTEGER OPTIONAL }

F-RESTART-response ::= SEQUENCE {
    checkpoint-identifier               [0] IMPLICIT INTEGER,
          - The following are conditional on the negotiation of consecutive or concurrent access.
    request-type                  Request-Type OPTIONAL,
    transfer-number                [1] IMPLICIT INTEGER,
    last-transfer-end-read-request  [2] IMPLICIT INTEGER OPTIONAL,
    last-transfer-end-read-response [3] IMPLICIT INTEGER OPTIONAL,
    last-transfer-end-write-request [4] IMPLICIT INTEGER OPTIONAL,
    last-transfer-end-write-response    [5] IMPLICIT INTEGER OPTIONAL }

END
```

Figure 9 (continued) - Bulk data transfer PDUs

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```
ISO8571-FTAM DEFINITIONS ::=

BEGIN

   Degree-Of-Overlap ::= [Application 30] IMPLICIT INTEGER
            { normal      (0),
              consecutive (1),
              concurrent  (2) }

   Request-Type ::= [Application 31] IMPLICIT INTEGER
            { read (0),
              write      (1) }

END
```

Figure 10 - Application wide types

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Section six: Conformance

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Annex A
Protocol state tables
(This annex forms part of the standard.)

A.1 Introduction

Add note after third paragraph:

Note - for concurrent access, there are separate state tables for read and write procedures, for both the FERPM and the Basic FPM.

A.1.1 System model

Add last paragraph.

In addition, for concurrent overlap, both the FPM and the FERPM are considered to consist of two sub-entities of read FPM and write FPM, and read FERPM and write FERPM. The additional local signals for concurrent overlap are:

q) L-TRERQ-R - signal indicating a re-issued F-TRANSFER-END(read) request primitive;

r) L-TRERQ-W -signal indicating a re-issued F-TRANSFER-END(write) request primitive;

s) L-TRERP-W - signal indicating a re-issued F-TRANSFER-END(write) response primitive;

t) L-TRERP-R - signal indicating a re-issued F-TRANSFER-END(read) response primitive;

u) L-WRTRQ - signal indicating a re-issued F-WRITE request primitive;

v) L-REARQ - signal indicating a re-issued F-READ request primitive;

w) L-OPEN - signal to a sub-entity of successful processing of F-OPEN primitive;

x) L-CLOSE - signal to a sub-entity of successful processing of F-CLOSE primitive;

y) L-RECVR - signal to a sub-entity to go into or out of the RECOVER-WT state;

z) L-PASIVE - signal to a sub-entity to go into the PASSIVE state.

A.1.2 Incoming states

Add last paragraph.

h) for concurrent overlap, the following suffices indicate the data transfer types of primitives and PDUs:

"R" Read

"W" Write

A.1.4 States

Add last paragraph.

The prefix "Q-" indicates the use of consecutive access. The prefixes "K-R-" & "K-W-" indicate the use of concurrent access and are with respect to read and writes respectively.

A.1.5 Predicates

Add to functional units of FPM.

U15: consecutive overlap
U16: concurrent overlap

A.1.8 Additional State Information

Replace first sentence.

The tables make use of the indicators and other state variables defined in: 6.2, 11.2 and 11.3.

Add last paragraph.

In overlapped access the following symbols are used:

TN - transfer number
RTN - read transfer number
WTN - write transfer number
BTN - bulk transfer number
SBTN - start bulk transfer number
RSTTN - restart transfer number
TE - transfer end

Add the following sub-clauses:

A.1.8.1 FPM in overlapped access

Each transfer request is placed in a queue. It is removed from the queue when a F-TRANSFER-END response is issued or a F-TRANSFER-END confirm is received.

The current state of the FPM always represents the state of the transfer that is currently on the top of the request queue. The FPM places each F-DATA-END primitive that is issued or received on a queue and checks the next request in the request queue to set the read/write indicator(s) for the next transfer.

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During the exchange of F-TRANSFER-END primitives, the initiating FPM places the F-TRANSFER-END request in a queue and the responding FPM places the F-TRANSFER-END response in a queue (these are saved for possible re-issuing when a re-synchronisation occurs). When a F-TRANSFER-END confirm is received then the F-TRANSFER-END request is removed from its queue. A F-TRANSFER-END response is removed from its queue when the transfer end response parameter on a F-TRANSFER-END request indicates its receipt by the initiator.

The transfer-end queues, the data-end queues and the read/write indicator(s) are used to determine the next state of the FPM.

To make the state tables manageable for concurrent overlap the basic FPM is considered to consist of the two sub-entities of read FPM and write FPM. Each sub-entity maintains its own states and communicates with the other via global variables. The operation of the sub-entities are independent apart from during cancel and restart. The cancellation or restart of a write may destroy control information of data transfer and transfer end requests for reads; the cancellation or restart of a read may destroy control information of transfer end responses for writes. These have to be saved and re-issued at the completion of resynchronisation to maintain the independence of read and write activities.

A.1.8.2 FERPM in overlapped access

The FERPM is divided into two sub-entities of read and write in concurrent access. It is assumed that under normal operation the read sub-entity will look after the FTAM regime and the file management regime. The write sub-entity stays in the PASSIVE state and enters into the XFER-IDLE state when it receives the local signal L-OPEN (from the read sub-entity) and it will go back to the PASSIVE state when it receives the locals signal L-CLOSE (read sub-entity). Either sub-entity can perform recovery of the FTAM regime and the file management regime. The sub-entity that is performing the recovery will send the local signal L-RECVR, to put the other entity into the RECOVER-WT state. When recovery is completed, the recovering sub-entity will again issue a L-RECVR signal to inform the other sub-entity that recovery is completed. It is assumed that each sub-entity will be informed by different local signals for type 1 and type 2 errors. The same signal will be sent to both sub-entities when type 3 errors occur. The re-sending of any control information is done at the end of the restart phase.

When a write sub-entity receives a type 2 error it will issue a Cancel in write and a read sub-entity will issue a Cancel in read when it receives a type 2 error. Recovery actions do not start until both cancels are completed. The entity that completes the cancel first will be put into the RECOVER-WT state. An indicator is set to remember which entity is in the wait state.

The FERPM is given the task of re-issuing F-TRANSFER-END requests and responses and F-READ and F-WRITE requests after a session resynchronisation. The cancellation of a write will require the initiator to re-issue any possible read requests and transfer end (read) requests. The cancellation of a read will require the responder to re-issue any possible transfer end (write) responses. In addition, during error recovery the initiator will resend any write requests from the transfer request queue and transfer end (write) requests from its docket as well as any from its transfer end queue. The responder will resend and transfer end (read) response from its docket and from its transfer end queue. It is assumed that F-TRANSFER-END primitives will be re-issued before transfer request primitives.

To reduce the complexity of the state tables, all processing of user primitives are held until the completion of error recovery.

A.1.9 Additional processing indicators for the FERPM

During recovery from class II and III errors in concurrent access, the FERPM uses the following extra indicators to co-ordinate events between the two sub-entities.

a) Error3 indicator - it is set when a sub-entity has sent a local L-ERROR3 signal to the other sub-entity to indicate that it is unable to recover from a class II error and is treating the error as a class III error. It is unset when recovery is completed.

b) Write Cancel indicator - it is set when the write sub-entity has issued a CANCEL when an error II occurs. It is unset when recovery is completed.

c) Read Cancel indicator - it is set when the read sub-entity has issued a CANCEL when an error II occurs. It is unset when recovery is completed.

d) Recovery indicator - It is set to READ if a read sub-entity is passive during the recovery from class II/III errors. It is set to WRITE if a write sub-entity is passive during the recovery from class II/III errors.

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A.2 FTAM regime management protocol machine (Kernel functional unit)

...

A.3 File regime management protocol machine

...

A.4 Bulk data transfer protocol machine

A.4.1 States - bulk data transfer

Relabel A.4.1:

A.4.1.1 Normal access (non-overlapped)

Add the following sub-clauses.

A.4.1.2 Consecutive access

Q-DXFRIDLE	Data transfer idle in consecutive overlap
Q-READ	Read data transfer in consecutive overlap
Q-I-READ-ENDING	Read transfer end, wait for F-TRANSFER-END request primitive from the internal file service user in consecutive overlap
Q-READ-ENDING	Read transfer ending, wait for transfer end request PDU in consecutive overlap
Q-I-R-XFER-ENDING	Wait for F-TRANSFER-END response primitive after READ from the internal file service user in consecutive overlap
Q-R-XFER-ENDING	Wait for TRANSFER-END response PDU after READ in consecutive overlap
Q-WRITE	Write data transfer in consecutive overlap
Q-I-WRT-ENDING	Write TRANSFER-END, wait for TRANSFER-END request PDU in consecutive overlap
Q-WRT-ENDING	Write transfer-end, wait for transfer end request PDU.
Q-I-W-XFER-ENDING	Wait for F-TRANSFER-END response primitive after WRITE from the internal file service user in consecutive overlap
Q-W-XFER-ENDING	Wait for TRANSFER-END response PDU after write in consecutive overlap
Q-CANCEL-PD	Cancel pending, wait for cancel response PDU in consecutive overlap
Q-I-CANCEL-PD	Cancel pending, wait for F-CANCEL response primitive from the internal file service user in consecutive overlap
Q-RRESTART-PD	Read restart pending, wait for restart response PDU in read operation in consecutive overlap
Q-I-RRESTART-PD	Read restart pending, wait for F-RESTART response primitive in read operation from the internal file service user in consecutive overlap

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Q-WRESTART-PD Write restart pending, wait for restart response PDU in write operation in consecutive overlap

Q-I-WRESTART-PD Write restart pending, wait for F-RESTART response primitive in write operation from the internal file service user in consecutive overlap

Q-XFRIDLE-REC Data transfer file during recovery in consecutive overlap

Q-REA-SYMIN-PD Wait for first P-SYNC-MINOR indication primitive, restart requested in consecutive overlap

Q-RES-SYMIN-PD Wait for first P-SYNC-MINOR indication primitive, restart requested in consecutive overlap

Q-CAN-SYMIN-PD Wait for first P-SYNC-MINOR indication primitive, cancel requested in consecutive overlap

Q-WRT-SYMIN-PD Wait for first P-SYNC-MINOR indication primitive after WRITE in consecutive overlap

Q-REA-SYMCF-PD Wait for first P-SYNC-MINOR confirm primitive after READ in consecutive overlap

Q-RES-SYMCF-PD Wait for first P-SYNC-MINOR confirm primitive, restart requested in consecutive overlap

Q-CAN-SYMCF-PD Wait for first P-SYNC-MINOR confirm primitive, cancel requested in consecutive overlap

Q-WRT-SYMCF-PD Wait for first P-SYNC-MINOR confirm primitive after WRITE in consecutive overlap

Q-RESTART-CAN-PD Restart cancel pending, wait for cancel or restart response PDU in consecutive overlap

A.4.1.3 Concurrent access

States for READ entity:

K-R-DXFRIDLE Data transfer idle in concurrent overlap in READ
K-READ Read data transfer in concurrent overlap in READ
K-I-READ-ENDING Read transfer end, wait for F-TRANSFER-END request primitive from the internal file service user in concurrent overlap in READ
K-READ-ENDING Read transfer ending, wait for F-TRANSFER-END request PDU in concurrent overlap in READ
K-I-RXFER-ENDING Wait for F-TRANSFER-END response primitive after READ from the internal file service user in concurrent overlap in READ
K-R-XFER-ENDING Wait for F-TRANSFER-END response PDU after READ in concurrent overlap in READ
K-RCANCEL-PD Cancel pending, wait for cancel response PDU in concurrent overlap in READ
K-I-RCANCEL-PD Cancel pending, wait for F-CANCEL response primitive from the internal file service user in concurrent overlap in READ
K-RRESTART-PD Read restart pending, wait for restart response PDU in read operation in concurrent overlap in READ
K-I-RRESTART-PD Read restart pending, wait for F-RESTART response primitive in read operation from the internal file service user in concurrent overlap in READ
K-R-XFRIDLE-REC Data transfer file during recover in concurrent overlap in READ
K-REA-SYMIN-PD Wait for first P-SYNC-MINOR indication primitive, restart requested in concurrent overlap in READ
K-RRES-SYMIN-PD Wait for first P-SYNC-MINOR indication primitive, restart requested in concurrent overlap in READ
K-RCAN-SYMIN-PD Wait for first P-SYNC-MINOR indication primitive, cancel requested in concurrent overlap in READ
K-RRES-SYMCF-PD Wait for first P-SYNC-MINOR confirm primitive, restart requested in concurrent overlap in READ
K-RCAN-SYMCF-PD Wait for first P-SYNC-MINOR confirm primitive, cancel requested in concurrent overlap in READ
K-REA-SYMCF-PD Wait for first P-SYNC-MINOR confirm primitive after READ in concurrent overlap in READ
K-RRESTART-CAN-PD Restart cancel pending, wait for cancel or restart response PdU in concurrent overlap in READ

States for WRITE entity:

K-W-DXFRIDLE Data transfer idle in concurrent overlap in WRITE
K-WRITE Write data transfer in concurrent overlap in WRITE
K-I-WRT-ENDING Write transfer end, wait for F-TRANSFER-END request PDU in concurrent overlap in WRITE

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K-WRT-ENDING Write transfer-end, wait for F-TRANSFER-ENDING request PDU in concurrent overlap in WRITE
K-I-WXFER-ENDING Wait for F-TRANSFER-END response primitive after WRITE from the internal file service user in concurrent overlap in WRITE
K-W-XFER-ENDING Wait for F-TRANSFER-END response PDU after WRITE in concurrent overlap in WRITE
K-WCANCEL-PD Cancel pending, wait for cancel response PDU in concurrent overlap in WRITE
K-I-WCANCEL-PD Cancel pending, wait for F-CANCEL response primitive from the internal file service user in concurrent overlap in WRITE
K-WRESTART-PD Write restart pending, wait for restart response PDU in write operation in concurrent overlap in WRITE
K-I-WRESTART-PD Write restart pending, wait for F-RESTART response primitive in write operation from the internal file service user in concurrent overlap in WRITE
K-W-XFRIDLE-REC Data transfer file during recover in concurrent overlap in WRITE
K-WRT-SYMIN-PD Wait for first P-SYNC-MINOR indication primitive, restart requested in concurrent overlap in WRITE
K-WRES-SYMIN-PD Wait for first P-SYNC-MINOR indication primitive, restart requested in concurrent overlap in WRITE
K-WCAN-SYMIN-PD Wait for first P-SYNC-MINOR indication primitive, cancel requested in concurrent overlap in WRITE
K-WRES-SYMCF-PD Wait for first P-SYNC-MINOR confirm primitive, restart requested in concurrent overlap in WRITE
K-WCAN-SYMCF-PD Wait for first P-SYNC-MINOR confirm primitive, cancel requested in concurrent overlap in WRITE
K-WRT-SYMCF-PD Wait for first P-SYNC-MINOR confirm primitive after WRITE in concurrent overlap in WRITE
K-WRESTART-CAN-PD Restart cancel pending, wait for cancel or restart response PdU in concurrent overlap in WRITE

A.4.4 Specific actions - bulk data transfer

Relabel A.4.4:

A.4.4.1 Normal access (non-overlapped)

Add the following sub-clause.

A.4.4.2 Consecutive and Concurrent access

[2] Add a PDU to the current PSDU and terminate the current PSDU.

[15] Preserve the PDU for further processing

[16] Add a PDU to the current PSDU and optionally terminate the current PSDU, according to local decision.

[18] Add the data given on the F-DATA request to the current PSDU. Optionally (depending upon local system considerations) terminate the PSDU.

[21] Unset discard indicator.

[25] Terminate the current PSDU.

[44] Increment the bulk transfer number.

[47] Preserve the primitive parameters for subsequent processing. In some states, it happens that when F-CANCEL primitive is preserved, there is already an F-RESTART primitive preserved: in this case, the F-RESTART primitive shall be discarded.

[401] Place request in request queue if request not already in the queue.

[402] Add a PDU to the current PSDU and terminate the current PSDU or optionally send the PDU when the current PSDU is terminated depending upon local system considerations.

[403] Use as parameter the user data from P-SYMIN.

[404] Place transfer end request in TE request queue if request not already in the queue.

[405] Remove first TE request from TE request queue and update the last TE confirm received and remove corresponding

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entry for TN received in checkpoint table.

[406] Remove first transfer request from transfer request queue.

[407] Place current TN in DE request queue.

[408] Remove first DE request from DE request queue.

[409] Set indicator to read.

[410] Set indicator to write.

[411] Mark the next transfer request (to show that the current TN has been updated in the checkpoint table)

[412] Add 1 to current transfer number and in checkpoint table corresponding to TN, set TN, BTN to be the current TN and BTN and set checkpoint counter to zero.

[413] Set BTN to be SBTN.

[414] Place current TN in DE indication queue.

[415] Remove first DE indication from DE indication queue.

[416] Send PDU with parameters: TN set to BTN - SBTN and TN of last TE confirm (or confirms) received as user data on a P-Resync request (or response) with second item set as abandon. (*Init read)

[417] Send PDU with parameters: TN set to BTN - SBTN and TN of last TE request (or requests) issued as user data on a P-Resync request (or response) with first item set as abandon. (* init write)

[418] Send PDU with parameters: TN set to BTN - SBTN and TN of last TE response (or response) issued as user data on a P-Resync request (or response) with first item set as abandon. (*resp read)

[419] Send PDU with parameters: TN set to BTN - SBTN and TN of last TE indication (or indications) received as user data on a P-Resync request (or response) with second item set as abandon. (*resp write)

[420] Clear queues and variables except BTN and the NSPNs.

[421] Reissue TE read requests and remove any TE write requests from TE request queue (or queues).

[425] PDU with TN and the checkpoint identifier is sent as user data on a P-RESYNC response primitive with first resync item set to restart and the first resync point serial number equal to those received on the P-RESYNC indication

[426] PDU with TN and the checkpoint identifier is sent as user data on a P-RESYNC request primitive with second resync item set to restart and the second resync point serial number equal to the sum of the checkpoint identifier, on the F-RESTART primitive, and the synchronization offset of the corresponding TN plus 1.

[427] PDU with TN and the checkpoint identifier is sent as user data on a P-RESYNC request primitive with first resync item set to restart and the first resync point serial number equal to the sum of the checkpoint identifier, on the F-RESTART primitive, and the synchronization offset of the corresponding TN plus 1.

[428] PDU with TN and the checkpoint identifier is sent as user data on a P-RESYNC response primitive with second resync item set to restart and the second resync point serial number equal to those received on the P-RESYNC indication.

[429] Place Transfer-end response in TE response queue if response is not already in the queue.

[430] Remove corresponding TE response from TE response queue and remove corresponding entry from checkpoint entry table.

[431] Update the TN for the last transfer end indication.

[432] Use as parameter the TN and the TN of the last transfer end confirm (or confirms) received. (*init read)

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[433] Use as parameter the TN and the TN of the last transfer end request (or requests) issued. (init write)

[434] If the response queue is not empty, remove TE responses from its queue up to TN of confirm received on the indication.

[435] Use as parameters the TN and the TN of the last transfer end indication (or indications) received. (*resp write)

[436] Use as parameter the TN and the TN of the last transfer end response (or responses) issued. (*resp read)

[438] Send PDU as user data with BTN = smaller of the BTN and the (transfer number on Cancel + SBTN) on a P-RESYNC request or response primitive with second item set to abandon..

[439] Send PDU as user data with BTN = smaller of the BTN and the (transfer number on Cancel + SBTN) on a P-RESYNC request or response primitive with first item set to abandon..

[440] If the DE queues are not empty, remove from the end of queues entries up to but not including the entry for TN, the smallest TN corresponding to the BTN

[441] Reissue Read requests with TN > current TN and remove any write requests from transfer request queue (or queues).

[444] Use (BTN received -SBTN) as the transfer number parameter.

[445] Set user data to TN and checkpoint identifier of I-CHECK request (or response) primitive.

[446] If there is no change in TN then use the TN and the checkpoint identifier received as parameters; otherwise use the new TN and the (final checkpoint identifier of the new TN +1) as parameters.

[447] Clear R/W indicator.

[449] The smaller of the BTN and the (TN received + SBTN) becomes the new BTN and the smallest TN in the checkpoint entry table corresponding to the new BTN becomes the new TN.

[451] Use for the sync point serial number, the checkpoint received plus the offset for the TN specified in F-CHECK.

[452] Use the TN in user data of P-SYMCF and use for checkpoint the sync point serial number minus the offset for the TN.

[453] Set discard indicator and set the outstanding checkpoint counter(s) for entries >= TN to zero.

[454] Increment the checkpoint identifier expected for the TN specified in F-CHECK.

[455] Increment the outstanding checkpoint counter for the TN specified in F-CHECK.

[456] Decrement the outstanding checkpoint counter for the TN specified in F-CHECK according to the checkpoint number confirmed (see 15.3.2).

[457] Set the checkpoint identifier expected for the corresponding TN to one.

[458] Set the synchronization offset for the corresponding TN to the value of the second NSPN minus the checkpoint identifier expected.

[459] Set the checkpoint identifier expected to the value negotiated plus one for the TN.

[460] Discard any user data not yet delivered and set outstanding checkpoint counter(s) for entries >= TN to zero.

[461] Use TN as the parameter.

[462] The checkpoint identifier for the TN shall be equal to the value received on the PDU.

[463] Reissue TE write response and remove any TE read response from TE response queue (or queues).

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[464] Add 1 to the first NSPN (sender).

[465] Add 1 to the second NSPN (receiver).

[466] Set the first NSPN equal to the synch point serial number negotiated with the presentation service provider.

[467] Set the second NSPN equal to the synch point serial number negotiated with the presentation service provider.

[468] Store the synchronization point serial number provided by the presentation service provider as the first NSPN.

[469] Store the synchronization point serial number provided by the presentation service provider as the second NSPN.

[470] Set the synchronization offset for the corresponding TN to the value of the first NSPN minus the checkpoint identifier expected.

[471] For all but the first entry in the checkpoint table that has a BTN = current BTN (if any), increment the BTN by 1.

Note - TN stands for RTN for concurrent overlap read entity and WTN for concurrent overlap write.

A.4.5 Predicates - bulk data transfer

Relabel A.4.5:

A.4.5.1 Normal access (non-overlapped)

Add the following sub-clause.

A.4.5.2 Consecutive and Concurrent access

P8: The context is not within the defined context set.

P14: The synchronization point exceeds 999 998, exceeding the session limitation.

P15: Discard indicator is set.

P27: The outstanding checkpoint counter exceeds the agreed maximum.

P400: The consecutive overlap functional unit has been negotiated.

P401: The Symm Sync functional unit of Session has been negotiated.

P402: The expected checkpoint identifier for the TN equals the sync point serial number received minus the offset for the TN.

P403: The next request is marked (indicating that TN has already been updated in the checkpoint table)

P404: Next transfer is read.

P405: Next transfer is write.

P406: Number in transfer queue exceeds limit set in open.

P407: The symm resync functional unit has been negotiated.

P408: The Data end request queue is empty.

P409: Read indicator is set.

P410: Transfer request queue is empty.

P411: The data end indication queue is empty.

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P412: Last transfer end confirm TN received < last transfer end response TN issued.

P413: Cancel read or restart read or transfer-end read.

P414: Cancel write or restart write or transfer-end write.

P415: Last transfer end indication TN received < last transfer end request TN issued.

P416: TN on TRERP PDU = TN of last transfer indication received.

P417: Cancel PDU preserved

P418: The transfer end request queue is not empty.

P419: Complete re-issue of transfer end requests

P420: Complete re-issue of transfer end response.

P421: TN > last TN in TE request queue.

P422: Last transfer end indication TN received > TN of last item in TE response queue.

P423: The TE response is already in the response queue and the TN of Transfer end response > TN of last TN confirm received by the initiating entity.

P424: The write indicator is set.

P425: On the Restart, Recover or Cancel primitive, the TN confirm (or confirms) received by initiator < the TN of last item in TE response queue (or queues)

P426: On the Restart, Recover or Cancel primitive, the TN indication (or indications) received by the responder < the TN of last item in TE request queue (or queues)

P427: TN of transfer end primitive = TN of last item in TE queue (or the last item removed from the queue if the TE queue is empty)

P428: TN in TRERQ PDU <= last transfer end indication TN received.

P429: TN > Last TE end indication + 1.

P430: Next TE request in queue is read.

P431: There are transfer requests with TN > current TN in the transfer request queue (or queues).

P432: THe TE request is already in a TE request queue and the TN of transfer end request > the last TN indication received by the responding entity.

P433 Complete re-issue of transfer request.

P434: There is no next transfer request.

P436: Request already in queue.

P437: TN=1

P447: Both activity types are cleared

Note - TN stands for RTN for concurrent overlap read entity and WTN for concurrent overlap write entity.

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A.4.6 Initiating state tables - bulk data transfer

Relabel A.4.6:

A.4.6.1 Normal access (non-overlapped) - Initiator

Relabel A.4.7:

A.4.6.2 Detailed entries - normal access

Add the following sub-clauses.

A.4.6.3 Consecutive access - Initiator

STATE / EVENT	Q-DXFRIDLE	Q-DXFRIDLE-REC	Q-REA-SYMIN-PD	Q-RES-SYMIN-PD	Q-CAN-SYMIN-PD	Q-READ	Q-I-READ-ENDING	Q-R-XFER-ENDING	Q-WRT-SYMCF-PD	Q-RES-SYMCF-PD	Q-CAN-SYMCF-PD	Q-WRITE	Q-I-WRT-ENDING	Q-W-XFER-ENDING	Q-CANCEL-PD	Q-I-CANCEL-PD	Q-RRESTART-PD	Q-WRESTART-PD	Q-I-RRESTART-PD	Q-I-WRESTART-PD	Q-RESTART-CAN-PD
I-REARQ	1	35	45			45	64	56	47			47	47	66							
I-WRTRQ	2	36	46			46	46	65	48			48	48	65							
I-DATRQ									4			4		51							
I-DAERQ									5			5		52							
DATIN						6	49	49							41		41				
DAERQ						8	50	50							41		41				
I-TRERQ							9						10								
TRERP								11						3							
I-CANRQ			31	31		12	12	54	34	34		7					38	38	12	7	
CANRP															13						
CANRQ						14			14			14	14	14	15		14	14	14	14	39
I-CANRP																16					
I-CHKRQ									17			17									
P-SYMCF									32	60	7	18	37	37	41						
P-SYMIN			29	21	12	19	42	42							41						
I-CHKRP						20	20	63													
I-RESRQ			30			21	21	59	33			22		60							
RESRP																	23	24			54
RESRQ						25		62	26			26	26	26			43	44			
I-RESRP																			27	28	

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A.4.6.4 Detailed entries - consecutive access

1:	P400&(~P401|~P407):	L-ERRABT	=>samestate
	P400&P401&P407:	[420],[401],[409],[44],[412],[413],[457],[458],REARQ[2]	=>Q-REA-SYMIN-PD
2:	P400&(~P401|~P407):	L-ERRABT	=>samestate
	P400&P401&P407:	[420],[401],[410],[44],[412],[413],WRTRQ[2],[464],	
	P14:	L-ERRABT	=>samestate
	~P14:	P-SYMRQ,[457],[470]	=>Q-WRT-SYMCF-PD
3:	P15:		=>samestate
	~P15:	I-TRECF,[405],[406],	
	P410:		=>Q-DXFRIDLE
	~P410&P409:	[412],[411],[457],[458]	=>Q-READ
	~P410&P424&P408&P427:		=>Q-WRITE
	~P410&P424&~P408&P427:		=>Q-I-WRT-ENDING
	~P410&~P430&~P427:		=>Q-W-XFER-ENDING
4:	P8:	L-ERRABT	=>samestate
	~P8:	P-DATRQ[18]	=>samestate
5:		DAERQ[16],[407]	=>Q-I-WRT-ENDING
6:	P15:		=>samestate
	~P15:	I-DATIN	=>samestate
7:		[453],[460],CANRQ[417]	=>Q-CANCEL-PD
8:	P15:		=>samestate
	~P15:	I-DAEIN,[414],	
	~P404&~P405:	[447]	=>Q-I-READ-ENDING
	P404&~P403:	[412],[411],[409],[457],[458]	=>Q-I-READ-ENDING
	P404&P403:	[409]	=>Q-I-READ-ENDING
	P405:	[410]	=>Q-I-READ-ENDING
9:	P432:	TRERQ[402]	=>samestate
	~P432:	[415],TRERQ[432][402],[404],[471],	
	P404&~P403:	[44],[409],[412],[411],[457],[458]	=>Q-R-XFER-ENDING
	P404&P403:	[44],[409]	=>Q-R-XFER-ENDING
	P405:	[44],[410],[412],[411],[457],[470]	=>Q-R-XFER-ENDING
	~P404&~P405:	[447]	=>Q-R-XFER-ENDING
10:		[408],TRERQ[402],[432],[404],[471],	
	P404:	[44],[409]	=>Q-W-XFER-ENDING
	P405&~P403:	[44],[410],[412],[411],[457],[470]	=>Q-W-XFER-ENDING
	P405&P403:	[44],[410]	=>Q-W-XFER-ENDING
	~P404&~P405:	[447]	=>Q-W-XFER-ENDING
11:	P15:		=>samestate
	~P15:	I-TRECF,[405],[406],	
	P410&P427:		=>Q-DXFRIDLE
	P410&~P427:		=>samestate
	~P410&P409&P411&P427:		=>Q-READ
	~P410&P424&P408&P427:		=>Q-WRITE
	~P410&P424&~P408&P427:		=>Q-I-WRT-ENDING
	~P410&P409&~P411&P427:		=>Q-I-READ-ENDING
	~P410&~P427&P430		=>Q-R-XFER-ENDING
	~P410&~P427&~P430		=>Q-W-XFER-ENDING

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12:	[453],[460],CANRQ[416]	=>Q-CANCEL-PD
13: ~P414&P413:	[449],[469],[21],I-CANCF[461],[440]	=>Q-DXFRIDLE
P414&~P413:	[449],[468],[21],I-CANCF[461],[440]	=>Q-DXFRIDLE
14: ~P414&P413:	[449],[469],[453],[460],I-CANIN[461]	=>Q-I-CANCEL-PD
P414&~P413:	[449],[468],[453],[460],I-CANIN[461]	=>Q-I-CANCEL-PD
15: ~P413&P414:	[449],CANRP[417],[468],[21],I-CANCF[461],[440]	=>Q-XFRIDLE
~P414&P413:	[449],CANRP[416],[469],[21],I-CANCF[461],[440]	=>Q-XFRIDLE
16: ~P413&P414:	[468],[21],CANRP[417],[440]	=>Q-XFRIDLE
~P414&P413:	[469],[21],CANRP[416],[440]	=>Q-XFRIDLE
17:	[25],[454],[464],	
~P14:	P-SYMRQ[445]	=>samestate
P14:	L-ERRABT	=>samestate
18:	I-CHKCF[452]	=>samestate
19: ~P27&P402:	I-CHKIN[403],[465],[454]	=>samestate
P27|~P402:	L-ERRABT	=>samestate
20:	P-SYMRP[451][445]	=>samestate
21:	[453],RESRQ[426]	=>Q-RRESTART-PD
22:	[453],RESRQ[427]	=>Q-WRESTART-PD
23:	[449],[467],[459],[458],[21],	
P418:	I-RESCF[446]	=>Q-R-XFER-ENDING
~P418:	I-RESCF[446]	=>Q-READ
24:	[449],[466],[459],[470],[21],	
P418:	I-RESCF[446]	=>Q-W-XFER-ENDING
~P418:	I-RESCF[446]	=>Q-WRITE
25:	[449],I-RESIN[446],[460]	=>Q-I-RRESTART-PD
26:	[449],I-RESIN[446]	=>Q-I-WRESTART-PD
27: P418:	[467],[459],[458],RESRP[428],[440]	=>Q-R-XFER-ENDING
~P418&P411:	[467],[459],[458],RESRP[428],[440]	=>Q-READ-ENDING
~P418&~P411:	[467],[459],[458],RESRP[428],[440]	=>Q-READ
28: P418:	[466],[459],[470],RESRP[425],[440]	=>Q-W-XFER-ENDING
~P418&P408:	[466],[459],[470],RESRP[425],[440]	=>Q-I-WRT-ENDING
~P418&~P408:	[466],[459],[470],RESRP[425],[440]	=>Q-WRITE
29:	[465],[458],P-SYMRP	=>Q-READ
30:	[453],[47]	=>Q-RES-SYMIN-PD
31:	[453],[47]	=>Q-CAN-SYMIN-PD
32:	[470]	=>Q-WRITE
33:	[453],[47]	=>Q-RES-SYMCF-PD
34:	[453],[47]	=>Q-CAN-SYMCF-PD
35:	REARQ[2],[458],[409]	=>Q-READ-SYMIN-PD

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36:	[458],WRTRQ[2],[410],[464],	
P14:	L-ERRABT	=>samestate
~P14:	P-SYMRQ	=>Q-WRT-SYMCF-PD
37: ~P421:	L-ERRABT	=>samestate
P421:	I-CHKCF[452]	=>samestate
38:	[47]	=>Q-RESTART-CAN-PD
39: ~P413&P414:	[449],CANRP[417],[466],[21],I-CANCF[461],[440]	=>Q-XFRIDLE
~P414&P413:	[449],CANRP[416],[467],[21],I-CANCF[461],[440]	=>Q-XFRIDLE
41:		=>samestate
42: ~P409:	L-ERRABT	=>samestate
P409:	[455],	
~P27&P402:	I-CHKIN[403],[465],[454]	=>samestate
P27|~P402:	L-ERRABT	=>samestate
43:	[449],[467],[459],[458],RESRP[428],I-RESCF[446],[440],[43],	
P418:		=>Q-R-XFER-ENDING
~P411&~P418:		=>Q-READ-ENDING
P411&~P418:		=>Q-READ
44:	[449],[466],[459],[470],RESRP[425],I-RESCF[446],[440],[43],	
P418:		=>Q-W-XFER-ENDING
~P418&~P408:		=>Q-I-WRT-ENDING
~P418&P408:		=>Q-WRITE
45:	[401],REARQ[2]	=>samestate
46:	[401],WRTRQ[2]	=>samestate
47:	[401],REARQ[402]	=>samestate
48:	[401],WRTRQ[402]	=>samestate
49: ~P409:	L-ERRABT	=>samestate
P15:		=>samestate
~P15:	I-DATIN	=>samestate
50: ~P409:	L-ERRABT	=>samestate
P15:		=>samestate
~P15:	I-DAEIN,[414],	
~P404&~P405:	[447]	=>samestate
P404&~P403:	[412],[411],[409],[457],[458]	=>samestate
P404&P403:	[409]	=>samestate
P405:	[410]	=>samestate
51: ~P424:	L-ERRABT	=>samestate
P8:	L-ERRABT	=>samestate
~P8:	P-DATRQ[18]	=>samestate
52: ~P424:	L-ERRABT	=>samestate
P424:	DAERQ[16],[407]	=>samestate
54: P413:	[453],[460],CANRQ[416]	=>Q-CANCEL-PD
P414:	[453],[460],CANRQ[417]	=>Q-CANCEL-PD
56: P434:	[401],[409],[44],[412],[411],[457],[458],REARQ[402]	=>samestate
~P434:	[401],REARQ[402]	=>samestate

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59: ~P409&~P424:	L-ERRABT	=>samestate
P409:	[453],RESRQ[426],[460]	=>Q-RRESTART-PD
P424:	[453],RESRQ[427]	=>Q-WRESTART-PD
60: ~P424:	L-ERRABT	=>samestate
P424:	[453],RESRQ[427]	=>Q-WRESTART-PD
62: ~P409|~P424:	L-ERRABT	=>samestate
P409:	[449],I-RESIN[446],[460]	=>Q-I-RRESTART-PD
P424:	[449],[460],I-RESIN[446]	=>Q-I-WRESTART-PD
63: ~P409:	L-ERRABT	=>samestate
P409:	[456],P-SYMRP[451][455]	=>samestate
64: P434:	[401],[409],[412],[411],[457],[458],REARQ[402]	=>samestate
~P434:	[401],REARQ[402]	=>samestate
65: P434:	[401],[410],[44],[412],[411],[457],[470],WRTRQ[402]	=>samestate
~P434:	[401],WRTRQ[402]	=>samestate
66: P434:	[401],[44],[409],REARQ[402]	=>samestate
~P434:	[401],REARQ[402]	=>samestate

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A.4.6.5 Concurrent access - Initiator

A.4.6.5.1 Concurrent read access - Initiator

STATE / EVENT	K-R-DXFRIDLE	K-R-DXFRIDLE-REC	K-REA-SYMIN-PD	K-RRES-SYMIN-PD	K-RCAN-SYMIN-PD	K-READ	K-I-READ-ENDING	K-R-XFER-ENDING	K-RCANCEL-PD	K-I-RCANCEL-PD	K-RRESTART-PD	K-I-RRESTART-PD	K-RRESTART-CAN-PD
I-REARQ	1	35	47			47	64	56					
DATIN						6	49	49	41		41		
DAERQ						8	50	50	41		41		
I-TRERQ-R							9						
TRERP-R								11					
I-CANRQ-R			31	31		12	12	54			38	12	
CANRP-R									13				
CANRQ-R						14			15		14	14	39
I-CANRP-R										16			
P-SYMIN			29	21	12	19	42	42	41				
I-CHKRP						20	20	63					
I-RESRQ-R			30			21	21	59					
RESRP-R											23		54
RESRQ-R						25		62			43		
I-RESRP-R												27	

A.4.6.5.2 Detailed entries - concurrent read access

1: P440&(~P401|~P407): L-ERRABT =>samestate
P440&P401&P407: [420],[401],[409],[44],[412],[413],[457],[458]REARQ[2] =>K-REA-SYMIN-PD

6: P15: =>samestate
~P15: I-DATIN =>samestate

8: P15: =>samestate
~P15: I-DAEIN,[414],
~P404: [447] =>K-I-READ-ENDING
P404&~P403: [412],[411],[409],[457],[458] =>K-I-READ-ENDING
P404&P403: [409] =>K-I-READ-ENDING

9: P432: TRERQ-R[402] =>samestate
[415],TRERQ-R[432][402],[404],[471],

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P404&~P403:	[44],[409],[412],[411],[457],[458]	=>K-R-XFER-ENDING
P404&P403:	[44],[409]	=>K-R-XFER-ENDING
~P404:	[447]	=>K-R-XFER-ENDING
11: P15:		=>samestate
~P15:	I-TRECF-R,[405],[406],	
P410&P427:		=>K-R-DXFRIDLE
P410&~P427:		=>samestate
~P410&P409&P411&P427:		=>K-READ
~P410&P409&~P411&P427:		=>K-I-READ-ENDING
~P410&~P427:		=>K-R-XFER-ENDING
12:	[453],[460],CANRQ-R[416]	=>K-RCANCEL-PD
13:	[449],[469],[21],I-CANCF-R[461],[440]	=>K-R-DXFRIDLE
14:	[449],[469],[453],[460],I-CANIN-R[461]	=>K-I-RCANCEL-PD
15:	[449],CANRP-R[416],[469],[21],I-CANCF-R[461],[440]	=>K-R-DXFRIDLE
16:	[21],CANRP-R[416],[440],[469]	=>K-R-DXFRIDLE
19: ~P27&P402:	I-CHKIN[403],[465],[454]	=>samestate
P27|~P402:	L-ERRABT	=>samestate
20:	[456],P-SYMRP[451][445]	=>samestate
21:	[453],RESRQ-R[426],[460]	=>K-RRESTART-PD
23:	[449],[467],[459],[458],[21],	
P418:	I-RESCF-R[446]	=>K-R-XFER-ENDING
~P418:	I-RESCF-R[446]	=>K-READ
25:	[449],I-RESIN-R[446],[460]	=>K-I-RRESTART-PD
27: P418:	[467],[459],[458],RESRP-R[428],[440]	=>K-R-XFER-ENDING
~P418&P411:	[467],[459],[458],RESRP-R[428],[440]	=>K-READ-ENDING
~p418&~p411:	[467],[459],[458],RESRP-R[428],[440]	=>K-READ
29:	[465],[458],P-SYMRP	=>K-READ
30:	[453],[47]	=>K-RRES-SYMIN-PD
31:	[453],[47]	=>K-RCAN-SYMIN-PD
35:	REARQ[2],[458],[409]	=>K-REA-SYMIN-PD
38:	[47]	=>K-RRESTART-CAN-PD
39:	[449],CANRP-R[416],[467],[21],I-CANCF-R[461],[440]	=>K-R-DXFRIDLE
41:		=>samestate
42: ~P409:	L-ERRABT	=>samestate
P409:	[455],	
~P27&P402:	I-CHKIN[403],[465],[454]	=>samestate
P27|~P402:	L-ERRABT	=>samestate
43:	[449],[467],[459],[458],[21], RESRP-R[428],I-RESCF-R[446],[440],	
P418:		=>K-R-XFER-ENDING
~P411&~P418:		=>K-READ-ENDING

--`,,`-`-`,,`,,`,`,,`---

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P411&~P418:		=>K-READ
47:	[401],REARQ[402]	=>samestate
49: ~P409:	L-ERRABT	=>samestate
P15:		=>samestate
~P15:	I-DATIN-R	=>samestate
50: ~P409:	L-ERRABT	=>samestate
P15:		=>samestate
~P15:	I-DAEIN-R,[414],	
~P404:	[447]	=>samestate
P404&~P403:	[412],[411],[409],[457],[458]	=>samestate
P404&P403:	[409]	=>samestate
54: P409: [453],[460],CANRQ-R[416]		=>K-RCANCEL-PD
~P409:	L-ERRABT	=>samestate
56: P434:	[401],[409],[44],[412],[411],[457],[458],REARQ[402]	=>samestate
~P434:	[401],REARQ[402]	=>samestate
59: ~P409	L-ERRABT	=>samestate
P409:	[453],RESRQ-R[426],[460]	=>K-RRESTART-PD
62: ~P409:	L-ERRABT	=>samestate
P409:	[449],I-RESIN-R[446],[460]	=>K-I-RRESTART-PD
63: ~P409:	L-ERRABT	=>samestate
P409:	[456],P-SYMRP[451][455]	=>samestate
64: P434:	[401],[409],[412],[411],[457],[458],REARQ[402]	=>samestate
~P434:	[401],REARQ[402]	=>samestate

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A.4.6.5.3 Concurrent write access - Initiator

STATE / EVENT	K-DXFRIDLE	K-WDXFRIDLE-REC	K-WRITE-PD	K-WRESTART-SYMCF-PD	K-WCANCEL-SYMCF-PD	K-WRITE	K-WRESTART-ENDING	K-WCANCEL-ENDING	K-I-WRT-ENDING	K-W-DXFRIDLE	K-W-XFER-ENDING	K-I-WRT-SYMCF-PD	K-WRESTART-CANCEL-PD
I-WRTRQ	2	36	48			48	46	65					
I-DATRQ			4			4		51					
I-DAERQ			5			5		52					
I-TRERQ-W							19						
TRERP-W								3					
I-CANRQ-W			34	34		7				38	7		
CANRP-W									13				
CANRQ-W			14			14	14	14	15	14	14	39	
I-CANRP-W									16				
I-CHKRQ-W			17			17							
P-SYMCF			32	60	7	18	37	37	41				
I-RESRQ-W			33			22		60					
RESRP-W										24		54	
RESRQ-W			26			26	26	26		44			
I-RESRP-W											28		

A.4.6.5.4 Detailed entries - concurrent write access

2:	P440&(~P401|~P407):	L-ERRABT	=>samestate
	P440&P401&P407:	[420],[401],[410],[44],[412],[413],WRTRQ[2],[464],	
	P14:	L-ERRABT	=>samestate
	~P14:	P-SYMRQ,[457],[470]	=>K-WRT-SYMCF-PD
3:	P15:		=>samestate
	~P15:	I-TRECF-W,[405],[406],	
	P410:		=>K-W-DXFRIDLE
	~P410&P424&P408&P427:		=>K-WRITE
	~P410&P424&~P408&P427:		=>K-I-WRT-ENDING
	~P410&~P430&~P427:		=>K-W-XFER-ENDING
4:	P8:	L-ERRABT	=>samestate
	~P8:	P-DATRQ[18]	=>samestate
5:		DAERQ[16],[407]	=>K-I-WRT-ENDING

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7:	[453],[460],CANRQ-W[417]	=>K-WCANCEL-PD
10	[408],TRERQ-W[402],[432],[404],[471],	
P405&~P403:	[44],[410],[412],[457],[470]	=>K-W-XFER-ENDING
P405&P403:	[44],[410]	=>K-W-XFER-ENDING
~P405:	[447]	=>K-W-XFER-ENDING
13:	[449],[468],[21],I-CANCF-W[461],[440]	=>K-W-DXFRIDLE
14:	[449],[468],[453],[460],I-CANIN-W[461]	=>K-I-WCANCEL-PD
15: P418:	[449],CANRP-W[417],[468],[21],I-CANCF-W[461]	=>K-W-XFRIDLE
~P418:	[449],CANRP-W[417],[468],[21],I-CANCF-W[461],[440]	=>K-W-XFRIDLE
16:	[468],[21],CANRP-W[417],[440]	=>K-W-XFRIDLE
17:	[25],[454],[464],	
~P14:	P-SYMRQ[445]	=>samestate
P14:	L-ERRABT	=>samestate
18:	I-CHKCF[452]	=>samestate
22:	[453],RESRQ-W[427]	=>K-WRESTART-PD
24:	[449],[466],[459],[470],[21],	
P418:	I-RESCF-W[446]	=>K-W-XFER-ENDING
~P418:	I-RESCF-W[446]	=>K-WRITE
26:	[449],I-RESIN-W[446]	=>K-I-WRESTART-PD
28: P418:	[466],[459],[470],RESRP-W[425],[440]	=>K-W-XFER-ENDING
~P418&P408:	[466],[459],[470],RESRP-W[425],[440]	=>K-I-WRT-ENDING
~P418&~P408:	[466],[459],[470],RESRP-W[425],[440]	=>K-WRITE
32:	[458]	=>K-WRITE
33:	[453],[47]	=>K-WRES-SYMCF-PD
34:	[453],[47]	=>K-WCAN-SYMCF-PD
36:	[458],WRTRQ[2],[410],[464],	
P14:	L-ERRABT	=>samestate
~P14:	P-SYMRQ	=>K-WRT-SYMCF-PD
37: ~P421:	L-ERRABT	=>samestate
P421:	I-CHKCF[452]	=>samestate
38:	[47]	=>K-WRESTART-CAN-PD
39:	[449],CANRP-W[417],[466],[21],I-CANCF-W[461],[440]	=>K-W-XFRIDLE
41:		=>samestate
44:	[449],[466],[459],[470], RESRP-W[425],I-RESCF-W[446],[440],	
P418:		=>K-W-XFER-ENDING
~P408&~P418:		=>K-I-WRT-ENDING
~P418&P408:		=>K-WRITE
46:	[401],WRTRQ[2]	=>samestate

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48:	[401],WRTRQ[402]	=>samestate
51: ~P424:	L-ERRABT	=>samestate
P8:	L-ERRABT	=>samestate
~P8:	P-DATRQ[18]	=>samestate
52: ~P424:	L-ERRABT	=>samestate
P424:	DAERQ[16],[407]	=>samestate
54: P424:	[453],[460],CANRQ-W[417]	=>K-WCANCEL-PD
~P424:	L-ERRABT	=>samestate
60: ~P424:	L-ERRABT	=>samestate
P424:	[453],RESRQ-W[427]	=>K-WRESTART-PD
65: P434:	[410],[44],[412],[411],[457],[470],WRTRQ[402],[401]	=>samestate
~P434:	WRTRQ[402],[401]	=>samestate

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A.4.7 Responding entity state tables - bulk data transfer

Relabel A.4.8:

A.4.7.1 Normal access (non-overlapped) - Responder

Relabel A.4.9:

A.4.7.2 Detailed entries - normal access

Add the following sub-clauses.

A.4.7.3 Consecutive access - Responder

STATE / EVENT	Q-DXFRIDLE	Q-DXFRIDLE-REC	Q-REA-SYMCF-PD	Q-RES-SYMCF-PD	Q-CAN-SYMCF-PD	Q-READ	Q-READ-ENDING	Q-IR-XFER-ENDING	Q-WRT-SYMIN-PD	Q-RES-SYMIN-PD	Q-CAN-SYMIN-PD	Q-WRITE	Q-WRT-ENDING	Q-IW-XFER-ENDING	Q-CANCEL-PD	Q-ICANCEL-PD	Q-RRESTART-PD	Q-WRESTART-PD	Q-IRRESTART-PD	Q-IWRESTART-PD	Q-RESTART-CAN-PD
REARQ	1	36	47			47	64	64	47			47	47	47							
WRTRQ	2	37	48			48	48	65	48			48	48	63							
I-DATRQ			4			4	51	51													
I-DAERQ			5			5	52	52													
DATIN								49				6		49	41			41			
DAERQ								50				8		50	41			41			
TRERQ							9	9					10		41			41			
I-TRERP								11						43							
I-CANRQ			30	30		12		54	33	33		7	7	7			39	39	12	7	
CANRP															13						
CANRQ			14	14		14	14					14			44		14	14	14	14	40
I-CANRP																15					
I-CHKRQ			16			16	42	42													
P-SYMCF			28	20	12	18	38	38							41						
P-SYMIN									31	34	35	17			41						
I-CHKRP												19	19								
I-RESRQ			29			20	60	59	32			21	21	59							
RESRP																	22	23			54
RESRQ			24			24	24	62				25		25			45	46			
I-RESRP																			26	27	

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A.4.7.4 Detailed entries - consecutive access

1:	P400&(~P401|~P407):	L-ERRABT	=>samestate
	P400&P401&P407&P437:	[420],[401],[409],[44],[412],[413],I-REAIN,[464],	
	P400&P401&P407&~P437:	[401],[409],[44],[412],I-REAIN,[464],	
	P14:	L-ERRABT	=>samestate
	~P14:	P-SYMRQ,[457],[470]	=>Q-REA-SYMCF-PD
2:	P400&(~P401|~P407):	L-ERRABT	=>samestate
	P400&P401&P407&P437:	[420],[401],[410],[44],[412],[413],[457],[458],I-WRTIN	=>Q-WRT-SYMIN-PD
	P400&P401&P407&~P437:	[401],[410],[44],[412],[457],[458],I-WRTIN	=>Q-WRT-SYMIN-PD
4:	~P8:	P-DATRQ[18]	=>samestate
	P8:	L-ERRABT	=>samestate
5:		DAERQ[2],[407],[471],	
	~P404&~P405:	[447]	=>Q-I-READ-ENDING
	P405:	[44],[410]	=>Q-I-READ-ENDING
	P404&~P403:	[44],[412],[411],[409],[457],[470]	=>Q-I-READ-ENDING
	P404&P403:	[44],[409]	=>Q-I-READ-ENDING
6:	P15:		=>samestate
	~P15:	I-DATIN	=>samestate
7:		[453],[460],CANRQ[419]	=>Q-CANCEL-PD
8:	P15:		=>samestate
	~P15:	I-DAEIN,[414]	=>Q-WRT-ENDING
9:	P15:		=>samestate
	~P15:	[408],I-TREIN,[434],[431],	
	P405&~P403:	[410],[412],[411],[457],[458]	=>Q-I-RXFER-ENDING
	P405&P403:	[410]	=>Q-I-RXFER-ENDING
	~P405:		=>Q-I-RXFER-ENDING
10:	P15:		=>samestate
	~P15:	[415],I-TREIN,[434],[431],	
	P405&~P403:	[410],[412],[411],[457],[458]	=>Q-I-WXFER-ENDING
	P405&P403:	[410]	=>Q-I-WXFER-ENDING
	P404:	[409]	=>samestate
	~P405&~P404:	[447]	=>Q-I-WXFER-ENDING
11:	P423:	TRERP[402]	=>samestate
	~P423:	TRERP[435][402],[429],[406],	
	P410&P416:		=>Q-DXFRIDLE
	P410&~P416:		=>samestate
	~P410&P409&P408&P416:		=>Q-READ
	~P410&P409&~P408&P416:		=>Q-READ-ENDING
	~P410&P424&P411&P416:		=>Q-WRITE
	~P410&P424&~P411&P416:		=>Q-WRT-ENDING
	~P410&~P416&P404:		=>Q-I-RXFER-ENDING
	~P410&~P416&P405:		=>Q-I-WXFER-ENDING
12:		[453],[460],CANRQ[418]	=>Q-CANCEL-PD
13:	P413:	[449],[468],[21],I-CANCF[461],[440]	=>Q-DXFRIDLE
	P414:	[449],[469],[21],I-CANCF[461],[440]	=>Q-DXFRIDLE

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14: P413:	[449],[468],[453],[460],I-CANIN[461]	=>Q-I-CANCEL-PD
P414:	[449],[469],[453],[460],I-CANIN[461]	=>Q-I-CANCEL-PD
15: ~P413&P414:	[21],CANRP[419],[469],[440]	=>Q-DXFRIDLE
P413&~P414:	[21],CANRP[418],[468],[440]	=>Q-DXFRIDLE
16:	[25],[454],[464],	
~P14:	P-SYMRQ[445]	=>samestate
P14:	L-ERRABT	=>samestate
17: ~P27&P402:	I-CHKIN[403],[465],[454]	=>samestate
P27|~P402:	L-ERRABT	=>samestate
18:	I-CHKCF,[452]	=>samestate
19:	P-SYMRP[451][445]	=>samestate
20:	[453],RESRQ[427]	=>Q-RRESTART-PD
21:	[453],RESRQ[426]	=>Q-WRESTART-PD
22:	[449],[466],[459],[470],[21],	
P422:	I-RESCF[446]	=>Q-I-RXFER-ENDING
~P422:	I-RESCF[446]	=>Q-READ
23:	[449],[467],[459],[458],[21],	
P422:	I-RESCF[446]	=>Q-I-WXFER-ENDING
~P422:	I-RESCF[446]	=>Q-WRITE
24:	[449],I-RESIN[446]	=>Q-I-RRESTART-PD
25:	[449],[460],I-RESIN[446]	=>Q-I-WRESTART-PD
26: P422:	[466],[459],[470],RESRP[425],[440]	=>Q-I-RXFER-ENDING
~P422&P408:	[466],[459],[470],RESRP[425],[440]	=>Q-READ-ENDING
~P422&~P408:	[466],[459],[470],RESRP[425],[440]	=>Q-READ
27: P422:	[467],[459],[458],RESRP[428],[440]	=>Q-I-WXFER-ENDING
~P422&P411:	[467],[459],[458],RESRP[428],[440]	=>Q-WRT-ENDING
~P422&~P411:	[467],[459],[458],RESRP[428],[440]	=>Q-WRITE
28:	[470]	=>Q-READ
29:	[453],[47]	=>Q-RES-SYMCF-PD
30:	[453],[47]	=>Q-CAN-SYMCF-PD
31:	[465],[458],P-SYMRP	=>Q-WRITE
32:	[453],[47]	=>Q-RES-SYMIN-PD
33:	[453],[47]	=>Q-CAN-SYMIN-PD
34:	[465],P-SYMRP,[453],RESRQ[426]	=>Q-WRESTART-PD
35:	[465],P-SYMRP,[453],CANRQ[419]	=>Q-CANCEL-PD
36:	[470],I-REAIN,[464],[409]	
P14:	L-ERRABT	=>samestate
~P14:	P-SYMRQ	=>Q-READ-SYMCF-PD
37:	I-WRTIN,[458],[410]	=>Q-WRT-SYMIN-PD

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38: P429:	I-CHKCF[452]	=>samestate
~P429:	L-ERRABT	=>samestate
39:	[453],[47]	=>Q-RESTART-CAN-PD
40: ~P413&P414:	[449],CANRP[419],[467],[21],I-CANCF[461],[440]	=>Q-DXFRIDLE
P413&~P414:	[449],CANRP[418],[466],[21],I-CANCF[461],[440]	=>Q-DXFRIDLE
41:		=>samestate
42: ~P409:	L-ERRABT	=>samestate
P409:	[25],[454],[464],	
~P14:	P-SYMRQ[445]	=>samestate
P14:	L-ERRABT	=>samestate
43: P423:	TRERP[402],[435]	=>samestate
~P423:	TRERP[402],[435],[429],[406],[471],	
P410:		=>Q-DXFRIDLE
~P410&P409&~P403:	[44],[457],[470],[412],[411]	=>Q-READ
~P410&P409&P403:	[44]	=>Q-READ
~P410&P424&~P411&P416:	[44]	=>Q-WRT-ENDING
~P410&P424&P411&P416:	[44]	=>Q-WRITE
~P410&~P416:	[44]	=>Q-I-WXFER-ENDING
44: ~P413&P414:	[449],CANRP[419],[469],[21],I-CANCF[461],[440]	=>Q-DXFRIDLE
~P414&P413:	[449],CANRP[418],[468],[21],I-CANCF[461],[440]	=>Q-DXFRIDLE
45:	[449],[466],[459],[470],RESRP[425],I-RESCF[446],[440],[21],	
P422:		=>Q-I-RXFER-ENDING
~P408:		=>Q-READ-ENDING
P408&~P422:		=>Q-READ
46:	[449],[467],[459],[458],RESRP[428],I-RESCF[446],[440],[21],	
P422:		=>Q-I-WXFER-ENDING
~P411:		=>Q-WRT-ENDING
P411&~P422:		=>Q-WRITE
47:	[401],	
~P406:	I-REAIN	=>samestate
P406:	L-ERRABT	=>samestate
48:	[401],	
~P406:	I-WRTIN	=>samestate
P406:	L-ERRABT	=>samestate
49: ~P424:	L-ERRABT	=>samestate
P15:		=>samestate
~P15:	I-DATIN	=>samestate
50: ~P424:	L-ERRABT	=>samestate
P15:		=>samestate
~P15:	I-DAEIN,[414]	=>samestate
51: P8|~P409:	L-ERRABT	=>samestate
~P8&P409:	P-DATRQ[18]	=>samestate
52: ~P409:	L-ERRABT	=>samestate
P409:	DAERQ[2],[407],[471],	
P404&~P403:	[44],[412],[411],[457],[470]	=>samestate
P404&P403:	[44]	=>samestate
P405:	[44],[410]	=>samestate

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~P404&~P405:	[447]	=>samestate
54: ~P409|~P424:	L-ERRABT	=>samestate
P409:	[453],[460],CANRQ[418]	=>Q-CANCEL-PD
P424:	[453],[460],CANRQ[419]	=>Q-CANCEL-PD
59: ~P409|~P424:	L-ERRABT	=>samestate
P409:	[453],RESRQ[427]	=>Q-RRESTART-PD
P424:	[453],RESRQ[426]	=>Q-WRESTART-PD
60: P409:	[453],RESRQ[427]	=>Q-RRESTART-PD
~P409:	L-ERRABT	=>samestate
62: ~P409|~P424:	L-ERRABT	=>samestate
P409:	[449],I-RESIN[446]	=>Q-I-RRESTART-PD
P424:	[449],[460],I-RESIN[446]	=>Q-I-WRESTART-PD
63: P434:	[401],[410],[412],[411],[457],[458],	
~P434:	[401],	
~P406:	I-WRTIN	=>samestate
P406:	L-ERRABT	=>samestate
64:	[401],	
P434&~P406:	[409],[44],[412],[411],[457],[470],I-REAIN	=>samestate
~P434&~P406:	I-REAIN	=>samestate
P406:	L-ERRABT	=>samestate
65: P434:	[401],[410],[44],[412],[411],[457],[458],	
~P434:	[401],	
~P406:	I-WRTIN	=>samestate
P406:	L-ERRABT	=>samestate

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A.4.7.5 Concurrent access - Responder

A.4.7.5.1 Concurrent read access - Responder

STATE / EVENT	K-R-DXFRIDLE	K-R-DXFRIDLE-REC	K-REA-SYMCF-PD	K-RRES-SYMCF-PD	K-RCAN-SYMCF-PD	K-READ	K-READ-ENDING	K-I-RXFER-ENDING	K-RCANCEL-PD	K-I-RCANCEL-PD	K-RRESTART-PD	K-I-RRESTART-PD	K-RRESTART-CAN-PD
REARQ	1	36	47			47	64	64					
I-DATRQ			4			4	51	51					
I-DAERQ			5			5	52	52					
TRERQ-R							9	9	41				
I-TRERP-R								11					
I-CANRQ-R			30	30		12		54			39	12	
CANRP-R									13				
CANRQ-R			14	14		14	14		44		14	14	40
I-CANRP-R										15			
I-CHKRQ			16			16	42	42					
P-SYMCF			28	20	12	18	38	38	41				
I-RESRQ-R			29			20	60	60					
RESRP-R											22		54
RESRQ-R			24			24	62	62			45		
I-RESRP-R												26	

A.4.7.5.2 Detailed entries - concurrent read access

1:	P440&(~P401|~P407):	L-ERRABT	=>samestate
	P440&P401&P407&P437:	[420],[401],[409],[44],[412],[413],I-REAIN,[464],	
	P440&P401&P407&~P437:	[401],[409],[44],[412],I-REAIN,[464],	
	P14:	L-ERRABT	=>samestate
	~P14:	P-SYMRQ,[457],[470]	=>K-READ-SYMCF-PD
4:	~P8:	P-DATRQ[18]	=>samestate
	P8:	L-ERRABT	=>samestate
5:		DAERQ[2],[407],[471],	
	~P404:	[447]	=>K-I-READ-ENDING
	P404&~P403:	[44],[412],[411],[409],[457],[470]	=>K-I-READ-ENDING
	P404&P403:	[44],[409]	=>K-I-READ-ENDING

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9:	P15:		=>samestate
	~P15	[408],I-TRERQ-R,[434],[431],	
	P404&~P403:	[412],[411],[457],[470],	
			=>K-I-RXFER-ENDING
11	P423:	TRERP-R[402],	
	~P423:	TRERP-R[402],[435],[429],[406],	
	P410&P416:		=>K-R-DXFRIDLE
	P410&~P416:		=>samestate
	~P410&P409&P408&P416:		=>K-READ
	~P410&P409&~P408&P416:		=>K-READ-ENDING
	~P410&~P416:		=>K-I-RXFER-ENDING
12:		[453],CANRQ-R[418]	=>K-RCANCEL-PD
13:		[449],[468],[21],I-CANCF-R[461],[440]	=>K-R-DXFRIDLE
14:		[449],[468],[453],I-CANIN-R[461]	=>K-I-RCANCEL-PD
15:		[21],CANRP-R[418],[468],[440]	=>K-R-DXFRIDLE
16:		[25],[454],[464],	
	~P14:	P-SYMRQ[445]	=>samestate
	P14:	L-ERRABT	=>samestate
18:		I-CHKCF[452]	=>samestate
20:		[453],RESRQ-R[427]	=>K-RRESTART-PD
22:		[449],[466],[459],[470],[21],	
	P422:	I-RESCF-R[446]	=>K-RXFER-ENDING
	~P422:	I-RESCF-R[446]	=>K-READ
24:		[449],I-RESIN-R[446]	=>K-I-RRESTART-PD
26:	P422:	[466],[459],[470],RESRP-R[425],[440]	=>K-I-RXFER-ENDING
	~P422&P408:	[466],[459],[470],RESRP-R[425],[440]	=>K-READ-ENDING
	~P422&~P408:	[466],[459],[470],RESRP-R[425],[440]	=>K-READ
28:		[470]	=>K-READ
29:		[453],[47]	=>K-RRES-SYMCF-PD
30:		[453],[47]	=>K-RCAN-SYMCF-PD
36:		[470],I-REAIN,[464],[409],	
	P14:	L-ERRABT	=>samestate
	~P14:	P-SYMRQ	=>K-REA-SYMCF-PD
38:	P429:	I-CHKCF[452]	=>samestate
	~P429:	L-ERRABT	=>samestate
39:		[453],[47]	=>K-RRESTART-CAN-PD
40:		[449],CANRP-R[418],[466],[21],I-CANCF-R[461],[440]	=>K-R-DXFRIDLE
41:			=>samestate
42:	~P409:	L-ERRABT	=>samestate
	P409:	[25],[454],[464],	
	~P14:	P-SYMRQ[445]	=>samestate
	P14:	L-ERRABT	=>samestate

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44:	[449],CANRP-R[418],[468],[21],I-CANCF-R[461],[440]	=>K-R-DXFRIDLE
45:	[449],[466],[459],[470],[2], RESRP-R[425],I-RESCF-R[446],[440],	
P422:		=>K-I-RXFER-ENDING
~P408:		=>K-READ-ENDING
P408&~P422:		=>K-READ
47:	[401],	
~P406:	I-REAIN	=>samestate
P406:	L-ERRABT	=>samestate
51: P8|~P409:	L-ERRABT	=>samestate
~P8&P409:	P-DATRQ[18]	=>samestate
52: ~P409:	L-ERRABT	=>samestate
P409:	DAERQ[2],[407],[471],	
P404&~P403:	[44],[412],[411],[457],[470]	=>samestate
P404&P403:	[44]	=>samestate
~P404:	[447]	=>samestate
54: P409:	[453],CANRQ-R[418]	=>K-RCANCEL-PD
~P409:	L-ERRABT	=>samestate
60: P409:	[453],RESRQ-R[427]	=>K-RRESTART-PD
~P409:	L-ERRABT	=>samestate
62: ~P409:	L-ERRABT	=>samestate
P409:	[449],I-RESIN-R[446]	=>K-I-RRESTART-PD
64: P434:	[401],[409],[44],[412],[411],[457],[470],	
~P434:	[401],	
~P406:	I-REAIN	=>samestate
P406:	L-ERRABT	=>samestate

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A.4.7.5.3 Concurrent write access - Responder

STATE / EVENT	K-W-DXFRIDLE	K-W-DXFRIDLE-REC	K-WRT-SYMIN-PD	K-WRESS-SYMIN-PD	K-WCAN-SYMIN-PD	K-WRITE	K-WRT-ENDING	K-I-WXFER-ENDING	K-WCANCEL-PD	K-I-WCANCEL-PD	K-WRESTART-PD	K-I-WRESTART-PD	K-WRESTART-CAN-PD
WRTRQ	2	37	48			48	48	65					
DATRQ						6		49	41		41		
DAERQ						8		50	41		41		
TRERQ-W							10		41		41		
I-TRERP-W								43					
I-CANRQ-W			33	33		7	7	7			39	7	
CANRP-W									13				
CANRQ-W						14			44		14	14	40
I-CANRP-W										15			
P-SYMIN			31	34	35	17			41				
I-CHKRP						19	19						
I-RESRQ-W			32			21	21	59					
RESRP-W											23		54
RESRQ-W						25		25			46		
I-RESRP-W												27	

A.4.7.5.4 Detailed entries - concurrent write access

2: P440&(~P401|~P407): L-ERRABT =>samestate
P440&P401&P407&P437: [420],[401],[410],[44],[412],[413],[457],[458],I-WRTIN =>K-WRT-SYMIN-PD
P440&P401&P407&~P437: [401],[410],[44],[412],[457],[458],I-WRTIN =>K-WRT-SYMIN-PD

6: P15: =>samestate
~P15: I-DATIN =>samestate

7: [453],[460],CANRQ-W[419] =>K-WCANCEL-PD

8: P15: =>samestate
~P15: I-DAEIN,[414] =>K-WRT-ENDING

10: P15: =>samestate
~P15: [415],I-TREIN-W,[434],[431],
P405&P403: [410] =>K-I-WXFER-ENDING
P405&~P403: [410],[412],[411],[457],[458] =>K-I-WXFER-ENDING

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~P405:	[447]	=>K-I-WXFER-ENDING
13:	[449],[469],[21],I-CANCF-W[461],[440]	=>K-W-DXFRIDLE
14:	[449],[469],[453],[460],I-CANIN-W[461]	=>K-I-WCANCEL-PD
15:	[21],CANRP-W[419],[469],[440]	=>K-W-DXFRIDLE
17: ~P27&P402:	I-CHKIN[403],[465],[454]	=>samestate
P27|~P402:	L-ERRABT	=>samestate
19:	P-SYMRP[451][445]	=>samestate
21:	[453],[460],RESRQ-W[426]	=>K-WRESTART-PD
23:	[449],[467],[459],[458],[21],	
P422:	I-RESCF-W[446]	=>K-I-WXFER-ENDING
~P422:	I-RESCF-W[446]	=>K-WRITE
25:	[449],[460],I-RESIN-W[446]	=>K-I-WRESTART-PD
27: P422:	[467],[459],[458],RESRP-W[428],[440]	=>K-I-WXFER-ENDING
~P422&P411:	[467],[459],[458],RESRP-W[428],[440]	=>K-WRT-ENDING
~P422&~P411:	[467],[459],[458],RESRP-W[428],[440]	=>K-WRITE
31:	[465],[458],P-SYMRP	=>K-WRITE
32:	[453],[47]	=>K-WRES-SYMIN-PD
33:	[453],[47]	=>K-WCAN-SYMIN-PD
34:	[465],P-SYMRP,[453],RESRQ-W[426]	=>K-WRESTART-PD
35:	[465],P-SYMRP,[453],CANRQ-W[419]	=>K-WCANCEL-PD
37:	I-WRTIN,[458],[410]	=>K-WRT-SYMIN-PD
39:	[453],[47]	=>K-WRESTART-CAN-PD
40:	[449],CANRP-W[419],[467],[21],I-CANCF-W[461],[440]	=>K-W-DXFRIDLE
41:		=>samestate
43: P423:	TRERP-W[402]	=>samestate
~P423:	TRERP-W[402],[429],[406],[471],	
P410:		=>K-W-DXFRIDLE
~P410&P424&~P411&P416:	[44]	=>K-WRT-ENDING
~P410&P424&P411&P416:	[44]	=>K-WRITE
~P410&~P416:	[44]	=>K-I-WXFER-ENDING
44:	[449],CANRP-W[419],[469],[21],I-CANCF-W[461],[440]	=>K-W-DXFRIDLE
46:	[449],[467],[459],[458],[21], RESRP-W[428],I-RESCF-W[446],[440],	
P422:		=>K-I-WXFER-ENDING
~P411:		=>K-WRT-ENDING
P411&~P422:		=>K-WRITE
48:	[401],	
~P406:	I-WRTIN	=>samestate
P406:	L-ERRABT	=>samestate
49: ~P424:	L-ERRABT	=>samestate

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P15:		=>samestate
~P15:	I-DATIN	=>samestate
50: ~P424:	L-ERRABT	=>samestate
P15:		=>samestate
~P15:	I-DAEIN,[414]	=>samestate
54: ~P424:	L-ERRABT	=>samestate
P424:	[453],[460],CANRQ-W[419]	=>K-WCANCEL-PD
59: ~P424:	L-ERRABT	=>samestate
P424:	[453],[460],RESRQ-W[426]	=>K-WRESTART-PD
65:		
P434:	[401],[410],[44],[412],[411],[457],[458],	
~P434:	[401],	
P406:	L-ERRABT	=>samestate
P~406:	I-WRTIN	=>samestate

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A.5 File error recovery protocol machine (FERPM)

A.5.1 States - file error recovery

Relabel A.5.1:

A.5.1.1 Normal access (non-overlapped)

Add the following sub-clauses.

A.5.1.2 Consecutive access

Q-PASSIVE	The basic file protocol is currently in operation but no transfer of file contents is in progress. It is used when the FERPM becomes inactive in normal error free activity, or when it cannot provide its services any more after issuing an L-ERRABT signal.
Q-XFER-IDLE	Data transfer idle.
Q-XFER	Normal transfer of file contents has been established.
Q-RE-ISSUE	After a CANCEL, RECOVER or RESTART, the initiating FERPM reissues TRANSFER-END requests and TRANSFER requests while the responding FERPM reissues TRANSFER-END responses
Q-RESTART-PD	Restart pending, wait for an I-RESCF event as an F-RESTART confirm primitive from the IFS.
Q-RESTART	A restart of a data transfer is in progress. A checkpoint identifier has been negotiated, and data following that checkpoint, but prior to the error, is being retransmitted.
Q-CANCEL-PD	Cancel pending, wait for an I-CANCF event as an F-CANCEL confirm primitive from the IFS.
CLOSE-EX	Close expected, wait for an I-CLOIN event as an F-CLOSE indication primitive from the IFS.
DESELECT-EX	Deselect expected, wait for an I-DESIN event as an F-DESELECT indication primitive from the IFS.
RECOVER-PD	Recover pending, wait for an I-RECCF event as an F-RECOVER confirm primitive from the IFS.
SEL-PD	SELECT pending, wait for an I-SELCF event as an F-SELECT confirm primitive from the IFS.
OPN-PD	OPEN pending, wait for an I-OPNCF event as an F-OPEN indication primitive form the IFS.
SEL-EX	SELECT expected, wait for an I-SELIN event as an F-SELECT indication primitive from the IFS.
OPN-EX	OPEN expected, wait for an I-OPNIN event as an F-OPEN indication primitive form the IFS.
XFER-EX	Data transfer expected, wait for an I-REAIN/I-WRITIN as an F-READ/F-WRITE indication primitive from the IFS.
INIT-EX	Initiation expected, wait for an I-ININ event as an F-INITIALIZE indication primitive from the IFS.
CLOSE-PD	Close pending, wait for an I-CLOCF event as an F-CLOSE confirm primitive from the IFS.
DESELECT-PD	Deselect pending, wait for an I-DESCF event as an F-DESELECT confirm primitive from the IFS.
INIT-PD	Initialize pending, wait for an I-INICF event as an F-INITIALIZE confirm primitive from the IFS.

A.5.1.3 Concurrent access

R-PASSIVE	The basic file protocol is currently in operation but no transfer of file contents is in progress. It is used when the Read sub-entity of FERPM becomes inactive in normal error free activity, or when it cannot

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	provide its services any more after issuing an L-ERRABT signal.
R-XFER-IDLE	Data transfer idle for the Read sub-entity of FERPM.
R-XFER	Normal transfer of file contents has been established for the Read sub-entity of FERPM.
R-REISSUE	After a CANCEL, RECOVER or RESTART, the initiating read sub-entity of FERPM reissues TRANSFER-END requests and TRANSFER requests while the responding read sub-entity of FERPM reissues TRANSFER-END responses
R-RESTART-PD	Restart pending, wait for an I-RESCF event as an F-RESTART confirm primitive from the IFS by the read sub-entity.
R-RESTART	A restart of a data transfer is in progress. A checkpoint identifier has been negotiated, and data following that checkpoint, but prior to the error, is being retransmitted for the read sub-entity.
R-CANCEL-PD	Cancel pending, wait for an I-CANCF event as an F-CANCEL confirm primitive from the IFS by the read sub-entity of FERPM.
R-RECOVER-WT	Recovery by the write sub-entity is in progress. The read sub-entity is waiting for the L-RECVR signal from the write sub-entity.
W-PASSIVE	The basic file protocol is currently in operation but no transfer of file contents is in progress. It is used when the Write sub-entity of FERPM becomes inactive in normal error free activity, or when it cannot provide its services any more after issuing an L-ERRABT signal.
W-XFER-IDLE	Data transfer idle for the Write sub-entity of FERPM.
W-XFER	Normal transfer of file contents has been established for the Write sub-entity of FERPM.
W-REISSUE	After a CANCEL, RECOVER or RESTART, the initiating Write sub-entity of FERPM reissues TRANSFER-END requests and TRANSFER requests while the responding Write sub-entity of FERPM reissues TRANSFER-END responses
W-CREISSUE	Cancel pending while re-issuing transfer requests and transfer end requests by the write sub-entity of FERPM.
W-RECOVER-WT	Recovery by the read sub-entity is in progress. The write sub-entity is waiting for the L-RECVR signal from the read sub-entity.
W-RESTART-PD	Restart pending, wait for an I-RESCF event as an F-RESTART confirm primitive from the IFS by the Write sub-entity.
W-RESTART	A restart of a data transfer is in progress. A checkpoint identifier has been negotiated, and data following that checkpoint, but prior to the error, is being retransmitted for the Write sub-entity.
W-CANCEL-PD	Cancel pending, wait for an I-CANCF event as an F-CANCEL confirm primitive from the IFS by the Write sub-entity of FERPM.
CLOSE-EX	Close expected, wait for an I-CLOIN event as an F-CLOSE indication primitive from the IFS by either sub-entity.
DESELECT-EX	Deselect expected, wait for an I-DESIN event as an F-DESELECT indication primitive from the IFS by either sub-entity.
RECOVER-PD	Recover pending, wait for an I-RECCF event as an F-RECOVER confirm primitive from the IFS by either sub-entity.
SEL-PD	SELECT pending, wait for an I-SELCF event as an F-SELECT confirm primitive from the IFS by either sub-entity.
OPN-PD	OPEN pending, wait for an I-OPNCF event as an F-OPEN indication primitive form the IFS by either sub-entity.

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SEL-EX	SELECT expected, wait for an I-SELIN event as an F-SELECT indication primitive from the IFS by either sub-entity.
OPN-EX	OPEN expected, wait for an I-OPNIN event as an F-OPEN indication primitive form the IFS by either sub-entity.
XFER-EX	Data transfer expected, wait for an I-REAIN/I-WRITIN as an F-READ/F-WRITE indication primitive from the IFS by either sub-entity.
INIT-EX	Initiation expected, wait for an I-ININ event as an F-INITIALIZE indication primitive from the IFS by either sub-entity.
CLOSE-PD	Close pending, wait for an I-CLOCF event as an F-CLOSE confirm primitive from the IFS by either sub-entity.
DESELECT-PD	Deselect pending, wait for an I-DESCF event as an F-DESELECT confirm primitive from the IFS by either sub-entity.
INIT-PD	Initialize pending, wait for an I-INICF event as an F-INITIALIZE confirm primitive from the IFS by either sub-entity.
REC-EX	Recover expected, wait for an I-RECIN event as an F-RECOVER indication primitive from the IFS by either sub-entity.

A.5.2 Incoming events - file error recovery

Add the following sub-clause.

A.5.2.1 Normal access (non-overlapped)

Relabel A.5.2.1:

A.5.2.1.1 Incoming events from the external file service user - normal access

Relabel A.5.2.2:

A.5.2.1.2 Incoming events from the internal file service - normal access

Relabel A.5.2.3:

A.5.2.1.3 Incoming events from the Local System Environment

Add the following sub-clauses.

A.5.2.2 Consecutive and concurrent access

A.5.2.2.1 Incoming events from the external file service user - access

F-OPNRQ	F-OPEN request primitive
F-CLORQ	F-CLOSE request primitive
F-REARQ	F-READ request primitive
F-WRTRQ	F-WRITE request primitive
F-DATRQ	F-DATA request primitive
F-DAERQ	F-DATA-END request primitive
F-TRERQ	F-TRANSFER-END request primitive
F-ANYRQ	F-INITIALIZE,F-READ-ATTRIBUTE,

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F-CHANGE-ATTRIBUTE,F-SELECT,F-CREATE,F-DESELECT, F-LOCATE,F-ERASE,F-BEGIN-GROUP,F-END-GROUP and F-U-ABORT request primitives

F-OPNRP F-OPEN response primitive
F-CLORP F-CLOSE response primitive
F-TRERP F-TRANSFER-END response primitive
F-ANYRP F-INITIALIZE,F-READ-ATTRIBUTE,F-CHANGE-ATTRIBUTE, F-SELECT,F-CREATE,F-DESELECT,F-LOCATE,F-ERASE, F-BEGIN-GROUP and F-END-GROUP response primitives
F-CANRQ F-CANCEL request primitive
F-CANRP F-CANCEL response primitive

A.5.2.2.2 Incoming events from the internal file service - access

I-OPNCF F-OPEN confirm primitive
I-CLOCF F-CLOSE confirm primitive
I-DATIN F-DATA indication primitive
I-DAEIN F-DATA-END indication primitive
I-CHKIN F-CHECK indication primitive
I-CHKCF F-CHECK confirm primitive
I-TRECF F-TRANSFER-END confirm primitive
I-ANYCF F-INITIALIZE,F-READ-ATTRIBUTE,F-CHANGE-ATTRIBUTE, F-SELECT,F-CREATE,F-DESELECT,F-LOCATE,F-ERASE, F-BEGIN-GROUP and F-END-GROUP confirm primitive
I-ANYIN F-INITIALIZE,F-READ-ATTRIBUTE,F-CHANGE-ATTRIBUTE, F-SELECT,F-CREATE,F-DESELECT,F-LOCATE,F-ERASE, F-BEGIN-GROUP,F-END-GROUP,F-U-ABORT and F-P-ABORT indication primitives
I-REAIN F-READ indication primitive
I-WRTIN F-WRITE indication primitive
I-CLOIN F-CLOSE indication primitive
I-TREIN F-TRANSFER-END indication primitive
I-CANIN F-CANCEL indication primitive
I-CANCF F-CANCEL confirm primitive
I-OPNIN F-OPEN indication primitive
I-RESIN F-RESTART indication primitive
I-RESCF F-RESTART confirm primitive
I-RESIN-R F-RESTART (read) indication primitive
I-RESIN-W F-RESTART (write) indication primitive
I-RESCF-R F-RESTART (read) confirm primitive
I-RESCF-W F-RESTART (write) confirm primitive
I-RECIN F-RECOVER indication primitive
I-RECCF F-RECOVER confirm primitive
I-RECIN-R F-RECOVER (read) indication primitive
I-RECIN-W F-RECOVER (write) indication primitive
I-RECCF-R F-RECOVER (read) confirm primitive
I-RECCF-W F-RECOVER (write) confirm primitive
I-CANIN-R F-CANCEL(read) indication primitive
I-CANIN-W F-CANCEL(write) indication primitive
I-CANCF-R F-CANCEL(read) confirm primitive
I-CANCF-W F-CANCEL(write) confirm primitive
I-TREIN-R F-TRANSFER-END(read) indication primitive
I-TREIN-W F-TRANSFER(write) indication primitive
I-TRECF-R F-TRANSFER-END(read) confirm primitive
I-TRECF-W F-TRANSFER-END(write) confirm primitive

A.5.2.2.3 Incoming events from the Local System Environment

L-TRERQ-R Re-issued F-TRANSFER-END(read) request primitive
L-TRERQ-W Re-issued F-TRANSFER-END(write) request primitive

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L-TRERP-W Re-issued F-TRANSFER-END(write) response primitive
L-TRERP-R Re-issued F-TRANSFER-END(read) response primitive
L-WRTRQ Re-issued F-WRITE request primitive
L-REARQ Re-issued F-READ request primitive
L-ERROR1 Class 1 error (as defined in 18.1)
L-ERROR1-R Class I error (as defined in 18.1) to Read sub-entity
L-ERROR1-W Class I error (as defined in 18.1) to Write sub-entity
L-ERROR2 Class II error (as defined in 18.1)
L-ERROR2-R Class II error (as defined in 18.1) to Read sub-entity
L-ERROR2-W Class II error (as defined in 18.1) to Write sub-entity
L-ERROR3 Class III error (as defined in 18.1)
L-GIVEUP Signal to give up recovery process
L-DATRQ Re-issued F-DATA request primitive
L-CHKRQ Re-issued F-CHECK request primitive
L-DAERQ Re-issued F-DATA-END request primitive
L-EORIN Indicates that all checkpoint identifiers and "data end" markers in the docket have been used, and all data to be resent have been sent.
L-OPEN Signal to a sub-entity of successful processing of F-OPEN primitive.
L-CLOSE Signal to a sub-entity of successful processing of F-CLOSE primitive
L-RECVR Signal to a sub-entity to go into or out of the RECOVER-WT state
L-PASIVE Signal to a sub-entity to go into the PASSIVE state.

A.5.3 Outgoing events - file error recovery

Add the following sub-clause.

A.5.3.1 Normal access (non-overlapped)

Relabel A.5.3.1:

A.5.3.1.1 Outgoing events from the external file service user - normal access

Relabel A.5.3.2:

A.5.3.1.2 Outgoing events from the internal file service - normal access

Relabel A.5.3.3:

A.5.3.1.3 Outgoing events from the Local System Environment - overlapped access

Add the following sub-clauses.

A.5.3.2 Consecutive and concurrent access

A.5.3.2.1 Outgoing events from the external file service user - overlapped access

F-OPNCF F-OPEN confirm primitive
F-ANYCF F-INITIALIZE,F-READ-ATTRIBUTE,F-CHANGE-ATTRIBUTE, F-SELECT,F-CREATE,F-DESELECT,F-LOCATE,F-ERASE, F-BEGIN-GROUP and F-END-GROUP confirm primitives
F-CLOCF F-CLOSE confirm primitive
F-DATIN F-DATA indication primitive
F-DAEIN F-DATE-END indication primitive
F-TRECF F-TRANSFER-END confirm primitive
F-OPNIN F-OPEN indication primitive
F-WRTIN F-WRITE indication primitive
F-CLOIN F-CLOSE indication primitive

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F-REAIN	F-READ indication primitive
F-TREIN	F-TRANSFER-END indication primitive
F-ANYIN	F-INITIALIZE,F-READ-ATTRIBUTE,F-CHANGE-ATTRIBUTE, F-SELECT,F-CREATE,F-DESELECT,F-LOCATE,F-ERASE, F-BEGIN-GROUP,F-END-GROUP,F-U-ABORT and F-P-ABORT indication primitives
F-CANIN	F-CANCEL indication primitive
F-CANCF	F-CANCEL confirm primitive

A.5.3.2.2 Outgoing events from the internal file service - overlapped access

I-OPNRQ	F-OPEN request primitive
I-CLORQ	F-CLOSE request primitive
I-DATRQ	F-DATA request primitive
I-DAERQ	F-DATA-END request primitive
I-CHKRQ	F-CHECK request primitive
I-TRERQ	F-TRANSFER-END request primitive
I-REARQ	F-READ request primitive
I-WRTRQ	F-WRITE request primitive
I-ANYRQ	F-INITIALIZE,F-READ-ATTRIBUTE,F-CHANGE-ATTRIBUTE, F-SELECT,F-CREATE,F-DESELECT,F-LOCATE,F-ERASE, F-BEGIN-GROUP,F-END-GROUP and F-U-ABORT request primitives
I-OPNRP	F-OPEN response primitive
I-CLORP	F-CLOSE response primitive
I-TRERP	F-TRANSFER-END response primitive
I-ANYRP	F-INITIALIZE,F-READ-ATTRIBUTE,F-CHANGE-ATTRIBUTE, F-SELECT,F-CREATE,F-DESELECT,F-LOCATE,F-ERASE, F-BEGIN-GROUP and F-END-GROUP response primitives
I-CHKRP	F-CHECK response primitive
I-CANRQ	F-CANCEL request primitive
I-CANRP	F-CANCEL response primitive
I-RESRQ	F-RESTART request primitive
I-RESRP	F-RESTART response primitive
I-RESRQ-R	F-RESTART (read) request primitive
I-RESRQ-W	F-RESTART (write) request primitive
I-RESRP-R	F-RESTART (read) response primitive
I-RESRP-W	F-RESTART (write) response primitive
I-RECRQ	F-RECOVER request primitive
I-RECRP	F-RECOVER response primitive
I-RECRQ-R	F-RECOVER (read) request primitive
I-RECRQ-W	F-RECOVER (write) request primitive
I-RECRP-R	F-RECOVER (read) response primitive
I-RECRP-W	F-RECOVER (write) response primitive
I-CANRQ-R	F-CANCEL(read) request primitive
I-CANRQ-W	F-CANCEL(write) request primitive
I-CANRP-R	F-CANCEL(read) response primitive
I-CANRP-W	F-CANCEL(write) response primitive
I-TRERQ-W	F-TRANSFER-END(write) request primitive
I-TRERQ-R	F-TRANSFER-END (read) request primitive
I-TRERP-R	F-TRANSFER-END(read) response primitive
I-TRERP-W	F-TRANSFER-END(write) response primitive

A.5.3.2.3 Outgoing events from the Local System Environment - overlapped access

L-ERROR2	Signal indicating class II error
L-ERROR2-R	Signal indicating class II error to read sub-entity
L-ERROR2-W	Signal indicating class II error to write sub-entity
L-ERROR3	Signal indicating class III error
L-RESEND	Resend data request to the local system

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L-STPRSD Stop resend data request to the local system
L-SUSPND Suspend issuing of F-DATRQ, F-DAERQ by the local system
L-RESUME Resume issuing of F-DATRQ, F-DAERQ by the local system
L-ERRABT signal FPM to issue an F-P-ABORT request PDU, with permanent error value
L-PABORT Signal FPM to issue a F-P-ABORT request PDU, and a F-P-ABORT indication primitive to the FERPM, both with transient error value
L-HOLD Hold primitives from external user
L-UNHOLD Process any held primitives
L-OPEN Signal to a sub-entity of successful processing of F-OPEN primitive.
L-CLOSE Signal to a sub-entity of successful processing of F-CLOSE primitive
L-RECVR Signal to a sub-entity to go into or out of the recovery-wt state
L-PASIVE Signal to a sub-entity to go into the PASSIVE state.

A.5.4 Specific actions -file error recovery

Relabel A.5.4:

A.5.4.1 Normal access (non-overlapped)

Add the following sub-clauses.

A.5.4.2 Consecutive and concurrent access

A.5.4.2.1 Normal procedure

[55] Delete the docket.

[56] Set the activity state indicator to "finished".

[57] Set the activity state indicator to "in-progress".

[58] Set the activity type indicator to "read".

[59] Set the activity type indicator to "write".

[60] Add the checkpoint identifier to the list in the docket. Increment the count of outstanding checkpoints by one.

[61] Delete from the docket all checkpoint identifiers smaller than the parameter in the primitive received or issued. Decrement the count of outstanding checkpoints by the number of the deleted identifiers.

[63] Set the activity state indicator to "starting".

[64] Set the activity state indicator to "data transfer finished".

[66] Use the last checkpoint identifier in the docket as the parameter

[67] Increment the checkpoint identifier count.

[68] Set the checkpoint identifier count to zero.

[69] Record the bulk data transfer number in the docket (the number is maintained by the FPM).

[70] Record which data values have been already delivered to the user.

[72] Use as parameter the checkpoint identifier.

[76] Record which data values have been sent.

[77] Create a docket and record in it the activity identifier, the information needed to issue or check an I-INIREQ (including the locations of the initiator and the responder), the recovery mode, the access context, the presentation context,

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a null checkpoint list and set the activity state indicator to "starting".

[201] Include a state result indicating failure.

[204] Store "data end" marker in the docket.

[206] Delete "data end" marker in the docket.

[213] Store "transfer end" marker (reflecting information on the PDU) in the docket.

[214] Delete"transfer end" marker from docket.

[215] Clear activity type indicator.

[216] Clear the activity state indicator.

[421] Reissue TE read requests and remove any TE write requests from TE request queue (or queues).

[432] Use as parameter the TN and the TN of the last transfer end confirm (or confirms) received. (*init read)

[441] Reissue Read requests with TN > current TN and remove any write requests from transfer request queue (or queues).

[463] Reissue TE write response and remove any TE read response from TE response queue (or queues)

[500] Increment the checkpoint identifier for the current TN

[501] Set the checkpoint identifier count for the TN received to zero.

[502] Add the checkpoint identifier to the appropriate list in the docket and increment the count of outstanding checkpoints by one for the TN received or issued.

[503] For the TN received or issued, delete from the docket all checkpoint identifiers smaller than the parameter in the primitive received or issued and decrement the count of outstanding checkpoints by the number of the deleted identifiers.

[504] Use the current TN and the last checkpoint identifier in the docket for that TN as the parameters.

[505] Create a docket and record in the docket the activity identifier, the information needed to issue or check an I-INIRQ (including the locations of the initiator and the the responder), the recovery mode, the access mode, the access context, the presentation context, a null checkpoint list or if the consecutive overlap access is used than a null checkpoint list for each entry in the checkpoint table and set the activity state indicator to "starting"; Or, if concurrent overlap access is used than a null checkpoint list for each entry of both the read checkpoint table and the write checkpoint table and set both activity state indicators to "starting".

[506] Record the bulk data transfer number in the docket for the TN.

[507] Use as parameter the current TN.

[508] Store "data end" marker in the docket for the current TN.

[509] Delete "data end" marker and "transfer-end" in the docket for the TN.received or issued.

[510] Add 1 to current TN;

[511] Set current TN to 0; In concurrent case, set both current TN for read (RTN) and write (WTN) to 0.

[512] Set the activity state indicator (or indicators) to "finished".

[513] Clear docket of any read 'data end' and read 'transfer end' markers if read cancel and any write 'data end' and write 'transfer end' markers if write cancel.

[514] Clear 'read' activity type indicator and set the read activity state indicator to "starting" if read cancel; or clear the

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write activity type indicator and set the write state indicator to "starting" if write cancel.

[515] Store 'transfer end' marker (reflecting information on the PDU) in the docket for the TN received or issued.

[516] Set current TN to zero.

[532] Use as parameter the last transfer end confirm(s) received.

[533] Use as parameter the last transfer end indication(s) received.

[548] Clear Cancel indicators.

[550] Let the other sub-entity process the primitive or signal.

A.5.4.2.2 Error recovery

[55] Delete the docket.

[56] Set the activity state indicator to "finished".

[57] Set the activity state indicator to "in-progress".

[58] Set the activity type indicator to "read".

[59] Set the activity type indicator to "write".

[60] Add the checkpoint identifier to the list in the docket. Increment the count of outstanding checkpoints by one.

[61] Delete from the docket all checkpoint identifiers smaller than the parameter in the primitive received or issued.

[63] Set the activity state indicator to"starting"

[64] Set the activity state indicator to "data transfer finished".

[67] Increment the checkpoint identifier count.

[68] Set the checkpoint identifier count to zero.

[69] Record the bulk data transfer number in the docket (the number is maintained by the FPM).

[70] Record which data values have been already delivered to the user.

[72] Use as parameter the checkpoint identifier.

[73] Use as the parameter the oldest (first) checkpoint identifier in the list in the docket.

[75] Use as the diagnostics parameter "activity identifier unknown".

[76] Record which data values have been sent.

[200] Wait for 2 recommended retry time seconds.

[201] Include a state result indicating failure.

[202] Use the data value specified by the L-DATRQ signal, representing previous F-DATA request primitives, as the parameter.

[204] Store "data end" marker in the docket.

[206] Delete "data end" marker in the docket.

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[207] Include an action result indicating transient error.

[209] Recreate select and open regimes.

[210] Include an action result indicating failure on next response with diagnostic of damage to open/select regime.

[211] Include a diagnostic of damage to open/select regime.

[212] Use as the parameter the bulk data transfer number recorded in the docket.

[213] Store "transfer end" marker (reflecting information on the PDU) in the docket.

[214] Delete "transfer end" marker from docket.

[215] Clear activity type indicator.

[216] Clear the activity state indicator.

[421] Reissue TE read requests and remove any TE write requests from TE request queue (or queues).

[432] Use as parameter the TN and the TN of the last transfer end confirm (or confirms) received. (*init read)

[433] Use as parameter the TN and the TN of the last transfer end request (or requests) issued. (init write)

[435] Use as parameters the TN and the TN of the last transfer end indication (or indications) received. (*resp write)

[436] Use as parameter the TN and the TN of the last transfer end response (or responses) issued.

[441] Reissue Read requests with TN > current TN and remove any write requests from transfer request queue (or queues).

[463] Reissue TE write response and remove any TE read response from TE response queue (or queues)

[500] Increment the checkpoint identifier for the current TN.

[501] Set the checkpoint identifier count for the TN received to zero.

[502] Add the checkpoint identifier to the appropriate list in the docket and increment the count of outstanding checkpoints by one for the TN received or issued.

[503] For the TN received or issued, delete from the docket all checkpoint identifiers smaller than the parameter in the primitive received or issued and decrement the count of outstanding checkpoints by the number of the deleted identifiers.

[504] Use the current TN and the last checkpoint identifier in the docket for the TN as the parameters.

[505] Create a docket and record in the docket the activity identifier, the information needed to issue or check an I-INIRQ (including the locations of the initiator and the the responder), the recovery mode, the access mode, the access context, the presentation context, a null checkpoint list or if the consecutive overlap access is used than a null checkpoint list for each entry in the checkpoint table and set the activity state indicator to "starting"; Or, if concurrent overlap access is used than a null checkpoint list for each entry of both the read checkpoints table and the write checkpoint table and set both activity state indicators to "starting".

[507] Use as parameter the current TN.

[508] Store 'data end' marker in the docket for the current TN.

[509] Delete 'data end' marker and 'transfer-end' marker in the docket for the TN received.

[511] Set current TN to 0; In concurrent case, set both current TN for read (RTN) and write (WTN) to 0.

[512] Set the activity state indicator (or the indicators) to "finished".

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[513] Clear docket of any read 'data end' and read 'transfer end' markers if read cancel and any write 'data end' and write 'transfer end' markers if write cancel.

[514] Clear 'read' activity type indicator and the read activity state indicator if read cancel; and the write activity type indicator and the write state indicator if write cancel.

[515] Store 'transfer end' marker (reflecting information on the PDU) in the docket for the TN received.

[516] Set current TN to zero.

[520] The issuer of the I-RESRQ or I-RECRQ primitive identifies a TN and a checkpoint identifier which is
a) for the sender, the last point acknowledged.
b) for the receiver, the last point received and secured.

[521] The issuer of the I-RESRP or I-RECRP primitive identifies a TN and a checkpoint identifier which is
a) for the sender, equal to the value provided by the issuer of the request, and
b) for the receiver, the last points received and secured.

[522] Mark the TNs and the checkpoint identifiers to be reissued.

[523] Use as the parameter the TN and the checkpoint identifier of the primitive received.

[524] Use as the parameter the TN and the checkpoint identifier negotiated.

[525] Re-issue TE requests from TE request Queue (or queues).

[526] Re-issue Transfer (Read/Write) requests with TN > current TN from Transfer request queue or queues.

[527] Re-issue TE response from TE response queue (or queues).

[528] Add 1 to RSTTN.

[529] Record the TN as RSTTN.

[530] Use as the parameter the TN and the checkpoint identifier available in the docket that is both
a) after the checkpoint identifier negotiated, and
b) not yet issued during this restart of the BDT.

[531] Discard all held primitives except F-CANRQ; process F-CANRQ, if any.

[532] Use as parameter the last transfer end confirm(s) received.

[533] Use as parameter the last transfer end indication(s) received.

[534] Use RSTTN as a parameter.

[535] Set recovery wait indicator to write.

[536] Set recovery wait indicator to read

[537] Clear recovery wait indicator.

[538] For both read and write , record separately the TNs as RSTTNs and record for the initiating FERPM the RTN received (or issued) and for the responding FERPM the WTN received (or issued). And, for each receiver, delete from the docket all checkpoint identifiers smaller than the parameter in the primitive received or issued. Decrement the count of outstanding checkpoints by number of the deleted identifiers.

[539] The issuer of the I-RECRQ primitive identifies two sets of TNs and checkpoint identifiers which are:
a) for the sender, the last TN and identifier acknowledged.
b) for the receiver, the last TN and identifier received and secured.

The BTN is set to BTN = TN + SBTN.

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[540] The issuer of the I-RECRP primitive identifies two sets of TNs and checkpoint identifiers which are:
a) for the sender, equal to the value provided by the issuer of the request, and
b) for the receiver, the last TN and identifier received and secured.
The BTN is set to BTN = TN + SBTN.

[541] Clear 'read' activity type indicator.

[542] Clear 'write' activity type indicator.

[543] Use the last checkpoint identifier in the docket for the received TN as the parameter.

[544] Set error3 indicator.

[545] Clear error3 indicator.

[546] Set read cancel indicator.

[547] Set write cancel indicator.

[548] Clear cancel and error3 indicators.

[550] Let the other sub-entity process the primitive or signal.

A.5.5 Predicates -file error recovery

Relabel A.5.5:

A.5.5.1 Normal access (non-overlapped)

Add the following sub-clauses.

A.5.5.2 Consecutive and concurrent access

A.5.5.2.1 Normal procedure

P23: The incoming response or confirm primitive has a state result indicating success.

P24: There are checkpoints that must be confirmed.

P29: The activity state indicator is set to "in-progress" and the activity type to "read".

P30: The activity state indicator is set to "in-progress" and the activity type to "write".

P31: The activity type indicator is set to "read".

P32: The activity type indicator is set to "write".

P33: The activity type indicator is set to "starting".

P34: The activfity state indicator is set to "finished".

P37: A checkpoint identifier is to be inserted in the data stream.

P99: The transfer service class has been negotiated.

P103: The incoming request or indication primitive has an action result indicating transient error.

P105: The activity state indicator is set to "data transfer finished".

P400: The consecutive overlap functional unit has been negotiated.

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P401: The Symm Sync functional unit of Session has been negotiated.

P404: Next transfer is read.

P405: Next transfer is write.

P409: Read indicator is set.

P413: Cancel read or restart read or transfer-end read.

P414: Cancel write or restart write or transfer-end write.

P419: Complete re-issue of transfer end requests

P420: Complete re-issue of transfer end response.

P424: The write indicator is set.

P425: On the restart, recover or cancel primitive, TN confirm (or confirms) received by initiator < TN of last item in TE response queue (or queues)

P426: On the restart, recover or cancel primitive, TN indication (or indications) received by the responder < TN of last item in TE request queue (or queues)

P430: Next TE request in queue is read.

P431: There are transfer requests with TN > current TN in the transfer request queue (or queues).

P433: Complete re-issue of transfer request.

P434: There is no next transfer request.

P436: Request already in queue.

P440: The concurrent overlap functional unit has been negotiated.

P447: Both activity types are cleared

NOTE: TN represents the transfer number in consecutive overlap and the read transfer number (RTN) or the write transfer number (WTN) in concurrent overlap.

A.5.5.2.2 Error recovery

P23: The incoming response or confirm primitive has a state result indicating success.

P24: There are checkpoints that must be confirmed.

P26: An F-DATA indication primitive corresponding to the incoming I-DATIN has already been issued to the user.

P28: The data value available is after the negotiated checkpoint.

P29: The activity state indicator is set to "in-progress" and the activity type to "read".

P30: The activity state indicator is set to "in-progress" and the activity type to "write".

P31: The activity type indicator is set to "read".

P32 The activity type indicator is set to "write".

P33: The activity state indicator is set to "starting".

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P34: The activity state indicator is set to "finished".

P37: A checkpoint identifier is to be inserted in the data stream.

P39: The entity has the docket for the activity identifier recovered, the current initiator matches the location, and the activity can be resumed.

P100: The recommended retry time field is present on the diagnostic parameter.

P101: The specified recovery is possible and is required.

P102: The specified association is possible.

P103: The incoming request or indication primitive has an action result indicating transient error.

P104: The "transfer end" marker is stored in the docket.

P105: The activity state indicator is set to "data transfer finished".

P106: The "data end" marker is stored in the docket.

P400: The consecutive overlap functional unit has been negotiated.

P401: The Symm Sync functional unit of Session has been negotiated.

P404: Next transfer is read.

P405: Next transfer is write.

P409: Read indicator is set.

P413: Cancel read or restart read or transfer-end read.

P414: Cancel write or restart write or transfer-end write.

P419: Complete re-issue of transfer end requests.

P420: Complete re-issue of transfer end response.

P424: The write indicator is set.

P425: On the Restart, Recover or Cancel primitive, the TN confirm (or confirms) received by initiator < the TN of last item in TE response or queue (or queues)

P426: On the Restart, Recover or Cancel primitive, the TN indication (or indications) received by the responder < the TN of last item in TE request queue (or queues)

P430: Next TE request in queue is read.

P431: There are transfer requests with TN > current TN in the transfer request queue (or queues).

P433: Complete re-issue of transfer request.

P434: There is no next transfer request.

P435: Both cancel indicators are not set.

P436: Request already in queue.

P440: The concurrent overlap functional unit has been negotiated.

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P441: Current TN=RSTTN

P442: A F-CANRQ primitive is to be processed.

P443: The transfer request corresponding to RSTTN is a Read request.

P444: Recovery wait indicator is set to read.

P445: Recovery wait indicator is set to write.

P446: Error3 indicator is set.

P447: Both activity types are cleared.

P448: An F-TRANSFER-END indication primitive corresponding to the incoming I-TREIN has already been issued to the user.

A.5.6 Initiating entity state tables - FERPM - (Normal procedure)

Relabel A.5.6:

A.5.6.1 Normal access (non-overlapped) - Initiator

Relabel A.5.7:

A.5.6.2 Detailed entries - normal access (non-overlapped procedure)

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Add the following sub-clauses.

A.5.6.3 Consecutive access - Initiator

STATE / EVENT	Q-PASSIVE	Q-XFER-IDLE	Q-XFER
F-OPENRQ	1		
I-OPNCF	2		
F-ANYRQ	3	3	
I-ANYCF	4	4	
F-CLORQ		5	
I-CLOCF		6	
F-REARQ		7	23
F-WRTRQ		8	24
F-DATRQ			9
I-DATIN			10
I-CHKCF			11
I-CHKIN			12
F-DAERQ			13
I-DAEIN			14
F-TRERQ			15
I-TRECF			16
F-CANRQ			17
I-CANCF			18
I-CANIN			19
F-CANRP			20

A.5.6.4 Detailed entries - consecutive access (normal procedure)

1: P400:	[511],[505],I-OPNRQ	=>samestate
2: P23:	F-OPNCF	=>Q-XFER-IDLE
~P23:	[55],F-OPNCF[201]	=>samestate
3:	I-ANYRQ	=>samestate
4:	F-ANYCF	=>samestate
5:	[56],I-CLORQ	=>samestate

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6:	[55],F-CLOCF	=>Q-PASSIVE
7: P400&P33:	[57],[58],[501],I-REARQ	=>Q-XFER
P400&P34:	L-ERRABT	=>samestate
8: P400&P33:	[57],[59],[501],I-WRTRQ	=>Q-XFER
P400&P34:	L-ERRABT	=>samestate
9: P37&P400:	[500],[502],I-CHKRQ[72][507],	
[76],I-DATRQ	=>samestate	
10:	[70],F-DATIN	=>samestate
11: P400:	[503]	=>samestate
12: P400:	[502],	
P24&P400:	I-CHKRP,[503],	=>samestate
13: P400:	[508],I-DAERQ	=>samestate
14: P24&P400:	I-CHKRP[504],[503],	
P400:	[508],F-DAEIN	=>samestate
15: P434&P400:	[64],	
P400&P404:	[58],	
P400&P405:	[59],	
P400:	[515],I-TRERQ[432]	=>samestate
16: P434&P400:	[63],[215],[509],F-TRECF,[516]	=>Q-XFER-IDLE
P400:	[509],F-TRECF	=>samestate
17: P400:	I-CANRQ[532]	=>samestate
18: P400:	[215],[63],[509],F-CANCF,[516]	=>Q-XFER-IDLE
19:	F-CANIN	=>samestate
20: P400:	[215],[63],[509],I-CANRP,[532],[516]	=>Q-XFER-IDLE
23: P400:	[501],I-REARQ,	
P105:	[58],[57],	=>samestate
24: P400:	[501],I-WRTRQ,	
P105:	[59],[57],	=>samestate

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A.5.6.5 Concurrent access - Initiator

A.5.6.5.1 Concurrent read access - Initiator

STATE / EVENT	R-PASSIVE	R-XFER-IDLE	R-XFER
F-OPNRQ	1		
I-OPNCF	2		
F-ANYRQ	3	3	
I-ANYCF	4	4	
F-CLORQ		5	
I-CLOCF		6	
F-REARQ		7	23
I-DATIN			10
I-CHKIN			12
I-DAEIN			14
F-TRERQ			15
F-CANRQ			17
F-CANRP			20
I-TRECF-R			25
I-CANCF-R			27
I-CANIN-R			19

A.5.6.5.2 Detailed entries - concurrent read access (normal procedure)

1: P440:	[511],[505],[548],I-OPNRQ	=>samestate
2: P23:	F-OPNCF,L-OPEN	=>R-XFER-IDLE
~P23:	[55],F-OPNCF[201]	=>samestate
3:	I-ANYRQ	=>samestate
4:	F-ANYCF	=>samestate
5: P447:	[512],I-CLORQ	=>samestate
~P447:	[55],L-ERRABT	=>samestate
6:	[55],F-CLOCF,L-CLOSE	=>R-PASSIVE
7: P440&P33:	[57],[58],[501],I-REARQ	=>R-XFER
P440&P34:	[55],L-ERRABT	=>samestate
10:	[70],F-DATIN	=>samestate

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12: P440:	[502],	
P24&P440:	I-CHKRP,[503],	
		=>samestate
14: P24&P440:	I-CHKRP[504],[503],	
P440:	[508],F-DAEIN	=>samestate
15: P434&P440&P413:	[64],	
P440&P413:	[515],I-TRERQ-R[432]	=>samestate
17: P413&P440:	I-CANRQ-R[532]	=>samestate
19:	F-CANIN	=>samestate
20: P440&P413:	[513],[514],I-CANRP-R,[532],[516]	=>R-XFER-IDLE
23: P440&~P31	[55],L-ERRABT	=>samestate
P440&P31:	[501],I-REARQ,	
P105:	[57],	
	=>samestate	
25: P434&P413:	[63],[215],[509],F-TRECF,[516]	=>R-XFER-IDLE
~P434&P413:	[509],F-TRECF	=>samestate
27:	[513],[514],F-CANCF,[516]	=>R-XFER-IDLE

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A.5.6.5.3 Concurrent write access - Initiator

STATE / EVENT	W-PASSIVE	W-XFER-IDLE	W-XFER	W-REISSUE
F-OPNRQ	30			
I-OPNCF	30			
F-ANYRQ	30	30		
I-ANYCF	30	30		
F-CLORQ		30		
I-CLOCF		30		
F-WRTRQ		8	24	
F-DATRQ			9	
I-CHKCF			11	
F-DAERQ			13	
F-TRERQ			15	
L-TRERQ-R				21
L-REARQ				22
I-TRECF-W			25	
I-CANCF-W			28	
I-CANIN-W			19	
F-CANRQ			17	
F-CANRP			20	
L-OPEN	31			
L-CLOSE		32		

A.5.6.5.4 Detailed entries - concurrent write access (normal procedure)

8: P440&P33:	[57],[59],[501],I-WRTRQ	=>W-XFER
P440&P34:	[55],L-ERRABT	=>samestate
9: P37&P440:	[500],[502],I-CHKRQ[72][507], [76],I-DATRQ	=>samestate
11: P440:	[503]	=>samestate
13: P440:	[508],I-DAERQ	=>samestate
15: P434&P440&P414:	[64],	
P440&P414:	[515],I-TRERQ-W[432]	=>samestate

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17: P414&P440:	I-CANRQ-W[532]	=>samestate
19:	F-CANIN	=>samestate
20: P440&P414:	[513],[514],I-CANRP-W[532],	
P426&P414:	[421],L-HOLD	=>W-REISSUE
~P426&P431&P414:	[441],L-HOLD	=>W-REISSUE
~P426&~P431&P414:	[516]	=>W-XFER-IDLE
21:	I-TRERQ-R,	
~P419:		=>samestate
P419&P431:	[441]	=>samestate
P419&~P431:	[516],L-UNHOLD	=>W-XFER-IDLE
22:	I-REARQ,	
~P433:		=>samestate
P433:	L-UNHOLD,[516]	=>W-XFER-IDLE
24: P440&~P32:	[55],L-ERRABT	=>samestate
P440&P32:	[501],I-WRTRQ,	
P105:	[57],	
		=>samestate
25: P434:	[63],[215],[509],F-TRECF,[516]	=>W-XFER-IDLE
~P434:	[509],F-TRECF	=>samestate
28:	[513],[514],F-CANCF,	
P426:	[421],L-HOLD	=>W-REISSUE
~P426&P431:	[441],L-HOLD	=>W-REISSUE
~P426&~P431:	[516]	=>W-XFER-IDLE
30:	[550]	=>samestate
31:		=>W-XFER-IDLE
32:		=>W-PASSIVE

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A.5.7 Responding entity state table - FERPM - (normal procedure)

Relabel A.5.8:

A.5.7.1 Normal access (non-overlapped) - Responder

Relabel A.5.9:

A.5.7.2 Detailed entries - normal access (normal procedure)

Add the following sub-clauses.

A.5.7.3 Consecutive access - Responder

STATE / EVENT	Q-PASSIVE	Q-XFER-IDLE	Q-XFER
I-OPENIN	1		
F-OPNRP	2		
F-ANYRP	3	3	
I-ANYIN	4	4	
I-CLOIN		5	
F-CLORP		6	
I-REAIN		7	23
I-WRTIN		8	24
F-DATRQ			9
I-DATIN			10
I-CHKCF			11
I-CHKIN			12
F-DAERQ			13
I-DAEIN			14
I-TREIN			15
F-TRERP			16
F-CANRQ			17
I-CANCF			18
I-CANIN			19
F-CANRP			20

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A.5.7.4 Detailed entries - consecutive access (normal procedure)

1: P400:	[511],[505],F-OPNIN	=>samestate
2: P23:	I-OPNRP	=>Q-XFER-IDLE
~P23:	[55],F-OPNRP	=>samestate
3:	I-ANYRP	=>samestate
4:	F-ANYIN	=>samestate
5: ~P103:	[56],F-CLOIN	=>samestate
6:	[55],I-CLORP	=>Q-PASSIVE
7: P400&P33:	[57],[58],[501],F-REAIN	=>Q-XFER
P400&P34:	L-ERRABT	=>samestate
8: P400&P33:	[57],[59],[501],F-WRTIN	=>Q-XFER
P400&P34:	L-ERRABT	=>samestate
9: P37&P400:	[500],[502],I-CHKRQ[72][507], [76],I-DATRQ	=>samestate
10:	[70],F-DATIN	=>samestate
11: P400:	[503]	=>samestate
12: P400:	[502],	
P24&P400:	I-CHKRP,[503],	=>samestate
13: P400:	[508],I-DAERQ	=>samestate
14: P24&P400:	I-CHKRP[504],[503],	
P400:	[508],F-DAEIN	=>samestate
15: P434&P400:	[64],	
P400&P405:	[59],	
P400:	F-TREIN	=>samestate
16: P434&P400:	[63],[215],[509],I-TRERP,[515],[516]	=>Q-XFER-IDLE
P400&P404:	[58],	
P400:	[509],I-TRERP,[515]	=>samestate
17: P400:	I-CANRQ[533]	=>samestate
18: P400:	[215],[63],[509],[512],F-CANCF,[516]	=>Q-XFER-IDLE
19:	F-CANIN	=>samestate
20: P400:	[215],[63],[509],I-CANRP[533],[516]	=>Q-XFER-IDLE
23: P400:	[501],	
~P436:	F-REAIN,	
P105:	[58],[57],	=>samestate
24: P400:	[501],	

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~P436: F-WRTIN,
P105: [59],[57],

=>samestate

Note -The condition "P103" in entry 5 is handled in A5.1.7.1 in entry 16

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A.5.7.5 Concurrent access - Responder

A.5.7.5.1 Concurrent read access - Responder

STATE / EVENT	R-PASSIVE	R-XFER-IDLE	R-XFER	R-REISSUE
I-OPENIN	1			
F-OPNRP	2			
F-ANYRP	3	3		
I-ANYIN	4	4		
I-CLOIN		5		
F-CLORP		6		
I-REAIN		7	23	
F-DATRQ			9	
I-CHKCF			11	
F-DAERQ			13	
F-TRERP			16	
F-CANRQ			17	
F-CANRP			20	
L-TRERP-W				21
I-TREIN-R			25	
I-CANCF-R			27	
I-CANIN-R			19	

A.5.7.5.2 Detailed entries - concurrent read access (normal procedure)

1: P440:	[511],[505],F-OPNIN	=>samestate
2: P23:	I-OPNRP,L-OPEN	=>R-XFER-IDLE
~P23:	[55],F-OPNRP	=>samestate
3:	I-ANYRP	=>samestate
4:	F-ANYIN	=>samestate
5: ~P103&P447:	[512],F-CLOIN	=>samestate
~P103&~P447:	[55],L-ERRABT	=>samestate
6:	[55],I-CLORP,L-CLOSE	=>R-PASSIVE
7: P440&P33:	[57],[58],[501],F-REAIN	=>R-XFER
P440&P34:	[55],L-ERRABT	=>samestate

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9: P37&P440:	[500],[502],I-CHKRQ[72][507], [76],I-DATRQ	=>samestate
11: P440:	[503]	=>samestate
13: P440:	[508],I-DAERQ	=>samestate
16: P434&P440&P413:	[63],[215],[509],I-TRERP-R,[515],[516]	=>R-XFER-IDLE
~P434&P413&P440:	[509],I-TRERP-R,[515]	=>samestate
17: P413&P440:	I-CANRQ-R[533]	=>samestate
19:	F-CANIN	=>samestate
20: P440&P413:	[513],[514],-CANRP[533],	
P425&P413:	[463],L-HOLD	=>R-REISSUE
~P425&P413:	[516]	=>R-XFER-IDLE
21:	I-TRERP-W,	
~P420:		=>samestate
P420:	L-UNHOLD,[516]	=>R-XFER-IDLE
23: ~P440&~P31:	[55],L-ERRABT	=>samestate
P440&P31:	[501],	
P105:	[57],	
~P436:	F-REAIN,	
		=>samestate
25: P434:	[64],	
	F-TREIN	=>samestate
27:	[513],[514],F-CANCF,	
P425:	[463],L-HOLD	=>R-REISSUE
~P425:	[516]	=>R-XFER-IDLE

Note -The condition "P103" in entry 5 is handled in A5.1.7.1 in entry 16

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A.5.7.5.3 Concurrent write access - Responder

STATE / EVENT	W-PASSIVE	W-XFER-IDLE	W-XFER
I-OPENIN	30		
F-OPNRP	30		
F-ANYRP	30	30	
I-ANYIN	30	30	
I-CLOIN		30	
F-CLORP		30	
I-WRTIN		8	
I-DATIN			10
I-CHKIN			12
I-DAEIN			14
F-TRERP			16
F-CANRQ			17
F-CANRP			20
I-TREIN-W			26
I-CANCF-W			28
I-CANIN-W			19
L-OPEN	31		
L-CLOSE		32	

A.5.7.5.4 Detailed entries - concurrent write access (normal procedure)

8: P440&P33:	[57],[59],[501],F-WRTIN	=>W-XFER
P440&P34:	[55],L-ERRABT	=>samestate
10:	[70],F-DATIN	=>samestate
12: P440:	[502],	
P24&P440:	I-CHKRP,[503],	=>samestate
14: P24&P440:	I-CHKRP[504],[503],	
P440:	[508],F-DAEIN	=>samestate
16: P434&P440&P414:	[63],[215],[509],I-TRERP-W,[515],[516]	=>W-XFER-IDLE
P414&P440:	[509],I-TRERP-W,[515]	=>samestate

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17: P414&P440:	I-CANRQ-W[533]	=>samestate
19:	F-CANIN	=>samestate
20: P440&P414:	[513],[514],I-CANRP[533],[516]	=>W-XFER-IDLE
24: P440&~P32:	[55],L-ERRABT	=>samestate
P440&P32:	[501],	
~P436:	F-WRTIN,	
P105:	[57],	=>samestate
26: P434:	[64],	
	[510],F-TREIN	=>samestate
28:	[513],[514],F-CANCF,	
P435:	[516]	=>XFER-IDLE
~P435:	[516]	=>samestate
30:	[550]	=>samestate
31:		=>W-XFER-IDLE
32:		=>W-PASSIVE

Note -The condition "P103" in entry 5 is handled in A5.1.7.1 in entry 16

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A.5.8 Initiating entity state tables - FERPM - (Class 1 errors)

Relabel A.5.10:

A.5.8.1 Normal access (non-overlapped) - Initiator

Relabel A.5.11:

A.5.8.2 Detailed entries - normal access (class 1 errors)

Add the following sub-clauses.

A.5.8.3 Consecutive access - Initiator

STATE / EVENT	Q-XFR	Q-RESTART-PD	Q-RESTART	Q-REISSUE
L-ERROR1	1		1	
I-RESCF		2		
I-RESIN	3			
I-DATIN			4	
I-CHKCF			6	
I-DAEIN			7	
L-DATRQ			9	
L-CHKRQ			10	
L-DAERQ			11	
L-EORIN			12	
L-TRERQ				13
L-REARQ				14
L-WRTRQ				15
I-CANIN		16	16	16
F-CANRP		17	17	17

A.5.8.4 Detailed entries - consecutive access (class 1 errors)

1:	P400&P101&P30 :	L-SUSPND,I-RESRQ[520][532],L-HOLD	=>Q-RESTART-PD
	P400&P101&P29 :	I-RESRQ[520],L-HOLD	=>Q-RESTART-PD
	P400&~P101 :	L-ERROR2	=>Q-XFER
2:	P400&P29 :	[503],[529]	=>Q-RESTART

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P400&P30 :	[522],[503],[529],L-RESEND[523]	=>Q-RESTART
3: P400&P29 :	I-RESRP[521],L-HOLD,[529]	=>Q-RESTART
P400&P30 :	L-HOLD,L-SUSPND,[522],[503],I-RESRP[521][532], L-RESEND[524],[529]	=>Q-RESTART
4: P400&P26 :		=>samestate
P400&~P26 :	F-DATIN,L-UNHOLD	=>Q-XFER
6: P400 :	[503]	=>samestate
7: P400&P24 :	I-CHKRP[543],[503],	
~P106 :	[508],F-DAEIN	=>Q-XFER
P106&P441&~P104 :	L-UNHOLD	=>Q-XFER
P106&~P441&~P104 :	[528]	=>samestate
P106&P441&P104 :	L-UNHOLD,I-TRERQ	=>Q-XFER
P106&~P441&P104 :	[528],I-TRERQ	=>samestate
9: P28 :	I-DATRQ[202]	=>samestate
~P28 :		=>samestate
10:	I-CHKRQ[530]	=>samestate
11: ~P441 :	[528],	
~P104 :	I-DAERQ	=>samestate
P104 :	I-DAERQ,I-TRERQ	=>samestate
12: ~P426&~P431 :	L-RESUME,L-UNHOLD	=>Q-XFER
P426 :	[525]	=>Q-RE-ISSUE
~P426&P431:	[526]	=>Q-RE-ISSUE
13:	I-TRERQ,	
~P419 :		=>samestate
P419&P431 :	[526]	=>samestate
P419&~P431 :	L-RESUME,L-UNHOLD	=>Q-XFER
14:	I-REARQ,	
~P433 :		=>samestate
P433 :	L-RESUME,L-UNHOLD	=>Q-XFER
15:	I-WRTRQ,	
~P433 :		=>samestate
P433 :	L-RESUME,L-UNHOLD	=>Q-XFER
16: P400&~P103&P30 :	L-STPRSD,	
P400&~P103&(P30|P29):	[531],	
~P442 :	F-CANIN,L-UNHOLD	=>samestate
P442 :	F-CANCF,[215],[63],[509],I-CANRP,[516],L-UNHOLD	=>Q-XFER-IDLE
17: P400 :	[215],[63],[509],I-CANRP,[516]	=>Q-XFER-IDLE

Note: Either P30 or P29 must be true for RESTART to occur.

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A.5.8.5 Concurrent access - Initiator

A.5.8.5.1 Concurrent read access - Initiator

STATE / EVENT	R-XFR	R-RESTART-PD	R-RESTART
L-ERROR1-R	1		1
I-RESCF-R		2	
I-RESIN-R	3		
I-DATIN			4
I-CHKCF			6
I-DAEIN			7
I-CANIN-R		16	17
I-CANRP-R		16	17

A.5.8.5.2 Detailed entries - concurrent read access (class 1 errors)

1:	P440&P101&P29 :	I-RESRQ-R[520][532],L-HOLD	=>R-RESTART-PD
	P440&(~P101|~P29) :	L-ERROR2-R,L-ERROR2-W	=>R-XFER
2:	P440&P29 :	[503],[529]	=>R-RESTART
3:	P440&P29 :	I-RESRP-R[521][532],L-HOLD,[529]	=>R-RESTART
4:	P440&P26 :		=>samestate
	P440&~P26 :	F-DATIN,L-UNHOLD	=>R-XFER
6:	P440 :	[503]	=>samestate
7:	P440&P24 :	I-CHKRP[543],[503],	
	~P106 :	[508],F-DAEIN	=>R-XFER
	P106&~P441&~P104 :	[528]	=>samestate
	P106&P441&~P104 :	L-UNHOLD	=>R-XFER
	P106&P441&P104 :	L-UNHOLD,I-TRERQ-R	=>R-XFER
	P106&~P441&P104:	[528],I-TRERQ-R	=>samestate
16:	P440&P29:	[531],	
	~P442:	F-CANIN,L-UNHOLD	=>samestate
	P442:	F-CANCF,[215],[63],[509],I-CANRP-R[532], [516],L-UNHOLD	=>R-XFER-IDLE
17:	P440:	[215],[63],[509],I-CANRP-R[532],[516]	=>R-XFER-IDLE

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A.5.8.5.3 Concurrent write access - Initiator

STATE / EVENT	W-XFR	W-RESTART-PD	W-RESTART	W-REISSUE	W-CREISSUE
L-ERROR1-W	1		1		
I-RESCF-W		2			
I-RESIN-W	3				
L-DATRQ			9		
L-CHKRQ			10		
L-DAERQ			11		
L-EORIN			12		
L-TRERQ-W				13	
L-REARQ				14	19
L-WRTRQ				15	20
I-CANIN-W		16	16	16	
F-CANRP-W		17	17	17	
L-TRERQ-R				18	21

A.5.8.5.4 Detailed entries - concurrent write access (class 1 errors)

1: P440&P101&P30 :	L-SUSPND,I-RESRQ-W[520][532],L-HOLD	=>W-RESTART-PD
P440&(~P101&~P30) :	L-ERROR2-R,L-ERROR2-W	=>W-XFER
2: P440&P30 :	[522],[503],[529],L-RESEND[523]	=>W-RESTART
3: P440&P30 :	L-HOLD,L-SUSPND,[522],[503], I-RESRP-W[521][532],L-RESEND[524],[529]	=>W-RESTART
9: P28 :	I-DATRQ[202]	=>samestate
~P28 :		=>samestate
10:	I-CHKRQ[530]	=>samestate
11: ~P441 :	[528],	
~P104 :	I-DAERQ	=>samestate
P104 :	I-DAERQ,I-TRERQ-W	=>samestate
12: ~P426&~P431 :	L-RESUME,L-UNHOLD	=>W-XFER
P426 :	[525]	=>W-REISSUE
~P426&P431 :	[526]	=>W-REISSUE
13:	I-TRERQ-W,	
~P419 :		=>samestate

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P419&P431 :	[526]	=>samestate
P419&~P431 :	L-RESUME,L-UNHOLD	=>W-XFER
14:	I-REARQ,	
~P433 :		=>samestate
P433 :	L-RESUME,L-UNHOLD	=>W-XFER
15:	I-WRTRQ,	
~P433 :		=>samestate
P433 :	L-RESUME,L-UNHOLD	=>W-XFER
16: P440&~P103 :	[531],	
~P442 :	F-CANIN,L-UNHOLD	=>samestate
P442 :	F-CANCF,[513],[514],I-CANRP-W[532],	
P426 :	[421]	=>CREISSUE
~P426&P431 :	[441]	=>CREISSUE
~P426&~P431 :	[63],[516],L-UNHOLD	=>W-XFER-IDLE
17: P440&P414 :	[513],[514],I-CANRP-W[532],	
P426 :	[421]	=>CREISSUE
~P426&P431 :	[441]	=>CREISSUE
~P426&~P431 :	[63],[516],L-UNHOLD	=>W-XFER-IDLE
18:	I-TRERQ-R,	
~P419:		=>samestate
P419&P431:	[526]	=>samestate
P419&~P431:	L-RESUME,L-UNHOLD	=>W-XFER
19:	I-REARQ,	
~P433:		=>samestate
P433:		[63],[516],L-UNHOLD =>W-XFER-IDLE
20:	I-WRTRQ,	
~P433:		=>samestate
P433:		[63],[516],L-UNHOLD =>W-XFER-IDLE
21:	I-TRERQ-R,	
~P419:		=>samestate
P419&P431:	[441]	=>samestate
P419&~P431:	[63],[516],L-UNHOLD	=>W-XFER-IDLE

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A.5.9 Responding entity state table - FERPM - (class 1 errors)

Relabel A.5.12:

A.5.9.1 Normal access (non-overlapped) - Responder

Relabel A.5.13:

A.5.9.2 Detailed entries - normal access (class 1 errors)

Add the following sub-clauses.

A.5.9.3 Consecutive access - Responder

STATE / EVENT	Q-XFR	Q-RESTART-PD	Q-RESTART	Q-REISSUE
L-ERROR1	1		1	
I-RESCF		2		
I-RESIN	3			
I-DATIN			4	
I-CHKCF			6	
I-DAEIN			7	
L-DATRQ			9	
L-CHKRQ			10	
L-DAERQ			11	
L-EORIN			12	
I-TREIN			13	
L-TRERP				14
I-CANIN		15	15	15
F-CANRP		16	16	16

A.5.9.4 Detailed entries - consecutive access (class 1 errors)

1:	P400&P101&P29 :	L-SUSPND,I-RESRQ[520][533],L-HOLD	=>Q-RESTART-PD
	P400&P101&P30 :	I-RESRQ[520],L-HOLD	=>Q-RESTART-PD
	P400&~P101 :	L-ERROR2	=>Q-XFER
2:	P400&P30 :	[503],[529]	=>Q-RESTART

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	P400&P29 :	[522],[503],[529],L-RESEND[523]	=>Q-RESTART
3:	P400&P30 :	I-RESRP[521][533],L-HOLD,[529]	=>Q-RESTART
	P400&P29 :	L-HOLD,L-SUSPND,[522],[503], I-RESRP[521],[533],L-RESEND[524],[529]	=>Q-RESTART
4:	P400&P26 :		=>samestate
	P400&~P26 :	F-DATIN,L-UNHOLD	=>Q-XFER
6:	P400 :	[503]	=>samestate
7:	P400&P24 :	I-CHKRP[543],[503],	
	~P106 :	[508],F-DAEIN	=>Q-XFER
	P106&P441&~P104 :	L-UNHOLD	=>Q-XFER
	P106&P441&P104 :		=>samestate
	P106&~P441 :		=>samestate
9:	P28 :	I-DATRQ[202]	=>samestate
	~P28 :		=>samestate
10:		I-CHKRQ[530]	=>samestate
11:	P441 :	I-DAERQ	=>samestate
	~P441 :	I-DAERQ,[528]	=>samestate
12:	~P425 :	L-RESUME,L-UNHOLD	=>Q-XFER
	P425:	[527]	=>Q-RE-ISSUE
13:	P104:	I-TRERP,	
	~P441:		=>samestate
	P441&P448:	L-UNHOLD	=>samestate
	P441&~P448:	F-TREIN,L-UNHOLD	=>Q-XFER
14:		I-TRERP,	
	~P420 :		=>samestate
	P420 :	L-RESUME,L-UNHOLD	=>Q-XFER
15:	P400&~P103&P29 :	L-STPRSD,	
	P400&~P103&(P30|P29):	[531],	
	~P442 :	F-CANIN,L-UNHOLD	=>samestate
	P442 :	F-CANCF,[215],[63],[509],I-CANRP,[516],L-UNHOLD	=>Q-XFER-IDLE
16:	P400 :	[215],[63],[509],I-CANRP,[516]	=>Q-XFER-IDLE

Note: Either P30 or P29 must be true for RESTART to occur.

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A.5.9.5 Concurrent access - Responder

A.5.9.5.1 Concurrent read access - Responder

STATE / EVENT	R-XFR	R-RESTART-PD	R-RESTART	R-REISSUE	R-CREISSUE
L-ERROR1-R	1		1		
I-RESCF-R		2			
I-RESIN-R	3				
L-DATRQ			9		
L-CHKRQ			10		
L-DAERQ			11		
L-EORIN			12		
L-TREIN-R			13		
I-TRERP-R				14	
I-CANIN-R		15	15	15	
F-CANRP		16	16	16	
L-TRERP-W				17	18

A.5.9.5.2 Detailed entries - concurrent read access (class 1 errors)

1: P440&P101&P29 :	L-SUSPND,I-RESRQ-R[520][533],L-HOLD	=>R-RESTART-PD
P440&{~P101&~P29) :	L-ERROR2-R,L-ERROR2-W	=>R-XFER
2: P440&P29 :	[522],[503],[529],L-RESEND[523]	=>R-RESTART
3: P440&P29 :	L-HOLD,L-SUSPND,[522],[503],I-RESRP-R[521][533], L-RESEND[524],[529]	=>R-RESTART
9: P28 :	I-DATRQ[202]	=>samestate
~P28 :		=>samestate
10:	I-CHKRQ[530]	=>samestate
11: P441 :	I-DAERQ	=>samestate
~P441 :	I-DAERQ,[528]	=>samestate
12: ~P425 :	L-RESUME,L-UNHOLD	=>R-XFER
P425 :	[527]	=>R-REISSUE
13: P104:	I-TRERQ-R,	
~P441:		=>samestate
P441&P448	L-UNHOLD	=>R-XFER
P441&~P448:	F-TREIN,L-UNHOLD	=>R-XFER

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14:	I-TRERP-R,	
~P420 :		=>samestate
P420 :	L-RESUME,L-UNHOLD	=>R-XFER
15: P440 :	L-STPRSD,[531],	
~P442 :	F-CANIN,L-UNHOLD	=>samestate
P442 :	F-CANCF,[513],[514],I-CANRP-R[533],	
P425 :	[463]	=>R-CREISSUE
~P425 :	[63],[516],L-UNHOLD	=>R-XFER-IDLE
16: P440&P413 :	[513],[514],I-CANRP-R[533],	
P425 :	[463]	=>R-CREISSUE
~P425 :	[63],[516],L-UNHOLD	=>R-XFER-IDLE
17:	I-TRERP-W,	
~P420 :		=>samestate
P420 :	L-RESUME,L-UNHOLD	=>R-XFER
18:	I-TRERQ-W,	
~P420:		=>samestate
P420:	[63],[516],L-UNHOLD	=>R-XFER-IDLE

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A.5.9.5.3 Concurrent write access - Responder

STATE / EVENT	W-XFR	W-RESTART-PD	W-RESTART
L-ERROR1-W	1		1
I-RESCF-W		2	
I-RESIN-W	3		
I-DATIN			4
I-CHKCF			6
I-DAEIN			7
I-TREIN-W			13
I-CANIN-W		15	16
I-CANRP-W		15	16
I-CANIN-W		15	16
F-CANRP		15	16

A.5.9.5.4 Detailed entries - concurrent write access (class 1 errors)

1: P440&P101&P30 :	I-RESRQ-W[520][533],L-HOLD	=>W-RESTART-PD
P440&(~P101|~P30) :	L-ERROR2-R,L-ERROR2-W	=>W-XFER
2: P440&P30 :	[503],[529]	=>W-RESTART
3: P440&P30 :	I-RESRP[521][533],L-HOLD,[529]	=>W-RESTART
4: P440&P26 :		=>samestate
P440&~P26 :	F-DATIN,L-UNHOLD	=>W-XFER
6: P440 :	[503]	=>samestate
7: P440&P24 :	I-CHKRP[543],[503],	
~P106 :	[508],F-DAEIN	=>W-XFER
P106&~P441 :		=>samestate
P106&P441&~P104 :	L-UNHOLD	=>W-XFER
P106&P441&P104 :		=>samestate
13: P441 :	L-UNHOLD	=>W-XFER
~P441 :	[528]	=>samestate
15: P440&P30:	[531],	
~P442:	F-CANIN,L-UNHOLD	=>samestate
P442:	F-CANCF,[215],[63],[509],I-CANRP-W[533], [516],L-UNHOLD	=>W-XFER-IDLE
16: P440:	[215],[63],[509],I-CANRP-W[533],[516]	=>W-XFER-IDLE

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A.5.10 Initiating entity state tables - FERPM - (Class II and III errors)

Relabel A.5.14:

A.5.10.1 Normal access (non-overlapped) - Initiator

Relabel A.5.15:

A.5.10.2 Detailed entries - normal access (class II and III errors)

Add the following sub-clauses.

STATE / EVENT	Q-XFER	Q-RESTART-PD	Q-RESTART	Q-CANCEL-PD	CLOSE-PD	DESLECT-PD	RECOVER-PD	INIT-PD	Q-PASSIVE	SEL-PD	OPN-PD	Q-XFER-IDLE
L-ERROR2	1	1	1									11
I-CANIN	2	2	2									
I-CANCF				3								
I-CLOCF					4							
I-DESCF						5						
I-RECCF							6					
L-ERROR3	7	7	7	7	7	7	7		7	7	7	7
I-PABIN	12	12	12	12	12	12	12		12	12	12	12
I-SELCF										9		
I-OPNCF											10	
I-INICF								8				

A.5.10.3 Consecutive access - Initiator

A.5.10.4 Detailed entries - consecutive access (class II and III errors)

1:	P400&-P101:	L-ERROR3	=>samestate
	P400&P101&P30:	L-SUSPND,I-CANRQ[207][433],L-HOLD	=>Q-CANCEL-PD
	P400&P101&P29:	I-CANRQ[207][432],L-HOLD	=>Q-CANCEL-PD

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2:	P103&P29&P400:	I-CANRP[432],I-CLORQ	=>CLOSE-PD
	P103&P30&P400:	L-SUSPND,I-CANRP[433],I-CLORQ	=>CLOSE-PD
3:		I-CLORQ	=>CLOSE-PD
4:		I-DESRQ	=>DESELECT-PD
5:	P400:	I-RECRQ[520][532]	=>RECOVER-PD
6:	P400&~P23&~P33&P34:	[55],F-CLOCF[211],L-ERRABT	=>Q-PASSIVE
	P400&~P23&P33&~P34:	L-HOLD,I-SELRQ	=>SEL-PD
	P400&~P23&101&~(P34|P33)-&(P30|P29):	I-RECRQ[520][532]	=>samestate
	P400&~P23&~P101&~(P34|P33)&(P30|P29):	[55],L-ERRABT	=>Q-PASSIVE
	P400&P23:	[503],[529],[209],	
	P443:	I-REARQ	=>Q-RESTART
	~P443:	[522],I-WRTRQ,L-RESEND[523]	=>Q-RESTART
7:	P400&P30:	L-SUSPND,	
	P400&P100&P101:	L-HOLD,L-PABORT,[200],I-INIRQ	=>INIT-PD
	P400&~P100&P101:	L-HOLD,L-PABORT,I-INIRQ	=>INIT-PD
	P400&~P101:	[55],L-ERRABT	=>Q-PASSIVE
8:	P23:	I-RECRQ[520][532]	=>RECOVER-PD
	~P23&P102:	[200],I-INIRQ	=>samestate
	~P23&~P102:	[55],L-ERRABT	=>Q-PASSIVE
9:	P23:	I-OPNRQ	=>OPN-PD
	~P23:	[55],L-ERRABT	=>Q-PASSIVE
10:	P23:	L-UNHOLD	=>Q-XFER-IDLE
	~P23:	[55],L-ERRABT	=>Q-PASSIVE
11:	~P101:	[55],L-ERRABT	=>Q-PASSIVE
	P101:	L-HOLD,I-CLORQ[211]	=>CLOSE-PD
12:	P400&P30:	L-SUSPND,	
	P400&P103&P100&P101:	L-HOLD,[200],I-INIRQ	=>INIT-PD
	P400&P103&~P100&P101:	L-HOLD,I-INIRQ	=>INIT-PD
	P400&(~P103|~P101):	[55],F-PABIN	=>Q-PASSIVE

NOTES

1 To avoid recovery procedures that never terminate the action in entry 6 by the condition P101 or ~P101 effectively allowing the local system to determine the number of times a recovery from any one error will be attempted.

2. The condition P101 in entries 12 and 7 includes the test when FQOS is zero but the FERPM is not null.

3. The condition ~P103 in entry 2 implies that this event is not relevant to the FERPM and that normal actions take over.

4. The predicates which model the activity state indicator are mutually exclusive, so that combinations of them cannot occur. These combinations are not included in the state table entries.

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A.5.10.5 Concurrent access - Initiator

STATE / EVENT	R-XFER	R-RESTART-PD	R-RESTART	R-CANCEL-PD	CLOSE-PD	DESLECT-PD	RECOVER-PD	INIT-PD	SEL-PD	OPN-PD	R-RECEIVER-WT	R-XFER-IDLE	R-PASSIVE
I-CANIN-R	2	2	2										
I-CANCF-R				3									
I-CLOCF					4						22		
I-DESCF						5					22		
I-RECCF							6				22		
L-ERROR3	7	7	7	7	7	7	7		7	7	22	7	7
I-PABIN	12	12	12	12	12	12	12		12	12	22	12	12
I-SELCF									9				
I-OPNCF										10			
I-INICF								8					
L-RECVR											23	24	
L-ERROR2-R	16	16	16									11	
L-PASIVE	20	20	20	20							20	20	

A.5.10.5.1 Concurrent read access - Initiator

A.5.10.5.2 Detailed entries - concurrent access (class II and III errors) - read

2:	P440&P103&P29:	I-CANRP-R[432],[546],	
	P435:	[536]	=>R-RECOVER-WT
	~P435&P30:	I-CLORQ	=>CLOSE-PD
	~P435&~P30:	I-CLORQ,L-RECVR	=>CLOSE-PD
3:		[546],	
	P435:	[536]	=>R-RECOVER-WT
	~P435:	I-CLORQ	=>CLOSE-PD
4:		I-DESRQ	=>DESELECT-PD
5:	P440:	I-RECRQ[539][532],[548]	=>RECOVER-PD

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6:	P440&P23&P29&P445:	[538],[209],I-REARQ,L-RECVR	=>R-RESTART
	P440&P23&~P29&P445:	L-RECVR	=>R-XFER-IDLE
	P440&~P23&~P33&P34&P445:	[55],F-CLOCF[211],L-ERRABT,L-PASIVE	=>R-PASSIVE
	P440&~P23&P33&~P34:	L-HOLD,I-SELRQ	=>SEL-PD
	P440&~P23&P101&~(P34|P33)&(P30|P29):	I-RECRQ[539][532]	=>samestate
	P440&~P23&~P101&~(P34|P33)&(P30|P29)&P445:	[55],L-ERRABT,L-PASIVE	=>R-PASSIVE
7:	P440&P100&P101:	L-HOLD,L-PABORT,[200],I-INIRQ	=>INIT-PD
	P440&~P100&P101:	L-HOLD,L-PABORT,I-INIRQ	=>INIT-PD
	P440&~P101:	[55],L-ERRABT,L-PASIVE	=>R-PASSIVE
8.	P23:	I-RECRQ[539][532]	=>RECOVER-PD
	~P23&P102:	[200],I-INIRQ	=>samestate
	~P23&~P102&P445:	[55],L-ERRAB,L-PASIVE	=>R-PASSIVE
9:	P23:	I-OPNRQ	=>OPN-PD
	~P23&P445:	[55],L-ERRABT,L-PASIVE	=>R-PASSIVE
10:	P23:	L-UNHOLD,L-RECVR	=>R-XFER-IDLE
	~P23&P445:	[55],L-ERRABT,L-PASIVE	=>R-PASSIVE
11:	P447&~P101:	[55],L-ERRABT	=>R-PASSIVE
	P447&P101:	L-HOLD,I-CLORQ[211]	=>CLOSE-PD
	~P447&P101:	[536]	=>R-RECOVER-WT
12:	P440&P100&P101&P103:	L-HOLD,[200],I-INIRQ	=>INIT-PD
	P440&~P100&P101&P103:	L-HOLD,I-INIRQ	=>INIT-PD
	P440&(~P101|~P103):	[55],F-PABIN,L-PASIVE	=>R-PASSIVE
16:	P440&P101:	I-CANRQ-R[207][507][532],L-HOLD,[546]	=>R-CANCEL-PD
	P440&~P101&~P446:	L-ERROR3,[544]	=>samestate
	P440&~P101&P446:		=>samestate
20:		L-UNHOLD	=>R-PASSIVE
22;		[550]	=>samestate
23:	P444&P29:	[537],[538],I-REARQ	=>R-RESTART
	P444&~P29:	[537]	=>R-XFER-IDLE
24:			=>R-RECOVER-WT

NOTES

1 To avoid recovery procedures that never terminate the action in entry 6 by the condition P101 or ~P101 effectively allowing the local system to determine the number of times a recovery from any one error will be attempted.

2 The condition P101 in entries 12 and 7 includes the test when FQOS is zero but the FERPM is not null.

3. The condition ~P103 in entry 2 implies that this event is not relevant to the FERPM and that normal actions take over.

4. The predicates which model the activity state indicator and wait indicator are mutually exclusive, so that combinations of them cannot occur. These combinations are not included in the state table entries.

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A.5.10.5.3 Concurrent write access - Initiator

STATE / EVENT	W-XFER	W-RESTART-PD	W-RESTART	W-CANCEL-PD	CLOSE-PD	DESLECT-PD	RECOVER-PD	INIT-PD	SEL-PD	OPN-PD	W-RECEVER-WT	W-XFER-IDLE	W-PASSIVE
I-CANIN-W	13	13	13										
I-CANCF-W				14									
I-CLOCF					4						22		
I-DESCF						5					22		
I-RECCF							6				22		
L-ERROR3	18	18	18	18	7	7	7		7	7	22	18	18
I-PABIN	18	18	18	18	12	12	12		12	12	22	18	18
I-SELCF									9				
I-OPNCF										10			
I-INICF								8			22		
L-RECVR											15	25	
L-ERROR2-W	17	17	17									21	
L-PASIVE	19	19	19	19							19	19	

A.5.10.5.4 Detailed entries - concurrent access (class II and III errors) - write

4: I-DESRQ =>DESELECT-PD

5: P440: I-RECRQ[539][532],[548] =>RECOVER-PD

6: P440&P23&~P30&P444: L-RECVR =>W-XFER-IDLE
P440&P23&P30&P444: [538],[522],[209],I-WRTRQ,L-RESEND[523],L-RECVR =>W-RESTART
P440&~P23&~P33&P34&P444:
[55],F-CLOCF[211],L-ERRABT,L-PASIVE =>W-PASSIVE
P440&~P23&P33&~P34: L-HOLD,I-SELRQ =>SEL-PD
P440&~P23&P101&~(P34|P33)&(P30|P29):
I-RECRQ[539][532] =>samestate
P440&~P23&~P101&~(P34|P33)&(P30|P29)&P444:
[55],L-ERRABT,L-PASIVE =>W-PASSIVE

7: P440&P100&P101: L-HOLD,L-PABORT,[200],I-INIRQ =>INIT-PD
P440&~P100&P101: L-HOLD,L-PABORT,I-INIRQ =>INIT-PD
P440&~P101: [55],L-ERRABT,L-PASSIVE =>W-PASSIVE

8. P23: I-RECRQ[539],[532] =>RECOVER-PD
~P23&P102: [200],I-INIRQ =>samestate
~P23&~P102&P444: [55],L-ERRABT,L-PASIVE =>W-PASSIVE

9: P23: I-OPNRQ =>OPN-PD

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~P23&P444:	[55],L-ERRABT,L-PASIVE	=>W-PASSIVE
10: P23:	L-UNHOLD,L-RECVR	=>W-XFER-IDLE
~P23&P444:	[55],L-ERRABT,L-PASIVE	=>W-PASSIVE
12: P440&P100&P101&P103:	L-HOLD,[200],I-INIRQ	=>INIT-PD
P440&~P100&P101&P103:	L-HOLD,I-INIRQ	=>INIT-PD
P440&(~P101|~P103):	[55],F-PABIN,L-PASIVE	=>W-PASSIVE
13: P440&P103&P30:	I-CANRP-W[433],[547],L-SUSPND,	
P435:	[535]	=>W-RECOVER-WT
~P435&P29:	I-CLORQ	=>CLOSE-PD
~P435&~P29:	I-CLORQ,L-RECVR	=>CLOSE-PD
14:	[547],	
P435:	[535]	=>W-RECOVER-WT
~P435:	I-CLORQ	=>CLOSE-PD
15: P445&P30:	[537],[538],[522],I-WRTRQ,L-RESEND[523]	=>W-RESTART
P445&~P30:	[537]	=>W-XFER-IDLE
17: P440&P101&P30:	L-SUSPND,I-CANRQ-W[207][507][532],L-HOLD,[547]	=>W-CANCEL-PD
P440&~P101&P30&~P446:	L-ERROR3,[544]	=>samestate
P440&~P101&P30&P446:		=>samestate
18:	L-SUSPND,L-HOLD,[550],[535]	=>W-RECOVER-WT
19:	L-UNHOLD	=>W-PASSIVE
21: P447&~P101:		=>W-PASSIVE
P447&P101:	[535]	=>W-RECOVER-WT
~P447&P101:	[535]	=>W-RECOVER-WT
22;	[550]	=>samestate
25:		=>W-RECOVER-WT

NOTES

1 To avoid recovery procedures that never terminate the action in entry 6 by the condition P101 or ~P101 effectively allowing the local system to determine the number of times a recovery from any one error will be attempted.

2 The condition P101 in entries 12 and 7 includes the test when FQOS is zero but the FERPM is not null.

3. The condition ~P103 in entry 2 implies that this event is not relevant to the FERPM and that normal actions take over.

4. The predicates which model the activity state indicator and wait indicator are mutually exclusive, so that combinations of them cannot occur. These combinations are not included in the state table entries.

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A.5.11 Responding entity state table - FERPM - (class II and III errors)

Relabel A.5.16:

A.5.11.1 Normal access (non-overlapped) - Responder

Relabel A.5.17:

A.5.11.2 Detailed entries - normal access (class II and III errors)

Add the following sub-clauses.

A.5.11.3 Consecutive access - Responder

STATE / EVENT	Q-XFER	Q-RESTART-PD	Q-RESTART	Q-CANCEL-PD	CLOSE-EX	DESLECT-EX	Q-PASSIVE	XFER-EX	INIT-EX	SEL-EX	OPN-EX	Q-XFER-IDLE
L-ERROR2	1	1	1				14					
I-CANIN	2	2	2									
I-CANCF				3								
I-CLOIN					4							16
I-DESIN						5						
I-RECIN							6					
L-ERROR3	7	7	7	7	7	7	7	7		7	7	7
I-PABIN	17	17	17	17	17	17	17	17		17	17	17
L-GIVEUP							12					
I-INIIN									8			
I-REAIN								13				
I-WRTIN								9				
I-SELIN										10		
I-OPNIN											11	

A.5.11.4 Detailed entries - consecutive access (class II and III errors)

1:	P400&~P101:	L-ERROR3	=>samestate
	P400&P101&P30:	I-CANRQ[207][435],L-HOLD	=>Q-CANCEL-PD
	P400&P101&P29:	I-SUSPND,I-CANRQ[207][436],L-HOLD	=>Q-CANCEL-PD
2:	P400&P103&P30:	I-CANRP[435]	=>CLOSE-EX
	P400&P103&P29:	L-SUSPND,I-CANRP[436]	=>CLOSE-EX
3:			=>CLOSE-EX
4:		I-CLORP	=>DESELECT-EX
5:		I-DESRP	=>Q-PASSIVE

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6.	P400&P101&P39&~P33&(P30|P29):		
		[209],I-RECRP[521][533],[503],[529]	=>Q-XFER-EX
	P400&P101&P39&P33&~P31&~P32:		
		I-RECRP[201]	=>SEL-EX
	P400&P101&P39&~P33&~P31&~P32:		
		I-RECRP[201]	=>samestate
	P400&P101&~P39:	I-RECRP[75][201]	=>samestate
	P400&~P101:	I-RECRP[201]	=>samestate
7:	P400&P29:	L-SUSPND,	
	P400&P101:	L-HOLD,L-PABORT	=>INIT-EX
	P400&~P101:	[55],L-ERRABT	=>Q-PASSIVE
8:	P102:	I-INIRP	=>Q-PASSIVE
	~P102:	I-INIRP[201]	=>Q-PASSIVE
9:	P400&P30&~P33&~P34:		=>Q-RESTART
	P400&~P30|P33|P34:	[55],L-ERRABT	=>Q-PASSIVE
10:		L-SELRP	=>OPN-EX
11:		L-HOLD,I-OPNRP	=>Q-XFER-IDLE
12:		[55],L-ERRABT	=>samestate
13:	P400&P29&~P33&~P34:	L-RESEND[523]	=>Q-RESTART
	P400&~P29|P33|P34:	[55],L-ERRABT	=>Q-PASSIVE
14:	P101&P400:	[210],L-HOLD	=>samestate
	~P101&P400:	[55],L-ERRABT	=>samestate
16:	P103	I-CLORP,L-HOLD	=>DESELECT-EX
17:	P400&P103&P101&P29:	L-SUSPND,L-HOLD	=>INIT-EX
	P400&P103&P101&P30:	L-HOLD	=>INIT-EX
	P400&(~P103|~P101):	[55],F-PABIN	=>Q-PASSIVE

NOTES

1. The condition P101 in entries 7 and 17 includes the test when FQOS is zero but the FERPM is not null.

2. The condition ~P103 in entries 2 and 16 implies that this event is not relevant to the FERPM and that normal actions take over.

3. The predicates which model the activity state indicator are mutually exclusive, so that combinations of them cannot occur. These combinations are not included in the state table entries.

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A.5.11.5 Concurrent access - Responder

A.5.11.5.1 Concurrent read access - Responder

STATE / EVENT	R-XFER	R-RESTART-PD	R-RESTART	R-CANCEL-PD	CLOSE-EX	DESLECT-EX	REC-EX	XFER-EX	INIT-PD	SEL-PD	OPN-PD	R-XFER-IDLE	R-RECEIVER-WT	R-PASSIVE
I-CANIN-R	2	2	2											
I-CANCF-R				3										
I-CLOIN					4							16	25	
I-DESIN						5							25	
I-RECIN							6						25	
L-ERROR3	7	7	7	7	7	7	7	7		7	7	7	25	7
I-PABIN	17	17	17	17	12	12	12	12		12	12	12	25	12
L-GIVEUP							12							
I-INIIN									8					
I-REAIN								13					26	
I-SELIN										10				
I-OPNIN											11			
L-RECVR												29	28	
L-ERROR2-R	18	18	18									14		
L-PASIVE	23	23	23	23								23	23	

A.5.11.5.2 Detailed entries - concurrent access (class II and III errors) - read

2: P440&P101: I-SUSPND,I-CANRP-R[436],[546],
P435: [536] =>R-RECOVER-WT
~P435&P29: =>CLOSE-EX
~P435&~P29: L-RECVR =>CLOSE-EX

3: [546],
P435: [536] =>R-RECOVER-WT
~P435: =>CLOSE-EX

4: I-CLORP =>DESELECT-EX

5: I-DESRP =>REC-EX

6: P440&P101&P39&~P33&~P34:
[209],I-RECRP[540][533],[538],[548] =>XFER-EX
P440&P101&P39&P33: I-RECRP[201],[548] =>SEL-EX
P440&P101&P39&~P33&P34: I-RECRP[201],[548] =>samestate
P440&P101&~P39: I-RECRP[75][201],[548] =>samestate
P440&~P101: I-RECRP[201],[548] =>samestate

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7: P440&P101:	L-SUSPND,L-HOLD,L-PABORT	=>INIT-EX
P440&~P101:	[55],L-ERRABT,L-PASIVE	=>R-PASSIVE
8: P102:	I-INIRP	=>REC-EX
~P102:	I-INIRP[201],L-PASIVE	=>R-PASSIVE
10:	L-SELRP	=>opN-ex
11:	I-OPNRP	=>XFER-EX
12: P444:	[55],L-ERRABT,L-PASIVE	=>R-PASSIVE
13: P440&P29&P445:	L-RESEND[524],L-RECVR	=>R-RESTART
P440&P29&~P445:	L-RESEND[524]	=>R-RESTART
P440&~P29&P445:	[55],L-ERRABT,L-PASIVE	=>R-PASSIVE
14: P447&P101:	[210],L-HOLD	=>samestate
P447&~P101:	[55],L-ERRABT,L-PASIVE	=>R-PASSIVE
~P447&P101:	[536]	=>R-RECOVER-WT
16: P103:	I-CLORP,L-HOLD	=>DESELECT-EX
17: P440&P103&P101:	L-SUSPND,L-HOLD	=>INIT-EX
P440&(~P103|~P101):	[55],F-PABIN,L-PASIVE	=>R-PASSIVE
18: P440&P101:	L-SUSPND,I-CANRQ-R[207][436],L-HOLD,[546]	=>R-CANCEL-PD
P440&~P101&~P446:	L-ERROR3,[544]	=>samestate
P440&~P101&P446:		=>samestate
25:	[550]	=>samestate
26: P440&P29&P444:	L-RESEND[524],[537]	=>R-RESTART
P440&~P29:	[55],L-ERRABT,L-PASIVE	=>R-PASSIVE
28: ~P29:	[537]	=>R-XFER-IDLE
P29:		=>samestate
29:		=>R-RECOVER-WT

NOTES

1 The condition P101 in entries 7 and 17 includes the test when FQOS is zero but the FERPM is not null.

2 The condition ~P103 in entries 2 and 16 implies that this event is not relevant to the FERPM and that normal actions take over.

3 The predicates which model the activity state indicator and wait indicator are mutually exclusive, so that combinations of them cannot occur. These combinations are not included in the state table entries.

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A.5.11.5.3 Concurrent write access - Responder

STATE / EVENT	W-XFER	W-RESTART-PD	W-RESTART	W-CANCEL-PD	CLOSE-EX	DESELECT-EX	REC-EX	XFER-EX	INIT-PD	SEL-PD	OPN-PD	W-XFER-IDLE	W-RECEIVER-WT	W-PASSIVE
I-CANIN-W	20	20	20											
I-CANCF-W				21										
I-CLOIN					4							24	25	
I-DESIN						5							25	
I-RECIN							6						25	
L-ERROR3	24	24	24	24	7	7	7	7		7	7	24	25	24
I-PABIN	24	24	24	24	12	12	12	12		12	12	24	25	24
L-GIVEUP							12							
I-INIIN									8				25	
I-WRTIN								9					27	
I-SELIN										10				
I-OPNIN											11			
L-RECVR												30	15	
L-ERROR2-W	19	19	19									29		
L-PASIVE	22	22	22	22								22	22	

A.5.11.5.4 Detailed entries - concurrent access (class II and III errors) - write

4:		I-CLORP	=>DESELECT-EX
5:		I-DESRP	=>REC-EX
6:	P440&P101&P39&~P33&~P34:		
		[209],I-RECRP[540][533],[538],[548]	=>XFER-EX
	P440&P101&P39&P33:	I-RECRP[201],[548]	=>SEL-EX
	P440&P101&P39&~P33&P34:	I-RECRP[201],[548]	=>samestate
	P440&P101&~P39:	I-RECRP[75][201],[548]	=>samestate
	P440&~P101:	I-RECRP[201],[548]	=>samestate
7:	P440&P101:	L-HOLD,L-PABORT	=>INIT-EX
	P440&~P101:	[55],L-ERRABT,L-PASIVE	=>W-PASSIVE
8:	P102:	I-INIRP	=>REC-EX
	~P102:	I-INIRP[201],L-PASIVE	=>W-PASSIVE
9:	P440&P30&P444:	L-RECVR	=>W-RESTART
	P440&P30&~P444:		=>W-RESTART
	P440&~P30&P444:	[55],L-ERRABT,L-PASIVE	=>W-PASSIVE

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10:	L-SELRP	=>opN-ex
11:	I-OPNRP	=>XFER-EX
12: P445:	[55],L-ERRABT,L-PASIVE	=>W-PASSIVE
15: ~P30:	[537]	=>W-XFER-IDLE
P30:		=>samestate
16: P103:	I-CLORP,L-HOLD	=>DESELECT-EX
19: P440&P101:	I-CANRQ-W[207][435],L-HOLD,[547]	=>W-CANCEL-PD
P440&~P101&~P446:	L-ERROR3,[544]	=>samestate
P440&~P101&P446:		=>samestate
20: P440&P103&P30:	I-CANRP-W[435],[547],	
P435:	[535]	=>W-RECOVER-WT
~P435&P29:		=>CLOSE-EX
~P435&~P29:	L-RECVR	=>CLOSE-EX
21:	[546],	
P435:	[535]	=>W-RECOVER-WT
~P435:		=>CLOSE-EX
22:	L-UNHOLD	=>W-PASSIVE
24:	L-HOLD,[550],[535]	=>W-RECOVER-WT
25:	[550]	=>samestate
27: P440&P30&P445:	[537]	=>W-RESTART
P440&~P30:	[55],L-ERRABT,L-PASIVE	=>W-PASSIVE
25: P447&~P101:		=>W-PASSIVE
P447&P101:	[535]	=>W-RECOVER-WT
~P447&P101:	[535]	=>W-RECOVER-WT
30:		=>W-RECOVER-WT

NOTES

1 The condition P101 in entries 7 and 17 includes the test when FQOS is zero but the FERPM is not null.

2 The condition ~P103 in entries 2 and 16 implies that this event is not relevant to the FERPM and that normal actions take over.

3 The predicates which model the activity state indicator and wait indicator are mutually exclusive, so that combinations of them cannot occur. These combinations are not included in the state table entries.

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INTERNATIONAL STANDARD

ISO 8571-4

First edition
1988-10-01

AMENDMENT 1
1992-12-15

Information processing systems – Open Systems Interconnection – File Transfer, Access and Management –

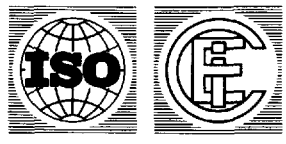
Part 4 :
File Protocol Specification

AMENDMENT 1 : Filestore Management

Technologies de l'information – Interconnexion de systèmes ouverts (OSI) – Transfert, accès et gestion de fichiers –

Partie 4 : Spécification du protocole de fichiers

AMENDEMENT 1 : Gestion du système de fichiers



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ISO 8571-4:1988/Amd.1:1992 (E)

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

Amendment 1 to International Standard ISO 8571-4:1988 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology.*

ISO 8571-4 consists of the following parts, under the general title *Information processing systems – Open Systems Interconnection – File Transfer, Access and Management*

- *Part 1 : General introduction*
- *Part 2 : Virtual Filestore Definition*
- *Part 3 : File Service Definition*
- *Part 4 : File Protocol Specification*
- *Part 5 : Protocol Implementation Conformance Statement Proforma*

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Information processing systems – Open Systems Interconnection – File Transfer, Access and Management –

Part 4 :
File Protocol Specification

AMENDMENT 1 : Filestore Management

NOTE – This amendment has additional subclauses and tables to ISO 8571 which are indicated by the use of lower case Roman letters beginning with "a" and imply ordering alphabetically, following the clause with the same numerical value in ISO 8571. These and all subsequent subclauses, tables, and cross references will be renumbered in subsequent editions.

0 Introduction

(amend 3rd paragraph, page 1)

ISO 8571 defines services for file transfer, access and management. It also specifies a protocol available within the application layer of the Reference Model. The service defined is of the category Application Service Element (ASE). It is concerned with identifiable bodies of information which can be treated as files, stored and managed within open systems, or passed between application processes.

(amend 4th paragraph, page 1)

ISO 8571 defines a basic file service. It provides sufficient facilities to support file transfer, file access, and management of files stored on open systems. ISO 8571 does not specify the interfaces to a file transfer, access or management facility within the local system.

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(append after subclause 8.2, page 8)

NOTE – This amendment adds the following file initiating entity actions. The detailed actions are listed below and detailed in the state table (Annex A).

8.2a Group Selection (Group Manipulation)

The initiating entity actions for Group Selection are described in Annex a.

8.2b Change Current Name Prefix (Limited Filestore Management)

The initiating entity actions for Change Current Name Prefix are described in Annex a.

8.2c List File Directory (Limited Filestore Management)

The initiating entity actions for List File Directory are described in Annex a.

8.2d Group Deletion (Group Manipulation)

The initiating entity actions for Group Deletion are described in Annex a.

8.2e Group Move (Group Manipulation)

The initiating entity actions for Group Move are described in Annex a.

8.2f Group Copy (Group Manipulation)

The initiating entity actions for Group Copy are described in Annex a.

8.2g Group List (Group Manipulation)

The initiating entity actions for Group List are described in Annex a.

8.2h Group Change Attributes (Enhanced Filestore Management)

The initiating entity actions for Group Change Attributes are described in Annex a.

8.2i Select-Another Object (group Manipulation)

The initiating entity actions for Select-Another Object are described in Annex a.

8.2j Move Object (Object Manipulation)

The initiating entity actions for Move Object are described in Annex a.

8.2k Copy Object (Object Manipulation)

The initiating entity actions for Copy Object are described in Annex a.

8.2l File-Directory Creation (Enhanced Filestore Management)

The initiating entity actions for File-Directory Creation are described in Annex a.

8.2m Reference Creation (Enhanced Filestore Management)

The initiating entity actions for Reference Creation are described in Annex a.

8.2n Reference Deletion (Enhanced Filestore Management)

The initiating entity actions for Reference Deletion are described in Annex a.

8.2o Read Reference Attributes (Enhanced Filestore Management)

The initiating entity actions for Read Reference Attributes are described in Annex a.

8.2p Change Reference Attributes (Enhanced Filestore Management)

The initiating entity actions for Change Reference Attributes are described in Annex a.

(append after subclause 9.2, page 15)

NOTE – This amendment adds the following file responding entity actions. The detailed actions are listed below and detailed in the state table (Annex A).

9.2a Group Selection (Group Manipulation)

The responding entity actions for Group Selection are described in Annex a.

9.2b Change Current Name Prefix (Limited Filestore Management)

The responding entity actions for Change Current Name Prefix are described in Annex a.

9.2c List File Directory (Limited Filestore Management)

The responding entity actions for List File Directory are described in Annex a.

9.2d Group Deletion (Group Manipulation)

The responding entity actions for Group Deletion are described in Annex a.

9.2e Group Move (Group Manipulation)

The responding entity actions for Group Move are described in Annex a.

9.2f Group Copy (Group Manipulation)

The responding entity actions for Group Copy are described in Annex a.

9.2g Group List (Group Manipulation)

The responding entity actions for Group List are described in Annex a.

9.2h Group Change Attributes (Enhanced Filestore Management)

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The responding entity actions for Group Change Attributes are described in Annex a.

9.2i Select-Another Object (Group Manipulation)

The responding entity actions for Select-Another Object are described in Annex a.

9.2j Move Object (Object Manipulation)

The responding entity actions for Move Object are described in Annex a.

9.2k Copy Object (Object Manipulation)

The responding entity actions for Copy Object are described in Annex a.

9.2l File-Directory Creation (Enhanced Filestore Management)

The responding entity actions for File-Directory Creation are described in Annex a.

9.2m Reference Creation (Enhanced Filestore Management)

The responding entity actions for Reference Creation are described in Annex a.

9.2n Reference Deletion (Enhanced Filestore Management)

The responding entity actions for Reference Deletion are described in Annex a.

9.2o Read Reference Attributes (Enhanced Filestore Management)

The responding entity actions for Read Reference Attributes are described in Annex a.

9.2p Change Reference Attributes (Enhanced Filestore Management)

The responding entity actions for Change Reference Attributes are described in Annex a.

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Section five: Abstract Syntax

20.3 ASN.1 Module Definition

(amend Figure 7, page 33)

```
1
2
3   ISO8571-FTAM DEFINITIONS ::=
4   BEGIN
5       PDU ::= CHOICE { FTAM-Regime-PDU, File-PDU, Bulk-Data-PDU, FSM-PDU }
6
7       FTAM-Regime-PDU ::= CHOICE {
8           f-initialize-request            [0] IMPLICIT F-INITIALIZE-request,
9           f-initialize-response           [1] IMPLICIT F-INITIALIZE-response,
10          f-terminate-request             [2] IMPLICIT F-TERMINATE-request,
11          f-terminate-response            [3] IMPLICIT F-TERMINATE-response,
12          f-u-abort-request               [4] IMPLICIT F-U-ABORT-request,
13          f-p-abort-request               [5] IMPLICIT F-P-ABORT-request }
14
15      F-INITIALIZE-request ::= SEQUENCE {
16          protocol-version                    Protocol-Version  DEFAULT { version-1 },
17          implementation-information          Implementation-Information OPTIONAL,
18          presentation-context-management     [2] IMPLICIT BOOLEAN DEFAULT FALSE,
19          service-class                       Service-Class DEFAULT { transfer-class },
20          -- Only the valid combinations as specified in ISO 8571-3 are allowed.
21          functional-units                    Functional-Units,
22          attribute-groups                    Attribute-Groups DEFAULT {},
23          shared-ASE-information              Shared-ASE-Information OPTIONAL,
24          ftam-quality-of-service             FTAM-Quality-of-Service,
25          contents-type-list                  Contents-Type-List OPTIONAL,
26          initiator-identity                  User-Identity OPTIONAL,
27          account                             Account OPTIONAL,
28          filestore-password                  Password OPTIONAL,
29          checkpoint-window                   [8] IMPLICIT INTEGER DEFAULT 1 }
30          -- If the recovery or restart data transfer functional units are
31          -- not available, the checkpoint-window parameter shall not be sent.
32
33      F-INITIALIZE-response ::= SEQUENCE {
34          state-result                        State-Result DEFAULT success,
35          action-result                       Action-Result DEFAULT success,
36          protocol-version                    Protocol-Version  DEFAULT { version-1 },
37          implementation-information          Implementation-Information OPTIONAL,
38          presentation-context-management     [2] IMPLICIT BOOLEAN DEFAULT FALSE,
39          service-class                       Service-Class DEFAULT { transfer-class },
40          -- Only the valid combinations as specified in ISO 8571-3 are allowed.
41          functional-units                    Functional-Units,
42          attribute-groups                    Attribute-Groups DEFAULT {},
43          shared-ASE-information              Shared-ASE-Information OPTIONAL,
44          ftam-quality-of-service             FTAM-Quality-of-Service,
45          contents-type-list                  Contents-Type-List OPTIONAL,
```


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```
        diagnostic                          Diagnostic OPTIONAL,
        checkpoint-window                   [8] IMPLICIT INTEGER DEFAULT 1 }
        -- If the recovery or restart data transfer functional units are
        -- not available, the checkpoint-window parameter shall not be sent.

Protocol-Version ::= [0] IMPLICIT BIT STRING
                            { version-1    (0),
                            version-2    (1) }

Implementation-Information ::= [1] IMPLICIT GraphicString
-- This parameter is provided solely for the convenience of implementors
-- needing to distinguish between implementations of a specific version number
-- of different equipment, it shall not be the subject of conformance test.

Service-Class ::= [3] IMPLICIT BIT STRING
                            { unconstrained-class    (0),
                            management-class    (1),
                            transfer-class    (2),
                            transfer-and-management-class    (3),
                            access-class    (4) }

Functional-Units ::= [4] IMPLICIT BIT STRING
                            { read    ( 2),
                            write    ( 3),
                            file-access    ( 4),
                            limited-file-management    ( 5),
                            enhanced-file-management    ( 6),
                            grouping    ( 7),
                            fadu-locking    ( 8),
                            recovery    ( 9),
                            restart-data-transfer    (10),
                            limited-filestore-management    (11),
                            enhanced-filestore-management    (12),
                            object-manipulation    (13),
                            group-manipulation    (14) }
-- Values 2 to 14 are chosen to align with numbering scheme used in ISO 8571-3.

Attribute-Groups ::= [5] IMPLICIT BIT STRING
                            { storage    (0),
                            security    (1),
                            private    (2),
                            extension    (3) }
-- The extension bit is defined if and only if the limited-filestore-management
-- or the group-manipulation functional units are available.

FTAM-Quality-of-Service ::= [6] IMPLICIT INTEGER
                            { no-recovery    (0),
                            class-1-recovery    (1),
                            class-2-recovery    (2),
                            class-3-recovery    (3) }

Contents-Type-List ::= [7] IMPLICIT SEQUENCE OF CHOICE
        { document-type-name            Document-Type-Name,
        abstract-syntax-name            Abstract-Syntax-Name }
```


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```
100
101 F-TERMINATE-request ::= SEQUENCE {
102     shared-ASE-information              Shared-ASE-Information OPTIONAL }
103
104 F-TERMINATE-response ::= SEQUENCE {
105     shared-ASE-information              Shared-ASE-Information OPTIONAL,
106     charging                            Charging OPTIONAL }
107
108 F-U-ABORT-request ::= SEQUENCE {
109     action-result                       Action-Result DEFAULT success,
110     diagnostic                          Diagnostic OPTIONAL }
111
112 F-P-ABORT-request ::= SEQUENCE {
113     action-result                       Action-Result DEFAULT success,
114     diagnostic                          Diagnostic OPTIONAL }
115
116 File-PDU ::= CHOICE {
117     f-select-request                    [ 6] IMPLICIT F-SELECT-request,
118     f-select-response                   [ 7] IMPLICIT F-SELECT-response,
119     f-deselect-request                  [ 8] IMPLICIT F-DESELECT-request,
120     f-deselect-response                 [ 9] IMPLICIT F-DESELECT-response,
121     f-create-request                    [10] IMPLICIT F-CREATE-request,
122     f-create-response                   [11] IMPLICIT F-CREATE-response,
123     f-delete-request                    [12] IMPLICIT F-DELETE-request,
124     f-delete-response                   [13] IMPLICIT F-DELETE-response,
125     f-read-attrib-request               [14] IMPLICIT F-READ-ATTRIB-request,
126     f-read-attrib-response              [15] IMPLICIT F-READ-ATTRIB-response,
127     f-change-attrib-request             [16] IMPLICIT F-CHANGE-ATTRIB-request,
128     f-change-attrib-response            [17] IMPLICIT F-CHANGE-ATTRIB-response,
129     f-open-request                      [18] IMPLICIT F-OPEN-request,
130     f-open-response                     [19] IMPLICIT F-OPEN-response,
131     f-close-request                     [20] IMPLICIT F-CLOSE-request,
132     f-close-response                    [21] IMPLICIT F-CLOSE-response,
133     f-begin-group-request               [22] IMPLICIT F-BEGIN-GROUP-request,
134     f-begin-group-response              [23] IMPLICIT F-BEGIN-GROUP-response,
135     f-end-group-request                 [24] IMPLICIT F-END-GROUP-request,
136     f-end-group-response                [25] IMPLICIT F-END-GROUP-response,
137     f-recover-request                   [26] IMPLICIT F-RECOVER-request,
138     f-recover-response                  [27] IMPLICIT F-RECOVER-response,
139     f-locate-request                    [28] IMPLICIT F-LOCATE-request,
140     f-locate-response                   [29] IMPLICIT F-LOCATE-response,
141     f-erase-request                     [30] IMPLICIT F-ERASE-request,
142     f-erase-response                    [31] IMPLICIT F-ERASE-response  }
143
144 F-SELECT-request ::= SEQUENCE {
145     attributes                          Select-Attributes,
146     requested-access                    Access-Request,
147     access-passwords                    Access-Passwords OPTIONAL,
148     path-access-passwords               Path-Access-Passwords OPTIONAL,
149     -- This parameter can only be sent when the
150     -- limited-filestore-management or the object-manipulation or
151     -- the group-manipulation functional units are available.
152      concurrency-control                Concurrency-Control OPTIONAL,
153     shared-ASE-information              Shared-ASE-Information OPTIONAL,
```


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```
154     account                                 Account OPTIONAL }
155
156 F-SELECT-response ::= SEQUENCE {
157     state-result                            State-Result DEFAULT success,
158     action-result                           Action-Result DEFAULT success,
159     attributes                              Select-Attributes,
160     referent-indicator                      Referent-Indicator OPTIONAL,
161     -- This parameter can only be sent when the
162     -- limited-filestore-management functional unit is available.
163     shared-ASE-information                  Shared-ASE-Information OPTIONAL,
164     diagnostic                              Diagnostic OPTIONAL }
165
166 F-DESELECT-request ::= SEQUENCE {
167     shared-ASE-information                  Shared-ASE-Information OPTIONAL }
168
169 F-DESELECT-response ::= SEQUENCE {
170     action-result                           Action-Result DEFAULT success,
171     charging                                Charging OPTIONAL,
172     -- Present if and only if the account field was present on
173     -- the PDU which established the selection regime.
174     shared-ASE-information                  Shared-ASE-Information OPTIONAL,
175     diagnostic                              Diagnostic OPTIONAL }
176
177 F-CREATE-request ::= SEQUENCE {
178     override            [0] IMPLICIT Override DEFAULT create-failure,
179     initial-attributes                      Create-Attributes,
180     create-password                         Password OPTIONAL,
181     requested-access                        Access-Request,
182     access-passwords                        Access-Passwords OPTIONAL,
183     path-access-passwords   Path-Access-Passwords OPTIONAL,
184     -- This parameter can only be sent when the
185     -- limited-filestore-management or the object-manipulation or
186     -- the group-manipulation functional units are available.
187      concurrency-control                    Concurrency-Control OPTIONAL,
188     shared-ASE-information                  Shared-ASE-Information OPTIONAL,
189     account                                 Account OPTIONAL }
190
191 F-CREATE-response ::= SEQUENCE {
192     state-result                            State-Result DEFAULT success,
193     action-result                           Action-Result DEFAULT success,
194     initial-attributes                      Create-Attributes,
195     shared-ASE-information                  Shared-ASE-Information OPTIONAL,
196     diagnostic                              Diagnostic OPTIONAL }
197
198 F-DELETE-request ::= SEQUENCE {
199     shared-ASE-information                  Shared-ASE-Information OPTIONAL }
200
201 F-DELETE-response ::= SEQUENCE {
202     action-result                           Action-Result DEFAULT success,
203     shared-ASE-information                  Shared-ASE-Information OPTIONAL,
204     charging                                Charging OPTIONAL,
205     diagnostic                              Diagnostic OPTIONAL }
206
207 F-READ-ATTRIB-request ::= SEQUENCE {
```


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```
208      attribute-names                    [0] IMPLICIT Attribute-Names,
209      attribute-extension-names          [1] IMPLICIT Attribute-Extension-Names
210                                                          OPTIONAL }
211      -- This parameter can only be sent when the
212      -- limited-filestore-management functional unit is available.
213
214  F-READ-ATTRIB-response ::= SEQUENCE {
215      action-result                      Action-Result DEFAULT success,
216      attributes                         Read-Attributes OPTIONAL,
217      -- Password values within the access control can not be read by means
218      -- of the read attribute action.  Whether other parts of the access
219      -- control object attribute can be read by means of the read
220      -- attribute action is decided locally by the responding entity, and
221      -- it shall not be the subject of conformance test.
222      diagnostic                         Diagnostic OPTIONAL }
223
224  F-CHANGE-ATTRIB-request ::= SEQUENCE {
225      attributes                         Change-Attributes }
226
227  F-CHANGE-ATTRIB-response ::= SEQUENCE {
228      action-result                      Action-Result DEFAULT success,
229      attributes                         Change-Attributes OPTIONAL,
230      -- Password values within access control attribute are never returned.
231      -- Other attributes are returned as an implementation choice.
232      diagnostic                         Diagnostic OPTIONAL }
233
234  F-OPEN-request ::= SEQUENCE {
235      processing-mode                        [0] IMPLICIT BIT STRING
236                                 { f-read    (0),
237                                 f-insert    (1),
238                                 f-replace   (2),
239                                 f-extend    (3),
240                                 f-erase     (4) } DEFAULT { f-read },
241  contents-type                          [1] CHOICE {
242                                 unknown         [0] IMPLICIT NULL,
243                                 proposed        [1] Contents-Type-Attribute },
244      concurrency-control                Concurrency-Control OPTIONAL,
245      shared-ASE-information             Shared-ASE-Information OPTIONAL,
246      enable-fadu-locking                [2] IMPLICIT BOOLEAN DEFAULT FALSE,
247      -- If the fadu-locking functional unit is not available, the
248      -- enable-fadu-locking parameter shall not be sent.
249      activity-identifier                Activity-Identifier OPTIONAL,
250      -- Only used in the recovery functional unit.
251      recovery-mode                      [3] IMPLICIT INTEGER
252                                 { none    (0),
253                                 at-start-of-file    (1),
254                                 at-any-active-checkpoint    (2) }
255                                                  DEFAULT none,
256      -- If the recovery or restart data transfer functional units are not
257      -- available, the recovery-mode parameter shall not be sent.
258      remove-contexts                    [4] IMPLICIT SET OF Abstract-Syntax-Name OPTIONAL,
259      define-contexts                    [5] IMPLICIT SET OF Abstract-Syntax-Name OPTIONAL}
260
261  F-OPEN-response ::= SEQUENCE {
```


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```
262     state-result                    State-Result DEFAULT success,
263     action-result                   Action-Result DEFAULT success,
264     contents-type                   [1] Contents-Type-Attribute,
265     concurrency-control             Concurrency-Control OPTIONAL,
266     shared-ASE-information           Shared-ASE-Information OPTIONAL,
267     diagnostic                      Diagnostic OPTIONAL,
268     recovery-mode                   [3] IMPLICIT INTEGER
269                                 { none    (0),
270                                 at-start-of-file    (1),
271                                 at-any-active-checkpoint    (2) }
272                                         DEFAULT none,
273     -- If the recovery or restart data transfer functional units are not
274     -- available, the recovery-mode parameter shall not be sent.
275     presentation-action             [6] IMPLICIT BOOLEAN DEFAULT FALSE }
276     -- This flag is set if the responder is going to follow this response
277     -- by a P-ALTER-CONTEXT exchange.
278
279 F-CLOSE-request ::= SEQUENCE {
280     action-result                   Action-Result DEFAULT success,
281     shared-ASE-information           Shared-ASE-Information OPTIONAL,
282     diagnostic                      Diagnostic OPTIONAL }
283
284 F-CLOSE-response ::= SEQUENCE {
285     action-result                   Action-Result DEFAULT success,
286     shared-ASE-information           Shared-ASE-Information OPTIONAL,
287     diagnostic                      Diagnostic OPTIONAL }
288
289 F-BEGIN-GROUP-request ::= SEQUENCE {
290     threshold                       [0] IMPLICIT INTEGER }
291
292 F-BEGIN-GROUP-response ::= SEQUENCE { }
293     -- No elements defined, shall be empty.
294
295 F-END-GROUP-request ::= SEQUENCE { }
296     -- No elements defined, shall be empty.
297
298 F-END-GROUP-response ::= SEQUENCE { }
299     -- No elements defined, shall be empty.
300
301 F-RECOVER-request ::= SEQUENCE {
302     activity-identifier             Activity-Identifier,
303     bulk-transfer-number            [0] IMPLICIT INTEGER,
304     requested-access                Access-Request,
305     access-passwords                Access-Passwords OPTIONAL,
306     path-access-passwords           Path-Access-Passwords OPTIONAL,
307     -- This parameter can only be sent when the
308     -- limited-filestore-management or the object-manipulation or
309     -- the group-manipulation functional units are available.
310     recovery-point                  [2] IMPLICIT INTEGER DEFAULT 0,
311     -- Zero indicates beginning of file
312     -- Point after last checkpoint indicates end of file
313     -- The recovery-point parameter shall only be sent by the entity that
314     -- was receiving data at the time of failure.
315     remove-contexts                 [3] IMPLICIT SET OF Abstract-Syntax-Name OPTIONAL,
```


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```
316     define-contexts                 [4] IMPLICIT SET OF Abstract-Syntax-Name OPTIONAL }
317
318 F-RECOVER-response ::= SEQUENCE {
319     state-result                    State-Result DEFAULT success,
320     action-result                   Action-Result DEFAULT success,
321     contents-type                   [1] Contents-Type-Attribute,
322     recovery-point                  [2] IMPLICIT INTEGER DEFAULT 0,
323     -- Zero indicates beginning of file.
324     -- Point after last checkpoint indicates end of file.
325     -- The recovery-point parameter shall only be sent by the entity that
326     -- was receiving data at the time of failure.
327     diagnostic                      Diagnostic OPTIONAL,
328     presentation-action             [6] IMPLICIT BOOLEAN DEFAULT FALSE }
329     -- This flag is set if the responder is going to follow this response
330     -- by a P-ALTER-CONTEXT exchange.
331
332 F-LOCATE-request ::= SEQUENCE {
333     file-access-data-unit-identity          FADU-Identity,
334     fadu-lock                               FADU-Lock OPTIONAL }
335
336 F-LOCATE-response ::= SEQUENCE {
337     action-result                           Action-Result DEFAULT success,
338     file-access-data-unit-identity          FADU-Identity OPTIONAL,
339     diagnostic                              Diagnostic OPTIONAL }
340
341 F-ERASE-request ::= SEQUENCE {
342     file-access-data-unit-identity          FADU-Identity }
343
344 F-ERASE-response ::= SEQUENCE {
345     action-result                   Action-Result DEFAULT success,
346     diagnostic                      Diagnostic OPTIONAL }
347
348 Bulk-Data-PDU ::= CHOICE {
349     f-read-request                  [32] IMPLICIT F-READ-request,
350     f-write-request                 [33] IMPLICIT F-WRITE-request,
351     -- There is no F-DATA FPDU, the contents of a file
352     -- are transferred in a different presentation context
353     -- and there is therefore no need to define the types
354     -- of file contents in the FTAM PCI abstract syntax.
355     -- File contents data are carried in values of the
356     -- data type Data-Element as defined in ISO 8571-2.
357     f-data-end-request              [34] IMPLICIT F-DATA-END-request,
358     f-transfer-end-request          [35] IMPLICIT F-TRANSFER-END-request,
359     f-transfer-end-response         [36] IMPLICIT F-TRANSFER-END-response,
360     f-cancel-request                [37] IMPLICIT F-CANCEL-request,
361     f-cancel-response               [38] IMPLICIT F-CANCEL-response,
362     -- There is no F-CHECK PDU.
363     f-restart-request               [39] IMPLICIT F-RESTART-request,
364     f-restart-response              [40] IMPLICIT F-RESTART-response }
365
366 F-READ-request ::= SEQUENCE {
367     file-access-data-unit-identity          FADU-Identity,
368     access-context                          Access-Context,
369     fadu-lock                               FADU-Lock OPTIONAL }
```


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```
370
371 F-WRITE-request ::= SEQUENCE {
372     file-access-data-unit-operation                [0] IMPLICIT INTEGER
373                                 { insert    (0),
374                                   replace   (1),
375                                   extend    (2) },
376     file-access-data-unit-identity                 FADU-Identity,
377     fadu-lock                                      FADU-Lock OPTIONAL }
378
379 F-DATA-END-request ::= SEQUENCE {
380     action-result                  Action-Result DEFAULT success,
381     diagnostic                     Diagnostic OPTIONAL }
382
383 F-TRANSFER-END-request ::= SEQUENCE {
384     shared-ASE-information         Shared-ASE-Information OPTIONAL }
385
386 F-TRANSFER-END-response ::= SEQUENCE {
387     action-result                  Action-Result DEFAULT success,
388     shared-ASE-information         Shared-ASE-Information OPTIONAL,
389     diagnostic                     Diagnostic OPTIONAL }
390
391 F-CANCEL-request ::= SEQUENCE {
392     action-result                  Action-Result DEFAULT success,
393     shared-ASE-information         Shared-ASE-Information OPTIONAL,
394     diagnostic                     Diagnostic OPTIONAL }
395
396 F-CANCEL-response ::= SEQUENCE {
397     action-result                  Action-Result DEFAULT success,
398     shared-ASE-information         Shared-ASE-Information OPTIONAL,
399     diagnostic                     Diagnostic OPTIONAL }
400
401 F-RESTART-request ::= SEQUENCE {
402     checkpoint-identifier          [0] IMPLICIT INTEGER }
403
404 F-RESTART-response ::= SEQUENCE {
405     checkpoint-identifier          [0] IMPLICIT INTEGER }
406
407 Abstract-Syntax-Name ::= [APPLICATION 0] IMPLICIT OBJECT IDENTIFIER
408
409 Access-Context  ::= [APPLICATION 1] IMPLICIT SEQUENCE {
410     access-context                 [0] IMPLICIT INTEGER
411         { hierarchical-all-data-units    (0),                    -- HA
412         hierarchical-no-data-units    (1),                       -- HN
413         flat-all-data-units    (2),          -- FA
414         flat-one-level-data-units    (3),                        -- FL
415         flat-single-data-unit    (4),         -- FS
416         unstructured-all-data-units    (5),                      -- UA
417         unstructured-single-data-unit    (6) },                  -- US
418     level-number       [1] IMPLICIT INTEGER OPTIONAL }
419     -- Present if and  only if flat-one-level-data-units
420     -- (access context FL) is selected.
421     -- As defined in ISO 8571-2.
422
423 Access-Passwords ::= [APPLICATION 2] IMPLICIT SEQUENCE {
```


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```
424     read-password                   [0] IMPLICIT Password,
425     insert-password                 [1] IMPLICIT Password,
426     replace-password                [2] IMPLICIT Password,
427     extend-password                 [3] IMPLICIT Password,
428     erase-password                  [4] IMPLICIT Password,
429     read-attribute-password         [5] IMPLICIT Password,
430     change-attribute-password       [6] IMPLICIT Password,
431     delete-password                 [7] IMPLICIT Password,
432     pass-passwords                  [8] IMPLICIT Pass-Passwords OPTIONAL,
433     link-password                   [9] IMPLICIT Password OPTIONAL }
434     -- The pass-passwords and the link-password must be included in the
435     -- access-passwords if and only if the limited-filestore-management
436     -- or the object-manipulation or the group-manipulation functional
437     -- units are available.
438
439 Access-Request ::= [APPLICATION 3] IMPLICIT BIT STRING
440                                     { read      (0),
441                                     insert      (1),
442                                     replace     (2),
443                                     extend      (3),
444                                     erase       (4),
445                                     read-attribute      (5),
446                                     change-attribute    (6),
447                                     delete-object       (7) }
448
449 Account ::= [APPLICATION 4] IMPLICIT GraphicString
450
451 Action-Result ::= [APPLICATION 5] IMPLICIT INTEGER
452                                     { success       (0),
453                                     transient-error     (1),
454                                     permanent-error     (2) }
455
456 Activity-Identifier ::= [APPLICATION 6] IMPLICIT INTEGER
457
458 Application-Entity-Title ::= [APPLICATION 7] ACSE-1.AE-title
459 -- As defined in ISO 8650.
460
461 Change-Attributes ::= [APPLICATION 8] IMPLICIT SEQUENCE {
462 -- Kernel Group
463     pathname                        Pathname-Attribute OPTIONAL,
464 -- Storage group
465     storage-account                 [ 3] Account-Attribute OPTIONAL,
466     object-availability             [12] Object-Availability-Attribute OPTIONAL,
467     future-object-size              [14] Object-Size-Attribute OPTIONAL,
468 -- Security group
469     access-control                  [15] Access-Control-Change-Attribute OPTIONAL,
470     path-access-control             [21] Access-Control-Change-Attribute OPTIONAL,
471     -- This parameter can only be sent when the
472     -- enhanced-filestore-management functional unit is available.
473     legal-qualification             [16] Legal-Qualification-Attribute OPTIONAL,
474 -- Private group
475     private-use                     [17] Private-Use-Attribute OPTIONAL,
476 -- Attribute Extensions group
477     attribute-extensions            [22] IMPLICIT Attribute-Extensions OPTIONAL }
```


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```
478      -- This parameter can only be sent when the
479      -- enhanced-filestore-management functional unit is available.
480  -- Atleast one attribute shall be present in the Change-Attributes
481  -- parameter on the request PDU.
482
483  Charging ::= [APPLICATION 9] IMPLICIT SEQUENCE OF SEQUENCE {
484      resource-identifier                [0] IMPLICIT GraphicString,
485      charging-unit                      [1] IMPLICIT GraphicString,
486      charging-value                     [2] IMPLICIT INTEGER }
487
488  Concurrency-Control ::= [APPLICATION 10] IMPLICIT SEQUENCE
489      { read                         [0] IMPLICIT Lock,
490      insert                         [1] IMPLICIT Lock,
491      replace                        [2] IMPLICIT Lock,
492      extend                         [3] IMPLICIT Lock,
493      erase                          [4] IMPLICIT Lock,
494      read-attribute                 [5] IMPLICIT Lock,
495      change-attribute               [6] IMPLICIT Lock,
496      delete-object                  [7] IMPLICIT Lock }
497
498  Lock ::= INTEGER
499              { not-required    (0),
500              shared    (1),
501              exclusive    (2),
502              no-access    (3) }
503
504  Constraint-Set-Name ::= [APPLICATION 11] IMPLICIT OBJECT IDENTIFIER
505
506  Create-Attributes ::= [APPLICATION 12] IMPLICIT SEQUENCE {
507  -- Kernel Group
508      pathname                                Pathname-Attribute,
509      object-type                             [18] IMPLICIT Object-Type-Attribute DEFAULT file,
510      -- This parameter can be sent if and only if the
511      -- limited-filestore-management functional unit is available.
512      permitted-actions                       [ 1] IMPLICIT Permitted-Actions-Attribute,
513      contents-type                           [ 2] Contents-Type-Attribute,
514  -- Storage group
515      storage-account                         [ 3] Account-Attribute OPTIONAL,
516      object-availability                     [12] Object-Availability-Attribute OPTIONAL,
517      future-object-size                      [14] Object-Size-Attribute OPTIONAL,
518  -- Security group
519      access-control                          [15] Access-Control-Attribute OPTIONAL,
520      path-access-control                     [21] Access-Control-Attribute OPTIONAL,
521      -- This parameter can be sent if and only if the
522      -- enhanced-filestore-management functional unit is available.
523      legal-qualification                     [16] Legal-Qualification-Attribute OPTIONAL,
524  -- Private group
525      private-use                             [17] Private-Use-Attribute OPTIONAL,
526  -- Attribute Extensions group
527      attribute-extensions                    [22] IMPLICIT Attribute-Extensions OPTIONAL }
528      -- This parameter can only be sent when the
529      -- limited-filestore-management functional unit is available.
530
531  Diagnostic ::= [APPLICATION 13] IMPLICIT SEQUENCE OF SEQUENCE {
```


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```
532     diagnostic-type                 [0] IMPLICIT INTEGER
533                                             { informative    (0),
534                                             transient    (1),
535                                             permanent    (2) },
536     error-identifier                [1] IMPLICIT INTEGER,
537     -- As defined in ISO 8571-3.
538     error-observer                  [2] IMPLICIT Entity-Reference,
539     error-source                    [3] IMPLICIT Entity-Reference,
540     suggested-delay                 [4] IMPLICIT INTEGER OPTIONAL,
541     further-details                 [5] IMPLICIT GraphicString OPTIONAL }
542
543 Entity-Reference ::= INTEGER
544                                     { no-categorization-possible    (0),
545                                     initiating-file-service-user    (1),
546                                     initiating-file-protocol-machine    (2),
547                                     service-supporting-the-file-protocol-machine    (3),
548                                     responding-file-protocol-machine    (4),
549                                     responding-file-service-user    (5) }
550 -- NOTE
551 -- 1. The values 0 and 3 are only valid as values in error-source.
552 -- 2. The value 5 corresponds to the virtual filestore.
553
554 Document-Type-Name ::= [APPLICATION 14] IMPLICIT OBJECT IDENTIFIER
555
556 FADU-Identity ::= [APPLICATION 15] CHOICE {
557     first-last                  [0] IMPLICIT INTEGER { first (0), last (1) },
558     relative                    [1] IMPLICIT INTEGER { previous (0), current (1), next (2) },
559     begin-end                   [2] IMPLICIT INTEGER { begin (0), end (1) },
560     single-name                 [3] IMPLICIT Node-Name,
561     name-list                   [4] IMPLICIT SEQUENCE OF Node-Name,
562     fadu-number                 [5] IMPLICIT INTEGER }
563     -- As defined in ISO 8571-2.
564
565 Node-Name ::= EXTERNAL
566 -- The type to be used for Node-Name is defined in ISO8571-FADU.
567
568 FADU-Lock ::= [APPLICATION 16] IMPLICIT INTEGER
569             { off (0), on (1) }
570
571 Password  ::= [APPLICATION 17] CHOICE { GraphicString, OCTET STRING }
572
573 Read-Attributes ::= [APPLICATION 18] IMPLICIT SEQUENCE {
574 -- Kernel Group
575     pathname                        Pathname-Attribute OPTIONAL,
576     object-type                     [18] IMPLICIT Object-Type-Attribute OPTIONAL,
577     -- This parameter can be sent if and only if
578     -- the limited-filestore-management functional unit is available.
579     permitted-actions               [ 1] IMPLICIT Permitted-Actions-Attribute
580                                                     OPTIONAL,
581     contents-type                   [ 2] Contents-Type-Attribute OPTIONAL,
582     linked-object                   [19] Pathname-Attribute OPTIONAL,
583     -- This parameter can be sent if and only if
584     -- the limited-filestore-management functional unit is available.
585     child-objects                   [23] Child-Objects-Attribute OPTIONAL,
```


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```
586      -- This parameter can be sent if and only if
587      -- the limited-filestore-management functional unit is available.
588  -- Storage group
589      primary-pathname                    [20] Pathname-Attribute OPTIONAL,
590      storage-account                     [ 3] Account-Attribute OPTIONAL,
591      date-and-time-of-creation           [ 4] Date-and-Time-Attribute OPTIONAL,
592      date-and-time-of-last-modification
593                                          [ 5] Date-and-Time-Attribute OPTIONAL,
594      date-and-time-of-last-read-access
595                                          [ 6] Date-and-Time-Attribute OPTIONAL,
596      date-and-time-of-last-attribute-modification
597                                          [ 7] Date-and-Time-Attribute OPTIONAL,
598      identity-of-creator                 [ 8] User-Identity-Attribute OPTIONAL,
599      identity-of-last-modifier           [ 9] User-Identity-Attribute OPTIONAL,
600      identity-of-last-reader             [10] User-Identity-Attribute OPTIONAL,
601      identity-last-attribute-modifier
602                                          [11] User-Identity-Attribute OPTIONAL,
603      object-availability                 [12] Object-Availability-Attribute OPTIONAL,
604      object-size                         [13] Object-Size-Attribute OPTIONAL,
605      future-object-size                  [14] Object-Size-Attribute OPTIONAL,
606  -- Security group
607      access-control                      [15] Access-Control-Attribute OPTIONAL,
608      path-access-control                 [21] Access-Control-Attribute OPTIONAL,
609      -- This parameter can be sent if and only if
610      -- the limited-filestore-management functional unit is available.
611      legal-qualification                 [16] Legal-Qualification-Attribute OPTIONAL,
612  -- Private group
613      private-use                         [17] Private-Use-Attribute OPTIONAL,
614  --   Attribute Extensions group
615      attribute-extensions                [22] IMPLICIT Attribute-Extensions OPTIONAL }
616      -- This parameter can be sent if and only if
617      -- the limited-filestore-management functional unit is available.
618
619  Select-Attributes ::= [APPLICATION 19] IMPLICIT SEQUENCE {
620  -- Kernel Group
621      pathname                            Pathname-Attribute }
622
623  Shared-ASE-Information ::= [APPLICATION 20] IMPLICIT EXTERNAL
624  -- This field may be used to convey commitment control as described
625  -- in ISO 8571-3.
626
627  State-Result ::= [APPLICATION 21] IMPLICIT INTEGER
628                       { success (0),
629                       failure (1) }
630
631  User-Identity ::= [APPLICATION 22] IMPLICIT GraphicString
632
633  Access-Control-Attribute ::= CHOICE {
634      no-value-available                  [0] IMPLICIT NULL,
635      -- Indicates partial support of this attribute.
636      -- This value shall only appear in response PDUs.
637      actual-values                       [1] IMPLICIT SET OF Access-Control-Element }
638      --  The semantics of this attribute is described in ISO 8571-2.
639
```


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```
640 Access-Control-Change-Attribute ::= CHOICE {
641     no-value-available                  [0] IMPLICIT NULL,
642     -- Indicates partial support of this attribute.
643     -- This value shall only appear in response PDUs.
644     actual-values                       [1] IMPLICIT SEQUENCE {
645         insert-values                   [0] IMPLICIT SET OF Access-Control-Element OPTIONAL,
646         -- This field is used by the change attribute actions to indicate
647         -- new values to be inserted in the access control object attribute.
648         delete-values                   [1] IMPLICIT SET OF Access-Control-Element OPTIONAL}}
649         -- This field is used by the change attribute action to indicate
650         -- old values to be removed from the access control object
651         -- attribute.
652     -- The semantics of this attribute is described in ISO 8571-2.
653
654 Access-Control-Element ::= SEQUENCE {
655         action-list     [0] IMPLICIT Access-Request,
656         concurrency-access                  [1] IMPLICIT Concurrency-Access OPTIONAL,
657         identity        [2] IMPLICIT User-Identity OPTIONAL,
658         passwords                           [3] IMPLICIT Access-Passwords OPTIONAL,
659         location        [4] IMPLICIT Application-Entity-Title OPTIONAL }
660
661 Concurrency-Access ::= SEQUENCE {
662         read            [0] IMPLICIT Concurrency-Key,
663         insert          [1] IMPLICIT Concurrency-Key,
664         replace         [2] IMPLICIT Concurrency-Key,
665         extend          [3] IMPLICIT Concurrency-Key,
666         erase           [4] IMPLICIT Concurrency-Key,
667         read-attribute                      [5] IMPLICIT Concurrency-Key,
668         change-attribute                    [6] IMPLICIT Concurrency-Key,
669         delete-object                       [7] IMPLICIT Concurrency-Key }
670
671 Concurrency-Key ::= BIT STRING
672                     { not-required  (0),
673                     shared  (1),
674                     exclusive  (2),
675                     no-access  (3) }
676
677 Account-Attribute ::= CHOICE {
678     no-value-available                  [0] IMPLICIT NULL,
679     -- Indicates partial support of this attribute.
680     -- This value shall only appear in response PDUs.
681     actual-values                       Account }
682
683 Contents-Type-Attribute ::= CHOICE {
684     document-type                               [0] IMPLICIT SEQUENCE {
685         document-type-name                      Document-Type-Name,
686         parameter                               [0] ANY OPTIONAL },
687     -- The actual types to be used for values of the parameter field
688     -- are defined in the named document type.
689     constraint-set-and-abstract-syntax          [1] IMPLICIT SEQUENCE {
690         constraint-set-name                     Constraint-Set-Name,
691         abstract-syntax-name                    Abstract-Syntax-Name } }
692
693 Date-and-Time-Attribute ::= CHOICE {
```


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```
694      no-value-available                    [0] IMPLICIT NULL,
695      -- Indicates partial support of this attribute.
696      -- This value shall only appear in response PDUs.
697      actual-values                         [1] IMPLICIT GeneralizedTime }
698
699  Object-Availability-Attribute ::= CHOICE {
700      no-value-available                    [0] IMPLICIT NULL,
701      -- Indicates partial support of this attribute.
702      -- This value shall only appear in response PDUs.
703      actual-values                         [1] IMPLICIT INTEGER
704                      { immediate-availability    (0),
705                        deferred-availability     (1) } }
706
707  Pathname-Attribute ::= CHOICE {
708      incomplete-pathname                   [0] IMPLICIT Pathname,
709      complete-pathname                     [APPLICATION 23] IMPLICIT Pathname }
710
711  Object-Size-Attribute ::= CHOICE {
712      no-value-available                    [0] IMPLICIT NULL,
713      -- Indicates partial support of this attribute.
714      -- This value shall only appear in response PDUs.
715      actual-values                         [1] IMPLICIT INTEGER }
716
717  Legal-Qualification-Attribute ::= CHOICE {
718      no-value-available                    [0] IMPLICIT NULL,
719      -- Indicates partial support of this attribute.
720      -- This value shall only appear in response PDUs.
721      actual-values                         [1] IMPLICIT GraphicString }
722
723  Permitted-Actions-Attribute ::=  BIT STRING
724              -- Actions available
725              { read     ( 0),
726                         insert     ( 1),
727                         replace    ( 2),
728                         extend     ( 3),
729                         erase      ( 4),
730                         read-attribute     ( 5),
731                         change-attribute     ( 6),
732                         delete-object     ( 7),
733                         pass     (11),
734                         link     (12),
735      -- FADU-Identity groups available
736                         traversal     ( 8),
737                         reverse-traversal     ( 9),
738                         random-order     (10) }
739
740  Private-Use-Attribute ::= CHOICE {
741      no-value-available                              [0] IMPLICIT NULL,
742      -- Indicates partial support of this attribute.
743      -- This value shall only appear in response PDUs.
744      abstract-syntax-not-supported                   [1] IMPLICIT NULL,
745      -- Indicates that abstract syntax is not available.
746      actual-values                                   [2] IMPLICIT EXTERNAL }
747
```


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```
Object-Type-Attribute ::= INTEGER
                          { file    (0),
                          file-directory    (1),
                          reference    (2) }

User-Identity-Attribute ::= CHOICE {
    no-value-available                [0] IMPLICIT NULL,
    -- Indicates partial support of this attribute.
    -- This value shall only appear in response PDUs.
    actual-values                     User-Identity }

Child-Objects-Attribute ::= SET OF GraphicString

FSM-PDU ::= CHOICE {
    f-change-prefix-request                [41] IMPLICIT F-CHANGE-PREFIX-request,
    f-change-prefix-response               [42] IMPLICIT F-CHANGE-PREFIX-response,
    f-list-request                         [43] IMPLICIT F-LIST-request,
    f-list-response                        [44] IMPLICIT F-LIST-response,
    f-group-select-request                 [45] IMPLICIT F-GROUP-SELECT-request,
    f-group-select-response                [46] IMPLICIT F-GROUP-SELECT-response,
    f-group-delete-request                 [47] IMPLICIT F-GROUP-DELETE-request,
    f-group-delete-response                [48] IMPLICIT F-GROUP-DELETE-response,
    f-group-move-request                   [49] IMPLICIT F-GROUP-MOVE-request,
    f-group-move-response                  [50] IMPLICIT F-GROUP-MOVE-response,
    f-group-copy-request                   [51] IMPLICIT F-GROUP-COPY-request,
    f-group-copy-response                  [52] IMPLICIT F-GROUP-COPY-response,
    f-group-list-request                   [53] IMPLICIT F-GROUP-LIST-request,
    f-group-list-response                  [54] IMPLICIT F-GROUP-LIST-response,
    f-group-change-attrib-request          [55] IMPLICIT F-GROUP-CHANGE-ATTRIB-request,
    f-group-change-attrib-response         [56] IMPLICIT F-GROUP-CHANGE-ATTRIB-response,
    f-select-another-request               [57] IMPLICIT F-SELECT-ANOTHER-request,
    f-select-another-response              [58] IMPLICIT F-SELECT-ANOTHER-response,
    f-create-directory-request             [59] IMPLICIT F-CREATE-DIRECTORY-request,
    f-create-directory-response            [60] IMPLICIT F-CREATE-DIRECTORY-response,
    f-link-request                         [61] IMPLICIT F-LINK-request,
    f-link-response                        [62] IMPLICIT F-LINK-response,
    f-unlink-request                       [63] IMPLICIT F-UNLINK-request,
    f-unlink-response                      [64] IMPLICIT F-UNLINK-response,
    f-read-link-attrib-request             [65] IMPLICIT F-READ-LINK-ATTRIB-request,
    f-read-link-attrib-response            [66] IMPLICIT F-READ-LINK-ATTRIB-response,
    f-change-link-attrib-request           [67] IMPLICIT F-CHANGE-LINK-ATTRIB-request,
    f-change-link-attrib-response          [68] IMPLICIT F-CHANGE-LINK-ATTRIB-response,
    f-move-request                         [69] IMPLICIT F-MOVE-request,
    f-move-response                        [70] IMPLICIT F-MOVE-response,
    f-copy-request                         [71] IMPLICIT F-COPY-request,
    f-copy-response                        [72] IMPLICIT F-COPY-response }

F-CHANGE-PREFIX-request ::= SEQUENCE {
    reset                             [0] IMPLICIT BOOLEAN DEFAULT FALSE,
    destination-file-directory        Destination-File-Directory,
    access-passwords                  Access-Passwords OPTIONAL,
    path-access-passwords             Path-Access-Passwords OPTIONAL }

F-CHANGE-PREFIX-response ::= SEQUENCE {
```


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```
802     action-result                   Action-Result DEFAULT success,
803     destination-file-directory      Destination-File-Directory OPTIONAL,
804     diagnostic                      Diagnostic OPTIONAL }
805
806 F-LIST-request ::= SEQUENCE {
807     attribute-value-assertions      Attribute-Value-Assertions,
808     scope                           Scope,
809     access-passwords                Access-Passwords OPTIONAL,
810     path-access-passwords           Path-Access-Passwords OPTIONAL,
811     attribute-names                 [0] IMPLICIT Attribute-Names,
812     attribute-extension-names       [1] IMPLICIT Attribute-Extension-Names
813                                             OPTIONAL }
814
815 F-LIST-response ::= SEQUENCE {
816     action-result                   Action-Result DEFAULT success,
817     objects-attributes-list         Objects-Attributes-List OPTIONAL,
818     diagnostic                      Diagnostic OPTIONAL }
819
820 F-GROUP-SELECT-request ::= SEQUENCE {
821     attribute-value-assertions      Attribute-Value-Assertions,
822     requested-access                Access-Request,
823     access-passwords                Access-Passwords OPTIONAL,
824     path-access-passwords           Path-Access-Passwords OPTIONAL,
825     concurrency-control             Concurrency-Control OPTIONAL,
826     maximum-set-size                [0] IMPLICIT INTEGER DEFAULT 0,
827     -- 0 implies no limit.
828     scope                           Scope,
829     account                         Account OPTIONAL,
830     shared-ASE-information          Shared-ASE-Information OPTIONAL }
831
832 F-GROUP-SELECT-response ::= SEQUENCE {
833     action-result                   Action-Result DEFAULT success,
834     shared-ASE-information          Shared-ASE-Information OPTIONAL,
835     diagnostic                      Diagnostic OPTIONAL }
836
837 F-GROUP-DELETE-request  ::= SEQUENCE {
838     request-operation-result        Request-Operation-Result OPTIONAL,
839     shared-ASE-information          Shared-ASE-Information OPTIONAL }
840
841 F-GROUP-DELETE-response ::= SEQUENCE {
842     action-result                   Action-Result DEFAULT success,
843     charging                        Charging OPTIONAL,
844     operation-result                 Operation-Result OPTIONAL,
845     shared-ASE-information          Shared-ASE-Information OPTIONAL,
846     diagnostic                      Diagnostic OPTIONAL }
847
848 F-GROUP-MOVE-request ::= SEQUENCE {
849     destination-file-directory      Destination-File-Directory,
850     override                        [0] IMPLICIT Override DEFAULT create-failure,
851     -- Only the values create-failure (0)
852     -- and delete-and-create-with-new-attributes (3) are allowed.
853     error-action                    [1] IMPLICIT Error-Action,
854     create-password                 Password OPTIONAL,
855     access-passwords                Access-Passwords OPTIONAL,
```


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```
856      path-access-passwords                Path-Access-Passwords OPTIONAL,
857      request-operation-result             Request-Operation-Result OPTIONAL,
858      attributes                           Change-Attributes OPTIONAL }
859
860  F-GROUP-MOVE-response ::= SEQUENCE {
861      action-result                        Action-Result DEFAULT success,
862      destination-file-directory           Destination-File-Directory OPTIONAL,
863      operation-result                     Operation-Result OPTIONAL,
864      diagnostic                           Diagnostic OPTIONAL }
865
866  F-GROUP-COPY-request ::= SEQUENCE {
867      destination-file-directory           Destination-File-Directory,
868      override                             [0] IMPLICIT Override DEFAULT create-failure,
869      -- Only the values create-failure (0)
870      -- and delete-and-create-with-new-attributes (3) are allowed.
871      error-action                         [1] IMPLICIT Error-Action,
872      create-password                      Password OPTIONAL,
873      access-passwords                     Access-Passwords OPTIONAL,
874      path-access-passwords                Path-Access-Passwords OPTIONAL,
875      request-operation-result             Request-Operation-Result OPTIONAL,
876      attributes                           Change-Attributes OPTIONAL }
877
878  F-GROUP-COPY-response ::= SEQUENCE {
879      action-result                        Action-Result DEFAULT success,
880      destination-file-directory           Destination-File-Directory OPTIONAL,
881      operation-result                     Operation-Result OPTIONAL,
882      diagnostic                           Diagnostic OPTIONAL }
883
884  F-GROUP-LIST-request ::= SEQUENCE {
885      attribute-names                      [0] IMPLICIT Attribute-Names,
886      attribute-extension-names            [2] IMPLICIT Attribute-Extension-Names
887                                                   OPTIONAL }
888
889  F-GROUP-LIST-response ::= SEQUENCE {
890   action-result                           Action-Result DEFAULT success,
891      objects-attributes-list              Objects-Attributes-List OPTIONAL,
892      diagnostic                           Diagnostic OPTIONAL }
893
894  F-GROUP-CHANGE-ATTRIB-request ::= SEQUENCE {
895      attributes                           Change-Attributes,
896      error-action                         [1] IMPLICIT Error-Action,
897      request-operation-result             Request-Operation-Result OPTIONAL,
898      shared-ASE-information               Shared-ASE-Information OPTIONAL }
899
900  F-GROUP-CHANGE-ATTRIB-response ::= SEQUENCE {
901       action-result                       Action-Result DEFAULT success,
902      operation-result                     Operation-Result OPTIONAL,
903      shared-ASE-information               Shared-ASE-Information OPTIONAL,
904      diagnostic                           Diagnostic OPTIONAL }
905
906  F-SELECT-ANOTHER-request ::= SEQUENCE {
907      shared-ASE-information               Shared-ASE-Information OPTIONAL }
908
909  F-SELECT-ANOTHER-response ::= SEQUENCE {
```


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```
910      state-result                    State-Result DEFAULT success,
911       action-result                  Action-Result DEFAULT success,
912      last-member-indicator           [0] IMPLICIT BOOLEAN DEFAULT FALSE,
913      referent-indicator              Referent-Indicator OPTIONAL,
914      shared-ASE-information          Shared-ASE-Information OPTIONAL,
915      diagnostic                      Diagnostic OPTIONAL }
916
917  F-CREATE-DIRECTORY-request ::= SEQUENCE {
918      initial-attributes              Create-Attributes,
919      create-password                 Password OPTIONAL,
920      requested-access                Access-Request,
921      shared-ASE-information          Shared-ASE-Information OPTIONAL,
922      account                         Account OPTIONAL }
923
924  F-CREATE-DIRECTORY-response ::= SEQUENCE {
925      state-result                    State-Result DEFAULT success,
926      action-result                   Action-Result DEFAULT success,
927      initial-attributes              Create-Attributes,
928      shared-ASE-information          Shared-ASE-Information OPTIONAL,
929      diagnostic                      Diagnostic OPTIONAL }
930
931  F-LINK-request ::= SEQUENCE {
932      initial-attributes              Create-Attributes,
933      target-object                   Pathname-Attribute,
934      create-password                 Password OPTIONAL,
935      requested-access                Access-Request,
936      access-passwords                Access-Passwords OPTIONAL,
937      path-access-passwords           Path-Access-Passwords OPTIONAL,
938      concurrency-control             Concurrency-Control OPTIONAL,
939      shared-ASE-information          Shared-ASE-Information OPTIONAL,
940      account                         Account OPTIONAL }
941
942  F-LINK-response ::= SEQUENCE {
943      state-result                    State-Result DEFAULT success,
944      action-result                   Action-Result DEFAULT success,
945      initial-attributes              Create-Attributes,
946      target-object                   Pathname-Attribute,
947      shared-ASE-information          Shared-ASE-Information OPTIONAL,
948      diagnostic                      Diagnostic OPTIONAL }
949
950  F-UNLINK-request ::= SEQUENCE {
951      shared-ASE-information          Shared-ASE-Information OPTIONAL }
952
953  F-UNLINK-response ::= SEQUENCE {
954      action-result                   Action-Result DEFAULT success,
955      shared-ASE-information          Shared-ASE-Information OPTIONAL,
956      charging                        Charging OPTIONAL,
957      diagnostic                      Diagnostic OPTIONAL }
958
959  F-READ-LINK-ATTRIB-request ::= SEQUENCE {
960      attribute-names                 [0] IMPLICIT Attribute-Names,
961       attribute-extension-names      [1] IMPLICIT Attribute-Extension-Names
962                                              OPTIONAL }
963
```


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```
F-READ-LINK-ATTRIB-response ::= SEQUENCE {
    action-result                    Action-Result DEFAULT success,
    attributes                       Read-Attributes OPTIONAL,
    diagnostic                       Diagnostic OPTIONAL }

F-CHANGE-LINK-ATTRIB-request ::= SEQUENCE {
    attributes                       Change-Attributes }

F-CHANGE-LINK-ATTRIB-response ::= SEQUENCE {
    action-result                    Action-Result DEFAULT success,
    attributes                       Change-Attributes OPTIONAL,
    diagnostic                       Diagnostic OPTIONAL }

F-MOVE-request ::= SEQUENCE {
    destination-file-directory       Destination-File-Directory,
    override                         [0] IMPLICIT Override DEFAULT create-failure,
    -- Only the values create-failure (0)
    -- and delete-and-create-with-new-attributes (3) are allowed.
    create-password                  Password OPTIONAL,
    access-passwords                 Access-Passwords OPTIONAL,
    path-access-passwords            Path-Access-Passwords OPTIONAL,
    attributes                       Change-Attributes OPTIONAL }

F-MOVE-response ::= SEQUENCE {
    action-result                    Action-Result DEFAULT success,
    destination-file-directory       Destination-File-Directory OPTIONAL,
    attributes                       Change-Attributes OPTIONAL,
    diagnostic                       Diagnostic OPTIONAL }

F-COPY-request ::= SEQUENCE {
    destination-file-directory       Destination-File-Directory,
    override                         [0] IMPLICIT Override DEFAULT create-failure,
    -- Only the values create-failure (0)
    -- and delete-and-create-with-new-attributes (3) are allowed.
    create-password                  Password OPTIONAL,
    access-passwords                 Access-Passwords OPTIONAL,
    path-access-passwords            Path-Access-Passwords OPTIONAL,
    attributes                       Change-Attributes OPTIONAL }

F-COPY-response  ::= SEQUENCE {
    action-result                    Action-Result DEFAULT success,
    destination-file-directory       Destination-File-Directory OPTIONAL,
    attributes                       Change-Attributes OPTIONAL,
    diagnostic                       Diagnostic OPTIONAL }

Attribute-Extension-Names ::= SEQUENCE OF Attribute-Extension-Set-Name

Attribute-Extension-Set-Name ::= SEQUENCE {
    extension-set-identifier         [0] IMPLICIT Extension-Set-Identifier,
    extension-attribute-names        [1] SEQUENCE OF Extension-Attribute-Identifier }

Attribute-Extensions ::= SEQUENCE OF Attribute-Extension-Set

Attribute-Extension-Set ::= SEQUENCE {
```


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```
1018      extension-set-identifier                [0] IMPLICIT Extension-Set-Identifier,
1019      extension-set-attributes                [1] SEQUENCE OF Extension-Attribute }
1020
1021  Extension-Attribute ::= SEQUENCE {
1022      extension-attribute-identifier                Extension-Attribute-Identifier,
1023      extension-attribute                           ANY DEFINED BY extension-attribute-identifier }
1024
1025  Extension-Set-Identifier ::= OBJECT IDENTIFIER
1026
1027  Extension-Attribute-Identifier ::= OBJECT IDENTIFIER
1028
1029  Attribute-Value-Assertions ::= [APPLICATION 26] IMPLICIT OR-Set
1030
1031  Scope ::= [APPLICATION 28] IMPLICIT SEQUENCE OF SEQUENCE {
1032      root-directory                          [0] Pathname-Attribute OPTIONAL,
1033      retrieval-scope                         [1] IMPLICIT INTEGER {child (0), all (1) } }
1034
1035  OR-Set ::= SEQUENCE OF AND-Set
1036
1037  AND-Set ::= SEQUENCE OF CHOICE {
1038  -- Kernel group
1039      pathname-pattern                        [ 0] IMPLICIT Pathname-Pattern,
1040      object-type-pattern                     [18] IMPLICIT Integer-Pattern,
1041      permitted-actions-pattern               [ 1] IMPLICIT Bitstring-Pattern,
1042      contents-type-pattern                   [ 2] Contents-Type-Pattern,
1043      linked-object-pattern                   [19] IMPLICIT Pathname-Pattern,
1044      child-objects-pattern                   [23] IMPLICIT Pathname-Pattern,
1045  -- Storage group
1046      primary-pathname-pattern                [20] IMPLICIT Pathname-Pattern,
1047      storage-account-pattern                 [ 3] IMPLICIT String-Pattern,
1048      date-and-time-of-creation-pattern
1049                                              [ 4] IMPLICIT Date-and-Time-Pattern,
1050      date-and-time-of-last-modification-pattern
1051                                              [ 5] IMPLICIT Date-and-Time-Pattern,
1052      date-and-time-of-last-read-access-pattern
1053                                              [ 6] IMPLICIT Date-and-Time-Pattern,
1054      date-and-time-of-last-attribute-modification-pattern
1055                                              [ 7] IMPLICIT Date-and-Time-Pattern,
1056      identity-of-creator-pattern             [ 8] IMPLICIT User-Identity-Pattern,
1057      identity-of-last-modifier-pattern
1058                                              [ 9] IMPLICIT User-Identity-Pattern,
1059      identity-of-last-reader-pattern         [10] IMPLICIT User-Identity-Pattern,
1060      identity-of-last-attribute-modifier-pattern
1061                                              [11] IMPLICIT User-Identity-Pattern,
1062      object-availability-pattern             [12] IMPLICIT Boolean-Pattern,
1063      object-size-pattern                     [13] IMPLICIT Integer-Pattern,
1064      future-object-size-pattern              [14] IMPLICIT Integer-Pattern,
1065  -- Security group
1066      -- Access control searches are disallowed.
1067      legal-qualification-pattern             [16] IMPLICIT String-Pattern,
1068  -- Private group
1069      -- Private use searches are disallowed.
1070  -- Attribute Extensions group
1071      attribute-extensions-pattern            [22] IMPLICIT Attribute-Extensions-Pattern }
```


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```
1072
1073 User-Identity-Pattern ::= String-Pattern
1074
1075 Equality-Comparision ::= BIT STRING
1076     { no-value-available-matches          (0),
1077     -- Set imples "No Value Available" matches the test.
1078     -- Clear implies "No Value Available" fails the test.
1079     equals-matches                        (1)
1080     -- Set implies equal items match the test.
1081     -- Clear implies equal items fail the test.
1082     }
1083
1084 Relational-Comparision ::= BIT STRING
1085     { no-value-available-matches          (0),
1086     -- Set imples "No Value Available" matches the test.
1087     -- Clear implies "No Value Available" fails the test.
1088     equals-matches                        (1),
1089     -- Set implies equal items match the test.
1090     -- Clear implies equal items fail the test.
1091     less-than-matches                     (2),
1092     -- Set implies a value less than the test case matches.
1093     -- Clear implies a value less than the test case fails.
1094     greater-than-matches                  (3)
1095     -- Set implies a value greater than the test case matches.
1096     -- Clear implies a value greater than the test case fails.
1097     }
1098     -- Bits 1 through 3 shall not all have the same value.
1099
1100 Pathname-Pattern ::= SEQUENCE {
1101     equality-comparision                  [0] IMPLICIT Equality-Comparision,
1102     pathname-value                        [1] IMPLICIT SEQUENCE OF CHOICE {
1103     string-match                          [2] IMPLICIT String-Pattern,
1104     any-match                             [3] IMPLICIT NULL } }
1105
1106 String-Pattern ::= SEQUENCE {
1107     equality-comparision                  [0] IMPLICIT Equality-Comparision,
1108     string-value                          [1] IMPLICIT SEQUENCE OF CHOICE {
1109     substring-match                       [2] IMPLICIT GraphicString,
1110     any-match                             [3] IMPLICIT NULL,
1111     number-of-characters-match            [4] IMPLICIT INTEGER } }
1112
1113 Bitstring-Pattern ::= SEQUENCE {
1114     equality-comparision                  [0] IMPLICIT Equality-Comparision,
1115     match-bitstring                       [1] IMPLICIT BIT STRING,
1116     significance-bitstring                [2] IMPLICIT BIT STRING }
1117
1118 Date-and-Time-Pattern ::= SEQUENCE {
1119     relational-comparision                [0] IMPLICIT Relational-Comparision,
1120     time-and-date-value                   [1] IMPLICIT GeneralizedTime }
1121
1122 Integer-Pattern ::= SEQUENCE {
1123     relational-comparision                [0] IMPLICIT Relational-Comparision,
1124     integer-value                         [1] IMPLICIT INTEGER }
1125
```


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```
Object-Identifier-Pattern ::= SEQUENCE {
    equality-comparision                [0] IMPLICIT Equality-Comparision,
    object-identifier-value             [1] IMPLICIT OBJECT IDENTIFIER }

Boolean-Pattern ::= SEQUENCE {
    equality-comparision                [0] IMPLICIT Equality-Comparision,
    boolean-value                       [1] IMPLICIT BOOLEAN }

Other-Pattern ::= Equality-Comparision
-- Matches against "No Value Available".

Contents-Type-Pattern ::= CHOICE {
    document-type-pattern               [0] IMPLICIT Object-Identifier-Pattern,
    constraint-set-abstract-syntax-pattern
                                        [1] IMPLICIT SEQUENCE {
    constraint-set-pattern              [2] IMPLICIT Object-Identifier-Pattern OPTIONAL,
    -- Absent implies any Object Identifier is equal.
    abstract-syntax-pattern             [3] IMPLICIT Object-Identifier-Pattern OPTIONAL
    -- Absent implies any Object Identifier is equal.
    } }

Attribute-Extensions-Pattern ::= SEQUENCE OF SEQUENCE {
    extension-set-identifier                    [0] IMPLICIT Extension-Set-Identifier,
    extension-set-attribute-patterns            [1] IMPLICIT SEQUENCE OF SEQUENCE {
    extension-attribute-identifier              Extension-Attribute-Identifier,
    extension-attribute-pattern                 ANY DEFINED BY extension-attribute-identifier }
    -- The extention-attribute-pattern must be defined in
    -- conjunction with the extention attribute in order to
    -- perform pattern matching operations on it.  It may be
    -- defined in terms of other patterns within this
    -- standard.
    }

Destination-File-Directory ::= [APPLICATION 24] Pathname-Attribute

Objects-Attributes-List ::= [APPLICATION 25] IMPLICIT SEQUENCE OF
                                            Read-Attributes

Override ::= INTEGER
        { create-failure    (0),
        select-old-object    (1),
        delete-and-create-with-old-attributes    (2),
        delete-and-create-with-new-attributes    (3) }

Error-Action ::= INTEGER
        { terminate        (0),
        continue        (1) }

Operation-Result ::= [APPLICATION 30] CHOICE {
        success-object-count                [0] IMPLICIT INTEGER,
        success-object-names                [1] IMPLICIT SEQUENCE OF Pathname }

Pathname ::= SEQUENCE OF GraphicString
```


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```
1180 Pass-Passwords ::= SEQUENCE OF Password
1181 -- There is a one-to-one correspondence between the elements of
1182 -- Pass-Passwords and the non-terminal elements of the specified
1183 - Pathname.
1184
1185 Path-Access-Passwords ::= [APPLICATION 27] IMPLICIT SEQUENCE OF SEQUENCE {
1186     read-password                    [0] IMPLICIT Password,
1187     insert-password                  [1] IMPLICIT Password,
1188     replace-password                 [2] IMPLICIT Password,
1189     extend-password                  [3] IMPLICIT Password,
1190     erase-password                   [4] IMPLICIT Password,
1191     read-attribute-password          [5] IMPLICIT Password,
1192     change-attribute-password        [6] IMPLICIT Password,
1193     delete-password                  [7] IMPLICIT Password,
1194     pass-passwords                   [8] IMPLICIT Pass-Passwords,
1195     link-password                    [9] IMPLICIT Password }
1196     -- There is a one-to-one correspondence between the elements of
1197     -- Path-Access-Passwords and the non-terminal elements of the
1198     -- specified Pathname.
1199
1200 Request-Operation-Result ::= [APPLICATION 31] IMPLICIT INTEGER {
1201                 summary      (0),
1202                 fill-list    (1) }
1203
1204 Attribute-Names ::= BIT STRING
1205 -- Kernel group
1206         { read-pathname      ( 0),
1207         read-object-type     (18),
1208         read-permitted-actions    ( 1),
1209         read-contents-type   ( 2),
1210         read-linked-object   (19),
1211         read-child-objects   (23),
1212 -- Storage group
1213         read-primary-pathname     (20),
1214         read-storage-account ( 3),
1215         read-date-and-time-of-creation    ( 4),
1216         read-date-and-time-of-last-modification    ( 5),
1217         read-date-and-time-of-last-read-access     ( 6),
1218         read-date-and-time-of-last-attribute-modification    ( 7),
1219         read-identity-of-creator     ( 8),
1220         read-identity-of-last-modifier    ( 9),
1221         read-identity-of-last-reader      (10),
1222         read-identity-of-last-attribute-modifier    (11),
1223         read-object-availability     (12),
1224         read-object-size     (13),
1225         read-future-object-size      (14),
1226 -- Security group
1227         read-access-control      (15),
1228         read-path-access-control     (21),
1229         read-legal-qualifications    (16),
1230 -- Private group
1231         read-private-use     (17) }
1232 -- Bits 19 through 23 are defined if and only if the limited-filestore-management
1233 -- or group-manipulation functional units are available.
```


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```
1234
1235 Referent-Indicator ::= [APPLICATION 29] IMPLICIT BOOLEAN
1236
1237 END
1238
1239
```


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Annex A
Protocol state tables

(This annex forms part of the standard.)

NOTE – This amendment supersedes the whole of annex A. Subclauses A.1.2 and A.1.7 in ISO 8571-4: 1988/Amd.4:1992, Annex A supersedes this amendment. All other parts of ISO 8571-4:1988/Amd.4:1992, Annex A are replaced by this annex.

A.1 Introduction

In the event of a discrepancy becoming apparent in the protocol described in the body of this standard and the protocol described in this Annex, this Annex is to take precedence.

These tables describe the operation of the basic file protocol machine (FPM) and error recovery protocol machine (FERPM).

The basic protocol tables are divided into three groups, covering:

a) the FTAM regime management protocol machine;

b) the file regime management protocol machine;

c) the bulk data transfer protocol machine.

The initial and final states of the file regime management protocol machine are also states of FTAM regime management protocol machine. The initial and final states of the bulk data transfer protocol machine are also states of the file regime management protocol machine.

To provide formally complete and consistent description of the FTAM protocol sequences of events are considered indivisible in the model. That indivisibility ensures both that the states used in the description are well defined and that they are sufficient to describe the protocol.

The reception of a service primitive and the generation of dependent actions are considered to be an indivisible action. The reception of an FPDU and the generation of dependent actions are considered to be an indivisible action.

The indivisibility of actions may, in some implementations, cause certain events from file service users to be invalid at some service interface.

The conventions adopted in this Annex are described below.

A.1.1 System model used for protocol description

There are four types of receivers and sources of incoming and outgoing events (see figure 12):

a) The internal file service user, which is the file error recovery protocol machine (FERPM);

b) The external file service user — initiator or responder;

c) The local system environment;

d) the underlying presentation and ACSE service providers.

All primitives to/from the external file service user are passed through as primitives to/from the internal file service user to the basic FPM.

If the FERPM is not null — that is, either the RESTART or the RECOVER functional unit is available — parameters needed for error control and recovery may be added to these primitives.

Signals to/from the local environment group together events signalling errors and events signalling interactions amongst the FERPM, its docket and its local system. These local signals are

e) L-ERRABT — local signal indicating protocol or other local errors leading to F-P-ABORT, with a permanent error value in the action result parameter;

f) L-PABORT — local signal indicating that a F-P-ABORT request PDU with a transient error value in the action result should be issued;

g) L-ERROR1, L-ERROR2 and L-ERROR3 — local signals indicating class I, class II and class III errors respectively;

h) L-SUSPND — a local signal sent by the sender in

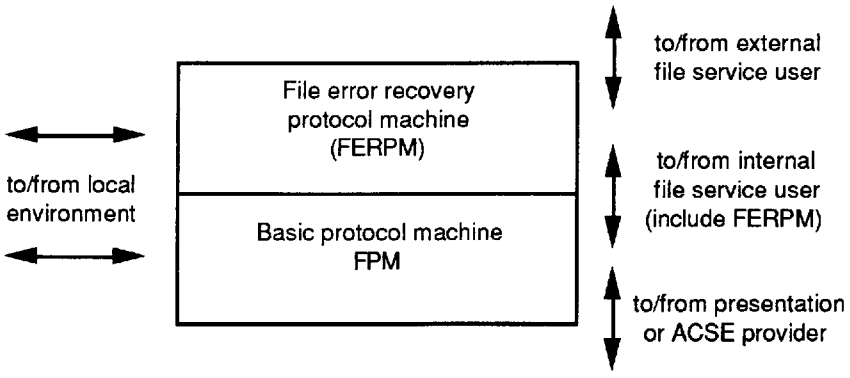

Figure 12 — State machine system model

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the RESTART state to the local system to suspend the issuing of F-DATA request and F-DATA-END request primitives;

i) L-RESUME — a local signal to the local system to resume the issuing of F-DATA request and F-DATA-END request primitives when a sender has completed its recovery from RESTART and is now back in DATA-XFER state;

j) L-RESEND — a local signal from the FERPM to the sending local system. This signal includes the negotiated restart checkpoint and eliminates the need to store data values in the docket. Upon receipt of this local signal the local system can either

1) resend data from the checkpoint if the local system is aware of the algorithm used by the FERPM to generate the checkpoint; or

2) resend data from the start of the file if it has no knowledge of the checkpoint generating algorithm. The FERPM in the RESTART state will discard all data from the local system that occurs before the negotiated checkpoint. The FERPM will only forward data past the negotiated checkpoint to the FPM;

k) L-DATRQ — signal representing a re-issued F-DATA request primitive from the local system;

l) L-DAERQ — signal representing a re-issued F-DATA-END request primitive when a "data-end" marker becomes available from the docket;

m) L-CHKRQ — signal representing a re-issued F-CHECK request primitive when a checkpoint identifier becomes available from the docket;

n) L-EORIN — end of restart indication signal indicating that all checkpoint identifiers, "data-end" markers are all data to be resent have been sent;

o) L-GIVEUP — signal indicating that the responding FERPM should abandon the recovery process. This is introduced so that if the initiating FERPM is unable to re-establish the association then the responding FERPM can inform its users of the irrecoverable error.

p) L-ERRCTX — signal indicating that the P-ALTER-CONTEXT negotiation is unsuccessful. The error is to be processed following the F-OPEN or F-RECOVER confirm as applicable.

q) L-HOLD — signal to FERPM to hold any primitive from the external user for later processing.

r) L-UNHOLD — signal to FERPM to process any previously held primitives.

s) L-STPSND --- a local signal from the FERPM to the sending local system to stop the resending of data and checkpoints.

A.1.2 Incoming Events

Events in the tables are depicted by abbreviated names. A list of these abbreviations, arranged alphabetically within categories, precedes each table. Wherever possible, these events have been arranged in the order in which a normal error-free sequence of events would occur.

It is assumed that incoming PDUs have been extracted from the user data fields of Presentation or ACSE indication or confirm primitives prior to being considered as incoming events.

The following naming conventions are used:

a) The prefix "F-" (as in F-INIRQ) indicates a primitive issued by the external file service (EFS) user or issued by the FERPM to the EFS user;

b) The prefix "P-" (as in P-ALTRQ) indicates a primitive issued by the Presentation Service (PS) provider.

c) The prefix "A-" (as in A-PABIN) indicates a primitive issued by the ACSE provider;

d) The prefix "L-" (as in L-ERRABT) indicates a local signal from the FPM or the FERPM to the local system or from the local system environment to the FPM or the FERPM;

e) The prefix "I-" (as in I-OPNRQ) indicates a primitive issued by the FERPM to the FPM or vice-versa;

f) Where no prefix is used, the event is the receipt of an FTAM PDU or, in the case of GRPRQ and GRPRP, a grouped sequence of PDUs. The only exception is "DATIN" which indicates a data value in user context in the data transfer state.

g) The following suffices indicate the basic types of primitives and PDUs:

"RQ"	request
"IN"	indication
"RP"	response
"CF"	confirm

A.1.3 Outgoing Events

The same naming conventions are used for outgoing events as for incoming events. Where the outgoing event is the issue of a PDU, it will normally give rise to the similarly named incoming event for the other protocol entity. For example, the outgoing event SELRP of the responding entity will become the incoming event SELRP for the initiating entity.

A.1.4 States

The suffix "-PD" indicates a pending state, waiting for some known primitive or PDU type. The suffix "-EX" indicates an expectant state in FERPM, waiting for some expected primitive.

The prefix "P-" normally indicates waiting for a primitive from the Presentation Service provider. Similarly, the prefix "F-" indicates waiting for a primitive from the EFS user. If neither of the above prefixes is used, the state normally indicates waiting for a PDU, or a non-pending state.

A.1.5 Predicates

The following symbols used in predicates have their normal Boolean algebraic meanings:

&	AND
|	OR
~	NOT

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An incoming event may satisfy more than one predicate, in which case the conditional actions for satisfied predicates will be executed.

Some actions may be conditional upon the negotiation of particular service functional units;

those in the FPM are:

U1: Kernel functional unit
U2: Read functional unit
U3: Write functional unit
U4: File access functional unit
U5: Limited management functional unit
U6: Enhanced management functional unit
U6a: Limited filestore management functional unit
U6b: *Enhanced filestore management* functional unit
U6c: Object manipulation functional unit
U6d: Group manipulation functional unit
U7: Grouping functional unit
U8: FADU locking functional unit

those in the FERPM are:

U9: Recovery functional unit
U10: Restart data transfer functional unit

A.1.6 Actions

Actions may be conditional on specified predicates, or they may be unconditional. When a line in a "detailed entries" specification commences with a predicate specifier followed by a colon, this indicates that all actions on that line are conditional upon the indicated predicate. An action may consist of one or more of the following:

a) an outgoing event, indicated by its abbreviated name;

b) a specified action, indicated by a number in square brackets [ ] and separated from any preceding items by a comma;

c) a specified qualifier, indicated by a number in square brackets [ ] following a preceding item without an intervening comma;

Actions and qualifiers are described in a single list preceding the table.

The next state which the protocol entity will enter is indicated by an arrow preceding a state name, e.g. "⇒ SELECTED". For the null transition back to the current state, the notation "⇒ *same state*" is used.

Once a state change occurs, all subsequent actions in that entry are ignored.

A.1.7 Implicit Action

The following entity actions have not been explicitly specified in the State tables, but constitute part of the entity behaviour:

a) A blank square in the table indicates an invalid event.

b) Unless otherwise stated in the tables, an invalid event would cause the action specified in 10.2 to be executed.

c) The Presentation Service is used throughout to identify "active" FTAM PCI from data with an equivalent encoding, but in a "passive" use data context.

d) For each incoming PDU, a check is made that the appropriate functional unit has been negotiated for the connection. If the check fails, the procedures for protocol violation specified in 10.2 are followed.

A.1.8 Additional State Information

The tables make use of the indicators and other state variables defined in 6.2 and 11.2. In addition, the file regime management tables for the initiator make use of a threshold indicator and an expected response list, as a means of specifying the entity state when a concatenated PDU group is outstanding.

The symbol NSPN is used to denote the Next Synchronization Point Number state variable.

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A.2 FTAM regime management protocol machine

A.2.1 States — FTAM regime management

UNINITIALIZED	FTAM regime ended.
INITIALIZE-PD	Initialize pending; wait for initialize response PDU.
INITIALIZED	FTAM regime started.
TERMINATE-PD	Terminate pending; wait for terminate response PDU.
I-INITIALIZE-PD	Initialize pending; wait for F-INITIALIZE response primitive from the internal file service user.
I-TERMINATE-PD	Terminate pending; wait for F-TERMINATE response primitive from the internal file service user.
CHG-PRE-PD	Change prefix pending, wait for change prefix response PDU
I-CHG-PRE-PD	Change prefix pending, wait for F-CHANGE-PREFIX response primitive from the internal file service user
LIST-PD	List pending, wait for list response PDU
I-LIST-PD	List pending, wait for F-LIST response primitive from the internal file service user
ANY-OTHER	Any other state of the file regime management protocol machine or the bulk data transfer protocol machine.
GRP-SELECT-PD	Group select pending, wait for group select response PDU
I-GRP-SELECT-PD	Group select pending, wait for F-GROUP-SELECT response primitive from the internal file service user
GRP-DELETE-PD	Group delete pending, wait for group delete response PDU
I-GRP-DELETE-PD	Group delete pending, wait for F-GROUP-DELETE response primitive from the internal file service user
GRP-COPY-PD	Group copy pending, wait for group copy response PDU
I-GRP-COPY-PD	Group copy pending, wait for F-GROUP-COPY response primitive from the internal file service user
GRP-MOVE-PD	Group move pending, wait for group move response PDU
I-GRP-MOVE-PD	Group move pending, wait for F-GROUP-MOVE response primitive from the internal file service user
GRP-LIST-PD	Group list pending, wait for group list response PDU
I-GRP-LIST-PD	Group list pending, wait for F-GROUP-LIST response primitive from the internal file service user
GRP-CATR-PD	Group change attribute pending, wait for group change attribute response PDU
I-GRP-CATR-PD	Group change attribute pending, wait for F-GROUP-CHANGE-ATTRIBUTE response primitive from the internal file service user

A.2.2 Incoming events — FTAM regime management

In the following lists, the functional unit in which the event occurs is included after the name, where applicable.

A.2.2.1 Incoming events — PDUs

UABRQ	U-Abort request PDU (on A-ABORT indication primitive)	U1
PABRQ	P-Abort request PDU (on A-ABORT indication primitive)	"
INIRQ	Initialize request PDU	"
INIRP	Initialize response PDU	"
TERRQ	Terminate request PDU	"
TERRP	Terminate response PDU	"

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CPRRQ	Change prefix request PDU	U6a
CPRRP	Change prefix response PDU	U6a
LISRQ	List request PDU	U6a
LISRP	List response PDU	U6a
GCPRQ	Group copy request PDU	U6d
GCPRP	Group copy response PDU	U6d
GDLRQ	Group delete request PDU	U6d
GDLRP	Group delete response PDU	U6d
GLSRQ	Group list request PDU	U6d
GLSRP	Group list response PDU	U6d
GCARQ	Group change attribute request PDU	U6d
GCARP	Group change attribute response PDU	U6d
GMVRQ	Group move request PDU	U6d
GMVRP	Group move response PDU	U6d
GSLRQ	Group select request PDU	U6d
GSLRP	Group select response PDU	U6d

A.2.2.2 Incoming events from the internal file service user

I-UABRQ	F-U-ABORT request primitive
I-INIRQ	F-INITIALIZE request primitive
I-INIRP	F-INITIALIZE response primitive
I-TERRQ	F-TERMINATE request primitive
I-TERRP	F-TERMINATE response primitive
I-CPRRQ	F-CHANGE-PREFIX request primitive
I-CPRRP	F-CHANGE-PREFIX response primitive
I-LISRQ	F-LIST request primitive
I-LISRP	F-LIST response primitive
I-GCPRQ	F-GROUP-COPY request primitive
I-GCPRP	F-GROUP-COPY response primitive
I-GDLRQ	F-GROUP-DELETE request primitive
I-GDLRP	F-GROUP-DELETE response primitive
I-GLSRQ	F-GROUP-LIST request primitive
I-GLSRP	F-GROUP-LIST response primitive
I-GCARQ	F-GROUP-CHANGE-ATTRIBUTE request primitive
I-GCARP	F-GROUP-CHANGE-ATTRIBUTE response primitive
I-GMVRQ	F-GROUP-MOVE request primitive
I-GMVRP	F-GROUP-MOVE response primitive
I-GSLRQ	F-GROUP-SELECT request primitive
I-GSLRP	F-GROUP-SELECT response primitive

A.2.2.3 Incoming events from the ACSE provider

A-PABIN	A-P-ABORT indication primitive

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A-ABIN A-ABORT indication primitive without user data

A-ASSCF A-ASSOCIATE confirm primitive without user data (with result indicating reject by ACSE or presentation service provider)

A.2.2.4 Incoming events from the local system

L-ERRABT Local signal indicating error leading to abort

L-PABORT Local signal indicating that a F-P-ABORT request PDU and a F-P-ABORT indication primitive to the internal file service user, both with a transient error value.

A.2.3 Outgoing events — FTAM regime management

A.2.3.1 Outgoing events — PDUs

UABRQ U-Abort request PDU

PABRQ P-Abort request PDU

INIRQ Initialize request PDU

INIRP Initialize response PDU

TERRQ Terminate request PDU

TERRP Terminate response PDU

CPRRQ Change prefix request PDU

CPRRP Change prefix response PDU

LISRQ List request PDU

LISRP List response PDU

GCPRQ Group copy request PDU

GCPRP Group copy response PDU

GDLRQ Group delete request PDU

GDLRP Group delete response PDU

GLSRQ Group list request PDU

GLSRP Group list response PDU

GCARQ Group change attribute request PDU

GCARP Group change attribute response PDU

GMVRQ Group move request PDU

GMVRP Group move response PDU

GSLRQ Group select request PDU

GSLRP Group select response PDU

A.2.3.2 Outgoing events to the internal file service user

I-UABIN F-U-ABORT indication primitive

I-PABIN F-P-ABORT indication primitive

I-INIIN F-INITIALIZE indication primitive

I-INICF F-INITIALIZE confirm primitive

I-TERIN F-TERMINATE indication primitive

I-TERCF F-TERMINATE confirm primitive

I-CPRIN F-CHANGE-PREFIX indication primitive

I-CPRCF F-CHANGE-PREFIX confirm primitive

I-LISIN F-LIST indication primitive

I-LISCF F-LIST confirm primitive

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I-GCPIN	F-GROUP-COPY indication primitive
I-GCPCF	F-GROUP-COPY confirm primitive
I-GDLIN	F-GROUP-DELETE indication primitive
I-GDLCF	F-GROUP-DELETE confirm primitive
I-GLSIN	F-GROUP-LIST indication primitive
I-GLSCF	F-GROUP-LIST confirm primitive
I-GCAIN	F-GROUP-CHANGE-ATTRIBUTE indication primitive
I-GCACF	F-GROUP-CHANGE-ATTRIBUTE confirm primitive
I-GMVIN	F-GROUP-MOVE indication primitive
I-GMVCF	F-GROUP-MOVE confirm primitive
I-GSLIN	F-GROUP-SELECT indication primitive
I-GSLCF	F-GROUP-SELECT confirm primitive

A.2.4 Specific actions — FTAM regime management

[1] Send the PDU constructed as user data and map parameters on the appropriate ACSE form.

[2] Add a pdu to the current PSDU and terminate the current PSDU

[3] Initialize state information - unset all additional state information indicators, set outstanding checkpoint counter to zero, NSPN to one.

[4] Set state result parameters to "success".

[5] In case of ACSE provider abort, if any diagnostic indicates communications failure then set the action result to transient error.

[6] Set state result parameter to "failure".

[7] Record the FQOS required and select the restart and/or recovery functional units if necessary.

[12] Establish the list of presentation contexts needed to support FTAM PCI and ACSE PCI abstract syntaxes. If necessary, determine, on the basis of the abstract syntaxes derived from the contents type list supplied by the external file service user, the list of presentation contexts needed to support the file contents, and add it to the previous list. The resultant list is used to construct the presentation context definition list parameter.

[13] Update the value of the contents type list parameter in the F-INITIALIZE indication primitive issued to the internal file service user, according to the abstract syntaxes rejected by the presentation service provider, if necessary.

[14] According to the value of the contents type list on the F-INITIALIZE response primitive received from the internal file service user, construct the presentation context definition result parameter.

[20] Set the action result parameter according to the result parameter of the A-ASSOCIATE confirm service primitive.

[62] Record the peer entity's checkpoint window.

[80] Set action result to permanent error

[81] Set action result to transient error

A.2.5 Predicates — FTAM regime management

P1: I-INITIALIZE request primitive is acceptable.

P2: Result parameter of the ACSE confirm primitive indicates success of the operation.

P3: State result parameter of the incoming response primitive indicates success of the operation.

P5: Initialize request PDU is acceptable.

P25: Negotiable parameters have values consistent with request.

P310: The group manipulation functional unit is selected.

P312: The limited filestore management functional unit is negotiated.

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A.2.6 Initiating entity state table — FTAM regime management

STATE / EVENT	UNINITIALIZED	INITIALIZE-PD	INITIALIZED	TERMINATE-PD	CHG-PRE-PD	LIST-PD	ANY-OTHER	GRP-SELECT-PD	GRP-DELETE-PD	GRP-COPY-PD	GRP-MOVE-PD	GRP-LIST-PD	GRP-CATR-PD
I-INITRQ	1												
A-ASSCF		10											
INIRP		2											
I-TERRQ			3										
TERRP				4									
I-CPRRQ			12										
CPRRP					13								
I-LISRQ			14										
LISRP						15							
A-PABIN		5	5	5	5	5	5						
A-ABIN		7	7	7	7	7	7						
UABRQ		6	6	6	6	6	6						
PABRQ		7	7	7	7	7	7						
I-UABRQ		8	8	8	8	8	8						
L-ERRABT		9	9	9	9	9	9						
L-PABORT		11	11	11	11	11	11						
I-GSLRQ			21										
GSLRP								22					
I-GDLRQ			23										
GDLRP									24				
I-GCPRQ			25										
GCPRP										26			
I-GMVRQ			27										
GMVRP											28		
I-GLSRQ			29										
GLSRP												30	
I-GCARQ			31										
GCARP													32

A.2.7 Initiating entity state table: detailed entries

1:	P1:	[3],[12],INIRQ[1]	⇒ INITIALIZE-PD
	~P1:	I-INICF[6]	⇒ *same state*
2:	P3&P2 & P25:	[62],I-INICF[4],[7]	⇒ INITIALIZED
	P3&P2 & ~P25:	I-INICF[6],PABRQ[1]	⇒ UNINITIALIZED
	~P2:	I-INICF[6]	⇒ UNINITIALIZED
	~P3:	PABRQ[1],I-PABIN[80]	⇒ UNINITIALIZED
3:		TERRQ[1]	⇒ TERMINATE-PD
4:		I-TERCF	⇒ UNINITIALIZED
5:		I-PABIN[81]	⇒ UNINITIALIZED
6:		I-UABIN	⇒ UNINITIALIZED

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7:	I-PABIN	⇒ UNINITIALIZED
8:	UABRQ[1]	⇒ UNINITIALIZED
9:	PABRQ[1],I-PABIN[80]	⇒ UNINITIALIZED
10:	I-INITCF[6],I-PABIN[20]	⇒ UNINITIALIZED
11:	PABRQ[1],I-PABIN[81]	⇒ UNINITIALIZED
12:	CPRRQ[2]	⇒ CHG-PRE-PD
13:	I-CPRCF	⇒ INITIALIZED
14:	LISRQ[2]	⇒ LIST-PD
15:	I-LISCF	⇒ INITIALIZED
21:	GSLRQ[2]	⇒ GRP-SELECT-PD
22:	I-GSLCF	⇒ INITIALIZED
23:	GDLRQ[2]	⇒ GRP-DELETE-PD
24:	I-GDLCF	⇒ INITIALIZED
25:	GCPRQ[2]	⇒ GRP-COPY-PD
26:	I-GCPCF	⇒ INITIALIZED
27:	GMVRQ[2]	⇒ GRP-MOVE-PD
28:	I-GMVCF	⇒ INITIALIZED
29:	GLSRQ[2]	⇒ GRP-LIST-PD
30:	I-GLSCF	⇒ INITIALIZED
31:	GCARQ[2]	⇒ GRP-CATR-PD
32:	I-GCACF	⇒ INITIALIZED

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A.2.8 Responding entity state table — FTAM regime management

STATE / EVENT	UNINITIALIZED	I-INITIALIZE-PD	INITIALIZED	I-TERMINATE-PD	I-CHG-PRE-PD	I-LIST-PD	ANY-OTHER	I-GRP-SELECT-PD	I-GRP-DELETE-PD	I-GRP-COPY-PD	I-GRP-MOVE-PD	I-GRP-LIST-PD	I-GRP-CATR-PD
INIRQ	1												
I-INIRP		2											
TERRQ			3										
I-TERRP				4									
CPRRQ			12										
I-CPRRP					13								
LISRQ			14										
I-LISRP						15							
A-PABIN		5	5	5	5	5	5						
A-ABIN		7	7	7	7	7	7						
UABRQ		6	6	6	6	6	6						
PABRQ		7	7	7	7	7	7						
I-UABRQ		8	8	8	8	8	8						
L-ERRABT		9	9	9	9	9	9						
L-PABORT		11	11	11	11	11	11						
GSLRQ			21										
I-GSLRP								22					
GDLRQ			23										
I-GDLRP									24				
GCPRQ			25										
I-GCPRP										26			
GMVRQ			27										
I-GMVRP											28		
GLSRQ			29										
I-GLSRP												30	
GCARQ			31										
I-GCARP													32

A.2.9 Responding entity state table: detailed entries

1:	P5:	I-ININ,[3],[62],[13]	⇒ I-INITIALIZED-PD
	~P5:	INIRP[6][1]	⇒ *same state*
2:	P3:	[7],[14],INIRP[1]	⇒ INITIALIZED
	~P3:	INIRP[6][1]	⇒ UNINITIALIZED
3:		I-TERIN	⇒ I-TERMINATE-PD
4:		TERRP[1]	⇒ UNINITIALIZED
5:		I-PABIN[81]	⇒ UNINITIALIZED
6:		I-UABIN	⇒ UNINITIALIZED
7:		I-PABIN	⇒ UNINITIALIZED
8:		UABRQ[1]	⇒ UNINITIALIZED

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9:		PABRQ[1],I-PABIN[80]	⇒ UNINITIALIZED
11:		PABRQ[1],I-PABIN[81]	⇒ UNINITIALIZED
12:	P312:	I-CPRIN	⇒ I–CHG-PRE-PD
	~P312:	PABRQ[1],I-PABIN[80]	⇒ UNINITIALIZED
13:		CPRRP[2]	⇒ INITIALIZED
14:	P312:	I-LISIN	⇒ I–LIST-PD
	~P312:	PABRQ[1],I-PABIN[80]	⇒ UNINITIALIZED
15:		LISRP[2]	⇒ INITIALIZED
21:	P310:	I-GSLIN	⇒ I-GRP-SELECT-PD
	~P310:	PABRQ[1],I-PABIN[80]	⇒ UNINITIALIZED
22:	P4:	GSLRP[2]	⇒ INITIALIZED
	~P4:	GSLRP[8][2]	⇒ INITIALIZED
23:	P310:	I-GDLIN	⇒ I-GRP-DELETE-PD
	~P310:	PABRQ[1],I-PABIN[80]	⇒ UNINITIALIZED
24:		GDLRP[2]	⇒ INITIALIZED
25:	P310:	I-GCPIN	⇒ I-GRP-COPY-PD
	~P310:	PABRQ[1],I-PABIN[80]	⇒ UNINITIALIZED
26:		GCPRP[2]	⇒ INITIALIZED
27:	P310:	I-GMVIN	⇒ I-GRP-MOVE-PD
	~P310:	PABRQ[1],I-PABIN[80]	⇒ UNINITIALIZED
28:		GMVRP[2]	⇒ INITIALIZED
29:	P310:	I-GLSIN	⇒ I-GRP-LIST-PD
	~P310:	PABRQ[1],I-PABIN[80]	⇒ UNINITIALIZED
30:		GLSRP[2]	⇒ INITIALIZED
31:	P310:	I-GCAIN	⇒ I-GRP-CATR-PD
	~P310:	PABRQ[1],I-PABIN[80]	⇒ UNINITIALIZED
32:		GCARP[2]	⇒ INITIALIZED

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A.3 Object regime management protocol machine

A.3.1 States — object regime management

In the FPM:

INITIALIZED	FTAM regime started
SELECT-PD	Select pending, wait for select response PDU
I-SELECT-PD	Select pending, wait for F-SELECT response primitive from the internal file service user
SELECTED	Selected
DESELECT-PD	Deselect pending, wait for deselect response PDU
I-DESELECT-PD	Deselect pending, wait for F-DESELECT response primitive from the internal file service user
CREAT-PD	Create pending, wait for create response PDU
I-CREATE-PD	Create pending, wait for F-CREATE response primitive from the internal file service user
DELETE-PD	delete pending, wait for delete response PDU
I-DELETE-PD	Delete pending, wait for F-DELETE response primitive from the internal file service user
READ-ATT-PD	Read attribute pending, wait for read attribute response PDU
I-READ-ATT-PD	Read attribute pending, wait for F-READ-ATTRIB response primitive from the internal file service user
CHG-ATT-PD	Change attribute pending, wait for change attribute response PDU.
I-CHG-ATT-PD	Change attribute pending, wait for F-CHANGE-ATTRIB response primitive from the internal file service user
OPEN-PD	Open pending, wait for open response PDU
I-OPEN-PD	Open pending, wait for F-OPEN response primitive from the internal file service user
P-ALTIN-PD	Presentation alter context pending, wait for P-ALTER-CONTEXT indication primitive.
P-ALTCF-PD	Presentation alter context pending, wait for P-ALTER-CONTEXT confirm primitive.
CLOSE-PD	Close pending, wait for close response PDU
I-CLOSE PD	Close pending, wait for F-CLOSE response primitive from the internal file service user
DXFRIDLE	Data transfer idle
LOCATE-PD	Locate pending, wait for locate response PDU
I-LOCATE-PD	Locate pending, wait for F-LOCATE response primitive from the internal file service user
ERASE-PD	Erase pending, wait for erase response PDU
I-ERASE-PD	Erase pending, wait for F-ERASE response primitive from the internal file service user
GROUPING	Building PDU group, wait for required primitives
GROUP-PD	Group pending, wait for response PDU group
I-GROUP-PD	Group pending, wait for F-BEGIN-GROUP response primitive from the internal file service user
CREATE-DIR-PD	Create directory pending, wait for create directory response PDU
I-CREATE-DIR-PD	Create directory pending, wait for F-CREATE-DIRECTORY response primitive from the internal file service user
LINK-PD	Link pending, wait for link response PDU
I-LINK-PD	Link pending, wait for F-LINK response primitive from the internal file service user
UNLINK-PD	Unlink pending, wait for unlink response PDU
I-UNLINK-PD	Unlink pending, wait for F-UNLINK response primitive from the internal file service user
SELECT-ANTR-PD	Select another pending, wait for select another response PDU
I-SELECT-ANTR-PD	Select another pending, wait for F-SELECT-ANOTHER response primitive from the internal file service user

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READ-LINK-ATT-PD	Read link attribute pending, wait for read link attribute response PDU
I-READ-LINK-ATT-PD	Read link attribute pending, wait for F-READ-LINK-ATTRIB response primitive from the internal file service user
CHG-LINK-ATT-PD	Change link attribute pending, wait for change link attribute response PDU
I-CHG-LINK-ATT-PD	Change link attribute pending, wait for F-CHANGE-LINK-ATTRIB response primitive from the internal file service user
COPY-PD	Copy pending, wait for copy response PDU
I-COPY-PD	Copy pending, wait for F-COPY response primitive from the internal file service user
MOVE-PD	Move pending, wait for move response PDU
I-MOVE-PD	Move pending, wait for F-MOVE response primitive from the internal file service user

In the FERPM:

RECOVER-PD	Recover pending, wait for recover response PDU
I-RECOVER-PD	Recover pending, wait for F-RECOVER response primitive from the internal file service user
P-ALTIN-REC-PD	Presentation alter context pending, wait for P-ALTER-CONTEXT indication primitive during recovery.
P-ALTCF-REC-PD	Presentation alter context pending, wait for P-ALTER-CONTEXT confirm primitive during recovery.
DXFRIDLE-REC	Data transfer idle during recovery

A.3.2 Incoming events — object regime management

A.3.2.1 Incoming events — PDUs

CATRQ	Change-attrib request PDU	U6
CATRP	Change-attrib response PDU	U6
CLORQ	Close request PDU	U2, U3
CLORP	Close response PDU	U2, U3
CRERQ	Create request PDU	U5
CRERP	Create response PDU	U5
DELRQ	Delete request PDU	U5
DELRP	Delete request PDU	U5
DESRQ	Deselect request PDU	U1
DESRP	Deselect response PDU	U1
ERARQ	Erase request PDU	U4
ERARP	Erase response PDU	U4
LOCRQ	Locate request PDU	U4
LOCRP	Locate response PDU	U4
OPNRQ	Open request PDU	U2, U3
OPNRP	Open response PDU	U2, U3
RATRQ	Read-attrib request PDU	U5
RATRP	Read-attrib response PDU	U5
RECRQ	Recover request PDU	U9
RECRP	Recover response PDU	U9
SELRQ	Select request PDU	U1
SELRP	Select response PDU	U1
GRPRQ	A sequence of request PDUs (PDU-Group) preceded by an F-BEGIN-GROUP request PDU and followed by a F-END-GROUP request PDU.	U7

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GRPRP	A sequence of response PDUs (PDU-Group) preceded by an F-BEGIN-GROUP response PDU and followed by a F-END-GROUP response PDU.	U7
CDRRQ	Create directory request PDU	U6b
CDRRP	Create directory response PDU	U6b
CLARQ	Change link attribute request PDU	U6b
CLARP	Change link attribute response PDU	U6b
CPYRQ	Copy request PDU	U6c
CPYRP	Copy response PDU	U6c
LNKRQ	Link request PDU	U6b
LNKRP	Link response PDU	U6b
MOVRQ	Move request PDU	U6c
MOVRP	Move response PDU	U6c
RLARQ	Read link attribute request PDU	U6b
RLARP	Read link attribute response PDU	U6b
SANRQ	Select another request PDU	U6d
SANRP	Select another response PDU	U6d

A.3.2.2 Incoming events from the internal file service user

I-CATRQ	F-CHANGE-ATTRIB request primitive
I-CATRP	F-CHANGE-ATTRIB response primitive
I-CLORQ	F-CLOSE request primitive
I-CLORP	F-CLOSE response primitive
I-CRERQ	F-CREATE request primitive
I-CRERP	F-CREATE response primitive
I-DELRQ	F-DELETE request primitive
I-DELRP	F-DELETE response primitive
I-DESRQ	F-DESELECT request primitive
I-DESRP	F-DESELECT response primitive
I-ERARQ	F-ERASE request primitive
I-ERARP	F-ERASE response primitive
I-LOCRQ	F-LOCATE request primitive
I-LOCRP	F-LOCATE response primitive
I-OPNRQ	F-OPEN request primitive
I-OPNRP	F-OPEN response primitive
I-RATRQ	F-READ-ATTRIB request primitive
I-RATRP	F-READ-ATTRIB response primitive
I-RECRQ	F-RECOVER request primitive
I-RECRP	F-RECOVER response primitive
I-SELRQ	F-SELECT request primitive
I-SELRP	F-SELECT response primitive
I-BGPRQ	F-BEGIN-GROUP request primitive
I-BGPRP	F-BEGIN-GROUP response primitive
I-EGPRQ	I-END-GROUP request primitive

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I-EGPRP	I-END-GROUP response primitive
I-CDRRQ	F-CREATE-DIRECTORY request primitive
I-CDRRP	F-CREATE-DIRECTORY response primitive
I-CLARQ	F-CHANGE-LINK-ATTRIB request primitive
I-CLARP	F-CHANGE-LINK-ATTRIB response primitive
I-CPYRQ	F-COPY request primitive
I-CPYRP	F-COPY response primitive
I-LNKRQ	F-LINK request primitive
I-LNKRP	F-LINK response primitive
I-MOVRQ	F-MOVE request primitive
I-MOVRP	F-MOVE response primitive
I-RLARQ	F-READ-LINK-ATTRIB request primitive
I-RLARP	F-READ-LINK-ATTRIB response primitive
I-SANRQ	F-SELECT-ANOTHER request primitive
I-SANRP	F-SELECT-ANOTHERsponse primitive

A.3.2.3 Incoming events from the presentation service provider

P-ALTIN	P-ALTER-CONTEXT indication primitive
P-ALTCF	P-ALTER-CONTEXT confirm primitive

A.3.3 Outgoing events — file regime management

A.3.3.1 Outgoing events — PDUs

CATRQ	Change-attrib request PDU
CATRP	Change-attrib response PDU
CLORQ	Close request PDU
CLORP	Close response PDU
CRERQ	Create request PDU
CRERP	Create response PDU
DELRQ	Delete request PDU
DELRP	Delete response PDU
DESRQ	Deselect request PDU
DESRP	Deselect response PDU
ERARQ	Erase request PDU
ERARP	Erase response PDU
LOCRQ	Locate request PDU
LOCRP	Locate response PDU
OPNRQ	Open request PDU
OPNRP	Open response PDU
PABRQ	P-Abort request PDU
RATRQ	Read-attrib request PDU
RATRP	Read-attrib response PDU
RECRQ	Recover request PDU
RECRP	Recover response PDU

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SELRQ	Select request PDU
SELRP	Select response PDU
CDRRQ	Create directory request PDU
CDRRP	Create directory response PDU
CLARQ	Change link attribute request PDU
CLARP	Change link attribute response PDU
CPYRQ	Copy request PDU
CPYRP	Copy response PDU
LNKRQ	Link request PDU
LNKRP	Link response PDU
MOVRQ	Move request PDU
MOVRP	Move response PDU
RLARQ	Read link attribute request PDU
RLARP	Read link attribute response PDU
SANRQ	Select another request PDU
SANRP	Select another response PDU

A.3.3.2 Outgoing events to the internal file service user

I-CATIN	F-CHANGE-ATTRIB indication primitive
I-CATCF	F-CHANGE-ATTRIB confirm primitive
I-CLOIN	F-CLOSE indication primitive
I-CLOCF	F-CLOSE confirm primitive
I-CREIN	F-CREATE indication primitive
I-CRECF	F-CREATE confirm primitive
I-DELIN	F-DELETE indication primitive
I-DELCF	F-DELETE confirm primitive
I-DESIN	F-DESELECT indication primitive
I-DESCF	F-DESELECT confirm primitive
I-ERAIN	F-ERASE indication primitive
I-ERACF	F-ERASE confirm primitive
I-LOCIN	F-LOCATE indication primitive
I-LOCCF	F-LOCATE confirm primitive
I-OPNIN	F-OPEN indication primitive
I-OPNCF	F-OPEN confirm primitive
I-PABIN	F-P-ABORT indication primitive
I-RATIN	F-READ-ATTRIB indication primitive
I-RATCF	F-READ-ATTRIB confirm primitive
I-RECIN	F-RECOVER indication primitive
I-RECCF	F-RECOVER confirm primitive
I-SELIN	F-SELECT indication primitive
I-SELCF	F-SELECT confirm primitive
I-CDRIN	F-CREATE-DIRECTORY indication primitive
I-CDRCF	F-CREATE-DIRECTORY confirm primitive

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I-CLAIN F-CHANGE-LINK-ATTRIB indication primitive

I-CLACF F-CHANGE-LINK-ATTRIB confirm primitive

I-CPYIN F-COPY indication primitive

I-CPYCF F-COPY confirm primitive

I-LNKIN F-LINK indication primitive

I-LNKCF F-LINK confirm primitive

I-MOVIN F-MOVE indication primitive

I-MOVCF F-MOVE confirm primitive

I-RLAIN F-READ-LINK-ATTRIB indication primitive

I-RLACF F-READ-LINK-ATTRIB confirm primitive

I-SANIN F-SELECT-ANOTHER indication primitive

I-SANCF F-SELECT-ANOTHER confirm primitive

A.3.3.3 Outgoing events to the presentation service provider

P-ALTRQ P-ALTER-CONTEXT request primitive

P-ALTRP P-ALTER-CONTEXT response primitive

A.3.3.4 Outgoing events to the local system

L-ERRCTX Local signal indicating P-ALTER-CONTEXT error

A.3.4 Specific actions — file regime management

[1] Send the PDU constructed as user data and map parameters on the appropriate ACSE form.

[2] Add a PDU to the current PSDU and terminate the current PSDU.

[8] Includes a state result parameter indicating failure.

[9] Set the remove contexts parameter of the F-OPEN or the F-RECOVER request PDU.

[10] Determine, on the basis of the abstract syntax derived from the contents type supplied by the external file service user, the set of presentation contexts necessary to support the file contents. All contexts identified in the remove context parameter of the OPNRQ or RECRQ PDUs shall be deleted unless required in the new open regime; optionally, the responder may elect to delete any other contexts in the defined context set which are not required. Inform the user if contexts need to be defined but the functional unit is unavailable

[11] Set the presentation-action parameter of the OPNRP or RECRP PDU if a P-ALTER-CONTEXT exchange is needed.

[15] Preserve the PDU or PDUs for further processing.

[28] Set the bulk data transfer number to that specified in the F-RECOVER request primitive or PDU.

[31] Set the bulk data transfer number to zero.

[32] Erase the expected response list. Set the threshold indicator to the value given by the primitive parameter. Add an F-BEGIN-GROUP request PDU to the current PSDU.

[33] Add a request PDU corresponding to the primitive function to the current PSDU, and add the corresponding element to the expected response list.

[34] Add an F-END-GROUP request PDU to the current PSDU and terminate the PSDU.

[35] Check that every PDU in the PDU-Group is one of SELRP, CRERP, CLORP, RATRP, CATRP, DESRP, DELRP, or OPNRP; and that the composition and ordering of the PDUs is consistent with the group specified by the expected response list (recognizing that the response group may be truncated because of a detected error).

[36] Check that the number of PDUs in the PDU-Group is consistent with the value of the threshold parameter and that the other parameter values are consistent with negotiation.

[37] Considering each PDU in the PDU-Group, issue the corresponding confirm primitive to the IFS user with parameters derived from the PDU.

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[38] Add a response PDU corresponding to the primitive function to the current PSDU.

[39] Add an F-END-GROUP response PDU to the current PSDU and terminate the PSDU.

[40] Check that the composition and ordering of the PDU-Group is consistent with one of the concatenated sequences "A", "C", or "D", as defined in Part 3, Annex E.

[41] Check that the composition and ordering of the PDU-Group is consistent with the concatenated sequence "E" as defined in Part 3, Annex E.

[42] Check that the composition and ordering of the PDU-Group is consistent with the concatenated sequence "B" as defined in Part 3, Annex E.

[43] Considering in turn each PDU in the PDU-Group, issue the corresponding indication primitive to the IFS user with parameters derived from the PDU.

[45] Set the checkpoint identifier expected to the value negotiated plus one.

A.3.5 Predicates — object regime management

P4: The state result parameter on the incoming response PDU or response primitive indicates successful execution of operation.

P6: The P-ALTER-CONTEXT negotiation fails.

P7: A group of PDUs is preserved.

P9: The presentation context management functional unit is available and there are presentation contexts to be deleted or defined.

P10: The presentation-action parameter in the OPNRP PDU or in the RECRP PDU is TRUE, in which case the presentation context management functional unit should be available.

P17: The PDU-Group contains a SELRP or CRERP PDU with a state result parameter indicating failure, or a DESRP or DELRP PDU.

P18: Checking the PDU-Group reveals a protocol error.

P19: The PDU-Group contains an OPNRP PDU with a state result parameter indicating success.

P43: The recovery procedure is in progress.

P310: The group manipulation functional unit is selected.

P311: The object manipulation functional unit is selected

P313: The enhanced filestore management functional unit is selected.

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A.3.6 Initiating entity state table — object regime management

STATE / EVENT	INITIALIZED	SELECT-PD	SELECTED	DESELECT-PD	CREATE-PD	DELETE-PD	READ-ATT-PD	CHG-ATT-PD	OPEN-PD	P-ALTIN-PD	DXFRIDLE	DXFRIDLE-REC	CLOSE-PD	RECOVER-PD	P-ALTIN-REC-PD	LOCATE-PD	ERASE-PD	CREATE-DIR-PD	LINK-PD	UNLINK-PD	SELECT-ANTR-PD	READ-LINK-ATT-PD	CHG-LINK-ATT-PD	COPY-PD	MOVE-PD	GROUPING	GROUP-PD
I-SELRQ	1																								28	
SELRP		2																								
I-DESRQ			3																						28	
DESRP				4																						
I-CRERQ	5																								28	
CRERP					6																					
I-DELRQ			7																						28	
DELRP						8																				
I-RATRQ			9																						28	
RATRP							10																			
I-CATRQ			11																						28	
CATRP								12																		
I-OPNRQ			13																						22	
OPNRP									14																	
P-ALTIN										15					21											
I-CLORQ											17	17													28	
CLORP													18													
I-RECRQ	19																									
RECRP														20												
I-LOCRQ											23	23														
LOCRP																24										
I-ERARQ											25	25														
ERARP																	26									
I-CDRRQ	31																								28	
CDRRP																		32								
I-LNKRQ	33																								28	
LNKRP																			34							
I-ULNRQ			35																						28	
ULNRP																				36						
I-SANRQ	37																								28	
SANRP																					38					
I-RLARQ			39																						28	
RLARP																						40				
I-CLARQ			41																						28	
CLARP																							42			
I-CPYRQ			43																						28	
CPYRP																								44		
I-MOVRQ			45																						28	
MOVRP																										46
I-BGPRQ	27		27								27	27														
I-EGPRQ																									29	
GRPRP																										30

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A.3.7 Initiating entity state table (Part 2) — detailed entries

1:		SELRQ[2]	⇒ SELECT-PD
2:	P4:	I-SELCF	⇒ SELECTED
	~P4:	I-SELCF[8]	⇒ INITIALIZED
3:		DESRQ[2]	⇒ DESELECT-PD
4:		I-DESCF	⇒ INITIALIZED
5:		CRERQ[2]	⇒ CREATE-PD
6:		I-RECF	⇒ SELECTED
7:		DELRQ[2]	⇒ DELETE-PD
8:		I-DELCF	⇒ INITIALIZED
9:		RATRQ[2]	⇒ READ-ATT-PD
10:		I-RATCF	⇒ SELECTED
11:		CATRQ[2]	⇒ CHG-ATT-PD
12:		I-CATCF	⇒ SELECTED
13:	P9:	[9], OPNRQ[2],[31]	⇒ OPEN-PD
14:	~P4:	I-OPNCF[8]	⇒ SELECTED
	P4 & ~P10:	I-OPNCF	⇒ DXFRIDLE
	P4 & P10:	[15]	⇒ P-ALTIN-PD
15:	P6:	L-ERRCTX, P-ALTRP,	
	P7:	[37]	⇒ DXFRIDLE
	~P7:	I-OPNCF	⇒ DXFRIDLE
17:		CLORQ[2]	⇒ CLOSE-PD
18:		I-CLOCF	⇒ SELECTED
19:	P9:	[9], RECRQ[2],[28]	⇒ RECOVER-PD
20:	~P4:	I-RECCF[8]	⇒ INITIALIZED
	P4 & ~P10:	[45],I-RECCF	⇒ DXFRIDLE-REC
	P4 & P10:	[15]	⇒ P-ALTIN-REC-PD
21:	P6:	L-ERRCTX, P-ALTRP, [45],I-RECCF	⇒ DXFRIDLE-REC
22:	P9:	[9], [31],[33]	⇒ *same state*
23:		LOCRQ[2]	⇒ LOCATE-PD
24:	~P43:	I-LOCCF	⇒ DXFRIDLE
	P43:	I-LOCCF	⇒ DXFRIDLE-REC
25:		ERARQ[2]	⇒ ERASE-PD
26:	~P43:	IERACF	⇒ DXFRIDLE
	P43:	IERACF	⇒ DXFRIDLE-REC
27:		[32]	⇒ GROUPING
28:		[33]	⇒ *same state*
29:		[34]	⇒ GROUP-PD

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30:		[35],[36],	
	P18:	I-PABIN, PABRQ[1]	⇒UNINITIALIZED
	P17 & ~P18:	[37]	⇒ INITIALIZED
	~P17 & ~P18 & P19 & ~P10:	[37]	⇒ DXFRIDLE
	~P17 & ~P18 & P19 & P10:	[15]	⇒ P-ALTIN-PD
	~P17 & ~P18 & ~P19:	[37]	⇒ SELECTED
31:		CDRRQ[2]	⇒ CREATE-DIR-PD
32:	P4:	I-CDRCF	⇒ SELECTED
	~P4 :	I-CDRCF[8]	⇒ INITIALIZED
33:		LNKRQ[2]	⇒ LINK-PD
34:	P4:	I-LNKCF	⇒ SELECTED
	~P4 :	I-LNKCF[8]	⇒ INITIALIZED
35:		ULNRQ[2]	⇒ UNLINK-PD
36:		I-ULNCF	⇒ INITIALIZED
37:		SANRQ[2]	⇒ SELECT-ANTR-PD
38:	P4:	I-SANCF	⇒ SELECTED
	~P4:	I-SANCF[8]	⇒ INITIALIZED
39:		RLARQ[2]	⇒ READ-LINK-ATT-PD
40:		I-RLACF	⇒ SELECTED
41:		CLARQ[2]	⇒ CHG-LINK-ATT-PD
41:		I-CLACF	⇒ SELECTED
42:		CPYRQ[2]	⇒ COPY-PD
43:		I-CPYCF	⇒ SELECTED
44:		MOVRQ[2]	⇒ MOVE-PD
45:		I-MOVCF	⇒ SELECTED

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A.3.8 Responding entity state table — object regime management

STATE / EVENT	INITIALIZED	I-SELECT-PD	SELECTED	I-DESELECT-PD	I-CREATE-PD	I-DELETE-PD	I-READ-ATT-PD	I-CHG-ATT-PD	I-OPEN-PD	P-ALTIN-PD	DXFRIDLE	DXFRIDLE-REC	I-CLOSE-PD	I-RECOVER-PD	P-ALTCF-REC-PD	I-LOCATE-PD	I-ERASE-PD	I-CREATE-DIR-PD	I-LINK-PD	I-UNLINK-PD	I-SELECT-ANTR-PD	I-READ-LINK-ATT-PD	I-CHG-LINK-ATT-PD	I-COPY-PD	I-MOVE-PD	I-GROUP-PD	GROUPING
SELRQ	1																										
I-SELRP		2																									32
DESRQ			3																								
I-DESRP				4																							32
CRERQ	5																										
I-CRERP					6																						32
DELRQ			7																								
I-DELRP						8																					32
RATRQ			9																								
I-RATRP							10																				32
CATRQ			11																								
ICATRP								12																			32
OPNRQ			13																								
I-OPNRP									14																		22
P-ALTCF										15					21												
CLORQ											17	17															
I-CLORP													18														32
RECRQ	19																										
I-RECRP														20													
LOCRQ											24	24															
I-LOCRP																25											
ERARQ											26	26															
I-ERARP																	27										
CDRRQ	34																										
I-CDRRP																		35									32
LNKRQ	36																										
I-LNKRP																			37								32
ULNRQ			38																								
I-ULNRP																				39							32
SANRQ	40																										
I-SANRP																					41						32
RLARQ			42																								
I-RLARP																						43					32
CLARQ			44																								
I-CLARP																							45				32
CPYRQ			46																								
I-CPYRP																								47			32
MOVRQ			48																								
I-MOVRP																									49		32
I-BGPRP																										31	
I-EGPRP																											33
GRPRQ	28		29								30	30															

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A.3.9 Responding entity state table (Part 2) — detail entries

1:		I-SELIN	⇒ I-SELECT-PD
2:	P4:	SELRP[2]	⇒ SELECTED
	~P4:	SELRP[8][2]	⇒ INITIALIZED
3:		I-DESIN	⇒ I-DESELECT-PD
4:		DESRP[2]	⇒ INITIALIZED
5:		I-CREIN	⇒ I-CREATE-PD
6:	P4:	CRERP[2]	⇒ SELECTED
	~P4:	CRERP[8][2]	⇒ INITIALIZED
7:		I-DELIN	⇒ I-DELETE-PD
8:		DELRP[2]	⇒ INITIALIZED
9:		I-RATIN	⇒ I-READ-ATT-PD
10:		RATRP[2]	⇒ SELECTED
11:		I-CATIN	⇒ I-CHG-ATT-PD
12:		CATRP[2]	⇒ SELECTED
13:		I-OPNIN,[31]	⇒ I-OPEN-PD
14:	~P4:	OPNRP[8][2]	⇒ SELECTED
	P4:	[10]	
	P4 & ~P9:	OPNRP[2]	⇒ DXFRIDLE
	P4 & P9:	[11],OPNRP[2],P-ALTRQ	⇒ P-ALTCF-PD
15:	P6:	L-ERRCTX,	⇒ DXFRIDLE
17:		I-CLOIN	⇒ I-CLOSE-PD
18:		CLORP[2]	⇒ SELECTED
19:		I-RECIN,[28]	⇒ I-RECOVER-PD
20:	~P4:	RECRP[8][2]	⇒ INITIALIZED
	P4:	[10],[45],	
	P4 & ~ P9:	RECRP[2]	⇒ DXFRIDLE-REC
	P4 & P9:	[11],RECRP[2],P-ALTRQ	⇒ P-ALTCF-REC-PD
21:	P6:	L-ERRCTX,	⇒ DXFRIDLE-REC
22:		[38],[31]	⇒ *same state*
24:		I-LOCIN	⇒ I-LOCATE-PD
25:	~P43:	LOCRP[2]	⇒ DXFRIDLE
	P43:	LOCRP[2]	⇒ DXFRIDLE-REC
26:		I-ERAIN	⇒ I-ERASE-PD
27:	~P43:	ERARP[2]	⇒ DXFRIDLE
	P43:	ERARP[2]	⇒ DXFRIDLE-REC
28:		[40],	
	P18:	I-PABIN,PABRQ[1]	⇒ UNINITIALIZED
	~P18:	[43]	⇒ I-GROUP-PD

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29:		[41],	
	P18:	I-PABIN,PABRQ[1]	⇒ UNINITIALIZED
	~P18:	[43]	⇒ I-GROUP-PD
30:		[42],	
	P18:	I-PABIN,PABRQ[1]	⇒ UNINITIALIZED
	~P18:	[43]	⇒ I-GROUP-PD
31:		[38]	⇒ GROUPING
32:		[38]	⇒ *same state*
33:		[39],	
	P17:		⇒ INITIALIZED
	~P17 & P19:	[10],	
	~P17 & P19 & ~P9:		⇒ DXFRIDLE
	~P17 & P19 & P9	P-ALTRQ	⇒ P-ALTCF-PD
	~P17 & ~P19:		⇒ SELECTED
34:	P313:	I-CDRIN	⇒ I-CREATE-DIR-PD
	~P313:	PABRQ[1],I-PABIN[80]	⇒ UNINITIALIZED
35:	P4:	CDRRP[2]	⇒ SELECTED
	~P4 :	CDRRP[8][2]	⇒ INITIALIZED
36:	P313;	I-LNKIN	⇒ I-LINK-PD
	~P313:	PABRQ[1],I-PABIN[80]	⇒ UNINITIALIZED
37:	P4:	LNKRP[2]	⇒ SELECTED
	~P4	LNKRP[8][2]	⇒ INITIALIZED
38:	P313:	I-ULNIN	⇒ I-UNLINK-PD
	~P313:	PABRQ[1],I-PABIN[80]	⇒ UNINITIALIZED
39:		ULNRP[2]	⇒ INITIALIZED
40:	P310:	I-SANIN	⇒ I-SELECT-ANTR-PD
	~P310:	PABRQ[1],I-PABIN[80]	⇒ UNINITIALIZED
41:	P4:	SANRP[2]	⇒ SELECTED
	~P4 :	SANRP[8][2]	⇒ INITIALIZED
42:	P313:	I-RLAIN	⇒ I-READ-LINK-ATT-PD
	~P313:	PABRQ[1],I-PABIN[80]	⇒ UNINITIALIZED
43:		RLARP[2]	⇒ SELECTED
44:	P313:	I-CLAIN	⇒ I-CHG-LINK-ATT-PD
	~P313:	PABRQ[1],I-PABIN[80]	⇒ UNINITIALIZED
45:		CLARP[2]	⇒SELECTED
46:	P311:	I-CPYIN	⇒I-COPY-PD
	~P311:	PABRQ[1],I-PABIN[80]	⇒ UNINITIALIZED
47:		CPYRP[2]	⇒ SELECTED
48:	P311:	I-MOVIN	⇒ I-MOVE-PD
	~P311:	PABRQ[1],I-PABIN[80]	⇒ UNINITIALIZED
49:		MOVRP[2]	⇒ SELECTED

NOTE: L-ERRCTX provides information to the responder's environment.

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A.4 Bulk data transfer protocol machine

A.4.1 States — bulk data transfer

DXFRIDLE	Data transfer idle
READ	Read data transfer
I-READ-ENDING	Read transfer end, wait for F-TRANSFER-END request primitive from the internal file service user
READ-ENDING	Read transfer ending, wait for transfer end request PDU
I-R-XFR-ENDING	Wait for F-TRANSFER-END response primitive after READ from the internal file service user
R-XFER-ENDING	Wait Wait for transfer-end response PDU after READ
WRITE	Write data transfer
I-WRITE-ENDING	Write transfer-end, wait for F-TRANSFER-END request primitive from the internal file service user
WRITE-ENDING	Write transfer-end, wait for transfer end request PDU
I-W-XFR-ENDING	Wait for F-TRANSFER-END response primitive after WRITE from the internal file service user
W-XFER-ENDING	Wait for transfer-end response PDU after WRITE
CANCEL-PD	Cancel pending, wait for cancel response PDU
I-CANCEL-PD	Cancel pending, wait for F-CANCEL response primitive from the internal file service user
RRESTART-PD	Read restart pending, wait for restart response PDU in read operation
I-RRESTART-PD	Read restart pending, wait for F-RESTART response primitive in read operation from the internal file service user
WRESTART-PD	Write restart pending, wait for restart response PDU in write operation
I-WRESTART-PD	Write restart pending, wait for F-RESTART response primitive in write operation from the internal file service user
P-TOKEN-PD	Wait for sync-minor token
DXFRIDLE-REC	Data transfer idle during recovery
REA-SYMIN-PD	Wait for first P-SYNC-MINOR indication primitive after READ
RES-SYMIN-PD	Wait for first P-SYNC-MINOR indication primitive, restart requested
CAN-SYMIN-PD	Wait for first P-SYNC-MINOR indication primitive, cancel requested
WRT-SYMIN-PD	Wait for first P-SYNC-MINOR indication primitive after WRITE
REA-SYMCF-PD	Wait for first P-SYNC-MINOR confirm primitive after READ
RES-SYMCF-PD	Wait for first P-SYNC-MINOR confirm primitive, restart requested
CAN-SYMCF-PD	Wait for first P-SYNC-MINOR confirm primitive, cancel requested
WRT-SYMCF-PD	Wait for first P-SYNC-MINOR confirm primitive after WRITE
RESTART-CAN-PD	Restart cancel pending, wait for cancel or restart response PDU

A.4.2 Incoming events — bulk data transfer

A.4.2.1 Incoming events — PDUs

CANRP	Cancel response PDU (in user data of P-RESYNC(abandon) confirm if resync functional unit has been negotiated).	U2, U3
CANRQ	Cancel request PDU (in user data of P-RESYNC(abandon) indication if resync functional unit has been negotiated).	U2, U3
DAERQ	Data end request PDU.	U2, U3
TRERP	Transfer end response PDU.	U2, U3
TRERQ	Transfer end request PDU.	U2, U3

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RESRQ	Restart request PDU, in user data of P-RESYNC (restart) indication.	U10
RESRP	Restart response PDU, in user data of P-RESYNC (restart) confirm.	U10
REARQ	Read request PDU.	U2
WRTRQ	Write request PDU.	U3
DATIN	data value in user context (not syntactically classed as a PDU).	U2, U3

A.4.2.2 Incoming events from the internal file service user

I-CANRP	F-CANCEL response primitive.
I-CANRQ	F-CANCEL request primitive.
I-CHKRQ	F-CHECK request primitive.
I-CHKRP	F-CHECK response primitive
I-DATRQ	F-DATA request primitive.
I-DAERQ	F-DATA-END request primitive.
I-REARQ	F-READ request primitive.
I-RESRQ	F-RESTART request primitive.
I-RESRP	F-RESTART response primitive
I-TRERQ	F-TRANSFER-END request primitive.
I-TRERP	F-TRANSFER-END response primitive
I-WRTRQ	F-WRITE request primitive.

A.4.2.3 Incoming events from the presentation service provider

P-SYMIN	P-SYNC-MINOR indication primitive.
P-SYMCF	P-SYNC-MINOR confirm primitive.
P-TOKIN	P-TOKEN-GIVE indication with minor-sync. token.

A.4.3 Outgoing events — bulk data transfer

A.4.3.1 Outgoing events — PDUs

CANRP	Cancel response PDU (in user data of P-RESYNC(abandon) response if resync functional unit has been negotiated)
CANRQ	Cancel request PDU (in user data of P-RESYNC(abandon) request if resync functional unit has been negotiated)
DAERQ	Data end request PDU
TRERP	Transfer end response PDU
TRERQ	Transfer end request PDU
RESRQ	Restart request PDU, in user data of P-RESYNC(restart) request
RESRP	Restart response PDU, in user data of P-RESYNC(restart) response
REARQ	Read request PDU
WRTRQ	Write request PDU

A.4.3.2 Outgoing events to the internal file service user

I-CANCF	F-CANCEL confirm primitive
I-CANIN	F-CANCEL indication primitive
I-CHKIN	F-CHECK indication primitive
I-CHKCF	F-CHECK confirm primitive
I-DATIN	F-DATA indication primitive

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I-DAEIN F-DATA-END indication primitive

I-REAIN F-READ indication primitive

I-RESIN F-RESTART indication primitive

I-RESCF F-RESTART confirm primitive

I-TREIN F-TRANSFER-END indication primitive

I-TRECF F-TRANSFER-END confirm primitive

I-WRTIN F-WRITE indication primitive

A.4.3.3 Outgoing events to the presentation service provider

P-SYMRQ P-SYNC-MINOR request primitive

P-SYMRP P-SYNC-MINOR response primitive

P-DATRQ P-DATA request primitive

P-TOKRQ P-TOKEN-GIVE request primitive with minor-synch token

A.4.3.4 Outgoing events to the local system

L-ERRABT Local signal indicating an error leading to abort

A.4.4 *Specific actions — bulk data transfer*

[2] Add a PDU to the current PSDU and terminate the current PSDU.

[15] Preserve the PDU for further processing

[16] Add a PDU to the current PSDU and optionally terminate the current PSDU, according to local decision.

[17] Use for the sync point serial number, the checkpoint received plus the offset.

[18] Add the data given on the F-DATA request to the current PSDU. Optionally (depending upon local system considerations) terminate the PSDU.

[19] Use for the checkpoint, the sync point serial number received minus the offset.

[21] Unset discard indicator.

[22] Set discard indicator and set the outstanding checkpoint counter to zero.

[23] Discard any user data not yet delivered and set outstanding checkpoint counter to zero.

[24] Add 1 to the NSPN.

[25] Terminate the current PSDU.

[26] If Presentation resynchronize functional unit is available, send PDU as user data on a P-RESYNC(abandon) request or response primitive; otherwise add PDU to the current PSDU and terminate the current PSDU.

[27] Increment the checkpoint identifier expected.

[29] Increment the outstanding checkpoint counter.

[30] Decrement the outstanding checkpoint counter according to the checkpoint number confirmed (see 15.3.2).

[44] Increment the bulk data transfer number.

[45] Set the checkpoint identifier expected to the value negotiated plus one.

[46] PDU with the checkpoint identifier is sent as user data on a P-RESYNC(restart) response primitive with sync point serial number equal to those received on the P-RESYNC indication.

[47] Preserve the primitive parameters for subsequent precessing. In some states, it happens that when F-CANCEL primitive is preserved, there is already an F-RESTART primitive preserved: in this case, the F-RESTART primitive shall be discarded.

[48] Set the checkpoint identifier expected to 1.

[49] Set the synchronization offset to the value of the NSPN minus the checkpoint identifier expected. ((In a bulk data transfer that does not involve recovery, the checkpoint identifier is zero, at this point in the protocol).

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[50] PDU is sent as user data on a P-RESYNCH (restart) request, with a synchronization point serial number equal to the sum of the checkpoint identifier, on the F-RESTART primitive, and the synchronization offset plus 1.

[51] The checkpoint identifier shall be equal to the value received on the PDU.

[52] Set the NSPN equal to the synch point serial number negotiated with the presentation service provider.

[53] Store the synchronization point serial number provided by the presentation service provider as NSPN.

A.4.5 Predicates — bulk data transfer

P8: The context is not within the defined context set.

P13: The transfer service class has been negotiated and the bulk data transfer number is greater than 1.

P14: The synchronization point exceeds 999 998, exceeding the session service limitation.

P15: Discard indicator is set.

P20: The resync functional unit has been negotiated.

P21: The sync-minor functional unit has been negotiated.

P22: The entity possesses the sync-minor token.

P27: The outstanding checkpoint counter exceeds the agreed maximum.

P41: The expected checkpoint identifier equals the sync point serial number received minus the offset.

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A.4.6 Initiating state table — bulk data transfer

STATE / EVENT	DXFRIDLE	DXFRIDLE-REC	REA-SYMIN-PD	RES-SYMIN-PD	CAN-SYMIN-PD	READ	I-READ-ENDING	R-XFER-ENDING	P-TOKEN-PD	WRT-SYMCF-PD	RES-SYMCF-PD	CAN-SYMCF-PD	WRITE	I-WRITE-ENDING	W-XFER-ENDING	CANCEL-PD	I-CANCEL-PD	RRESTART-PD	WRESTART-PD	I-RRESTART-PD	I-WRESTART-PD	RESTART-CAN-PD
I-REARQ	1	35																				
I-WRTRQ	2	36																				
P-TOKIN	42								3							42						
I-DATRQ										4			4									
I-DAERQ										5			5									
DATIN						6										41		41				
DAERQ						8										41		41				
I-TRERQ							9							10								
TRERP								11							3							
I-CANRQ			31	31		12	12			34	34		12					38	38	12	12	
CANRP																13						
CANRQ						14				14			14	14	14	15		14	14	14	14	39
I-CANRP																	16					
I-CHKRQ										17			17									
P-SYMCF										32	22	12	18	37	37	41						
P-SYMIN			29	21	12	19										41						
I-CHKRP						20	20															
I-RESRQ			30			21	21			33			22									
RESRP																		23	24			40
RESRQ						25				26			26	26	26			43	44			
I-RESRP																				27	28	

A.4.7 Initiating entity state table (Part 3) — detailed entries

1:		[44],	
	~P13 & P21:	REARQ[2],P-TOKRQ,[48],[49]	⇒ REA-SYMIN-PD
	~P13 & ~P21:	REARQ[2]	⇒ READ
	P13:	L-ERRABT	⇒ *same state*
2:		[44],	
	P13:	L-ERRABT	⇒ *same state*
	~P13 & ~P21:	WRTRQ[16]	⇒ WRITE
	~P13 & P21:	WRTRQ[2],[24],	
	~P13 & P14 & P21:	L-ERRABT	⇒ *same state*
	~P13 & ~P14 & P21	P-SYMRQ,[48],[49]	⇒ WRT-SYMCF-PD
3:		I-TRECF	⇒ DXFRIDLE
4:	~P8:	P-DATRQ[18]	⇒ *same state*
	P8:	L-ERRABT	⇒ *same state*
5:		DAERQ[16]	⇒ I-WRITE-ENDING
6:	P15:		⇒ *same state*
	~P15:	I-DATIN	⇒ *same state*
8:	P15:		⇒ *same state*
	~P15:	I-DAEIN	⇒ I-READ-ENDING
9:		TRERQ[2]	⇒ R-XFER-ENDING

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10:		TRERQ[2]	⇒ W-XFER-ENDING
11:	P21:	[15]	⇒ P-TOKEN-PD
	~P21:	I-TRECF	⇒ DXFRIDLE
12:		[22],[23],CANRQ[26]	=CANCEL-PD
13:	P20:	[53], [21],I-CANCF	⇒ DXFRIDLE
14:	P20:	[53], [22],[23], I-CANIN	⇒ I-CANCEL-PD
15:	P20:	CANRP[26],[53], [21],I-CANCF	⇒ DXFRIDLE
16:	P20:	[53], CANRP[26],[21]	⇒ DXFRIDLE
17:		[25],[27],[24],	
	~P14:	P-SYMRQ	⇒ *same state*
	P14:	L-ERRABT	⇒ *same state*
18:		I-CHKCF[19]	⇒ *same state*
19:		[29],	
	~P27 & P41:	I-CHKIN,[24],[27]	⇒ *same state*
	P27 | ~P41:	L-ERRABT	⇒ *same state*
20:		[30],P-SYMRP[17]	⇒ *same state*
21:		[22],RESRQ[50]	⇒ RRESTART-PD
22:		[22],RESRQ[50]	⇒ WRESTART-PD
23:		[52],[45],[49],[21],I-RESCF	⇒ READ
24:		[52],[45],[49],[21],I-RESCF	⇒ WRITE
25:		[23],I-RESIN	⇒ I-RRESTART-PD
26:		I-RESIN	⇒ I-WRESTART-PD
27:		[52],[45],[49],RESRP[46]	⇒ READ
28:		[52],[45],[49],RESRP[46]	⇒ WRITE
29:		[24],[49],P-SYMRP	⇒ READ
30:		[47],[22]	⇒ RES-SYMIN-PD
31:		[47],[22]	⇒ CAN-SYMIN-PD
32:		[49]	⇒ WRITE
33		[47],[22]	⇒ RES-SYMCF-PD
34:		[47],[22]	⇒ CAN-SYMCF-PD
35:		REARQ[2],P-TOKRQ,[49]	⇒ REA-SYMIN-PD
36:		WRTRQ[2],[24],	
	P14:	L-ERRABT	⇒ *same state*
	~P14:	P-SYMRQ,[49]	⇒ WRT-SYMCF-PD
37:		I-CHKCF[19]	⇒ *same state*
38:		[47]	⇒ RESTART-CAN-PD
39:	P20:	[52], [21],I-CANCF,CANRP[26]	⇒ DXFRIDLE
40:		CANRQ[26]	⇒ CANCEL-PD

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41:		⇒ *same state*
42:		⇒ *same state*
43:	[52],[45],[49],[21],I-RESCF,RESRP[46]	⇒ READ
44:	[52],[45],[49],[21],I-RESCF,RESRP[46]	⇒ WRITE

NOTE – The entries 38, 39, 40 are due to the Session service behaviour in the resynchronize management, in collision cases.

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A.4.8 Responding entity state table — bulk data transfer

STATE / EVENT	DXFR IDLE	DXFR IDLE-REC	P-TOKEN-PD	REA-SYMCF-PD	RES-SYMCF-PD	CAN-SYMCF-PD	READ	READ-ENDING	I-R-XFR-ENDING	WRT-SYMIN-PD	RES-SYMIN-PD	CAN-SYMIN-PD	WRITE	WRITE-ENDING	I-W-XFR-ENDING	CANCEL-PD	I-CANCEL-PD	RRESTART-PD	WRESTART-PD	I-RRESTART-PD	I-WRESTART-PD	RESTART-CAN-PD
REARQ	1	36																				
WRTRQ	2	37																				
P-TOKIN			3																			
I-DATRQ				4			4															
I-DAERQ				5			5															
DATIN													6			42			42			
DAERQ													8			42			42			
TRERQ								9						10		42			42			
I-TRERP									11						43							
I-CANRQ				30	30		12			33	33		12	12	12			39	39	12	12	
CANRP																13						
CANRQ				14	14		14	14					14			44		14	14	14	14	40
I-CANRP																	15					
I-CHKRQ				16			16															
P-SYMCF				28	20	12	18	38								42						
P-SYMIN										31	34	35	17			42						
I-CHKRP													19	19								
I-RESRQ				29			20			32			21	21	21							
RESRP																		22	23			41
RESRQ				24			24	24	24				25					45	46			
I-RESRP																				26	27	

A.4.9 Responding entity state table (Part 3) — detailed entries

1:		[44],	
	~P13 & P21:	[15],[48],[49]	⇒ P-TOKEN-PD
	~P13 & ~P21:	I-REAIN	⇒ READ
	P13:	L-ERRABT	⇒ *same state*
2:		[44],	
	~P13 & P21:	I-WRTIN,[48],[49]	⇒ WRT-SYMIN-PD
	~P13 & ~P21:	I-WRTIN	⇒ WRITE
	P13:	L-ERRABT	⇒ *same state*
3:		I-REAIN,[24],	
	~P14:	P-SYMRQ	⇒ READ-SYMCF-PD
	P14:	L-ERRABT	⇒ *same state*
4:	~P8:	P-DATRQ[18]	⇒ *same state*
	P8:	L-ERRABT	⇒ *same state*
5:		DAERQ[2]	⇒ READ-ENDING
6:	P15:		⇒ *same state*
	~P15:	I-DATIN	⇒ *same state*
8:	P15:		⇒ *same state*
	~P15:	I-DAEIN	⇒ WRITE-ENDING

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9:	P15:		⇒ *same state*
	~P15:	I-TREIN	⇒ I-R-XFR-ENDING
10:	P15:		⇒ *same state*
	~P15:	I-TREIN	⇒ I-W-XFR-ENDING
11:	P21:	TRERP[2],P-TOKRQ	⇒ DXFRIDLE
	~P21:	TRERP[2]	⇒ DXFRIDLE
12:		[22],[23],CANRQ[26]	⇒ CANCEL-PD
13:	P21 & P22 & ~P20:	P-TOKRQ,	
	P20:	[53], [21],I-CANCF	⇒ DXFRIDLE
14:	P20:	[53], [22],[23],I-CANIN	⇒ I-CANCEL-PD
15:	P21 & P22 & ~P20:	P-TOKRQ,	
	P20:	[53], CANRP[26],[21]	⇒ DXFRIDLE
16:		[25],[27],[24]	
	~P14:	P-SYMRQ	⇒ *same state*
	P14:	L-ERRABT	⇒ *same state*
17:		[29],	
	~P27 & P41:	I-CHKIN,[24],[27]	⇒ *same state*
	P27 | ~P41:	L-ERRABT	⇒ *same state*
18:		I-CHKCF[19]	⇒ *same state*
19:		[30],P-SYMRP[17]	⇒ *same state*
20:		[22],RESRQ[50]	⇒ RRESTART-PD
21:		[22],RESRQ[50]	⇒ WRESTART-PD
22:		[52],[45],[49],[21],I-RESCF	⇒ READ
23:		[52],[45],[49],[21],I-RESCF	⇒ WRITE
24:		I-RESIN	⇒ I-RRESTART-PD
25:		[23],I-RESIN	⇒ I-WRESTART-PD
26:		[52],[45],[49],RESRP[46]	⇒ READ
27:		[52],[45],[49],RESRP[46]	⇒ WRITE
28:		[49]	⇒ READ
29:		[22],[47]	⇒ RES-SYMCF-PD
30:		[22],[47]	⇒ CAN-SYMCF-PD
31:		[24],[49],P-SYMRP	⇒ WRITE
32:		[22],[47]	⇒ RES-SYMIN-PD
33:		[22],[47]	⇒ CAN-SYMIN-PD
34:		[24],P-SYMRP,[22],RESRQ[50]	⇒ WRESTART-PD
35:		[24],P-SYMRP,[22],CANRQ[26]	⇒ CANCEL-PD
36:		[15],[49]	⇒ P-TOKEN-PD
37:		I-WRTIN,[49]	⇒ WRT-SYMIN-PD
38:		I-CHKCF[19]	⇒ *same state*
39:		[22],[47]	⇒ RESTART-CAN-PD

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40:	P21 & P22 & ~P20: P20:	P-TOKRQ, [53], [21],I-CANCF,CANRP[26]	⇒ DXFRIDLE
41:		CANRQ[26]	⇒ CANCEL-PD
42:			⇒ *same state*
43:		TRERP[2]	⇒ DXFRIDLE
44:	P21 & P22&~P20: P20:	P-TOKRQ, [53],CANRP[26], [21],I-CANCF	⇒ DXFRIDLE
45:		[52],[45],[49],[21],I-RESCF[51],RESRP[46]	⇒ READ
46:		[52],[45],[49],[21],I-RESCF,RESRP[46]	⇒ WRITE

NOTE – The entries 14, 39, 40, 41, 45, and 46 are due to the Session service behaviour in the resynchronize management, in collision cases.

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A.5 File error recovery protocol machine (FERPM)

NOTE – The description of the file error recovery protocol machine given here omits the description of grouping, which does not materially affect the recovery behaviour. The transitions for the grouped cases can be derived from those in the basic protocol machine.

A.5.1 States — file error recovery

INIT-PD	Initialize pending, wait for an I-INICF event as an F-INITIALIZE confirm primitive from the IFS.
PASSIVE	The basic file protocol is currently in operation but no transfer of file contents is in progress. It is used when the FERPM becomes inactive in normal error free activity, or when it cannot provide its services any more after issuing an L-ERRABT signal.
XFER-IDLE	Data transfer idle.
XFER	Normal transfer of file contents has been established.
RESTART-PD	Restart pending, wait for an I-RESCF event as an F-RESTART confirm primitive from the IFS.
RESTART	A restart of a data transfer is in progress. A checkpoint identifier has been negotiated, and data following that checkpoint, but prior to the error, is being retransmitted.
CANCEL-PD	Cancel pending, wait for an I-CANCF event as an F-CANCEL confirm primitive from the IFS.
CLOSE-EX	Close expected, wait for an I-CLOIN event as an F-CLOSE indication primitive from the IFS.
DESELECT-EX	Deselect expected, wait for an I-DESIN event as an F-DESELECT indication primitive from the IFS.
RECOVER-PD	Recover pending, wait for an I-RECCF event as an F-RECOVER confirm primitive from the IFS.
SEL-PD	SELECT pending, wait for an I-SELCF event as an F-SELECT confirm primitive from the IFS.
OPN-PD	OPEN pending, wait for an I-OPNCF event as an F-OPEN confirm primitive from the IFS.
SEL-EX	SELECT expected, wait for an I-SELIN event as an F-SELECT indication primitive from the IFS.
OPN-EX	OPEN expected, wait for an I-OPNIN event as an F-OPEN indication primitive from the IFS.
XFER-EX	Data transfer expected, wait for an I-REAIN/I-WRTIN as an F-READ/F-WRITE indication primitive from the IFS.
INIT-EX	Initiation expected, wait for an I-ININ event as an F-INITIALIZE indication primitive from the IFS.
CLOSE-PD	Close pending, wait for an I-CLOCF event as an F-CLOSE confirm primitive from the IFS.
DESELECT-PD	Deselect pending, wait for an I-DESCF event as an F-DESELECT confirm primitive from the IFS.

A.5.2 Incoming events — file error recovery

A.5.2.1 Incoming events from the external file service user

F-OPNRQ	F-OPEN request primitive
F-CLORQ	F-CLOSE request primitive
F-REARQ	F-READ request primitive
F-WRTRQ	F-WRITE request primitive
F-DATRQ	F-DATA request primitive
F-DAERQ	F-DATA-END request primitive
F-TRERQ	F-TRANSFER-END request primitive
F-ANYRQ	F-INITIALIZE, F-READ-ATTRIBUTE, F-CHANGE-ATTRIBUTE, F-SELECT, F-CREATE, F-DESELECT, F-LOCATE, F-ERASE, F-BEGIN-GROUP, F-END-GROUP, F-TERMINATE, F-LIST, F-CHANGE-PREFIX, F-GROUP-SELECT, F-GROUP-COPY, F-GROUP-MOVE, F-GROUP-LIST, F-LINK, F-CREATE-DIRECTORY, F-SELECT-ANOTHER, F-UNLINK, F-GROUP-DELETE and F-U-ABORT request primitives
F-OPNRP	F-OPEN response primitive
F-CLORP	F-CLOSE response primitive

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F-TRERP	F-TRASNSFER-END response primitive
F-ANYRP	F-INITIALIZE, F-READ-ATTRIBUTE, F-CHANGE-ATTRIBUTE, F-SELECT, F-CREATE, F-DESELECT, F-LOCATE, F-ERASE, F-BEGIN-GROUP, F-TERMINATE, F-LIST, F-CHANGE-PREFIX, F-GROUP-SELECT, F-GROUP-COPY, F-GROUP-MOVE, F-GROUP-LIST, F-LINK, F-CREATE-DIRECTORY, F-SELECT-ANOTHER, F-UNLINK, F-GROUP-DELETE and F-END-GROUP response primitives
F-CANRQ	F-CANCEL request primitive
F-CANRP	F-CANCEL response primitive

A.5.2.2 Incoming events from the internal file service

I-INICF	F-INITIALIZE confirm primitive
I-OPNCF	F-OPEN confirm primitive
I-CLOCF	F-CLOSE confirm primitive
I-DATIN	F-DATA indication primitive
I-DAEIN	F-DATA-END indication primitive
I-CHKIN	F-CHECK indication primitive
I-CHKCF	F-CHECK confirm primitive
I-TRECF	F-TRANSFER-END confirm primitive
I-ANYCF	F-INITIALIZE, F-READ-ATTRIBUTE, F-CHANGE-ATTRIBUTE, F-SELECT, F-CREATE, F-DELESELECT, F-LOCATE, F-ERASE, F-BEGIN-GROUP, F-TERMINATE, F-LIST, F-CHANGE-PREFIX, F-GROUP-SELECT, F-GROUP-COPY, F-GROUP-MOVE, F-GROUP-LIST, F-LINK, F-CREATE-DIRECTORY, F-SELECT-ANOTHER, F-UNLINK, F-GROUP-DELETE and F-END-GROUP confirm primitive
I-SELCF	F-SELECT confirm primitive
I-DESCF	F-DESELECT confirm primitive
I-ININ	F-INITIALIZE indication primitive
I-SELIN	F-SELECT indication primitive
I-DESIN	F-DESELECT indication primitive
I-OPNIN	F-OPEN indication primitive
I-CLOIN	F-CLOSE indication primitive
I-TREIN	F-TRANSFER-END indication primitive
I-CANIN	F-CANCEL indication primitive
I-CANCF	F-CANCEL confirm primitive
I-PABIN	F-P-ABORT indication primitive
I-RECCF	F-RECOVER confirm primitive
I-RESCF	F-RESTART confirm primitive
I-RECIN	F-RECOVER indication primitive
I-RESIN	F-RESTART indication primitive
I-ANYIN	F-INITIALIZE, F-READ-ATTRIBUTE, F-CHANGE-ATTRIBUTE, F-SELECT, F-CREATE, F-DESELECT, F-LOCATE, F-ERASE, F-BEGIN-GROUP, F-END-GROUP, F-TERMINATE, F-LIST, F-CHANGE-PREFIX, F-GROUP-SELECT, F-GROUP-COPY, F-GROUP-MOVE, F-GROUP-LIST, F-LINK, F-CREATE-DIRECTORY, F-SELECT-ANOTHER, F-UNLINK, F-GROUP-DELETE, F-U-ABORT and F-P-ABORT indication primitives
I-REAIN	F-READ indication primitive
I-WRTIN	F-WRITE indication primitive

A.5.2.3 Incoming events from the Local System Environment

L-ERROR1	Class I error (as defined in 18.1)

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L-ERROR2	Class II error (as defined in 18.1)
L-ERROR3	Class III error (as defined in 18.1)
L-GIVEUP	Signal to give up recovery process
L-DATRQ	Reissued F-DATA request primitive
L-CHKRQ	Reissued F-CHECK request primitive
L-DAERQ	Reissued F-DATA-END request primitive
L-EORIN	Indicates that all checkpoint identifiers and "data end" markers in the docket have been used, and all data to be resent have been sent.
L-HOLD	Signal to the FERPM to hold any primitive from the external user for later processing
L-UNHOLD	Signal to FERPM to process any previous held primitives

A.5.3 Outgoing events — file error recovery

A.5.3.1 Outgoing events to the external file service user

F-OPNCF	F-OPEN confirm primitive
F-ANYCF	F-INITIALIZE, F-READ-ATTRIBUTE, F-CHANGE-ATTRIBUTE, F-SELECT, F-CREATE, F-DESELECT, F-LOCATE, F-ERASE, F-TERMINATE, F-LIST, F-CHANGE-PREFIX, F-GROUP-SELECT, F-GROUP-COPY, F-GROUP-MOVE, F-GROUP-LIST, F-LINK, F-CREATE-DIRECTORY, F-SELECT-ANOTHER, F-UNLINK, F-GROUP-DELETE, F-BEGIN-GROUP and F-END-GROUP confirm primitives
F-CLOCF	F-CLOSE confirm primitive
F-DATIN	F-DATA indication primitive
F-DAEIN	F-DATA-END indication primitive
F-TRECF	F-TRANSFER-END confirm primitive
F-OPNIN	F-OPEN indication primitive
F-WRTIN	F-WRITE indication primitive
F-CLOIN	F-CLOSE indication primitive
F-REAIN	F-READ indication primitive
F-TREIN	F-TREANSFER-END indication primitive
F-ANYIN	F-INITIALIZE, F-READ-ATTRIBUTE, F-CHANGE-ATTRIBUTE, F-SELECT, F-CREATE, F-DESELECT, F-LOCATE, F-ERASE, F-TERMINATE, F-LIST, F-CHANGE-PREFIX, F-GROUP-SELECT, F-GROUP-COPY, F-GROUP-MOVE, F-GROUP-LIST, F-LINK, F-CREATE-DIRECTORY, F-SELECT-ANOTHER, F-UNLINK, F-GROUP-DELETE, F-BEGIN-GROUP, F-END-GROUP, F-U-ABORT and F-P-ABORT indication primitives
F-PABIN	F-P-ABORT indication primitive
F-CANIN	F-CANCEL indication primitive
F-CANCF	F-CANCEL confirm primitive

A.5.3.2 Outgoing events to the internal file service

I-SELRQ	F-SELECT request primitive
I-OPNRQ	F-OPEN request primitive
I-CLORQ	F-CLOSE request primitive
I-DATRQ	F-DATA request primitive
I-DAERQ	F-DATA-END request primitive
I-CHKRQ	F-CHECK request primitive
I-TRERQ	F-TRANSFER-END request primitive
I-REARQ	F-READ request primitive
I-WRTRQ	F-WRITE request primitive

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I-ANYRQ	F-INITIALIZE, F-READ-ATTRIBUTE, F-CHANGE-ATTRIBUTE, F-SELECT, F-CREATE, F-DESELECT, F-LOCATE, F-ERASE, F-TERMINATE, F-LIST, F-CHANGE-PREFIX, F-GROUP-SELECT, F-GROUP-COPY, F-GROUP-MOVE, F-GROUP-LIST, F-LINK, F-CREATE-DIRECTORY, F-SELECT-ANOTHER, F-UNLINK, F-GROUP-DELETE , F-BEGIN-GROUP, F-END-GROUP and F-U-ABORT request primitives
I-INIRP	F-INITIALIZE response primitive
I-OPNRP	F-OPEN response primitive
I-SELRP	F-SELECT response primitive
I-CLORP	F-CLOSE response primitive
I-TRERP	F-TRANSFER-END response primitive
I-ANYRP	F-INITIALIZE, F-READ-ATTRIBUTE, F-CHANGE-ATTRIBUTE, F-SELECT, F-CREATE, F-DESELECT, F-LOCATE, F-ERASE, F-TERMINATE, F-LIST, F-CHANGE-PREFIX, F-GROUP-SELECT, F-GROUP-COPY, F-GROUP-MOVE, F-GROUP-LIST, F-LINK, F-CREATE-DIRECTORY, F-SELECT-ANOTHER, F-UNLINK, F-GROUP-DELETE, F-BEGIN-GROUP and F-END-GROUP response primitives
I-CHKRP	F-CHECK response primitive
I-RESRQ	F-RESTART request primitive
I-RESRP	F-RESTART response primitive
I-CANRQ	F-CANCEL request primitive
I-CANRP	F-CANCEL response primitive
I-DESRQ	F-DESELECT request primitive
I-RECRQ	F-RECOVER request primitive
I-INIRQ	F-INITIALIZE request primitive
I-RECRP	F-RECOVER response primitive
I-DESRP	F-DESELECT response primitive

A.5.3.3 Outgoing events to the local system environment

L-ERROR2	Signal indicating class II error
L-ERROR3	Signal indicating class III error
L-RESEND	Resend data request to the local system
L-STPSND	Stop resending data and checkpoint requests to the local system
L-SUSPND	Suspend issuing of F-DATRQ, F-DAERQ by the local system
L-RESUME	Resume issuing of F-DATRQ, F-DAERQ by the local system
L-ERRABT	Signal FPM to issue an F-P-ABORT request PDU, with permanent error value.
L-PABORT	Signal FPM to issue a F-P-ABORT request PDU, and a F-P-ABORT indication primitive to the FERPM, both with transient error value.
L-HOLD	Hold primitives from external user
L-UNHOLD	Process any held primitives

A.5.4 Specific actions — file error recovery

[54] Mark the checkpoint identifiers to be reissued.

[55] Delete the docket.

[56] Set the activity state indicator to "finished".

[57] Set the activity state indicator to "in-progress".

[58] Set the activity type indicator to "read".

[59] Set the activity type indicator to "write".

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[60] Add the checkpoint identifier to the list in the docket. Increment the count of outstanding checkpoints by one.

[61] Delete from the docket all checkpoint identifiers smaller than the parameter in the primitive received or issued. Decrement the count of outstanding checkpoints by the number of the deleted identifiers.

[63] Set the activity state indicator to "starting".

[64] Set the activity state indicator to "data transfer finished".

[66] Use the last checkpoint identifier in the docket as the parameter.

[67] Increment the checkpoint identifier count.

[68] Set the checkpoint identifier count to zero.

[69] Record the bulk data transfer number in the docket (the number is maintained by the FPM).

[70] Record which data values have been already delivered to the user.

[71] Use as the parameter the checkpoint identifier available in the docket that is both

a) after the checkpoint identifier negotiated, and
b) not yet reissued during this restart of the BDT.

[72] Use as parameter the checkpoint identifier.

[73] Use as the parameter the oldest (first) checkpoint identifier in the list in the docket.

[74] Use as the parameter the checkpoint identifier of the primitive received.

[75] Use as the diagnostics parameter "activity identifier unknown".

[76] Record which data values have been sent.

[77] Create a docket and record in it the activity identifier, the information needed to issue or check an I-INIRQ (including the locations of the initiator and responder), the recovery mode, the access context, the presentation context, a null checkpoint list and set the activity state indicator to "starting".

[78] The issuer of the I-RESRQ or I-RECRQ primitive identifies a checkpoint identifier which is

a) for the sender, the last point acknowledged,
b) for the receiver, the last point received and secured.

[79] The issuer of the I-RESRP primitive identifies a checkpoint identifier which is

c) for the sender, equal to the value provided by the issuer of the request, and
d) for the receiver, the last point received and secured.

[200] Wait for $2^{\text{Recommended retry time}}$ seconds.

[201] Include a state result indicating failure.

[202] Use the data value specified by the L-DATRQ signal, representing previous F-DATA request primitives, as the parameter.

[203] Use as the parameter the checkpoint identifier negotiated.

[204] Store "data end" marker in the docket.

[206] Delete "data end" marker in the docket.

[207] Include an action result indicating transient error.

[209] Recreate select and open regimes.

[210] Include a action result indicating failure on next response with diagnostic of damage to open/select regime.

[211] Include a diagnostic of damage to open/select regime.

[212] Use as the parameter the bulk data transfer number recorded in the docket.

[213] Store "transfer end" marker (reflecting information on the PDU) in the docket.

[214] Delete "transfer end" marker from docket.

[215] Clear activity type indicator.

[216] Clear the activity state indicator.

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A.5.5 Predicates — file error recovery

P23: The incoming response or confirm primitive has a state result indicating success.

P24: There are checkpoints that must be confirmed.

P26: An F-DATA indication primitive corresponding to the incoming I-DATIN has already been issued to the user.

P28: The data value available is after the negotiated checkpoint.

P29: The activity state indicator is set to "in-progress" and the activity type indicator to "read".

P30: The activity state indicator is set to "in-progress" and the activity type indicator to "write".

P31: The activity type indicator is set to "read".

P32: The activity type indicator is set to "write".

P33: The activity state indicator is set to "starting".

P34: The activity state indicator is set to "finished".

P37: A checkpoint identifier is to be inserted in the data stream.

P39: The entity has the docket for the activity identifier recovered, the current initiator matches the location, and the activity can be resumed.

P40: The entity is sender of data.

P99: The transfer service class has been negotiated.

P100: The recommended retry time field is present on the diagnostic parameter.

P101: The specified recovery is possible and is required.

P102: The specified association is possible.

P103: The incoming request or indication primitive has an action result indicating transient error.

P104: The "transfer end" marker is stored in the docket.

P105: The activity state indicator is set to "data transfer finished".

P106: The "data end" marker is stored in the docket.

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A.5.6 Initiating entity state table — FERPM — (normal procedure)

STATE / EVENT	PASSIVE	XFER-IDLE	XFER
F-OPNRQ	1		
I-OPNCF	2		
F-ANYRQ	3	3	
I-ANYCF	4	4	
F-CLORQ		5	
I-CLOCF		6	
F-REARQ		7	
F-WRTRQ		8	
F-DATRQ			9
I-DATIN			10
I-CHKCF			11
I-CHKIN			12
F-DAERQ			13
I-DAEIN			14
F-TRERQ			15
I-TRECF			16
F-CANRQ			17
I-CANCF			18
I-CANIN			19
F-CANRP			20

A.5.7 Initiating entity state table — FERPM — detailed entries (normal procedure)

1:		[77],I-OPNRQ	⇒ *same state*
2:	P23:	F-OPNCF	⇒ XFER-IDLE
	~P23:	[55],F-OPNCF[201]	⇒ *same state*
3:		I-ANYRQ	⇒ *same state*
4:		F-ANYCF	⇒ *same state*
5:		[56],I-CLORQ	⇒ *same state*
6:		[55],F-CLOCF	⇒ PASSIVE
7:		[57],[58],[68],I-REARQ,[69]	⇒ XFER
8:		[57],[59],[68],I-WRTRQ,[69]	⇒ XFER
9:	P37:	[67],[60],I-CHKRQ[72], [76],I-DATRQ	⇒ *same state*
10:		[70],F-DATIN	⇒ *same state*
11:		[61]	⇒ *same state*
12:	P24:	[60], I-CHKRP,[61],	⇒ *same state*
13:		[204],I-DAERQ	⇒ *same state*
14:	P24:	I-CHKRP[66],[61], [204],F-DAEIN	⇒ *same state*

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15:	P29:	[64], [213],I-TRERQ	⇒ *same state*
16:	~P99: P99:	[63], [64], [215],[206],[214],F-TRECF	⇒ XFER-IDLE
17:		I-CANRQ	⇒ *same state*
18:		[215],[216],[206],[214],F-CANCF	⇒ XFER-IDLE
19:		F-CANIN	⇒ *same state*
20:		[215],[216],[206],[214],I-CANRP	⇒ XFER-IDLE

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A.5.8 Responding entity state table — FERPM — (normal procedure)

STATE / EVENT	PASSIVE	XFER-IDLE	XFER
I-OPNIN	1		
F-OPNRP	2		
F-ANYRP	3	3	
I-ANYIN	4	4	
I-CLOIN		5	
F-CLORP		6	
I-REAIN		7	
I-WRTIN		8	
F-DATRQ			9
I-DATIN			10
I-CHKCF			11
I-CHKIN			12
F-DAERQ			13
I-DAEIN			14
I-TREIN			15
F-TRERP			16
F-CANRQ			17
I-CANCF			18
I-CANIN			19
F-CANRP			20

A.5.9 Responding entity state table — FERPM — detailed entries (normal procedure)

1:		[77],F-OPNIN	⇒ *same state*
2:	P23:	I-OPNRP	⇒ XFER-IDLE
	~P23:	[55],I-OPNRP[201]	⇒ *same state*
3:		I-ANYRP	⇒ *same state*
4:		F-ANYIN	⇒ *same state*
5:	~P103:	[56],F-CLOIN	⇒ *same state*
6:		[55],I-CLORP	⇒ PASSIVE
7:		[57],[58],[68],F-REAIN,[69]	⇒ XFER
8:		[57],[59],[68],F-WRTIN,[69]	⇒ XFER
9:	P37:	[67],[60],I-CHKRQ[72], [76],I-DATRQ	⇒ *same state*
10:		[70],F-DATIN	⇒ *same state*
11:		[61]	⇒ *same state*
12:	P24:	[60], I-CHKRP,[61],	⇒ *same state*
13:		[204],I-DAERQ	⇒ *same state*
14:	P24:	I-CHKRP[66],[61], [204],F-DAEIN	⇒ *same state*

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15:	P29:	[64], [213],F-TREIN	⇒ *same state*
16:	~P99: P99:	[63], [64], [213],[214],[206],I-TRERP	⇒ XFER-IDLE
17:		I-CANRQ	⇒ *same state*
18:		[215],[216],[206],[214],F-CANCF	⇒ XFER-IDLE
19:		F-CANIN	⇒ *same state*
20:		[215],[216],[206],[214],I-CANRP	⇒ XFER-IDLE

NOTE – The condition P103 in entry 6 is handled in A.5.17 (in entry 16).

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A.5.10 Initiating entity state table — FERPM — (class I errors)

STATE / EVENT	XFER	RESTART-PD	RESTART
L-ERROR1	1		1
I-RESCF		2	
I-RESIN	3		
I-DATIN			4
I-CHKCF			6
I-DAEIN			7
L-DATRQ			9
L-CHKRQ			10
L-DAERQ			11
L-EORIN			12
I-CANIN		13	13
I-CANCF		14	14
F-CANRQ		15	15
F-CANRP		16	16

A.5.11 Initiating entity state table — FERPM — detailed entries (class I errors)

1:	P101 & P40:	L-SUSPND,I-RESRQ[78]	⇒RESTART-PD
	P101 & ~P40:	I-RESRQ[78]	⇒RESTART-PD
	~P101:	L-ERROR2	⇒XFER
2:	~P40:	[61]	⇒RESTART
	P40:	[54],[61],L-RESEND[74]	⇒RESTART
3:	~P40:	I-RESRP[79]	⇒RESTART
	P40:	L-SUSPND,[54],[61],I-RESRP[79],L-RESEND[203]	⇒RESTART
4:	P26:		⇒ *same state*
	~P26:	F-DATIN	⇒XFER
6:		[61]	⇒ *same state*
7:	P24:	I-CHKRP[66],[61],	
	~P106:	F-DAEIN	⇒XFER
	P106 & ~P104:	L-UNHOLD	⇒XFER
	P106 & P104:	L-UNHOLD, I-TRERQ	⇒XFER
9:	P28:	I-DATRQ[202]	⇒ *same state*
	~P28:		⇒ *same state*
10:		I-CHKRQ[71]	⇒ *same state*
11:		I-DAERQ, L-UNHOLD	⇒ *same state*
12:	~P104:	L-RESUME	⇒XFER
	P104:	I-TRERQ, L-RESUME	⇒XFER
13:	~P103&~P40:	F-CANIN	⇒ *same state*
	~P103&P40:	L-STPSND,FCANIN	⇒ *same state*
14:	~P103:	[215],[216],[206],[214],F-CANCF	⇒XFER-IDLE
15:	~P40:	I-CANRQ	⇒ *same state*
	P40:	L-STPSND,I-CANRQ	⇒ *same state*

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16:	[215],[216],[206],[214],I-CANRP	⇒ XFER-IDLE

NOTE – The condition P103 in entries 13 and 14 is handled in entries 2 and 3 of A.5.14.

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A.5.12 Responding entity state table — FERPM — (class 1 errors)

STATE / EVENT	XFER	RESTART-PD	RESTART
L-ERROR1	1		1
I-RESCF		2	
I-RESIN	3		
I-DATIN			4
I-CHKCF			6
I-DAEIN			7
L-DATRQ			9
L-CHKRQ			10
L-DAERQ			11
L-EORIN			12
I-TREIN			13
I-CANIN		14	14
I-CANCF		15	15
F-CANRQ		16	16
F-CANRP		17	17

A.5.13 Responding entity state table — FERPM — detailed entries (class 1 errors)

1:	P101 & P40:	L-SUSPND,I-RESRQ[78]	⇒RESTART-PD
	P101 & ~P40:	I-RESRQ[78]	⇒RESTART-PD
	~P101:	L-ERROR2	⇒XFER
2:	~P40:	[61]	⇒RESTART
	P40:	[54],[61],L-RESEND[74]	⇒RESTART
3:	~P40:	I-RESRP[79]	⇒RESTART
	P40:	L-SUSPND,[54],[61],I-RESRP[79],L-RESEND[203]	⇒RESTART
4:	P26:		⇒ *same state*
	~P26:	F-DATIN	⇒XFER
6:		[61]	⇒ *same state*
7:	P24:	I-CHKRP[66],[61],	
	~P106:	F-DAEIN	⇒XFER
	P106 & P104:		⇒ *same state*
	P106 & ~P104:		⇒XFER
9:	P28:	I-DATRQ[202]	⇒ *same state*
	~P28:		⇒ *same state*
10:		I-CHKRQ[71]	⇒ *same state*
11:		I-DAERQ[206]	⇒ *same state*
12:	~P104:	L-RESUME	⇒XFER
	P104:	L-RESUME	⇒ *same state*
13:		L-UNHOLD	⇒XFER
14:	~P103&~P40:	F-CANIN	⇒ *same state*
	~P103&P40:	L-STPSND,FCANIN	⇒ *same state*
15:	~P103:	[215],[216],[206],[214],F-CANCF	⇒XFER-IDLE

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16:	~P40:	I-CANRQ	⇒ *same state*
	P40:	L-STPSND,I-CANRQ	⇒ *same state*
17:		[215],[216],[206],[214],I-CANRP	⇒ XFER-IDLE

NOTE – The condition P103 in entries 13 and 14 is handled in entries 2 and 3 of A.5.16

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A.5.14 Initiating entity state table — FERPM — detailed entries — (class II and III errors)

STATE / EVENT	XFER	RESTART-PD	RESTART	CANCEL-PD	CLOSE-PD	DESELECT-PD	RECOVER-PD	INIT-PD	PASSIVE	SEL-PD	OPN-PD	XFER-IDLE
L-ERROR2	1	1	1									11
I-CANIN	2	2	2									
I-CANCF				3								
I-CLOCF					4							
I-DESCF						5						
I-RECCF							6					
L-ERROR3	7	7	7	7	7	7	7		7	7	7	7
I-PABIN	12	12	12	12	12	12	12		12	12	12	12
I-SELCF										9		
I-OPNCF											10	
I-INICF								8				

A.5.15 Initiating entity state table — FERPM — detailed entries (class II and III errors)

1:	~P101 & P104:	L-ERROR3	⇒ *same state*
	~P101:	[55],L-ERRABT	⇒ PASSIVE
	P101 & ~P40 & ~P106:	I-CANRQ[207]	⇒ CANCEL-PD
	P101 & P40:	L-SUSPND,I-CANRQ[207]	⇒ CANCEL-PD
	P101 & ~P40 & P106:	I-CANRQ[207],L-HOLD	⇒ CANCEL-PD
2:	P103 & ~P40:	I-CANRP,I-CLORQ	⇒ CLOSE-PD
	P103 & P40:	L-SUSPND,I-CANRP,I-CLORQ	⇒ CLOSE-PD
3:		I-CLORQ	⇒ CLOSE-PD
4:		I-DESRQ	⇒ DESELECT-PD
5:		I-RECRQ[212][78]	⇒ RECOVER-PD
6:	P23 & (P29 | P31) & ~(P30 | P32):	[209],I-REARQ	⇒ RESTART
	P23 & (P30 | P32) & ~(P29 | P31):	[209],I-WRTRQ,L-RESEND[74]	⇒ RESTART
	~P23 & ~P33 & P34:	[55],F-CLOCF[211],L-ERRABT	⇒ PASSIVE
	~P23 & P33 & ~P34:	L-HOLD,I-SELRQ	⇒ SEL-PD
	~P23 & P101 & ~(P34 | P33) & (P29 | P30 | P31 | P32):	I-RECRQ[212][78]	⇒ *same state*
	~P23 & ~P101 & ~(P34 | P33 | P105) & (P29 | P30 | P31 | P32):	[55],L-ERRABT	⇒ PASSIVE
	~P23 & ~P33 & ~P34 & P105 & P99:	[55],F-TRECF[211],L-ERRABT	⇒ PASSIVE
	~P23 & ~P33 & ~P34 & P105 & ~P99:	F-TRECF,I-SELRQ,[215],[206],[214]	⇒ SEL-PD
7:	P106:	L-HOLD,	
	P40:	L-SUSPND,	
	P100 & P101:	L-PABORT,[200],I-INIRQ	⇒ INIT-PD
	~P100 & P101:	L-PABORT,I-INIRQ	⇒ INIT-PD
	~P101:	[55],L-ERRABT	⇒ PASSIVE
8:	P23 & ~P31 & P32:	I-RECRQ[73][212]	⇒ RECOVER-PD
	P23 & P31 & ~P32:	I-RECRQ[66][212]	⇒ RECOVER-PD
	~P23 & P102:	[200],I-INIRQ	⇒ *same state*
	~P23 & ~P102:	[55],L-ERRABT	⇒ PASSIVE
9:	P23:	I-OPNRQ	⇒ OPN-PD
	~P23:	[55],L-ERRABT	⇒ PASSIVE

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10: P23:	L-UNHOLD	⇒ XFER-IDLE
~P23:	[55],L-ERRABT	⇒ PASSIVE
11: ~P101:	[55],L-ERRABT	⇒ PASSIVE
P101:	L-HOLD,I-CLORQ[211]	⇒ CLOSE-PD
12: P106:	L-HOLD,	
P40 & P103 & P100 & P101:	L-SUSPND,[200],I-INIRQ	⇒ INIT-PD
~P40 & P103 & P100 & P101:	[200],I-INIRQ	⇒ INIT-PD
P40 & P103 & ~P100 & P101:	L-SUSPND,I-INIRQ	⇒ INIT-PD
~P40 & P103 & ~P100 & P101:	I-INIRQ	⇒ INIT-PD
~P103 | ~P101:	[55],F-PABIN	⇒ PASSIVE

NOTES

1 To avoid recovery procedures that never terminate the action in entry 6 by the condition P101 or ~P101 effectively allowing the local system to determine the number of times a recovery from any one error will be attempted.

2 The condition P101 in entries 12 and 7 includes the test when FQOS is zero but the FERPM is not null.

3 The condition ~P103 in entry 2 implies that this event is not relevant to the FERPM and that normal actions take over.

4 The predicates which model the activity state indicator are mutually exclusive, so that combinations of them cannot occur. These combinations are not included in the state table entries.

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A.5.16 Responding entity state table — FERPM — (class II and III errors)

STATE / EVENT	XFER	RESTART-PD	RESTART	CANCEL-PD	CLOSE-EX	DESELECT-EX	PASSIVE	XFER-EX	INIT-EX	SEL-EX	OPN-EX	XFER-IDLE
L-ERROR2	1	1	1				14					
I-CANIN	2	2	2									
I-CANCF				3								
I-CLOIN					4							16
I-DESIN						5						
I-RECIN							6					
L-ERROR3	7	7	7	7	7	7	7	7		7	7	7
I-PABIN	17	17	17	17	17	17	17	17		17	17	17
L-GIVEUP							12					
I-INIIN									8			
I-REAIN								13				
I-WRTIN								9				
I-SELIN										10		
I-OPNIN											11	

A.5.17 Responding entity state table — FERPM — detailed entries (class II and III errors)

1:	~P101 & P104:	L-ERROR3	⇒ *same state*
	~P101:	[55],L-ERRABT	⇒ PASSIVE
	P101 & P40:	L-SUSPND,I-CANRQ[207]	⇒ CANCEL-PD
	P101 & ~P40 & ~P104:	I-CANRQ[207]	⇒ CANCEL-PD
	P101 & ~P40 & P104:	I-CANRQ[207],L-HOLD	⇒ CANCEL-PD
2:	P103 & P40:	L-SUSPND,I-CANRP	⇒ CLOSE-EX
	P103 & ~P40:	I-CANRP	⇒ CLOSE-EX
3:			⇒ CLOSE-EX
4:		I-CLORP	⇒ DESELECT-EX
5:		I-DESRP	⇒ PASSIVE
6:	P101 & P31 & ~P32 & ~P33 & P39:	[209],I-RECRP[74]	⇒ XFER-EX
	P101 & ~P31 & P32 & ~P33 & P39:	[209],I-RECRP[66]	⇒ XFER-EX
	P101 & ~P31 & ~P32 & P33 & P39:	I-RECRP[201]	⇒ SEL-EX
	P101 & ~P31 & ~P32 & ~P33 & P39:	I-RECRP[201]	⇒ *same state*
	P101 & ~P39:	I-RECRP[75][201]	⇒ *same state*
	~P101:	I-RECRP[201]	⇒ *same state*
7:	P104:	L-HOLD,	
	P101 & ~P40:	L-PABORT	⇒ INIT-EX
	P101 & P40:	L-PABORT,L-SUSPND	⇒ INIT-EX
	~P101:	[55],L-ERRABT	⇒ PASSIVE
8:	P102:	I-ININP	⇒ PASSIVE
	~P102:	I-ININP[201]	⇒ PASSIVE
9:	P30:		⇒ RESTART
	~P30:	[55],L-ERRABT	⇒ PASSIVE
10:		L-SELRP	⇒ OPN-EX
11:		L-UNHOLD,I-OPNRP	⇒ XFER-IDLE

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12:		[55],L-ERRABT	⇒ *same state*
13:	P29:	L-RESEND[203]	⇒ RESTART
	~P29:	[55],L-ERRABT	⇒ PASSIVE
14:	P101:	[210],L-HOLD	⇒ *same state*
	~P101:	[55],L-ERRABT	⇒ *same state*
16:	P103	I-CLORP,L-HOLD	⇒ DESELECT-EX
17:	P104:	L-HOLD,	
	P103 & P101 & P40:	L-SUSPND	⇒ INIT-EX
	P103 & P101 & ~P40:		⇒ INIT-EX
	~P103 | ~P101:	[55],F-PABIN	⇒ PASSIVE

NOTES

1 The condition P101 in entries 7 and 17 includes the test when FQOS is zero but the FERPM is not null.

2 The condition ~P103 in entries 2 and 16 implies that this event is not relevant to the FERPM and that normal actions take over.

3 The predicates which model the activity state indicator are mutually exclusive, so that combinations of them cannot occur. These combinations are not included in the state table entries.

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Replace clause C.1 in annex C with the following:

AND-Set	Declared at line:	1023 (TYP),
	referenced at:	1021,
		1023
Abstract-Syntax-Name	Declared at line:	407 (TYP),
	referenced at:	99,
		258,
		259,
		315,
		316,
		407,
		691
Access-Context	Declared at line:	409 (TYP),
	referenced at:	368,
		409
Access-Control-Attribute	Declared at line:	633 (TYP),
	referenced at:	519,
		520,
		607,
		608,
		633
Access-Control-Change-Attribute	Declared at line:	640 (TYP),
	referenced at:	469,
		470,
		640
Access-Control-Element	Declared at line:	654 (TYP),
	referenced at:	637,
		645,
		648,
		654
Access-Passwords	Declared at line:	423 (TYP),
	referenced at:	147,
		182,
		305,
		423,
		658,
		796,
		807,
		821,
		853,
		871,
		922,
		969,
		985
Access-Request	Declared at line:	439 (TYP),
	referenced at:	146,
		181,
		304,
		439,

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		655,
		820,
		906,
		921
Account	Declared at line:	449 (TYP),
	referenced at:	27,
		154,
		189,
		449,
		681,
		827,
		908,
		926
Account-Attribute	Declared at line:	677 (TYP),
	referenced at:	465,
		515,
		590,
		677
Action-Result	Declared at line:	451 (TYP),
	referenced at:	35,
		109,
		113,
		158,
		170,
		193,
		202,
		215,
		228,
		263,
		280,
		285,
		320,
		337,
		345,
		380,
		387,
		392,
		397,
		451,
		800,
		814,
		831,
		840,
		859,
		877,
		888,
		897,
		912,
		930,
		940,
		951,
		959,
		974,
		990

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Activity-Identifier	Declared at line:	456 (TYP),
	referenced at:	249,
		302,
		456
Application-Entity-Title	Declared at line:	458 (TYP),
	referenced at:	458,
		659
Attribute-Extension-Names	Declared at line:	995 (TYP),
	referenced at:	209,
		810,
		884,
		947,
		995
Attribute-Extension-Set	Declared at line:	1003 (TYP),
	referenced at:	1001,
		1003
Attribute-Extension-Set-Name	Declared at line:	997 (TYP),
	referenced at:	995,
		997
Attribute-Extensions	Declared at line:	1001 (TYP),
	referenced at:	477,
		527,
		615,
		1001
Attribute-Extensions-Pattern	Declared at line:	1133 (TYP),
	referenced at:	1057,
		1133
Attribute-Groups	Declared at line:	83 (TYP),
	referenced at:	22,
		42,
		83
Attribute-Names	Declared at line:	1190 (TYP),
	referenced at:	208,
		809,
		883,
		946,
		1190
Attribute-Value-Assertions	Declared at line:	1015 (TYP),
	referenced at:	805,
		819,
		1015
Bitstring-Pattern	Declared at line:	1099 (TYP),
	referenced at:	1027,
		1099
Boolean-Pattern	Declared at line:	1116 (TYP),
	referenced at:	1048,
		1116
Bulk-Data-PDU	Declared at line:	348 (TYP),
	referenced at:	5,
		348
Change-Attributes	Declared at line:	461 (TYP),
	referenced at:	225,
		229,
		461,

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		856, 874, 956, 960, 971, 976, 987, 992
Charging	Declared at line: referenced at:	483 (TYP), 106, 171, 204, 483, 841, 942
Child-Objects-Attribute	Declared at line: referenced at:	759 (TYP), 585, 759
Concurrency-Access	Declared at line: referenced at:	661 (TYP), 656, 661
Concurrency-Control	Declared at line: referenced at:	488 (TYP), 152, 187, 244, 265, 488, 823, 924
Concurrency-Key	Declared at line: referenced at:	671 (TYP), 662, 663, 664, 665, 666, 667, 668, 669, 671
Constraint-Set-Name	Declared at line: referenced at:	504 (TYP), 504, 690
Contents-Type-Attribute	Declared at line: referenced at:	683 (TYP), 243, 264, 321, 513, 581, 683
Contents-Type-List	Declared at line: referenced at:	97 (TYP), 25, 45, 97
Contents-Type-Pattern	Declared at line:	1123 (TYP),

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	referenced at:	1028, 1123
Create-Attributes	Declared at line: referenced at:	506 (TYP), 179, 194, 506, 904, 913, 918, 931
Date-and-Time-Attribute	Declared at line: referenced at:	693 (TYP), 591, 593, 595, 597, 693
Date-and-Time-Pattern	Declared at line: referenced at:	1104 (TYP), 1035, 1037, 1039, 1041, 1104
Destination-File-Directory	Declared at line: referenced at:	1145 (TYP), 795, 801, 847, 860, 865, 878, 964, 975, 980, 991, 1145
Diagnostic	Declared at line: referenced at:	531 (TYP), 46, 110, 114, 164, 175, 196, 205, 222, 232, 267, 282, 287, 327, 339, 346, 381, 389, 394, 399,

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		531, 802, 816, 833, 844, 862, 880, 890, 901, 915, 934, 943, 953, 961, 977, 993
Document-Type-Name	Declared at line: referenced at:	554 (TYP), 98, 554, 685
Entity-Reference	Declared at line: referenced at:	543 (TYP), 538, 539, 543
Equality-Comparision	Declared at line: referenced at:	1061 (TYP), 1061, 1087, 1093, 1100, 1113, 1117, 1120
Error-Action	Declared at line: referenced at:	1156 (TYP), 851, 869, 1156
Extension-Attribute	Declared at line: referenced at:	1007 (TYP), 1005, 1007
Extension-Attribute-Identifier	Declared at line: referenced at:	1013 (TYP), 999, 1008, 1013, 1136
Extension-Set-Identifier	Declared at line: referenced at:	1011 (TYP), 998, 1004, 1011, 1134
F-BEGIN-GROUP-request	Declared at line: referenced at:	289 (TYP), 133, 289
F-BEGIN-GROUP-response	Declared at line: referenced at:	292 (TYP), 134,

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		292
F-CANCEL-request	Declared at line:	391 (TYP),
	referenced at:	360, 391
F-CANCEL-response	Declared at line:	396 (TYP),
	referenced at:	361, 396
F-CHANGE-ATTRIB-request	Declared at line:	224 (TYP),
	referenced at:	127, 224
F-CHANGE-ATTRIB-response	Declared at line:	227 (TYP),
	referenced at:	128, 227
F-CHANGE-LINK-ATTRIB-request	Declared at line:	955 (TYP),
	referenced at:	786, 955
F-CHANGE-LINK-ATTRIB-response	Declared at line:	958 (TYP),
	referenced at:	787, 958
F-CHANGE-PREFIX-request	Declared at line:	793 (TYP),
	referenced at:	762, 793
F-CHANGE-PREFIX-response	Declared at line:	799 (TYP),
	referenced at:	763, 799
F-CLOSE-request	Declared at line:	279 (TYP),
	referenced at:	131, 279
F-CLOSE-response	Declared at line:	284 (TYP),
	referenced at:	132, 284
F-COPY-request	Declared at line:	979 (TYP),
	referenced at:	790, 979
F-COPY-response	Declared at line:	989 (TYP),
	referenced at:	791, 989
F-CREATE-DIRECTORY-request	Declared at line:	903 (TYP),
	referenced at:	778, 903
F-CREATE-DIRECTORY-response	Declared at line:	910 (TYP),
	referenced at:	779, 910
F-CREATE-request	Declared at line:	177 (TYP),
	referenced at:	121, 177
F-CREATE-response	Declared at line:	191 (TYP),
	referenced at:	122, 191
F-DATA-END-request	Declared at line:	379 (TYP),
	referenced at:	357, 379
F-DELETE-request	Declared at line:	198 (TYP),
	referenced at:	123,

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		198
F-DELETE-response	Declared at line:	201 (TYP),
	referenced at:	124,
		201
F-DESELECT-request	Declared at line:	166 (TYP),
	referenced at:	119,
		166
F-DESELECT-response	Declared at line:	169 (TYP),
	referenced at:	120,
		169
F-END-GROUP-request	Declared at line:	295 (TYP),
	referenced at:	135,
		295
F-END-GROUP-response	Declared at line:	298 (TYP),
	referenced at:	136,
		298
F-ERASE-request	Declared at line:	341 (TYP),
	referenced at:	141,
		341
F-ERASE-response	Declared at line:	344 (TYP),
	referenced at:	142,
		344
F-GROUP-COPY-request	Declared at line:	864 (TYP),
	referenced at:	772,
		864
F-GROUP-COPY-response	Declared at line:	876 (TYP),
	referenced at:	773,
		876
F-GROUP-DELETE-request	Declared at line:	835 (TYP),
	referenced at:	768,
		835
F-GROUP-DELETE-response	Declared at line:	839 (TYP),
	referenced at:	769,
		839
F-GROUP-LIST-request	Declared at line:	882 (TYP),
	referenced at:	774,
		882
F-GROUP-LIST-response	Declared at line:	887 (TYP),
	referenced at:	775,
		887
F-GROUP-MOVE-request	Declared at line:	846 (TYP),
	referenced at:	770,
		846
F-GROUP-MOVE-response	Declared at line:	858 (TYP),
	referenced at:	771,
		858
F-GROUP-SELECT-request	Declared at line:	818 (TYP),
	referenced at:	766,
		818
F-GROUP-SELECT-response	Declared at line:	830 (TYP),
	referenced at:	767,
		830
F-INITIALIZE-request	Declared at line:	15 (TYP),
	referenced at:	8,

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		15
F-INITIALIZE-response	Declared at line:	33 (TYP),
	referenced at:	9,
		33
F-LINK-request	Declared at line:	917 (TYP),
	referenced at:	780,
		917
F-LINK-response	Declared at line:	928 (TYP),
	referenced at:	781,
		928
F-LIST-request	Declared at line:	804 (TYP),
	referenced at:	764,
		804
F-LIST-response	Declared at line:	813 (TYP),
	referenced at:	765,
		813
F-LOCATE-request	Declared at line:	332 (TYP),
	referenced at:	139,
		332
F-LOCATE-response	Declared at line:	336 (TYP),
	referenced at:	140,
		336
F-MOVE-request	Declared at line:	963 (TYP),
	referenced at:	788,
		963
F-MOVE-response	Declared at line:	973 (TYP),
	referenced at:	789,
		973
F-OPEN-request	Declared at line:	234 (TYP),
	referenced at:	129,
		234
F-OPEN-response	Declared at line:	261 (TYP),
	referenced at:	130,
		261
F-P-ABORT-request	Declared at line:	112 (TYP),
	referenced at:	13,
		112
F-READ-ATTRIB-request	Declared at line:	207 (TYP),
	referenced at:	125,
		207
F-READ-ATTRIB-response	Declared at line:	214 (TYP),
	referenced at:	126,
		214
F-READ-LINK-ATTRIB-request	Declared at line:	945 (TYP),
	referenced at:	784,
		945
F-READ-LINK-ATTRIB-response	Declared at line:	950 (TYP),
	referenced at:	785,
		950
F-READ-request	Declared at line:	366 (TYP),
	referenced at:	349,
		366
F-RECOVER-request	Declared at line:	301 (TYP),
	referenced at:	137,

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		301
F-RECOVER-response	Declared at line:	318 (TYP),
	referenced at:	138,
		318
F-RESTART-request	Declared at line:	401 (TYP),
	referenced at:	363,
		401
F-RESTART-response	Declared at line:	404 (TYP),
	referenced at:	364,
		404
F-SELECT-ANOTHER-request	Declared at line:	892 (TYP),
	referenced at:	776,
		892
F-SELECT-ANOTHER-response	Declared at line:	895 (TYP),
	referenced at:	777,
		895
F-SELECT-request	Declared at line:	144 (TYP),
	referenced at:	117,
		144
F-SELECT-response	Declared at line:	156 (TYP),
	referenced at:	118,
		156
F-TERMINATE-request	Declared at line:	101 (TYP),
	referenced at:	10,
		101
F-TERMINATE-response	Declared at line:	104 (TYP),
	referenced at:	11,
		104
F-TRANSFER-END-request	Declared at line:	383 (TYP),
	referenced at:	358,
		383
F-TRANSFER-END-response	Declared at line:	386 (TYP),
	referenced at:	359,
		386
F-U-ABORT-request	Declared at line:	108 (TYP),
	referenced at:	12,
		108
F-UNLINK-request	Declared at line:	936 (TYP),
	referenced at:	782,
		936
F-UNLINK-response	Declared at line:	939 (TYP),
	referenced at:	783,
		939
F-WRITE-request	Declared at line:	371 (TYP),
	referenced at:	350,
		371
FADU-Identity	Declared at line:	556 (TYP),
	referenced at:	333,
		338,
		342,
		367,
		376,
		556
FADU-Lock	Declared at line:	568 (TYP),

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	referenced at:	334, 369, 377, 568
FSM-PDU	Declared at line: referenced at:	761 (TYP), 5, 761
FTAM-Quality-of-Service	Declared at line: referenced at:	91 (TYP), 24, 44, 91
FTAM-Regime-PDU	Declared at line: referenced at:	7 (TYP), 5, 7
File-PDU	Declared at line: referenced at:	116 (TYP), 5, 116
Functional-Units	Declared at line: referenced at:	67 (TYP), 21, 41, 67
ISO8571-FTAM	Declared at line: referenced at:	3 (MOD), 3
Implementation-Information	Declared at line: referenced at:	55 (TYP), 17, 37, 55
Integer-Pattern	Declared at line: referenced at:	1108 (TYP), 1026, 1049, 1050, 1108
Legal-Qualification-Attribute	Declared at line: referenced at:	717 (TYP), 473, 523, 611, 717
Lock	Declared at line: referenced at:	498 (TYP), 489, 490, 491, 492, 493, 494, 495, 496, 498
Node-Name	Declared at line: referenced at:	565 (TYP), 560, 561, 565
OR-Set	Declared at line: referenced at:	1021 (TYP), 1015, 1021

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unconstrained-class Referenced at: 61
unknown Referenced at: 242
unstructured-all-data-units Referenced at: 416
unstructured-single-data-unit Referenced at: 417
version-1 Referenced at: 16,
36,
52

version-2 Referenced at: 53
write Referenced at: 69

Replace Annex C.2 with the following:

AE-title Referenced at: 458,
1227

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UDC 681.3.01

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INTERNATIONAL STANDARD ISO 8571-4 : 1988
TECHNICAL CORRIGENDUM 1

Published 1992-10-15

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Information processing systems — Open Systems Interconnection — File Transfer, Access and Management —

Part 4:
File Protocol Specification

TECHNICAL CORRIGENDUM 1

Systèmes de traitement de l'information — Interconnexion de systèmes ouverts — Gestion, accès et transfert de fichier —

Partie 4: Spécification du protocole de transfert de fichier

RECTIFICATIF TECHNIQUE 1

Technical corrigendum 1 to International Standard ISO 8571-4 : 1988 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*.

Page 43

Figure 11

After line 654, insert the following note:

"-- In the case where the parameter is a null list, "NULL" shall be
-- explicity encoded."

UDC 681.3 : 621.39 **Ref. No. ISO 8571-4 : 1988/Cor.1 : 1992 (E)**

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Page 48

Subclause A.1.2

Insert a new first paragraph as follows:

"The receipt of sequences of service events are assumed to be permissible in accordance with those defined in ISO 8571-3."

Page 49

Subclause A.1.7

Add a new item e) as follows:

"For each incoming PDU the permissible sequences of service events as defined in ISO 8571-3 shall be checked. If the check fails the procedures for protocol violation specified in 10.2 are followed."

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INTERNATIONAL STANDARD

ISO 8571-4

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1988-10-01

AMENDMENT 4
1992-11-15

Information processing systems – Open Systems Interconnection – File Transfer, Access and Management –

Part 4:
File Protocol Specification

AMENDMENT 4

Systèmes de traitement de l'information – Interconnexion de systèmes ouverts – Gestion, accès et transfert de fichier –

Partie 4: Spécification du protocole de transfert de fichier

AMENDEMENT 4

Reference number
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ISO 8571-4:1988/Amd.4:1992 (E)

Foreword

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In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

Amendment 4 to International Standard ISO 8571-4:1988 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology.*

ISO 8571 consists of the following parts, under the general title *Information processing systems – Open Systems Interconnection – File Transfer, Access and Management*:

– *Part 1: General introduction*

– *Part 2: Virtual Filestore Definition*

– *Part 3: File Service Definition*

– *Part 4: File Protocol Specification*

– *Part 5: Protocol Implementation Conformance Statement Proforma*

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Information processing systems – Open Systems Interconnection – File Transfer, Access and Management –

Part 4:
File Protocol Specification

AMENDMENT 4

Page 6

Remove subclause 6.2.4.

Page 7

Modify the last sentence of clause 7 paragraph 4 to read "The series of *file protocol* data units may not be divided..."

Page 9

Add the following to subclauses 8.3.1 and 8.3.2 after the word "initialized":

> "..., where the *requested access* refers to a subset of the actions requested by the *service class* and *functional units* negotiated at initialization,..."

Page 10

Remove from 8.3.3 the following:

> "...where the requested access must refer to a subset of the actions requested,..."

Page 12

Remove subclause 8.9.3 item b.

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Replace subclause 8.9.3 item c with the following text:

"If the presentation action parameter is false, issue an F-OPEN confirm primitive to the IFS user, with parameters derived from the data values received, and enter the state "data transfer idle"."

Replace subclause 8.9.3 item d with the following text:

"If the presentation action parameter is true, preserve the PDU for further processing and enter state "p-alter context pending"."

Remove subclause 8.9.4 item a.

Replace subclause 8.9.4 item b with the following text:

"If the presentation action parameter is false, issue an F-OPEN confirm primitive to the IFS user, with parameters derived from the data values received;"

Replace subclause 8.9.4 item d with the following text:

"If the PDU did not carry a state result indicating failure and if the presentation action parameter is true, preserve the PDU for further processing;"

Change the last sentence of 8.9.5 first paragraph from:

"...in the state "p-alter context pending" and the p-alter indicator is set, the entity shall:..."

to:

"...in the state "p-alter context pending" and the presentation context management functional unit is available and there are presentation contexts to be deleted or defined, the entity shall:..."

Add the word "Construct" at the beginning of 8.9.5 a). "Construct a presentation..."

Remove subclause 8.9.5 item d.

Change the last sentence of 8.9.6 first paragraph from:

"...in the state "p-alter context pending" and the p-alter indicator is unset, the entity shall:..."

to:

"...in the state "p-alter context pending" and the presentation context management functional unit is available or there are no presentation contexts to be deleted or defined, the entity shall:..."

Page 13

Remove subclause 8.13.2 item b.

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Page 14

Replace subclause 8.13.2 item c with the following text:

> "If the presentation action parameter is false, issue an F-RECOVER confirm primitive to the IFS user, with parameters derived from the data values received, and enter the state "data transfer idle recover"."

Replace subclause 8.13.2 item d with the following text:

> "If the presentation action parameter is true, preserve the PDU for further processing and enter the state "p-alter context pending"."

Change the last sentence of 8.13.3 first paragraph from:

> "...in the state "p-alter context pending" and the p-alter indicator is set, the entity shall:..."

to:

> "...in the state "p-alter context pending" and the presentation context management functional unit is available and there are presentation contexts to be deleted or defined, the entity shall:..."

Remove subclause 8.13.3 item d.

Change the last sentence of 8.13.4 first paragraph from:

> "...in the state "p-alter context pending" and the p-alter indicator is unset, the entity shall:..."

to:

> "...in the state "p-alter context pending" and the presentation context management functional unit is unavailable or there are no presentation contexts to be deleted or defined, the entity shall:..."

Page 18

Replace "current PDU" with "current PSDU" in subclause 9.10.4 item a.

Page 19

Replace "F-RECOVER response primitive" with "F-RECOVER response service primitive" in subclause 9.13.2 item e.

Page 20

Replace "an action result parameter" with "a diagnostic parameter" in subclause 10.2 item a.

Page 21

Replace "presentation" with "Presentation" and "session" with "Session" in subclause 11.2.2 second sentence.

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Replace "session" with "Presentation" and "presentation" with "Presentation" in subclause 11.2.4

Page 22

Replace "next resynchronization point number" with "next synchronization point number" in subclause 11.2.5 at the end of the first paragraph.

Replace "presentation" with "Presentation" in subclause 11.2.5.

Replace "next synchronization point serial number" with "next synchronization point number" in subclause 13.1.2 b).

Page 24

In subclauses 15.1.2 and 15.2.2 replace "P-SYNCH-MINOR" with "P-SYNC-MINOR".

Replace "next synchronization point serial number" with "next synchronization point number" in subclause 15.3.1 item e.

Replace both occurrences "next synchronization point serial number" with "next synchronization point number" in subclause 15.3.1 item f.

Replace "synch point serial number" with "synchronization point serial number" in subclause 15.3.2 item b.

Page 25

Replace "next synchronization point serial number" with "next synchronization point number" in subclause 16.3.1 item c.

Replace "next synchronization point serial number" with "next synchronization point number" in subclause 16.3.1 item g.

Replace "synch point serial number" with "synchronization point serial number" in subclause 16.3.2 item b.

Replace "expected synchronization number" with "next synchronization point number" in subclause 17.2.5 item b.

Page 26

Replace "synchronization point number" with "synchronization point serial number" and replace "next resynchronization point serial number" with "next synchronization point number" in the last sentence of the paragraph in subclause 17.3.1.

Replace "resynchronization point number" with "synchronization point serial number" in subclause 17.3.3 item c.

Replace "resynchronization point number" with "synchronization point serial number" in subclause 17.3.4 item d.

Replace "resynchronization point number" with "synchronization point serial number" in subclause 17.3.5 item e.

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Page 27

Replace "indication Permanent" with "indication. Permanent" in subclause 18.1.3 last paragraph.

Page 28

In subclause 19.1.1 item a replace "carrying" with "not carrying".

Add "d) issue an F-INITIALIZE request to the IFS provider." to subclause 19.1.2.1.1.

Page 29

In subclause 19.1.4 paragraph change the word "when" to "while".

Replace "F-INITIALIZE request" with "F-INITIALIZE response" in subclause 19.1.5.3.

Replace "FERPM and shall retain" with "FERPM shall retain" in subclause 19.1.5.4.

Page 30

In subclause 19.2.1 first sentence position the sentence after figure 4.

Replace subclause 19.2.1.3 with the following:

> "If the entity is a sending entity, the F-RESTART request shall include the last acknowledged point as a recovery point."

Replace "Write or Read procedure" with "Read or Write procedure" in figure 5.

Replace ", it shall discard the primitive." with ", it shall decide that it is a collision-loser in the Session layer and shall send an F-RESTART response as a response to the F-RESTART indication." in the last sentence of subclause 19.2.1.7.

Page 31

In 19.2.3.4 c) replace the words:

> "and an F-U-ABORT request to the internal file service provider, with a diagnostic..."

by the words:

> "and locally signal the internal file service provider to issue a F-P-ABORT PDU with a diagnostic..."

Page 33

Add the following comments in the ASN.1 (subclause 20.3):

> Insert after lines 29 and 45 the following:
>
> > "– If the recovery of restart data transfer functional units are not available, the checkpoint window parameter shall not be sent."

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Page 37

Insert after line 255 the following:

"– If the fadu-locking functional unit is not available, the enable-fadu-locking parameter shall not be sent."

Change line 260 from "at-start-of-file" to "at-start-of-transfer".

Insert after line 275 the following:

"– If the recovery or restart data transfer functional unit are not available, the recovery-mode parameter shall not be sent."

Page 38

Insert after lines 309 and 319 the following:

"– The recovery-point parameter shall only be sent by the entity that was receiving data at the time of failure."

Page 40

Add an ASN.1 note in subclause 20.3 after line 470 stating "– At least one attribute parameter shall be present in Change Attributes on the request PDU".

Page 43

Add a note after line 654 of figure 11:

"– in the case where the parameter is a null list, "NULL" shall be
– – explicitly encoded."

Page 45

Add a new subclause 20.5 titled "Rules of extensibility" with the following text:

"For the F-INITIALIZE request FPDU, a receiving Responder FPM shall:

a) ignore any undefined element;
b) where named bits are used in subclause 20.3, treat any as insignificant when no name is assigned to it.

Pages 47 to 85

Replace annex A with the attached text.

The following subclauses have been amended:

A.1.1, A.1.2, A.1.6, A.1.7, A.2.4, A.2.7, A.2.9, A.3.4, A.3.5, A.3.9, A.4.4, A.4.6, A.4.7, A.4.8, A.4.9, A.5.2.1, A.5.2.2, A.5.2.3, A.5.3.1, A.5.3.2, A.5.3.3, A.5.4, A.5.5, A.5.6, A.5.7, A.5.8, A.5.9, A.5.11, A.5.12, A.5.13, A.5.15 and A.5.17.

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Annex A
Protocol state tables

(This annex forms part of the standard.)

A.1 Introduction

In the event of a discrepancy becoming apparent in the protocol described in the body of this standard and the protocol described in this Annex, this Annex is to take precedence.

These tables describe the operation of the basic file protocol machine (FPM) and error recovery protocol machine (FERPM).

The basic protocol tables are divided into three groups, covering:

a) the FTAM regime management protocol machine;

b) the file regime management protocol machine;

c) the bulk data transfer protocol machine.

The initial and final states of the file regime management protocol machine are also states of FTAM regime management protocol machine. The initial and final states of the bulk data transfer protocol machine are also states of the file regime management protocol machine.

To provide formally complete and consistent description of the FTAM protocol sequences of events are considered indivisible in the model. That indivisibility ensures both that the states used in the description are well defined and that they are sufficient to describe the protocol.

The reception of a service primitive and the generation of dependent actions are considered to be an indivisible action. The reception of an FPDU and the generation of dependent actions are considered to be an indivisible action.

The indivisibility of actions may, in some implementations, cause certain events from file service users to be invalid at some service interface.

The conventions adopted in this Annex are described below.

A.1.1 System model used for protocol description

There are four types of receivers and sources of incoming and outgoing events (see figure 12):

a) The internal file service user, which is the file error recovery protocol machine (FERPM);

b) The external file service user — initiator or responder;

c) The local system environment;

d) the underlying presentation and ACSE service providers.

All primitives to/from the external file service user are passed through as primitives to/from the internal file service user to the basic FPM.

If the FERPM is not null — that is, either the RESTART or the RECOVER functional unit is available — parameters needed for error control and recovery may be added to these primitives.

Signals to/from the local environment group together events signalling errors and events signalling interactions amongst the FERPM, its docket and its local system. These local signals are

e) L-ERRABT — local signal indicating protocol or other local errors leading to F-P-ABORT, with a permanent error value in the action result parameter;

f) L-PABORT — local signal indicating that a F-P-ABORT request PDU with a transient error value in the action result should be issued;

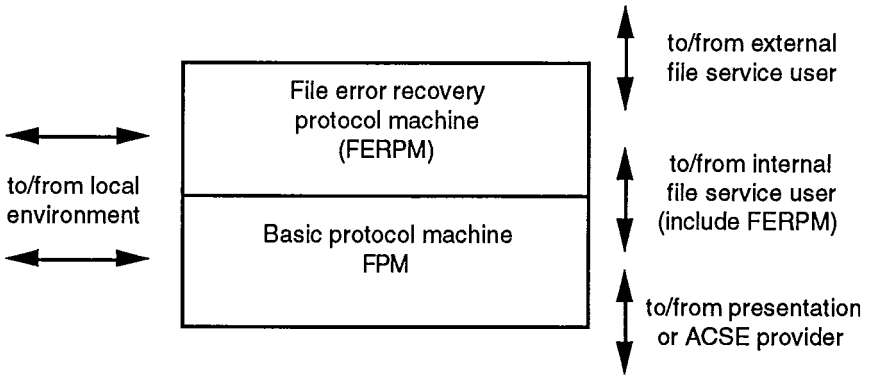

Figure 12 — State machine system model

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g) L-ERROR1, L-ERROR2 and L-ERROR3 — local signals indicating class I, class II and class III errors respectively;

h) L-SUSPND — a local signal sent by the sender in the RESTART state to the local system to suspend the issuing of F-DATA request and F-DATA-END request primitives;

i) L-RESUME — a local signal to the local system to resume the issuing of F-DATA request and F-DATA-END request primitives when a sender has completed its recovery from RESTART and is now back in DATA-XFER state;

j) L-RESEND — a local signal from the FERPM to the sending local system. This signal includes the negotiated restart checkpoint and eliminates the need to store data values in the docket. Upon receipt of this local signal the local system can either

1) resend data from the checkpoint if the local system is aware of the algorithm used by the FERPM to generate the checkpoint; or

2) resend data from the start of the file if it has no knowledge of the checkpoint generating algorithm. The FERPM in the RESTART state will discard all data from the local system that occurs before the negotiated checkpoint. The FERPM will only forward data past the negotiated checkpoint to the FPM;

k) L-DATRQ — signal representing a re-issued F-DATA request primitive from the local system;

l) L-DAERQ — signal representing a re-issued F-DATA-END request primitive when a "data-end" marker becomes available from the docket;

m) L-CHKRQ — signal representing a re-issued F-CHECK request primitive when a checkpoint identifier becomes available from the docket;

n) L-EORIN — end of restart indication signal indicating that all checkpoint identifiers, "data-end" markers are all data to be resent have been sent;

o) L-GIVEUP — signal indicating that the responding FERPM should abandon the recovery process. This is introduced so that if the initiating FERPM is unable to re-establish the association then the responding FERPM can inform its users of the irrecoverable error.

p) L-ERRCTX — signal indicating that the P-ALTER-CONTEXT negotiation is unsuccessful. The error is to be processed following the F-OPEN or F-RECOVER confirm as applicable.

q) L-HOLD — signal to FERPM to hold any primitive from the external user for later processing.

r) L-UNHOLD — signal to FERPM to process any previously held primitives.

s) L-STPSND --- a local signal from the FERPM to the sending local system to stop the resending of data and checkpoints.

A.1.2 Incoming Events

The receipt of sequences of service events are assumed to be permissible in accordance with those defined in ISO 8571-3.

Events in the tables are depicted by abbreviated names. A list of these abbreviations, arranged alphabetically within categories, precedes each table. Wherever possible, these events have been arranged in the order in which a normal error-free sequence of events would occur.

It is assumed that incoming PDUs have been extracted from the user data fields of Presentation or ACSE indication or confirm primitives prior to being considered as incoming events.

The following naming conventions are used:

a) The prefix "F-" (as in F-INIRQ) indicates a primitive issued by the external file service (EFS) user or issued by the FERPM to the EFS user;

b) The prefix "P-" (as in P-ALTRQ) indicates a primitive issued by the Presentation Service (PS) provider.

c) The prefix "A-" (as in A-PABIN) indicates a primitive issued by the ACSE provider;

d) The prefix "L-" (as in L-ERRABT) indicates a local signal from the FPM or the FERPM to the local system or from the local system environment to the FPM or the FERPM;

e) The prefix "I-" (as in I-OPNRQ) indicates a primitive issued by the FERPM to the FPM or vice-versa;

f) Where no prefix is used, the event is the receipt of an FTAM PDU or, in the case of GRPRQ and GRPRP, a grouped sequence of PDUs. The only exception is "DATIN" which indicates a data value in user context in the data transfer state.

g) The following suffices indicate the basic types of primitives and PDUs:

"RQ"	request
"IN"	indication
"RP"	response
"CF"	confirm

A.1.3 Outgoing Events

The same naming conventions are used for outgoing events as for incoming events. Where the outgoing event is the issue of a PDU, it will normally give rise to the similarly named incoming event for the other protocol entity. For example, the outgoing event SELRP of the responding entity will become the incoming event SELRP for the initiating entity.

A.1.4 States

The suffix "-PD" indicates a pending state, waiting for some known primitive or PDU type. The suffix "-EX" indicates an expectant state in FERPM, waiting for some expected primitive.

The prefix "P-" normally indicates waiting for a primitive from the Presentation Service provider. Similarly, the

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prefix "F-" indicates waiting for a primitive from the EFS user. If neither of the above prefices is used, the state normally indicates waiting for a PDU, or a non-pending state.

A.1.5 Predicates

The following symbols used in predicates have their normal Boolean algebraic meanings:

&	AND
|	OR
~	NOT

An incoming event may satisfy more than one predicate, in which case the conditional actions for satisfied predicates will be executed.

Some actions may be conditional upon the negotiation of particular service functional units;

those in the FPM are:

U1:	Kernel functional unit
U2:	Read functional unit
U3:	Write functional unit
U4:	File access functional unit
U5:	Limited management functional unit
U6:	Enhanced management functional unit
U7:	Grouping functional unit
U8:	FADU locking functional unit

those in the FERPM are:

U9:	Recovery functional unit
U10:	Restart data transfer functional unit

A.1.6 Actions

Actions may be conditional on specified predicates, or they may be unconditional. When a line in a "detailed entries" specification commences with a predicate specifier followed by a colon, this indicates that all actions on that line are conditional upon the indicated predicate. An action may consist of one or more of the following:

a) an outgoing event, indicated by its abbreviated name;

b) a specified action, indicated by a number in square brackets [ ] and separated from any preceding items by a comma;

c) a specified qualifier, indicated by a number in square brackets [ ] following a preceding item without a intervening comma;

Actions are qualifiers are described in a single list preceding the table.

The next state which the protocol entity will enter is indicated by an arrow preceding a state name, e.g. "⇒ SELECTED". For the null transition back to the current state, the notation "⇒ *same state*" is used.

Once a state change occurs, all subsequent actions in that entry are ignored.

A.1.7 Implicit Action

The following entity actions have not been explicitly specified in the State tables, but constitute part of the entity behaviour:

a) A blank square in the table indicates an invalid event.

b) Unless otherwise stated in the tables, an invalid event would cause the action specified in 10.2 to be executed.

c) The Presentation Service is used throughout to identify "active" FTAM PCI from data with an equivalent encoding, but in a "passive" use data context.

d) For each incoming PDU, a check is made that the appropriate functional unit has been negotiated for the connection. If the check fails, the procedures for protocol violation specified in 10.2 are followed.

e) For each incoming PDU the permissible sequences of service events as defined in ISO 8571-3 shall be checked. If the check fails the procedures for protocol violation specified in 10.2 are followed.

A.1.8 Additional State Information

The tables make use of the indicators and other state variables defined in 6.2 and 11.2. In addition, the file regime management tables for the initiator make use of a threshold indicator and an expected response list, as a means of specifying the entity state when a concatenated PDU group is outstanding.

The symbol NSPN is used to denote the Next Synchronization Point Number state variable.

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A.2 FTAM regime management protocol machine (Kernel functional unit)

A.2.1 States — FTAM regime management

UNINITIALIZED	FTAM regime ended.
INITIALIZE-PD	Initialize pending; wait for initialize response PDU.
INITIALIZED	FTAM regime started.
TERMINATE-PD	Terminate pending; wait for terminate response PDU.
I-INITIALIZE-PD	Initialize pending; wait for F-INITIALIZE response primitive from the internal file service user.
I-TERMINATE-PD	Terminate pending; wait for F-TERMINATE response primitive from the internal file service user.
ANY-OTHER	Any other state of the file regime management protocol machine or the bulk data transfer protocol machine.

A.2.2 Incoming events — FTAM regime management

In the following lists, the functional unit in which the event occurs is included after the name, where applicable.

A.2.2.1 Incoming events — PDUs

UABRQ	U-Abort request PDU (on A-ABORT indication primitive)	U1
PABRQ	P-Abort request PDU (on A-ABORT indication primitive)	"
INIRQ	Initialize request PDU	"
INIRP	Initialize response PDU	"
TERRQ	Terminate request PDU	"
TERRP	Terminate response PDU	"

A.2.2.2 Incoming events from the internal file service user

I-UABRQ	F-U-ABORT request primitive
I-INIRQ	F-INITIALIZE request primitive
I-INIRP	F-INITIALIZE response primitive
I-TERRQ	F-TERMINATE request primitive
I-TERRP	F-TERMINATE response primitive

A.2.2.3 Incoming events from the ACSE provider

A-PABIN	A-P-ABORT indication primitive
A-ABIN	A-ABORT indication primitive without user data
A-ASSCF	A-ASSOCIATE confirm primitive without user data (with result indicating reject by ACSE or presentation service provider)

A.2.2.4 Incoming events from the local system

L-ERRABT	Local signal indicating error leading to abort
L-PABORT	Local signal indicating that a F-P-ABORT request PDU and a F-P-ABORT indication primitive to the internal file service user, both with a transient error value.

A.2.3 Outgoing events — FTAM regime management

A.2.3.1 Outgoing events — PDUs

UABRQ	U-Abort request PDU
PABRQ	P-Abort request PDU

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INIRQ	Initialize request PDU
INIRP	Initialize response PDU
TERRQ	Terminate request PDU
TERRP	Terminate response PDU

A.2.3.2 Outgoing events to the internal file service user

I-UABIN	F-U-ABORT indication primitive
I-PABIN	F-P-ABORT indication primitive
I-INIIN	F-INITIALIZE indication primitive
I-INICF	F-INITIALIZE confirm primitive
I-TERIN	F-TERMINATE indication primitive
I-TERCF	F-TERMINATE confirm primitive

A.2.4 Specific actions — FTAM regime management

[1] Send the PDU constructed as user data and map parameters on the appropriate ACSE form.

[3] Initialize state information - unset all additional state information indicators, set outstanding checkpoint counter to zero, NSPN to one.

[4] Set state result parameters to "success".

[5] In case of ACSE provider abort, if any diagnostic indicates communications failure then set the action result to transient error.

[6] Set state result parameter to "failure".

[7] Record the FQOS required and select the restart and/or recovery functional units if necessary.

[12] Establish the list of presentation contexts needed to support FTAM PCI and ACSE PCI abstract syntaxes. If necessary, determine, on the basis of the abstract syntaxes derived from the contents type list supplied by the external file service user, the list of presentation contexts needed to support the file contents, and add it to the previous list. The resultant list is used to construct the presentation context definition list parameter.

[13] Update the value of the contents type list parameter in the F-INITIALIZE indication primitive issued to the internal file service user, according to the abstract syntaxes rejected by the presentation service provider, if necessary.

[14] According to the value of the contents type list on the F-INITIALIZE response primitive received from the internal file service user, construct the presentation context definition result parameter.

[20] Set the action result parameter according to the result parameter of the A-ASSOCIATE confirm service primitive.

[62] Record the peer entity's checkpoint window.

[80] Set action result to permanent error

[81] Set action result to transient error

A.2.5 Predicates — FTAM regime management

P1: I-INITIALIZE request primitive is acceptable.

P2: Result parameter of the ACSE confirm primitive indicates success of the operation.

P3: State result parameter of the incoming response primitive indicates success of the operation.

P5: Initialize request PDU is acceptable.

P25: Negotiable parameters have values consistent with request.

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A.2.6 Initiating entity state table — FTAM regime management

STATE / EVENT	UNINITIALIZED	INITIALIZE-PD	INITIALIZED	TERMINATE-PD	ANY-OTHER
I-INITRQ	1				
A-ASSCF		10			
INIRP		2			
I-TERRQ			3		
TERRP				4	
A-PABIN		5	5	5	5
A-ABIN		7	7	7	7
UABRQ		6	6	6	6
PABRQ		7	7	7	7
I-UABRQ		8	8	8	8
L-ERRABT		9	9	9	9
L-PABORT		11	11	11	11

A.2.7 Initiating entity state table: detailed entries

1:	P1:	[3],[12],INIRQ[1]	⇒ INITIALIZE-PD
	~P1:	I-INICF[6]	⇒ *same state*
2:	P3&P2 & P25:	[62],I-INICF[4],[7]	⇒ INITIALIZED
	P3&P2 & ~P25:	I-INICF[6],PABRQ[1]	⇒ UNINITIALIZED
	~P2:	I-INICF[6]	⇒ UNINITIALIZED
	~P3:	PABRQ[1],I-PABIN[80]	⇒ UNINITIALIZED
3:		TERRQ[1]	⇒ TERMINATE-PD
4:		I-TERCF	⇒ UNINITIALIZED
5:		I-PABIN[81]	⇒ UNINITIALIZED
6:		I-UABIN	⇒ UNINITIALIZED
7:		I-PABIN	⇒ UNINITIALIZED
8:		UABRQ[1]	⇒ UNINITIALIZED
9:		PABRQ[1],I-PABIN[80]	⇒ UNINITIALIZED
10:		I-INITCF[6],I-PABIN[20]	⇒ UNINITIALIZED
11:		PABRQ[1],I-PABIN[81]	⇒ UNINITIALIZED

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A.2.8 Responding entity state table — FTAM regime management

STATE / EVENT	UNINITIALIZED	I-INITIALIZE-PD	INITIALIZED	I-TERMINATE-PD	ANY-OTHER
INIRQ	1				
I-INIRP		2			
TERRQ			3		
I-TERRP				4	
A-PABIN		5	5	5	5
A-ABIN		7	7	7	7
UABRQ		6	6	6	6
PABRQ		7	7	7	7
I-UABRQ		8	8	8	8
L-ERRABT		9	9	9	9
L-PABORT		11	11	11	11

A.2.9 Responding entity state table: detailed entries

1:	P5:	I-INIIN,[3],[62],[13]	⇒ I-INITIALIZE-PD
	~P5:	INIRP[6][1]	⇒ *same state*
2:	P3:	[7],[14],INIRP[1]	⇒ INITIALIZED
	~P3:	INIRP[6][1]	⇒ UNINITIALIZED
3:		I-TERIN	⇒ I-TERMINATE-PD
4:		TERRP[1]	⇒ UNITIALIZED
5:		I-PABIN[81]	⇒ UNITIALIZED
6:		I-UABIN	⇒ UNITIALIZED
7:		I-PABIN	⇒ UNITIALIZED
8:		UABRQ[1]	⇒ UNITIALIZED
9:		PABRQ[1],I-PABIN[80]	⇒ UNITIALIZED
11:		PABRQ[1],I-PABIN[81]	⇒ UNITIALIZED

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A.3 File regime management protocol machine

A.3.1 States — file regime management

In the FPM:

INITIALIZED	FTAM regime started
SELECT-PD	Select pending, wait for select response PDU
I-SELECT-PD	Select pending, wait for F-SELECT response primitive from the internal file service user
SELECTED	Selected
DESELECT-PD	Deselect pending, wait for deselect response PDU
I-DESELECT-PD	Deselect pending, wait for F-DESELECT response primitive from the internal file service user
CREAT-PD	Create pending, wait for create response PDU
I-CREATE-PD	Create pending, wait for F-CREATE response primitive from the internal file service user
DELETE-PD	delete pending, wait for delete response PDU
I-DELETE-PD	Delete pending, wait for F-DELETE response primitive from the internal file service user
READ-ATT-PD	Read attribute pending, wait for read attribute response PDU
I-READ-ATT-PD	Read attribute pending, wait for F-READ-ATTRIB response primitive from the internal file service user
CHG-ATT-PD	Change attribute pending, wait for change attribute response PDU.
I-CHG-ATT-PD	Change attribute pending, wait for F-CHANGE-ATTRIB response primitive from the internal file service user
OPEN-PD	Open pending, wait for open response PDU
I-OPEN-PD	Open pending, wait for F-OPEN response primitive from the internal file service user
P-ALTIN-PD	Presentation alter context pending, wait for P-ALTER-CONTEXT indication primitive.
P-ALTCF-PD	Presentation alter context pending, wait for P-ALTER-CONTEXT confirm primitive.
CLOSE-PD	Close pending, wait for close response PDU
I-CLOSE PD	Close pending, wait for F-CLOSE response primitive from the internal file service user
DXFRIDLE	Data transfer idle
LOCATE-PD	Locate pending, wait for locate response PDU
I-LOCATE-PD	Locate pending, wait for F-LOCATE response primitive from the internal file service user
ERASE-PD	Erase pending, wait for erase response PDU
I-ERASE-PD	Erase pending, wait for F-ERASE response primitive from the internal file service user
GROUPING	Building PDU group, wait for required primitives
GROUP-PD	Group pending, wait for response PDU group
I-GROUP-PD	Group pending, wait for F-BEGIN-GROUP response primitive from the internal file service user

In the FERPM:

RECOVER-PD	Recover pending, wait for recover response PDU
I-RECOVER-PD	Recover pending, wait for F-RECOVER response primitive from the internal file service user
P-ALTIN-REC-PD	Presentation alter context pending, wait for P-ALTER-CONTEXT indication primitive during recovery.
P-ALTCF-REC-PD	Presentation alter context pending, wait for P-ALTER-CONTEXT confirm primitive during recovery.
DXFRIDLE-REC	Data transfer idle during recovery

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A.3.2 Incoming events — file regime management

A.3.2.1 Incoming events — PDUs

CATRQ	Change-attrib request PDU	U6
CATRP	Change-attrib response PDU	U6
CLORQ	Close request PDU	U2, U3
CLORP	Close response PDU	U2, U3
CRERQ	Create request PDU	U5
CRERP	Create response PDU	U5
DELRQ	Delete request PDU	U5
DELRP	Delete request PDU	U5
DESRQ	Deselect request PDU	U1
DESRP	Deselect response PDU	U1
ERARQ	Erase request PDU	U4
ERARP	Erase response PDU	U4
LOCRQ	Locate request PDU	U4
LOCRP	Locate response PDU	U4
OPNRQ	Open request PDU	U2, U3
OPNRP	Open response PDU	U2, U3
RATRQ	Read-attrib request PDU	U5
RATRP	Read-attrib response PDU	U5
RECRQ	Recover request PDU	U9
RECRP	Recover response PDU	U9
SELRQ	Select request PDU	U1
SELRP	Select response PDU	U1
GRPRQ	A sequence of request PDUs (PDU-Group) preceded by an F-BEGIN-GROUP request PDU and followed by a F-END-GROUP request PDU.	U7
GRPRP	A sequence of response PDUs (PDU-Group) preceded by an F-BEGIN-GROUP response PDU and followed by a F-END-GROUP response PDU.	U7

A.3.2.2 Incoming events from the internal file service user

I-CATRQ	F-CHANGE-ATTRIB request primitive
I-CATRP	F-CHANGE-ATTRIB response primitive
I-CLORQ	F-CLOSE request primitive
I-CLORP	F-CLOSE response primitive
I-CRERQ	F-CREATE request primitive
I-CRERP	F-CREATE response primitive
I-DELRQ	F-DELETE request primitive
I-DELRP	F-DELETE response primitive
I-DESRQ	F-DESELECT request primitive
I-DESRP	F-DESELECT response primitive
I-ERARQ	F-ERASE request primitive
I-ERARP	F-ERASE response primitive
I-LOCRQ	F-LOCATE request primitive

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I-LOCRP	F-LOCATE response primitive
I-OPNRQ	F-OPEN request primitive
I-OPNRP	F-OPEN response primitive
I-RATRQ	F-READ-ATTRIB request primitive
I-RATRP	F-READ-ATTRIB response primitive
I-RECRQ	F-RECOVER request primitive
I-RECRP	F-RECOVER response primitive
I-SELRQ	F-SELECT request primitive
I-SELRP	F-SELECT response primitive
I-BGPRQ	F-BEGIN-GROUP request primitive
I-BGPRP	F-BEGIN-GROUP response primitive
I-EGPRQ	I-END-GROUP request primitive
I-EGPRP	I-END-GROUP response primitive

A.3.2.3 Incoming events from the presentation service provider

P-ALTIN	P-ALTER-CONTEXT indication primitive
P-ALTCF	P-ALTER-CONTEXT confirm primitive

A.3.3 Outgoing events — file regime management

A.3.3.1 Outgoing events — PDUs

CATRQ	Change-attrib request PDU
CATRP	Change-attrib response PDU
CLORQ	Close request PDU
CLORP	Close response PDU
CRERQ	Create request PDU
CRERP	Create response PDU
DELRQ	Delete request PDU
DELRP	Delete response PDU
DESRQ	Deselect request PDU
DESRP	Deselect response PDU
ERARQ	Erase request PDU
ERARP	Erase response PDU
LOCRQ	Locate request PDU
LOCRP	Locate response PDU
OPNRQ	Open request PDU
OPNRP	Open response PDU
PABRQ	P-Abort request PDU
RATRQ	Read-attrib request PDU
RATRP	Read-attrib response PDU
RECRQ	Recover request PDU
RECRP	Recover response PDU
SELRQ	Select request PDU

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SELRP Select response PDU

A.3.3.2 Outgoing events to the internal file service user

I-CATIN F-CHANGE-ATTRIB indication primitive

I-CATCF F-CHANGE-ATTRIB confirm primitive

I-CLOIN F-CLOSE indication primitive

I-CLOCF F-CLOSE confirm primitive

I-CREIN F-CREATE indication primitive

I-CRECF F-CREATE confirm primitive

I-DELIN F-DELETE indication primitive

I-DELCF F-DELETE confirm primitive

I-DESIN F-DESELECT indication primitive

I-DESCF F-DESELECT confirm primitive

I-ERAIN F-ERASE indication primitive

I-ERACF F-ERASE confirm primitive

I-LOCIN F-LOCATE indication primitive

I-LOCCF F-LOCATE confirm primitive

I-OPNIN F-OPEN indication primitive

I-OPNCF F-OPEN confirm primitive

I-PABIN F-P-ABORT indication primitive

I-RATIN F-READ-ATTRIB indication primitive

I-RATCF F-READ-ATTRIB confirm primitive

I-RECIN F-RECOVER indication primitive

I-RECCF F-RECOVER confirm primitive

I-SELIN F-SELECT indication primitive

I-SELCF F-SELECT confirm primitive

A.3.3.3 Outgoing events to the presentation service provider

P-ALTRQ P-ALTER-CONTEXT request primitive

P-ALTRP P-ALTER-CONTEXT response primitive

A.3.3.4 Outgoing events to the local system

L-ERRCTX Local signal indicating P-ALTER-CONTEXT error

A.3.4 Specific actions — file regime management

[1] Send the PDU constructed as user data and map parameters on the appropriate ACSE form.

[2] Add a PDU to the current PSDU and terminate the current PSDU.

[8] Includes a state result parameter indicating failure.

[9] Set the remove contexts parameter of the F-OPEN or the F-RECOVER request PDU.

[10] Determine, on the basis of the abstract syntax derived from the contents type supplied by the external file service user, the set of presentation contexts necessary to support the file contents. All contexts identified in the remove context parameter of the OPNRQ or RECRQ PDUs shall be deleted unless required in the new open regime; optionally, the responder may elect to delete any other contexts in the defined context set which are not required. Inform the user if contexts need to be defined but the functioal unit is unavailable

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[11] Set the presentation-action parameter of the OPNRP or RECRP PDU if a P-ALTER-CONTEXT exchange is needed.

[15] Preserve the PDU or PDUs for further processing.

[28] Set the bulk data transfer number to that specified in the F-RECOVER request primitive or PDU.

[31] Set the bulk data transfer number to zero.

[32] Erase the expected response list. Set the threshold indicator to the value given by the primitive parameter. Add an F-BEGIN-GROUP request PDU to the current PSDU.

[33] Add a request PDU corresponding to the primitive function to the current PSDU, and add the corresponding element to the expected response list.

[34] Add an F-END-GROUP request PDU to the current PSDU and terminate the PSDU.

[35] Check that every PDU in the PDU-Group is one of SELRP, CRERP, CLORP, RATRP, CATRP, DESRP, DELRP, or OPNRP; and that the composition and ordering of the PDUs is consistent with the group specified by the expected response list (recognizing that the response group may be truncated because of a detected error).

[36] Check that the number of PDUs in the PDU-Group is consistent with the value of the threshold parameter and that the other parameter values are consistent with negotiation.

[37] Considering each PDU in the PDU-Group, issue the corresponding confirm primitive to the IFS user with parameters derived from the PDU.

[38] Add a response PDU corresponding to the primitive function to the current PSDU.

[39] Add an F-END-GROUP response PDU to the current PSDU and terminate the PSDU.

[40] Check that the composition and ordering of the PDU-Group is consistent with one of the concatenated sequences "A", "C", or "D", as defined in Part 3, Annex E.

[41] Check that the composition and ordering of the PDU-Group is consistent with the concatenated sequence "E" as defined in Part 3, Annex E.

[42] Check that the composition and ordering of the PDU-Group is consistent with the concatenated sequence "B" as defined in Part 3, Annex E.

[43] Considering in turn each PDU in the PDU-Group, issue the corresponding indication primitive to the IFS user with parameters derived from the PDU.

[45] Set the checkpoint identifier expected to the value negotiated plus one.

A.3.5 Predicates — file regime management

P4: The state result parameter on the incoming response PDU or response primitive indicates successful execution of operation.

P6: The P-ALTER-CONTEXT negotiation fails.

P7: A group of PDUs is preserved.

P9: The presentation context management functional unit is available and there are presentation contexts to be deleted or defined.

P10: The presentation-action parameter in the OPNRP PDU or in the RECRP PDU is TRUE, in which case the presentation context management functional unit should be available.

P17: The PDU-Group contains a SELRP or CRERP PDU with a state result parameter indicating failure, or a DESRP or DELRP PDU.

P18: Checking the PDU-Group reveals a protocol error.

P19: The PDU-Group contains an OPNRP PDU with a state result parameter indicating success.

P43: The recovery procedure is in progress.

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A.3.6 Initiating entity state table — file regime management

STATE / EVENT	INITIALIZED	SELECT-PD	SELECTED	DESELECT-PD	CREATE-PD	DELETE-PD	READ-ATT-PD	CHG-ATT-PD	OPEN-PD	P-ALTIN-PD	DXFRIDLE	DXFRIDLE-REC	CLOSE-PD	RECOVER-PD	P-ALTIN-REC-PD	LOCATE-PD	ERASE-PD	GROUPING	GROUP-PD
I-SELRQ	1																	28	
SELRP		2																	
I-DESRQ			3															28	
DESRP				4															
I-CRERQ	5																	28	
CRERP					6														
I-DELRQ			7															28	
DELRP						8													
I-RATRQ			9															28	
RATRP							10												
I-CATRQ			11															28	
CATRP								12											
I-OPNRQ			13															22	
OPNRP									14										
P-ALTIN										15					21				
I-CLORQ											17	17						28	
CLORP													18						
I-RECRQ	19																		
RECRP														20					
I-LOCRQ											23	23							
LOCRP																24			
I-ERARQ											25	25							
ERARP																	26		
I-BGPRQ	27		27								27	27							
I-EGPRQ																		29	
GRPRP																			30

A.3.7 Initiating entity state table (Part 2) — detailed entries

1:		SELRQ[2]	⇒ SELECT-PD
2:	P4:	I-SELCF	⇒ SELECTED
	~P4:	I-SELCF[8]	⇒ INITIALIZED
3:		DESRQ[2]	⇒ DESELECT-PD
4:		I-DESCF	⇒ INITIALIZED
5:		CRERQ[2]	⇒ CREATE-PD
6:	P4:	I-CRECF	⇒ SELECTED
	~P4:	I-CRECF[8]	⇒ INITIALIZED
7:		DELRQ[2]	⇒ DELETE-PD

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8:		I-DELCF	⇒ INITIALIZED
9:		RATRQ[2]	⇒ READ-ATT-PD
10:		I-RATCF	⇒ SELECTED
11:		CATRQ[2]	⇒ CHG-ATT-PD
12:		I-CATCF	⇒ SELECTED
13:	P9:	[9], OPNRQ[2],[31]	⇒ OPEN-PD
14:	~P4:	I-OPNCF[8]	⇒ SELECTED
	P4 & ~P10:	I-OPNCF	⇒ DXFRIDLE
	P4 & P10:	[15]	⇒ P-ALTIN-PD
15:	P6:	L-ERRCTX, P-ALTRP,	
	P7:	[37]	⇒ DXFRIDLE
	~P7:	I-OPNCF	⇒ DXFRIDLE
17:		CLORQ[2]	⇒ CLOSE-PD
18:		I-CLOCF	⇒ SELECTED
19:	P9:	[9], RECRQ[2],[28]	⇒ RECOVER-PD
20:	~P4:	I-RECCF[8]	⇒ INITIALIZED
	P4 & ~P10:	[45],I-RECCF	⇒ DXFRIDLE-REC
	P4 & P10:	[15]	⇒ P-ALTIN-REC-PD
21:	P6:	L-ERRCTX, P-ALTRP, [45],I-RECCF	⇒ DXFRIDLE-REC
22:	P9:	[9], [31],[33]	⇒ *same state*
23:		LOCRQ[2]	LOCATE-PD
24:	~P43:	I-LOCCF	⇒ DXFRIDLE
	P43:	I-LOCCF	⇒ DXFRIDLE-REC
25:		ERARQ[2]	⇒ ERASE-PD
26:	~P43:	IERACF	⇒ DXFRIDLE
	P43:	IERACF	⇒ DXFRIDLE-REC
27:		[32]	⇒ GROUPING
28:		[33]	⇒ *same state*
29:		[34]	⇒ GROUP-PD

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30:		[35],[36],	
	P18:	I-PABIN, PABRQ[1]	⇒UNINITIALIZED
	P17 & ~P18:	[37]	⇒ INITIALIZED
	~P17 & ~P18 & P19 & ~P10:	[37]	⇒ DXFRIDLE
	~P17 & ~P18 & P19 & P10:	[15]	⇒ P-ALTIN-PD
	~P17 & ~P18 & ~P19:	[37]	⇒ SELECTED

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A.3.8 Responding entity state table — file regime management

STATE / EVENT	INITIALIZED	I-SELECT-PD	SELECTED	I-DESELECT-PD	I-CREATE-PD	I-DELETE-PD	I-READ-ATT-PD	I-CHG-ATT-PD	I-OPEN-PD	P-ALTCF-PD	DXFRIDLE	DXFRIDLE-REC	I-CLOSE-PD	I-RECOVER-PD	P-ALTCF-REC-PD	I-LOCATE-PD	I-ERASE-PD	I-GROUP-PD	GROUPING
SELRQ	1																		
I-SELRP		2																	32
DESRQ			3																
I-DESRP				4															32
CRERQ	5																		
I-CRERP					6														32
DELRQ			7																
I-DELRP						8													32
RATRQ			9																
I-RATRP							10												32
CATRQ			11																
ICATRP								12											32
OPNRQ			13																
I-OPNRP									14										22
P-ALTCF										15					21				
CLORQ											17	17							
I-CLORP													18						32
RECRQ	19																		
I-RECRP														20					
LOCRQ											24	24							
I-LOCRP																25			
ERARQ											26	26							
I-ERARP																	27		
I-BGPRP																		31	
I-EGPRP																			33
GRPRQ	28		29								30	30							

A.3.9 Responding entity state table (Part 2) — detail entries

1:		I-SELIN	⇒ I-SELECT-PD
2:	P4:	SELRP[2]	⇒ SELECTED
	~P4:	SELRP[8][2]	⇒ INITIALIZED
3:		I-DESIN	⇒ I-DESELECT-PD
4:		DESRP[2]	⇒ INITIALIZED
5:		I-CREIN	⇒ I-CREATE-PD
6:	P4:	CRERP[2]	⇒ SELECTED
	~P4:	CRERP[8][2]	⇒ INITIALIZED
7:		I-DELIN	⇒ I-DELETE-PD

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8:		DELRP[2]	⇒ INITIALIZED
9:		I-RATIN	⇒ I-READ-ATT-PD
10:		RATRP[2]	⇒ SELECTED
11:		I-CATIN	⇒ I-CHG-ATT-PD
12:		CATRP[2]	⇒ SELECTED
13:		I-OPNIN,[31]	⇒ I-OPEN-PD
14:	~P4:	OPNRP[8][2]	⇒ SELECTED
	P4:	[10]	
	P4 & ~P9:	OPNRP[2]	⇒ DXFRIDLE
	P4 & P9:	[11],OPNRP[2],P-ALTRQ	⇒ P-ALTCF-PD
15:	P6:	L-ERRCTX,	⇒ DXFRIDLE
17:		I-CLOIN	⇒ I-CLOSE-PD
18:		CLORP[2]	⇒ SELECTED
19:		I-RECIN,[28]	⇒ I-RECOVER-PD
20:	~P4:	RECRP[8][2]	⇒ INITIALIZED
	P4:	[10],[45],	
	P4 & ~ P9:	RECRP[2]	⇒ DXFRIDLE-REC
	P4 & P9:	[11],RECRP[2],P-ALTRQ	⇒ P-ALTCF-REC-PD
21:	P6:	L-ERRCTX,	⇒ DXFRIDLE-REC
22:		[38],[31]	⇒ *same state*
24:		I-LOCIN	⇒ I-LOCATE-PD
25:	~P43:	LOCRP[2]	⇒ DXFRIDLE
	P43:	LOCRP[2]	⇒ DXFRIDLE-REC
26:		I-ERAIN	⇒ I-ERASE-PD
27:	~P43:	ERARP[2]	⇒ DXFRIDLE
	P43:	ERARP[2]	⇒ DXFRIDLE-REC
28:		[40],	
	P18:	I-PABIN,PABRQ[1]	⇒ UNINITIALIZED
	~P18:	[43]	⇒ I-GROUP-PD
29:		[41],	
	P18:	I-PABIN,PABRQ[1]	⇒ UNINITIALIZED
	~P18:	[43]	⇒ I-GROUP-PD
30:		[42],	
	P18:	I-PABIN,PABRQ[1]	⇒ UNINITIALIZED
	~P18:	[43]	⇒ I-GROUP-PD
31:		[38]	⇒ GROUPING
32:		[38]	⇒ *same state*

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33:	[39],	
P17:		⇒ INITIALIZED
~P17 & P19:	[10],	
~P17 & P19 & ~P9:		⇒ DXFRIDLE
~P17 & P19 & P9	P-ALTRQ	⇒ P-ALTCF-PD
~P17 & ~P19:		⇒ SELECTED

NOTE: L-ERRCTX provides information to the responder's environment.

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A.4 Bulk data transfer protocol machine

A.4.1 States — bulk data transfer

DXFRIDLE	Data transfer idle
READ	Read data transfer
I-READ-ENDING	Read transfer end, wait for F-TRANSFER-END request primitive from the internal file service user
READ-ENDING	Read transfer ending, wait for transfer end request PDU
I-R-XFR-ENDING	Wait for F-TRANSFER-END response primitive after READ from the internal file service user
R-XFER-ENDING	Wait Wait for transfer-end response PDU after READ
WRITE	Write data transfer
I-WRITE-ENDING	Write transfer-end, wait for F-TRANSFER-END request primitive from the internal file service user
WRITE-ENDING	Write transfer-end, wait for transfer end request PDU
I-W-XFR-ENDING	Wait for F-TRANSFER-END response primitive after WRITE from the internal file service user
W-XFER-ENDING	Wait for transfer-end response PDU after WRITE
CANCEL-PD	Cancel pending, wait for cancel response PDU
I-CANCEL-PD	Cancel pending, wait for F-CANCEL response primitive from the internal file service user
RRESTART-PD	Read restart pending, wait for restart response PDU in read operation
I-RRESTART-PD	Read restart pending, wait for F-RESTART response primitive in read operation from the internal file service user
WRESTART-PD	Write restart pending, wait for restart response PDU in write operation
I-WRESTART-PD	Write restart pending, wait for F-RESTART response primitive in write operation from the internal file service user
P-TOKEN-PD	Wait for sync-minor token
DXFRIDLE-REC	Data transfer idle during recovery
REA-SYMIN-PD	Wait for first P-SYNC-MINOR indication primitive after READ
RES-SYMIN-PD	Wait for first P-SYNC-MINOR indication primitive, restart requested
CAN-SYMIN-PD	Wait for first P-SYNC-MINOR indication primitive, cancel requested
WRT-SYMIN-PD	Wait for first P-SYNC-MINOR indication primitive after WRITE
REA-SYMCF-PD	Wait for first P-SYNC-MINOR confirm primitive after READ
RES-SYMCF-PD	Wait for first P-SYNC-MINOR confirm primitive, restart requested
CAN-SYMCF-PD	Wait for first P-SYNC-MINOR confirm primitive, cancel requested
WRT-SYMCF-PD	Wait for first P-SYNC-MINOR confirm primitive after WRITE
RESTART-CAN-PD	Restart cancel pending, wait for cancel or restart response PDU

A.4.2 Incoming events — bulk data transfer

A.4.2.1 Incoming events — PDUs

CANRP	Cancel response PDU (in user data of P-RESYNC(abandon) confirm if resync functional unit has been negotiated).	U2, U3
CANRQ	Cancel request PDU (in user data of P-RESYNC(abandon) indication if resync functional unit has been negotiated).	U2, U3
DAERQ	Data end request PDU.	U2, U3
TRERP	Transfer end response PDU.	U2, U3

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TRERQ	Transfer end request PDU.	U2, U3
RESRQ	Restart request PDU, in user data of P-RESYNC (restart) indication.	U10
RESRP	Restart response PDU, in user data of P-RESYNC (restart) confirm.	U10
REARQ	Read request PDU.	U2
WRTRQ	Write request PDU.	U3
DATIN	data value in user context (not syntactically classed as a PDU).	U2, U3

A.4.2.2 Incoming events from the internal file service user

I-CANRP	F-CANCEL response primitive.
I-CANRQ	F-CANCEL request primitive.
I-CHKRQ	F-CHECK request primitive.
I-CHKRP	F-CHECK response primitive
I-DATRQ	F-DATA request primitive.
I-DAERQ	F-DATA-END request primitive.
I-REARQ	F-READ request primitive.
I-RESRQ	F-RESTART request primitive.
I-RESRP	F-RESTART response primitive
I-TRERQ	F-TRANSFER-END request primitive.
I-TRERP	F-TRANSFER-END response primitive
I-WRTRQ	F-WRITE request primitive.

A.4.2.3 Incoming events from the presentation service provider

P-SYMIN	P-SYNC-MINOR indication primitive.
P-SYMCF	P-SYNC-MINOR confirm primitive.
P-TOKIN	P-TOKEN-GIVE indication with minor-sync. token.

A.4.3 Outgoing events — bulk data transfer

A.4.3.1 Outgoing events — PDUs

CANRP	Cancel response PDU (in user data of P-RESYNC(abandon) response if resync functional unit has been negotiated)
CANRQ	Cancel request PDU (in user data of P-RESYNC(abandon) request if resync functional unit has been negotiated)
DAERQ	Data end request PDU
TRERP	Transfer end response PDU
TRERQ	Transfer end request PDU
RESRQ	Restart request PDU, in user data of P-RESYNC(restart) request
RESRP	Restart response PDU, in user data of P-RESYNC(restart) response
REARQ	Read request PDU
WRTRQ	Write request PDU

A.4.3.2 Outgoing events to the internal file service user

I-CANCF	F-CANCEL confirm primitive
I-CANIN	F-CANCEL indication primitive
I-CHKIN	F-CHECK indication primitive

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I-CHKCF	F-CHECK confirm primitive
I-DATIN	F-DATA indication primitive
I-DAEIN	F-DATA-END indication primitive
I-REAIN	F-READ indication primitive
I-RESIN	F-RESTART indication primitive
I-RESCF	F-RESTART confirm primitive
I-TREIN	F-TRANSFER-END indication primitive
I-TRECF	F-TRANSFER-END confirm primitive
I-WRTIN	F-WRITE indication primitive

A.4.3.3 Outgoing events to the presentation service provider

P-SYMRQ	P-SYNC-MINOR request primitive
P-SYMRP	P-SYNC-MINOR response primitive
P-DATRQ	P-DATA request primitive
P-TOKRQ	P-TOKEN-GIVE request primitive with minor-synch token

A.4.3.4 Outgoing events to the local system

L-ERRABT	Local signal indicating an error leading to abort

A.4.4 Specific actions — bulk data transfer

[2] Add a PDU to the current PSDU and terminate the current PSDU.

[15] Preserve the PDU for further processing

[16] Add a PDU to the current PSDU and optionally terminate the current PSDU, according to local decision.

[17] Use for the sync point serial number, the checkpoint received plus the offset.

[18] Add the data given on the F-DATA request to the current PSDU. Optionally (depending upon local system considerations) terminate the PSDU.

[19] Use for the checkpoint, the sync point serial number received minus the offset.

[21] Unset discard indicator.

[22] Set discard indicator and set the outstanding checkpoint counter to zero.

[23] Discard any user data not yet delivered and set outstanding checkpoint counter to zero.

[24] Add 1 to the NSPN.

[25] Terminate the current PSDU.

[26] If Presentation resynchronize functional unit is available, send PDU as user data on a P-RESYNC(abandon) request or response primitive; otherwise add PDU to the current PSDU and terminate the current PSDU.

[27] Increment the checkpoint identifier expected.

[29] Increment the outstanding checkpoint counter.

[30] Decrement the outstanding checkpoint counter according to the checkpoint number confirmed (see 15.3.2).

[44] Increment the bulk data transfer number.

[45] Set the checkpoint identifier expected to the value negotiated plus one.

[46] PDU with the checkpoint identifier is sent as user data on a P-RESYNC(restart) response primitive with sync point serial number equal to those received on the P-RESYNC indication.

[47] Preserve the primitive parameters for subsequent precessing. In some states, it happens that when F-CANCEL primitive is preserved, there is already an F-RESTART primitive preserved: in this case, the F-RESTART primitive shall be discarded.

[48] Set the checkpoint identifier expected to 1.

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[49] Set the synchronization offset to the value of the NSPN minus the checkpoint identifier expected. ((In a bulk data transfer that does not involve recovery, the checkpoint identifier is zero, at this point in the protocol)

[50] PDU is sent as user data on a P-RESYNCH (restart) request, with a synchronization point serial number equal to the sum of the checkpoint identifier, on the F-RESTART primitive, and the synchronization offset plus 1.

[51] The checkpoint identifier shall be equal to the value received on the PDU.

[52] Set the NSPN equal to the synch point serial number negotiated with the presentation service provider.

[53] Store the synchronization point serial number provided by the presentation service provider as NSPN.

A.4.5 Predicates — bulk data transfer

P8: The context is not within the defined context set.

P13: The transfer service class has been negotiated and the bulk data transfer number is greater than 1.

P14: The synchronization point exceeds 999 998, exceeding the session service limitation.

P15: Discard indicator is set.

P20: The resync functional unit has been negotiated.

P21: The sync-minor functional unit has been negotiated.

P22: The entity possesses the sync-minor token.

P27: The outstanding checkpoint counter exceeds the agreed maximum.

P41: The expected checkpoint identifier equals the sync point serial number received minus the offset.

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A.4.6 Initiating state table — bulk data transfer

STATE / EVENT	DXFRIDLE	DXFRIDLE-REC	REA-SYMIN-PD	RES-SYMIN-PD	CAN-SYMIN-PD	READ	I-READ-ENDING	R-XFER-ENDING	P-TOKEN-PD	WRT-SYMCF-PD	RES-SYMCF-PD	CAN-SYMCF-PD	WRITE	I-WRITE-ENDING	W-XFER-ENDING	CANCEL-PD	I-CANCEL-PD	RRESTART-PD	WRESTART-PD	I-RRESTART-PD	I-WRESTART-PD	RESTART-CAN-PD
I-REARQ	1	35																				
I-WRTRQ	2	36																				
P-TOKIN	42								3							42						
I-DATRQ										4			4									
I-DAERQ										5			5									
DATIN						6										41		41				
DAERQ						8										41		41				
I-TRERQ							9							10								
TRERP								11							3							
I-CANRQ			31	31		12	12			34	34		12					38	38	12	12	
CANRP																13						
CANRQ						14				14			14	14	14	15		14	14	14	14	39
I-CANRP																	16					
I-CHKRQ										17			17									
P-SYMCF										32	22	12	18	37	37	41						
P-SYMIN			29	21	12	19										41						
I-CHKRP						20	20															
I-RESRQ			30			21	21			33			22									
RESRP																		23	24			40
RESRQ						25				26			26	26	26			43	44			
I-RESRP																				27	28	

A.4.7 Initiating entity state table (Part 3) — detailed entries

1:		[44],	
	~P13 & P21:	REARQ[2],P-TOKRQ,[48],[49]	⇒ REA-SYMIN-PD
	~P13 & ~P21:	REARQ[2]	⇒ READ
	P13:	L-ERRABT	⇒ *same state*
2:		[44],	
	P13:	L-ERRABT	⇒ *same state*
	~P13 & ~P21:	WRTRQ[16]	⇒ WRITE
	~P13 & P21:	WRTRQ[2],[24],	
	~P13 & P14 & P21:	L-ERRABT	⇒ *same state*
	~P13 & ~P14 & P21	P-SYMRQ,[48],[49]	⇒ WRT-SYMCF-PD
3:		I-TRECF	⇒ DXFRIDLE
4:	~P8:	P-DATRQ[18]	⇒ *same state*
	P8:	L-ERRABT	⇒ *same state*
5:		DAERQ[16]	⇒ I-WRITE-ENDING

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6:	P15:		⇒ *same state*
	~P15:	I-DATIN	⇒ *same state*
8:	P15:		⇒ *same state*
	~P15:	I-DAEIN	⇒ I-READ-ENDING
9:		TRERQ[2]	⇒ R-XFER-ENDING
10:		TRERQ[2]	⇒ W-XFER-ENDING
11:	P21:	[15]	⇒ P-TOKEN-PD
	~P21:	I-TRECF	⇒ DXFRIDLE
12:		[22],[23],CANRQ[26]	=CANCEL-PD
13:	P20:	[53], [21],I-CANCF	⇒ DXFRIDLE
14:	P20:	[53], [22],[23], I-CANIN	⇒ I-CANCEL-PD
15:	P20:	CANRP[26],[53], [21],I-CANCF	⇒ DXFRIDLE
16:	P20:	[53], CANRP[26],[21]	⇒ DXFRIDLE
17:		[25],[27],[24],	
	~P14:	P-SYMRQ	⇒ *same state*
	P14:	L-ERRABT	⇒ *same state*
18:		I-CHKCF[19]	⇒ *same state*
19:		[29],	
	~P27 & P41:	I-CHKIN,[24],[27]	⇒ *same state*
	P27 I ~P41:	L-ERRABT	⇒ *same state*
20:		[30],P-SYMRP[17]	⇒ *same state*
21:		[22],RESRQ[50]	⇒ RRESTART-PD
22:		[22],RESRQ[50]	⇒ WRESTART-PD
23:		[52],[45],[49],[21],I-RESCF	⇒ READ
24:		[52],[45],[49],[21],I-RESCF	⇒ WRITE
25:		[23],I-RESIN	⇒ I-RRESTART-PD
26:		I-RESIN	⇒ I-WRESTART-PD
27:		[52],[45],[49],RESRP[46]	⇒ READ
28:		[52],[45],[49],RESRP[46]	⇒ WRITE
29:		[24],[49],P-SYMRP	⇒ READ
30:		[47],[22]	⇒ RES-SYMIN-PD
31:		[47],[22]	⇒ CAN-SYMIN-PD
32:		[49]	⇒ WRITE

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33		[47],[22]	⇒ RES-SYMCF-PD
34:		[47],[22]	⇒ CAN-SYMCF-PD
35:		REARQ[2],P-TOKRQ,[49]	⇒ REA-SYMIN-PD
36:		WRTRQ[2],[24],	
	P14:	L-ERRABT	⇒ *same state*
	~P14:	P-SYMRQ,[49]	⇒ WRT-SYMCF-PD
37:		I-CHKCF[19]	⇒ *same state*
38:		[47]	⇒ RESTART-CAN-PD
39:	P20:	[52],	
		[21],I-CANCF,CANRP[26]	⇒ DXFRIDLE
40:		CANRQ[26]	⇒ CANCEL-PD
41:			⇒ *same state*
42:			⇒ *same state*
43:		[52],[45],[49],[21],I-RESCF,RESRP[46]	⇒ READ
44:		[52],[45],[49],[21],I-RESCF,RESRP[46]	⇒ WRITE

NOTE - The entries 38, 39, 40 are due to the Session service behaviour in the resynchronize management, in collision cases.

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A.4.8 Responding entity state table — bulk data transfer

STATE / EVENT	DXFR IDLE	DXFR IDLE-REC	P-TOKEN-PD	REA-SYMCF-PD	RES-SYMCF-PD	CAN-SYMCF-PD	READ	READ-ENDING	I-R-XFR-ENDING	WRT-SYMIN-PD	RES-SYMIN-PD	CAN-SYMIN-PD	WRITE	WRITE-ENDING	I-W-XFR-ENDING	CANCEL-PD	I-CANCEL-PD	RRESTART-PD	WRESTART-PD	I-RRESTART-PD	I-WRESTART-PD	RESTART-CAN-PD
REARQ	1	36																				
WRTRQ	2	37																				
P-TOKIN			3																			
I-DATRQ				4			4															
I-DAERQ				5			5															
DATIN													6			42			42			
DAERQ													8			42			42			
TRERQ								9						10		42			42			
I-TRERP									11						43							
I-CANRQ				30	30		12			33	33		12	12	12			39	39	12	12	
CANRP																13						
CANRQ				14	14		14	14					14			44		14	14	14	14	40
I-CANRP																	15					
I-CHKRQ				16			16															
P-SYMCF				28	20	12	18	38								42						
P-SYMIN										31	34	35	17			42						
I-CHKRP													19	19								
I-RESRQ				29			20			32			21	21	21							
RESRP																		22	23			41
RESRQ				24			24	24	24				25					45	46			
I-RESRP																				26	27	

A.4.9 Responding entity state table (Part 3) — detailed entries

1: [44],
- ~P13 & P21: [15],[48],[49] ⇒ P-TOKEN-PD
- ~P13 & ~P21: I-REAIN ⇒ READ
- P13: L-ERRABT ⇒ *same state*

2: [44],
- ~P13 & P21: I-WRTIN,[48],[49] ⇒ WRT-SYMIN-PD
- ~P13 & ~P21: I-WRTIN ⇒ WRITE
- P13: L-ERRABT ⇒ *same state*

3: I-REAIN,[24],
- ~P14: P-SYMRQ ⇒ READ-SYMCF-PD
- P14: L-ERRABT ⇒ *same state*

4:
- ~P8: P-DATRQ[18] ⇒ *same state*
- P8: L-ERRABT ⇒ *same state*

5: DAERQ[2] ⇒ READ-ENDING

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6:	P15:		⇒ *same state*
	~P15:	I-DATIN	⇒ *same state*
8:	P15:		⇒ *same state*
	~P15:	I-DAEIN	⇒ WRITE-ENDING
9:	P15:		⇒ *same state*
	~P15:	I-TREIN	⇒ I-R-XFR-ENDING
10:	P15:		⇒ *same state*
	~P15:	I-TREIN	⇒ I-W-XFR-ENDING
11:	P21:	TRERP[2],P-TOKRQ	⇒ DXFRIDLE
	~P21:	TRERP[2]	⇒ DXFRIDLE
12:		[22],[23],CANRQ[26]	⇒ CANCEL-PD
13:	P21 & P22 & ~P20:	P-TOKRQ,	
	P20:	[53],	
		[21],I-CANCF	⇒ DXFRIDLE
14:	P20:	[53],	
		[22],[23],I-CANIN	⇒ I-CANCEL-PD
15:	P21 & P22 & ~P20:	P-TOKRQ,	
	P20:	[53],	
		CANRP[26],[21]	⇒ DXFRIDLE
16:		[25],[27],[24]	
	~P14:	P-SYMRQ	⇒ *same state*
	P14:	L-ERRABT	⇒ *same state*
17:		[29],	
	~P27 & P41:	I-CHKIN,[24],[27]	⇒ *same state*
	P27 ! ~P41:	L-ERRABT	⇒ *same state*
18:		I-CHKCF[19]	⇒ *same state*
19:		[30],P-SYMRP[17]	⇒ *same state*
20:		[22],RESRQ[50]	⇒ RRESTART-PD
21:		[22],RESRQ[50]	⇒ WRESTART-PD
22:		[52],[45],[49],[21],I-RESCF	⇒ READ
23:		[52],[45],[49],[21],I-RESCF	⇒ WRITE
24:		I-RESIN	⇒ I-RRESTART-PD
25:		[23],I-RESIN	⇒ I-WRESTART-PD
26:		[52],[45],[49],RESRP[46]	⇒ READ
27:		[52],[45],[49],RESRP[46]	⇒ WRITE
28:		[49]	⇒ READ
29:		[22],[47]	⇒ RES-SYMCF-PD
30:		[22],[47]	⇒ CAN-SYMCF-PD

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31:		[24],[49],P-SYMRP	⇒ WRITE
32:		[22],[47]	⇒ RES-SYMIN-PD
33:		[22],[47]	⇒ CAN-SYMIN-PD
34:		[24],P-SYMRP,[22],RESRQ[50]	⇒ WRESTART-PD
35:		[24],P-SYMRP,[22],CANRQ[26]	⇒ CANCEL-PD
36:		[15],[49]	⇒ P-TOKEN-PD
37:		I-WRTIN,[49]	⇒ WRT-SYMIN-PD
38:		I-CHKCF[19]	⇒ *same state*
39:		[22],[47]	⇒ RESTART-CAN-PD
40:	P21 & P22 & ~P20: P20:	P-TOKRQ, [53], [21],I-CANCF,CANRP[26]	⇒ DXFRIDLE
41:		CANRQ[26]	⇒ CANCEL-PD
42:			⇒ *same state*
43:		TRERP[2]	⇒ DXFRIDLE
44:	P21 & P22&~P20: P20:	P-TOKRQ, [53],CANRP[26], [21],I-CANCF	⇒ DXFRIDLE
45:		[52],[45],[49],[21],I-RESCF[51],RESRP[46]	⇒ READ
46:		[52],[45],[49],[21],I-RESCF,RESRP[46]	⇒ WRITE

NOTE - The entries 14, 39, 40, 41, 45, and 46 are due to the Session service behaviour in the resynchronize management, in collision cases.

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A.5 File error recovery protocol machine (FERPM)

Note - The description of the file error recovery protocol machine given here omits the description of grouping, which does not materially affect the recovery behaviour. The transitions for the grouped cases can be derived from those in the basic protocol machine.

A.5.1 States — file error recovery

INIT-PD	Initialize pending, wait for an I-INICF event as an F-INITIALIZE confirm primitive from the IFS.
PASSIVE	The basic file protocol is currently in operation but no transfer of file contents is in progress. It is used when the FERPM becomes inactive in normal error free activity, or when it cannot provide its services any more after issuing an L-ERRABT signal.
XFER-IDLE	Data transfer idle.
XFER	Normal transfer of file contents has been established.
RESTART-PD	Restart pending, wait for an I-RESCF event as an F-RESTART confirm primitive from the IFS.
RESTART	A restart of a data transfer is in progress. A checkpoint identifier has been negotiated, and data following that checkpoint, but prior to the error, is being retransmitted.
CANCEL-PD	Cancel pending, wait for an I-CANCF event as an F-CANCEL confirm primitive from the IFS.
CLOSE-EX	Close expected, wait for an I-CLOIN event as an F-CLOSE indication primitive from the IFS.
DESELECT-EX	Deselect expected, wait for an I-DESIN event as an F-DESELECT indication primitive from the IFS.
RECOVER-PD	Recover pending, wait for an I-RECCF event as an F-RECOVER confirm primitive from the IFS.
SEL-PD	SELECT pending, wait for an I-SELCF event as an F-SELECT confirm primitive from the IFS.
OPN-PD	OPEN pending, wait for an I-OPNCF event as an F-OPEN confirm primitive form the IFS.
SEL-EX	SELECT expected, wait for an I-SELIN event as an F-SELECT indication primitive from the IFS.
OPN-EX	OPEN expected, wait for an I-OPNIN event as an F-OPEN indication primitive form the IFS.
XFER-EX	Data transfer expected, wait for an I-REAIN/I-WRTIN as an F-READ/F-WRITE indication primitive from the IFS.
INIT-EX	Initiation expected, wait for an I-ININ event as an F-INITIALIZE indication primitive from the IFS.
CLOSE-PD	Close pending, wait for an I-CLOCF event as an F-CLOSE confirm primitive from the IFS.
DESELECT-PD	Deselect pending, wait for an I-DESCF event as an F-DESELECT confirm primitive from the IFS.

A.5.2 Incoming events — file error recovery

A.5.2.1 Incoming events from the external file service user

F-OPNRQ	F-OPEN request primitive
F-CLORQ	F-CLOSE request primitive
F-REARQ	F-READ request primitive
F-WRTRQ	F-WRITE request primitive
F-DATRQ	F-DATA request primitive
F-DAERQ	F-DATA-END request primitive
F-TRERQ	F-TRANSFER-END request primitive
F-ANYRQ	F-INITIALIZE, F-READ-ATTRIBUTE, F-CHANGE-ATTRIBUTE, F-SELECT, F-CREATE, F-DESELECT, F-LOCATE, F-ERASE, F-BEGIN-GROUP, F-END-GROUP, F-TERMINATE and F-U-ABORT request primitives
F-OPNRP	F-OPEN response primitive
F-CLORP	F-CLOSE response primitive

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F-TRERP	F-TRASNSFER-END response primitive
F-ANYRP	F-INITIALIZE, F-READ-ATTRIBUTE, F-CHANGE-ATTRIBUTE, F-SELECT, F-CREATE, F-DESELECT, F-LOCATE, F-ERASE, F-BEGIN-GROUP, F-TERMINATE, and F-END-GROUP response primitives
F-CANRQ	F-CANCEL request primitive
F-CANRP	F-CANCEL response primitive

A.5.2.2 Incoming events from the internal file service

I-INICF	F-INITIALIZE confirm primitive
I-OPNCF	F-OPEN confirm primitive
I-CLOCF	F-CLOSE confirm primitive
I-DATIN	F-DATA indication primitive
I-DAEIN	F-DATA-END indication primitive
I-CHKIN	F-CHECK indication primitive
I-CHKCF	F-CHECK confirm primitive
I-TRECF	F-TRANSFER-END confirm primitive
I-ANYCF	F-INITIALIZE, F-READ-ATTRIBUTE, F-CHANGE-ATTRIBUTE, F-SELECT, F-CREATE, F-DELESELECT, F-LOCATE, F-ERASE, F-BEGIN-GROUP, F-TERMINATE, and F-END-GROUP confirm primitive
I-SELCF	F-SELECT confirm primitive
I-DESCF	F-DESELECT confirm primitive
I-INIIN	F-INITIALIZE indication primitive
I-SELIN	F-SELECT indication primitive
I-DESIN	F-DESELECT indication primitive
I-OPNIN	F-OPEN indication primitive
I-CLOIN	F-CLOSE indication primitive
I-TREIN	F-TRANSFER-END indication primitive
I-CANIN	F-CANCEL indication primitive
I-CANCF	F-CANCEL confirm primitive
I-PABIN	F-P-ABORT indication primitive
I-RECCF	F-RECOVER confirm primitive
I-RESCF	F-RESTART confirm primitive
I-RECIN	F-RECOVER indication primitive
I-RESIN	F-RESTART indication primitive
I-ANYIN	F-INITIALIZE, F-READ-ATTRIBUTE, F-CHANGE-ATTRIBUTE, F-SELECT, F-CREATE, F-DESELECT, F-LOCATE, F-ERASE, F-BEGIN-GROUP, F-END-GROUP, F-TERMINATE, F-U-ABORT and F-P-ABORT indication primitives
I-REAIN	F-READ indication primitive
I-WRTIN	F-WRITE indication primitive

A.5.2.3 Incoming events from the Local System Environment

L-ERROR1	Class I error (as defined in 18.1)
L-ERROR2	Class II error (as defined in 18.1)
L-ERROR3	Class III error (as defined in 18.1)
L-GIVEUP	Signal to give up recovery process

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L-DATRQ	Reissued F-DATA request primitive
L-CHKRQ	Reissued F-CHECK request primitive
L-DAERQ	Reissued F-DATA-END request primitive
L-EORIN	Indicates that all checkpoint identifiers and "data end" markers in the docket have been used, and all data to be resent have been sent.
L-HOLD	Signal to the FERPM to hold any primitive from the external user for later processing
L-UNHOLD	Signal to FERPM to process any previous held primitives

A.5.3 Outgoing events — file error recovery

A.5.3.1 Outgoing events to the external file service user

F-OPNCF	F-OPEN confirm primitive
F-ANYCF	F-INITIALIZE, F-READ-ATTRIBUTE, F-CHANGE-ATTRIBUTE, F-SELECT, F-CREATE, F-DESELECT, F-LOCATE, F-ERASE, F-TERMINATE, F-BEGIN-GROUP and F-END-GROUP confirm primitives
F-CLOCF	F-CLOSE confirm primitive
F-DATIN	F-DATA indication primitive
F-DAEIN	F-DATA-END indication primitive
F-TRECF	F-TRANSFER-END confirm primitive
F-OPNIN	F-OPEN indication primitive
F-WRTIN	F-WRITE indication primitive
F-CLOIN	F-CLOSE indication primitive
F-REAIN	F-READ indication primitive
F-TREIN	F-TREANSFER-END indication primitive
F-ANYIN	F-INITIALIZE, F-READ-ATTRIBUTE, F-CHANGE-ATTRIBUTE, F-SELECT, F-CREATE, F-DESELECT, F-LOCATE, F-ERASE, F-TERMINATE, F-BEGIN-GROUP, F-END-GROUP, F-U-ABORT and F-P-ABORT indication primitives
F-PABIN	F-P-ABORT indication primitive
F-CANIN	F-CANCEL indication primitive
F-CANCF	F-CANCEL confirm primitive

A.5.3.2 Outgoing events to the internal file service

I-SELRQ	F-SELECT request primitive
I-OPNRQ	F-OPEN request primitive
I-CLORQ	F-CLOSE request primitive
I-DATRQ	F-DATA request primitive
I-DAERQ	F-DATA-END request primitive
I-CHKRQ	F-CHECK request primitive
I-TRERQ	F-TRANSFER-END request primitive
I-REARQ	F-READ request primitive
I-WRTRQ	F-WRITE request primitive
I-ANYRQ	F-INITIALIZE, F-READ-ATTRIBUTE, F-CHANGE-ATTRIBUTE, F-SELECT, F-CREATE, F-DESELECT, F-LOCATE, F-ERASE, F-TERMINATE, F-BEGIN-GROUP, F-END-GROUP and F-U-ABORT request primitives
I-INIRP	F-INITIALIZE response primitive
I-OPNRP	F-OPEN response primitive

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I-SELRP	F-SELECT response primitive
I-CLORP	F-CLOSE response primitive
I-TRERP	F-TRANSFER-END response primitive
I-ANYRP	F-INITIALIZE, F-READ-ATTRIBUTE, F-CHANGE-ATTRIBUTE, F-SELECT, F-CREATE, F-DESELECT, F-LOCATE, F-ERASE, F-TERMINATE, F-BEGIN-GROUP and F-END-GROUP response primitives
I-CHKRP	F-CHECK response primitive
I-RESRQ	F-RESTART request primitive
I-RESRP	F-RESTART response primitive
I-CANRQ	F-CANCEL request primitive
I-CANRP	F-CANCEL response primitive
I-DESRQ	F-DESELECT request primitive
I-RECRQ	F-RECOVER request primitive
I-INIRQ	F-INITIALIZE request primitive
I-RECRP	F-RECOVER response primitive
I-DESRP	F-DESELECT response primitive

A.5.3.3 Outgoing events to the local system environment

L-ERROR2	Signal indicating class II error
L-ERROR3	Signal indicating class III error
L-RESEND	Resend data request to the local system
L-STPSND	Stop resending data and checkpoint requests to the local system
L-SUSPND	Suspend issuing of F-DATRQ, F-DAERQ by the local system
L-RESUME	Resume issuing of F-DATRQ, F-DAERQ by the local system
L-ERRABT	Signal FPM to issue an F-P-ABORT request PDU, with permanent error value.
L-PABORT	Signal FPM to issue a F-P-ABORT request PDU, and a F-P-ABORT indication primitive to the FERPM, both with transient error value.
L-HOLD	Hold primitives from external user
L-UNHOLD	Process any held primitives

A.5.4 Specific actions — file error recovery

[54] Mark the checkpoint identifiers to be reissued.

[55] Delete the docket.

[56] Set the activity state indicator to "finished".

[57] Set the activity state indicator to "in-progress".

[58] Set the activity type indicator to "read".

[59] Set the activity type indicator to "write".

[60] Add the checkpoint identifier to the list in the docket. Increment the count of outstanding checkpoints by one.

[61] Delete from the docket all checkpoint identifiers smaller than the parameter in the primitive received or issued. Decrement the count of outstanding checkpoints by the number of the deleted identifiers.

[63] Set the activity state indicator to "starting".

[64] Set the activity state indicator to "data transfer finished".

[66] Use the last checkpoint identifier in the docket as the parameter.

[67] Increment the checkpoint identifier count.

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[68] Set the checkpoint identifier count to zero.

[69] Record the bulk data transfer number in the docket (the number is maintained by the FPM).

[70] Record which data values have been already delivered to the user.

[71] Use as the parameter the checkpoint identifier available in the docket that is both

a) after the checkpoint identifier negotiated, and
b) not yet reissued during this restart of the BDT.

[72] Use as parameter the checkpoint identifier.

[73] Use as the parameter the oldest (first) checkpoint identifier in the list in the docket.

[74] Use as the parameter the checkpoint identifier of the primitive received.

[75] Use as the diagnostics parameter "activity identifier unknown".

[76] Record which data values have been sent.

[77] Create a docket and record in it the activity identifier, the information needed to issue or check an I-INIRQ (including the locations of the initiator and responder), the recovery mode, the access context, the presentation context, a null checkpoint list and set the activity state indicator to "starting".

[78] The issuer of the I-RESRQ or I-RECRQ primitive identifies a checkpoint identifier which is

a) for the sender, the last point acknowledged,
b) for the receiver, the last point received and secured.

[79] The issuer of the I-RESRP primitive identifies a checkpoint identifier which is

c) for the sender, equal to the value provided by the issuer of the request, and
d) for the receiver, the last point received and secured.

[200] Wait for $2^{\text{Recommended retry time}}$ seconds.

[201] Include a state result indicating failure.

[202] Use the data value specified by the L-DATRQ signal, representing previous F-DATA request primitives, as the parameter.

[203] Use as the parameter the checkpoint identifier negotiated.

[204] Store "data end" marker in the docket.

[206] Delete "data end" marker in the docket.

[207] Include an action result indicating transient error.

[209] Recreate select and open regimes.

[210] Include a action result indicating failure on next response with diagnostic of damage to open/select regime.

[211] Include a diagnostic of damage to open/select regime.

[212] Use as the parameter the bulk data transfer number recorded in the docket.

[213] Store "transfer end" marker (reflecting information on the PDU) in the docket.

[214] Delete "transfer end" marker from docket.

[215] Clear activity type indicator.

[216] Clear the activity state indicator.

A.5.5 Predicates — file error recovery

P23: The incoming response or confirm primitive has a state result indicating success.

P24: There are checkpoints that must be confirmed.

P26: An F-DATA indication primitive corresponding to the incoming I-DATIN has already been issued to the user.

P28: The data value available is after the negotiated checkpoint.

P29: The activity state indicator is set to "in-progress" and the activity type indicator to "read".

P30: The activity state indicator is set to "in-progress" and the activity type indicator to "write".

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P31: The activity type indicator is set to "read".

P32: The activity type indicator is set to "write".

P33: The activity state indicator is set to "starting".

P34: The activity state indicator is set to "finished".

P37: A checkpoint identifier is to be inserted in the data stream.

P39: The entity has the docket for the activity identifier recovered, the current initiator matches the location, and the activity can be resumed.

P40: The entity is sender of data.

P99: The transfer service class has been negotiated.

P100: The recommended retry time field is present on the diagnostic parameter.

P101: The specified recovery is possible and is required.

P102: The specified association is possible.

P103: The incoming request or indication primitive has an action result indicating transient error.

P104: The "transfer end" marker is stored in the docket.

P105: The activity state indicator is set to "data transfer finished".

P106: The "data end" marker is stored in the docket.

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A.5.6 Initiating entity state table — FERPM — (normal procedure)

STATE / EVENT	PASSIVE	XFER-IDLE	XFER
F-OPNRQ	1		
I-OPNCF	2		
F-ANYRQ	3	3	
I-ANYCF	4	4	
F-CLORQ		5	
I-CLOCF		6	
F-REARQ		7	
F-WRTRQ		8	
F-DATRQ			9
I-DATIN			10
I-CHKCF			11
I-CHKIN			12
F-DAERQ			13
I-DAEIN			14
F-TRERQ			15
I-TRECF			16
F-CANRQ			17
I-CANCF			18
I-CANIN			19
F-CANRP			20

A.5.7 Initiating entity state table — FERPM — detailed entries (normal procedure)

1:		[77],I-OPNRQ	⇒ *same state*
2:	P23:	F-OPNCF	⇒ XFER-IDLE
	~P23:	[55],F-OPNCF[201]	⇒ *same state*
3:		I-ANYRQ	⇒ *same state*
4:		F-ANYCF	⇒ *same state*
5:		[56],I-CLORQ	⇒ *same state*
6:		[55],F-CLOCF	⇒ PASSIVE
7:		[57],[58],[68],I-REARQ,[69]	⇒ XFER
8:		[57],[59],[68],I-WRTRQ,[69]	⇒ XFER
9:	P37:	[67],[60],I-CHKRQ[72], [76],I-DATRQ	⇒ *same state*
10:		[70],F-DATIN	⇒ *same state*
11:		[61]	⇒ *same state*

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12:	P24:	[60], I-CHKRP,[61],	⇒ *same state*
13:		[204],I-DAERQ	⇒ *same state*
14:	P24:	I-CHKRP[66],[61], [204],F-DAEIN	⇒ *same state*
15:	P29:	[64], [213],I-TRERQ	⇒ *same state*
16:	~P99: P99:	[63], [64], [215],[206],[214],F-TRECF	⇒ XFER-IDLE
17:		I-CANRQ	⇒ *same state*
18:		[215],[216],[206],[214],F-CANCF	⇒ XFER-IDLE
19:		F-CANIN	⇒ *same state*
20:		[215],[216],[206],[214],I-CANRP	⇒ XFER-IDLE

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A.5.8 Responding entity state table — FERPM — (normal procedure)

STATE / EVENT	PASSIVE	XFER-IDLE	XFER
I-OPNIN	1		
F-OPNRP	2		
F-ANYRP	3	3	
I-ANYIN	4	4	
I-CLOIN		5	
F-CLORP		6	
I-REAIN		7	
I-WRTIN		8	
F-DATRQ			9
I-DATIN			10
I-CHKCF			11
I-CHKIN			12
F-DAERQ			13
I-DAEIN			14
I-TREIN			15
F-TRERP			16
F-CANRQ			17
I-CANCF			18
I-CANIN			19
F-CANRP			20

A.5.9 Responding entity state table — FERPM — detailed entries (normal procedure)

1:		[77],F-OPNIN	⇒ *same state*
2:	P23:	I-OPNRP	⇒ XFER-IDLE
	~P23:	[55],I-OPNRP[201]	⇒ *same state*
3:		I-ANYRP	⇒ *same state*
4:		F-ANYIN	⇒ *same state*
5:	~P103:	[56],F-CLOIN	⇒ *same state*
6:		[55],I-CLORP	⇒ PASSIVE
7:		[57],[58],[68],F-REAIN,[69]	⇒ XFER
8:		[57],[59],[68],F-WRTIN,[69]	⇒ XFER
9:	P37:	[67],[60],I-CHKRQ[72], [76],I-DATRQ	⇒ *same state*
10:		[70],F-DATIN	⇒ *same state*
11:		[61]	⇒ *same state*

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12:	P24:	[60], I-CHKRP,[61],	⇒ *same state*
13:		[204],I-DAERQ	⇒ *same state*
14:	P24:	I-CHKRP[66],[61], [204],F-DAEIN	⇒ *same state*
15:	P29:	[64], [213],F-TREIN	⇒ *same state*
16:	~P99: P99:	[63], [64], [215],[214],[206],I-TRERP	⇒ XFER-IDLE
17:		I-CANRQ	⇒ *same state*
18:		[215],[216],[206],[214],F-CANCF	⇒ XFER-IDLE
19:		F-CANIN	⇒ *same state*
20:		[215],[216],[206],[214],I-CANRP	⇒ XFER-IDLE

Note - The condition "P103" in entry 6 is handled in A.5.17 (in entry 16).

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A.5.10 Initiating entity state table — FERPM — (class I errors)

STATE / EVENT	XFER	RESTART-PD	RESTART
L-ERROR1	1		1
I-RESCF		2	
I-RESIN	3		
I-DATIN			4
I-CHKCF			6
I-DAEIN			7
L-DATRQ			9
L-CHKRQ			10
L-DAERQ			11
L-EORIN			12
I-CANIN		13	13
I-CANCF		14	14
F-CANRQ		15	15
F-CANRP		16	16

A.5.11 Initiating entity state table — FERPM — detailed entries (class I errors)

1:	P101 & P40:	L-SUSPND,I-RESRQ[78]	⇒ RESTART-PD
	P101 & ~P40:	I-RESRQ[78]	⇒ RESTART-PD
	~P101:	L-ERROR2	⇒ XFER
2:	~P40:	[61]	⇒ RESTART
	P40:	[54],[61],L-RESEND[74]	⇒ RESTART
3:	~P40:	I-RESRP[79]	⇒ RESTART
	P40:	L-SUSPND,[54],[61],I-RESRP[79],L-RESEND[203]	⇒ RESTART
4:	P26:		⇒ *same state*
	~P26:	F-DATIN	⇒ XFER
6:		[61]	⇒ *same state*
7:	P24:	I-CHKRP[66],[61],	
	~P106:	F-DAEIN	⇒ XFER
	P106 & ~P104:	L-UNHOLD	⇒ XFER
	P106 & P104:	L-UNHOLD, I-TRERQ	⇒ XFER
9:	P28:	I-DATRQ[202]	⇒ *same state*
	~P28:		⇒ *same state*
10:		I-CHKRQ[71]	⇒ *same state*
11:		I-DAERQ, L-UNHOLD	⇒ *same state*
12:	~P104:	L-RESUME	⇒ XFER
	P104:	I-TRERQ, L-RESUME	⇒ XFER

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13:	~P103&~P40:	F-CANIN	⇒ *same state*
	~P103&P40:	L-STPSND,FCANIN	⇒ *same state*
14:	~P103:	[215],[216],[206],[214],F-CANCF	⇒ XFER-IDLE
15:	~P40:	I-CANRQ	⇒ *same state*
	P40:	L-STPSND,I-CANRQ	⇒ *same state*
16:		[215],[216],[206],[214],I-CANRP	⇒ XFER-IDLE

NOTE: The conditin P103 in entries 13 and 14 is handled in entries 2 and 3 of A.5.14.

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A.5.12 Responding entity state table — FERPM — (class I errors)

STATE / EVENT	XFER	RESTART-PD	RESTART
L-ERROR1	1		1
I-RESCF		2	
I-RESIN	3		
I-DATIN			4
I-CHKCF			6
I-DAEIN			7
L-DATRQ			9
L-CHKRQ			10
L-DAERQ			11
L-EORIN			12
I-TREIN			13
I-CANIN		14	14
I-CANCF		15	15
F-CANRQ		16	16
F-CANRP		17	17

A.5.13 Responding entity state table — FERPM — detailed entries (class I errors)

1:	P101 & P40:	L-SUSPND,I-RESRQ[78]	⇒ RESTART-PD
	P101 & ~P40:	I-RESRQ[78]	⇒ RESTART-PD
	~P101:	L-ERROR2	⇒ XFER
2:	~P40:	[61]	⇒ RESTART
	P40:	[54],[61],L-RESEND[74]	⇒ RESTART
3:	~P40:	I-RESRP[79]	⇒ RESTART
	P40:	L-SUSPND,[54],[61],I-RESRP[79],L-RESEND[203]	⇒ RESTART
4:	P26:		⇒ *same state*
	~P26:	F-DATIN	⇒ XFER
6:		[61]	⇒ *same state*
7:	P24:	I-CHKRP[66],[61],	
	~P106:	F-DAEIN	⇒ XFER
	P106 & P104:		⇒ *same state*
	P106 & ~P104:		⇒ XFER
9:	P28:	I-DATRQ[202]	⇒ *same state*
	~P28:		⇒ *same state*
10:		I-CHKRQ[71]	⇒ *same state*
11:		I-DAERQ[206]	⇒ *same state*

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12:	~P104:	L-RESUME	⇒ XFER
	P104:	L-RESUME	⇒ *same state*
13:		L-UNHOLD	⇒ XFER
14:	~P103&~P40:	F-CANIN	⇒ *same state*
	~P103&P40:	L-STPSND,FCANIN	⇒ *same state*
15:	~P103:	[215],[216],[206],[214],F-CANCF	⇒ XFER-IDLE
16:	~P40:	I-CANRQ	⇒ *same state*
	P40:	L-STPSND,I-CANRQ	⇒ *same state*
17:		[215],[216],[206],[214],I-CANRP	⇒ XFER-IDLE

NOTE: The conditin P103 in entries 13 and 14 is handled in entries 2 and 3 of A.5.16.

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A.5.14 Initiating entity state table — FERPM — detailed entries — (class II and III errors)

STATE / EVENT	XFER	RESTART-PD	RESTART	CANCEL-PD	CLOSE-PD	DESELECT-PD	RECOVER-PD	INIT-PD	PASSIVE	SEL-PD	OPN-PD	XFER-IDLE
L-ERROR2	1	1	1									11
I-CANIN	2	2	2									
I-CANCF				3								
I-CLOCF					4							
I-DESCF						5						
I-RECCF							6					
L-ERROR3	7	7	7	7	7	7	7		7	7	7	7
I-PABIN	12	12	12	12	12	12	12		12	12	12	12
I-SELCF										9		
I-OPNCF											10	
I-INICF								8				

A.5.15 Initiating entity state table — FERPM — detailed entries (class II and III errors)

1:	~P101 & P104:	L-ERROR3	⇒ *same state*
	~P101:	[55],L-ERRABT	⇒ PASSIVE
	P101 & ~P40 & ~P106:	I-CANRQ[207]	⇒ CANCEL-PD
	P101 & P40:	L-SUSPND,I-CANRQ[207]	⇒ CANCEL-PD
	P101 & ~P40 & P106:	I-CANRQ[207],L-HOLD	⇒ CANCEL-PD
2:	P103 & ~P40:	I-CANRP,I-CLORQ	⇒ CLOSE-PD
	P103 & P40:	L-SUSPND,I-CANRP,I-CLORQ	⇒ CLOSE-PD
3:		I-CLORQ	⇒ CLOSE-PD
4:		I-DESRQ	⇒ DESELECT-PD
5:		I-RECRQ[212][78]	⇒ RECOVER-PD
6:	P23 & (P29 I P31) & ~(P30 I P32):	[209],I-REARQ	⇒ RESTART
	P23 & (P30 I P32) & ~(P29 I P31):	[209],I-WRTRQ,L-RESEND[74]	⇒ RESTART
	~P23 & ~P33 & P34:	[55],F-CLOCF[211],L-ERRABT	⇒ PASSIVE
	~P23 & P33 & ~P34:	L-HOLD,I-SELRQ	⇒ SEL-PD
	~P23 & P101 & ~(P34 I P33) & (P29 I P30 I P31 I P32):	I-RECRQ[212][78]	⇒ *same state*
	~P23 & ~P101 & ~(P34 I P33 I P105) & (P29 I P30 I P31 I P32):	[55],L-ERRABT	⇒ PASSIVE
	~P23 & ~P33 & ~P34 & P105 & P99:	[55],F-TRECF[211],L-ERRABT	⇒ PASSIVE
	~P23 & ~P33 & ~P34 & P105 & ~P99:	F-TRECF,I-SELRQ,[215],[206],[214]	⇒ SEL-PD
7:	P106:	L-HOLD,	
	P40:	L-SUSPND,	
	P100 & P101:	L-PABORT,[200],I-INIRQ	⇒ INIT-PD
	~P100 & P101:	L-PABORT,I-INIRQ	⇒ INIT-PD
	~P101:	[55],L-ERRABT	⇒ PASSIVE

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8:	P23 & ~P31 & P32:	I-RECRQ[73][212]	⇒ RECOVER-PD
	P23 & P31 & ~P32:	I-RECRQ[66][212]	⇒ RECOVER-PD
	~P23 & P102:	[200],I-INIRQ	⇒ *same state*
	~P23 & ~P102:	[55],L-ERRABT	⇒ PASSIVE
9:	P23:	I-OPNRQ	⇒ OPN-PD
	~P23:	[55],L-ERRABT	⇒ PASSIVE
10:	P23:	L-UNHOLD	⇒ XFER-IDLE
	~P23:	[55],L-ERRABT	⇒ PASSIVE
11:	~P101:	[55],L-ERRABT	⇒ PASSIVE
	P101:	L-HOLD,I-CLORQ[211]	⇒ CLOSE-PD
12:	P106:	L-HOLD,	
	P40 & P103 & P100 & P101:	L-SUSPND,[200],I-INIRQ	⇒ INIT-PD
	~P40 & P103 & P100 & P101:	[200],I-INIRQ	⇒ INIT-PD
	P40 & P103 & ~P100 & P101:	L-SUSPND,I-INIRQ	⇒ INIT-PD
	~P40 & P103 & ~P100 & P101:	I-INIRQ	⇒ INIT-PD
	~P103 I ~P101:	[55],F-PABIN	⇒ PASSIVE

NOTES

1 To avoid recovery procedures that never terminate the action in entry 6 by the condition P101 or ~P101 effectively allowing the local system to determine the number of times a recovery from any one error will be attempted.

2 The condition P101 in entries 12 and 7 includes the test when FQOS is zero but the FERPM is not null.

3 The condition ~P103 in entry 2 implies that this event is not relevant to the FERPM and that normal actions take over.

4 The predicates which model the activity state indicator are mutually exclusive, so that combinations of them cannot occur. These combinations are not included in the state table entries.

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A.5.16 Responding entity state table — FERPM — (class II and III errors)

STATE / EVENT	XFER	RESTART-PD	RESTART	CANCEL-PD	CLOSE-EX	DESELECT-EX	PASSIVE	XFER-EX	INIT-EX	SEL-EX	OPN-EX	XFER-IDLE
L-ERROR2	1	1	1				14					
I-CANIN	2	2	2									
I-CANCF				3								
I-CLOIN					4							16
I-DESIN						5						
I-RECIN							6					
L-ERROR3	7	7	7	7	7	7	7	7		7	7	7
I-PABIN	17	17	17	17	17	17	17	17		17	17	17
L-GIVEUP							12					
I-INIIN									8			
I-REAIN								13				
I-WRTIN								9				
I-SELIN										10		
I-OPNIN											11	

A.5.17 Responding entity state table — FERPM — detailed entries (class II and III errors)

1:	~P101 & P104:	L-ERROR3	⇒ *same state*
	~P101:	[55],L-ERRABT	⇒ PASSIVE
	P101 & P40:	L-SUSPND,I-CANRQ[207]	⇒ CANCEL-PD
	P101 & ~P40 & ~P104:	I-CANRQ[207]	⇒ CANCEL-PD
	P101 & ~P40 & P104:	I-CANRQ[207],L-HOLD	⇒ CANCEL-PD
2:	P103 & P40:	L-SUSPND,I-CANRP	⇒ CLOSE-EX
	P103 & ~P40:	I-CANRP	⇒ CLOSE-EX
3:			⇒ CLOSE-EX
4:		I-CLORP	⇒ DESELECT-EX
5:		I-DESRP	⇒ PASSIVE
6:	P101 & P31 & ~P32 & ~P33 & P39:	[209],I-RECRP[74]	⇒ XFER-EX
	P101 & ~P31 & P32 & ~P33 & P39:	[209],I-RECRP[66]	⇒ XFER-EX
	P101 & ~P31 & ~P32 & P33 & P39:	I-RECRP[201]	⇒ SEL-EX
	P101 & ~P31 & ~P32 & ~P33 & P39:	I-RECRP[201]	⇒ *same state*
	P101 & ~P39:	I-RECRP[75][201]	⇒ *same state*
	~P101:	I-RECRP[201]	⇒ *same state*
7:	P104:	L-HOLD,	
	P101 & ~P40:	L-PABORT	⇒ INIT-EX
	P101 & P40:	L-PABORT,L-SUSPND	⇒ INIT-EX
	~P101:	[55],L-ERRABT	⇒ PASSIVE

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8:	P102:	I-INIRP	⇒ PASSIVE
	~P102:	I-INIRP[201]	⇒ PASSIVE
9:	P30:		⇒ RESTART
	~P30:	[55],L-ERRABT	⇒ PASSIVE
10:		L-SELRP	⇒ OPN-EX
11:		L-UNHOLD,I-OPNRP	⇒ XFER-IDLE
12:		[55],L-ERRABT	⇒ *same state*
13:	P29:	L-RESEND[203]	⇒ RESTART
	~P29:	[55],L-ERRABT	⇒ PASSIVE
14:	P101:	[210],L-HOLD	⇒ *same state*
	~P101:	[55],L-ERRABT	⇒ *same state*
16:	P103	I-CLORP,L-HOLD	⇒ DESELECT-EX
17:	P104:	L-HOLD,	
	P103 & P101 & P40:	L-SUSPND	⇒ INIT-EX
	P103 & P101 & ~P40:		⇒ INIT-EX
	~P103 | ~P101:	[55],F-PABIN	⇒ PASSIVE

NOTES

1 The condition P101 in entries 7 and 17 includes the test when FQOS is zero but the FERPM is not null.

2 The condition ~P103 in entries 2 and 16 implies that this event is not relevant to the FERPM and that normal actions take over.

3 The predicates which model the activity state indicator are mutually exclusive, so that combinations of them cannot occur. These combinations are not included in the state table entries.

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INTERNATIONAL STANDARD

ISO 8571-4
First edition
1988-10-01

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION
ORGANISATION INTERNATIONALE DE NORMALISATION
МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ

Information processing systems — Open Systems Interconnection — File Transfer, Access and Management —

Part 4 :
File Protocol Specification

Systèmes de traitement de l'information — Interconnexion de systèmes ouverts — Gestion, accès et transfert de fichier —

Partie 4 : Spécification du protocole de transfert de fichier

Reference number
ISO 8571-4 : 1988 (E)

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Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 8571-4 was prepared by Technical Committee ISO/TC 97, *Information processing systems.*

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

ISO 8571 consists of the following parts, under the general title *Information processing systems — Open Systems Interconnection — File Transfer, Access and Management*

- *Part 1 : General introduction*
- *Part 2 : Virtual Filestore Definition*
- *Part 3 : File Service Definition*
- *Part 4 : File Protocol Specification*

Annexes A and B form an integral part of this International Standard. Annex C is for information only.

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INTERNATIONAL STANDARD ISO 8571-4 : 1988 (E)

Information processing systems — Open Systems Interconnection — File Transfer, Access and Management —

Part 4 : File Protocol Specification

0 Introduction

ISO 8571 is one of a set of International Standards produced to facilitate the interconnection of computer systems. Its relation to other International Standards in the set is defined by the Reference Model for Open Systems Interconnection (ISO 7498). The Reference Model subdivides the area of standardization for interconnection into a series of layers of specification, each of manageable size.

The aim of Open Systems Interconnection is to allow, with a minimum of technical agreement outside the interconnection standards, the interconnection of computer systems:

a) from different manufacturers,

b) under different managements,

c) of different levels of complexity,

d) of different ages.

ISO 8571 defines a file service and specifies a file protocol available within the application layer of the Reference Model. The service defined is of the category Application Service Element (ASE). It is concerned with identifiable bodies of information which can be treated as files, and may be stored within open systems or passed between application processes.

ISO 8571 defines a basic file service. It provides sufficient facilities to support file transfer, and establishes a framework for file access and file management. ISO 8571 does not specify the interfaces to a file transfer or access facility within the local system.

ISO 8571 consists of the following four parts:

Part 1: General introduction
Part 2: Virtual Filestore definition
Part 3: File Service definition
Part 4: File Protocol specification

This part of ISO 8571 contains the following annexes which form part of the standard:

Annex A - Protocol State Tables;
Annex B - Reference to FTAM PDU Definitions;

and the following annex which does not form part of the standard:

Annex C - ASN.1 cross reference.

1 Scope

ISO 8571-4 consists of four main sections:

a) the basic protocol (in sections two and three), which supports the internal file service;

b) the error recovery protocol (in section four), which supports the external file service.

For each of these, ISO 8571-4 includes a formal statement of the nature of the automaton giving the necessary behaviour of each of the participating entities. It states:

1) the actions to be taken on receiving request and response primitives issued by a file service user;

2) the actions to be taken on receiving indication and confirm primitives issued by the Presentation Service provider;

3) the actions to be taken as a result of events within the local system.

c) the definition (in section five) of the abstract syntax required to convey the file protocol control information.

d) the conformance requirements to be met by implementors of this protocol (in section six).

The scope of the File Protocol is limited to the interconnection of systems; it does not specify or restrict the possible implementation of interfaces within a computer system.

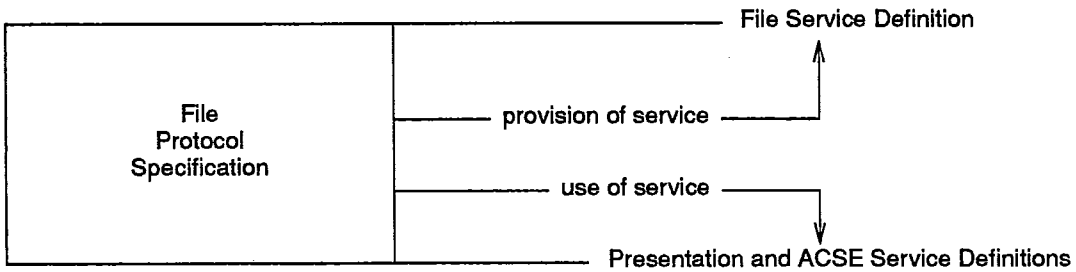

Figure 1 — Relationship between file protocol and service definitions

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2 Field of application

The purpose of ISO 8571-4 within the OSI scheme is to specify the behaviour which must be exhibited by a system in order to take part in the provision of the file transfer access and management service.

The file protocol specification references three service definitions in order to express the environment within which it is applied. ISO 8571-3 defines the aims and objectives that the protocol must achieve. The Presentation Service (ISO 8822) and ACSE Service (ISO 8649-2) define the set of assumptions about the supporting facilities which the protocol may exploit (see figure 1).

3 References

ISO 7498, *Information Processing Systems - Open Systems Interconnection - Basic Reference Model*

ISO 7498-3, *Information Processing Systems - Open Systems Interconnection - Basic Reference Model*
- Part 3: Naming and Addressing

ISO 8326, *Information Processing Systems - Open Systems Interconnection - Basic Connection Oriented Session Service Definition.*

ISO 8571, *Information processing systems - Open systems interconnection - File transfer, access and management.*
- Part 1: General introduction.
- Part 2: Virtual Filestore definition.
- Part 3: File Service definition.

ISO 8649, *Information Processing Systems - Open Systems Interconnection - Service definition for the Association Control Service Element.*

ISO 8650, *Information Processing Systems - Open Systems Interconnection - Protocol specification for the Association Control Service Element.*

ISO 8822, *Information Processing Systems - Open Systems Interconnection - Connection-oriented Presentation Service Definition.*

ISO 8824, *Information Processing Systems - Open Systems Interconnection - Specification of Abstract Syntax Notation One (ASN.1).*

ISO 8825, *Information Processing Systems - Open Systems Interconnection - Specification of basic encoding rules for Abstract Syntax Notation*

4 Definitions and abbreviations

Terms and abbreviations are defined in ISO 8571-1. The definitions of service primitive names and service state names given in ISO 8571-3 are also used in this part of ISO 8571.

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Section one: General

5 Overview of the file protocol

5.1 Service supported by the file protocol

ISO 8571-4 specifies the following protocols which support the file services defined in ISO 8571-3:

a) the basic protocol (see sections two and three), which supports the internal file service;

b) the error recovery protocol (see section four), which supports the external file service.

5.2 Services assumed by the basic file protocol

The file protocol specified in this part of ISO 8571-4 assumes the use of the services listed in table 1. These are Presentation Services as defined in ISO 8822 and ACSE Association Control Services defined in ISO 8649. The OSI *Reference Model* allows the use of FTAM as one component in a distributed application; the specification of such an application before and after the FTAM regime is outside the scope of ISO 8571-4.

The assumptions made in different file protocol functional units (see 5.6) are listed separately.

5.3 Functions provided

5.3.1 Functions in the basic protocol

The basic protocol supports the internal file service (see ISO 8571-1), using the ACSE and Presentation Services. It supports the following functions:

a) representation of the internal file service primitives as a sequence of protocol data units for transmission by the ACSE and Presentation Services;

b) grouping, when appropriate, of the representations of logically separate service primitives as distinct data values in a single P-DATA request service primitive;

c) ensuring the progress of the protocol.

5.3.2 Functions in the error recovery protocol

The error recovery protocol supports the external service (see ISO 8571-1), using the internal file service. It supports the following functions:

a) management of error recovery information during the normal operation of the file service;

b) restart of data transfer after interruption within the data transfer regime;

c) recovery from abnormal termination of the file open or file selection regime.

d) recovery from abnormal termination which destroys the internal file service regime.

5.4 Model used

In abstract, the operation of the protocol is modelled by the interaction of two file protocol machines (FPMs). The two FPMs communicate by means of the services available at their lower boundary, in such a way as to provide the services required at their upper boundary. These concepts are illustrated in figure 2.

The file service is defined asymmetrically with the file service user "A" being the initiator and file service user "B" being the responder.

The behaviour of each FPM is defined in terms of:

a) the actions it takes:

1) issue of indication or confirm service primitives to the upper service user;

2) issue request or response service primitives to the lower service provider;

b) the stimuli it receives:

1) receipt of request or response service primitives from the upper service user;

2) receipt of indication or confirm service primitives from the lower service provider;

Table 1 — Presentation and Session Services required by FTAM Functional Units

FTAM Functional Unit	Session Functional Unit	Presentation Functional Unit
Kernel(4)	Kernel Duplex Optionally: Resynch(1) Minor synch(2)	Kernel Duplex Optionally: Resynch(1) Minor synch(2) Context Management(3)
Recovery	Minor Synch	Minor Synch
Restart	Minor Synch Resynchronize	Minor Synch Resynchronize

NOTES

1 The resynchronize functional units shall be used if available.

2 *Minor synch is required whenever the resynchronize* functional unit is available. The presence of a confirmed minor synchronization point at the start of the bulk data regime is used to limit the destructive effects of resynchronization until after the regime has been fully established.

3 Use of the optional context management presentation functional unit implies the use of the typed data session functional unit.

4 The other functional units visible in the external service have the same presentation and session requirements as the kernel functional unit.

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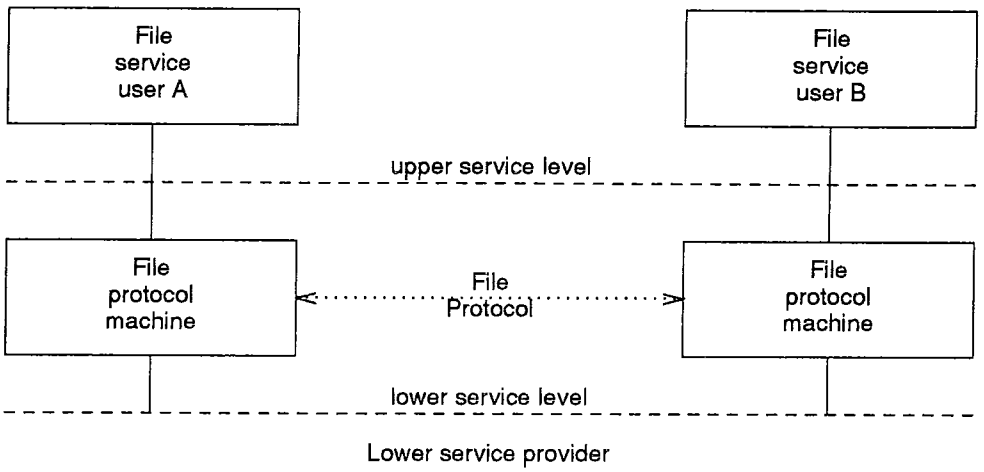

Figure 2 — File Protocol Machine model

3) local error indications;

4) management intervention.

c) the information available:

1) information associated with the lower service association endpoint; this information is lost if the lower service association ceases to exist;

2) information associated with the upper service association endpoint; in the error recovery protocol, procedures are provided for recovery on loss of the lower service association, based on the information associated with the two upper service association endpoints.

NOTES

1 For the basic protocol, the lower boundary service is the composite of ACSE and presentation service and the upper boundary service is the internal file service.

2 For the error recovery protocol, the lower boundary service is the internal file service and the upper boundary is the external file service.

3 The information describing the upper service association in the external file service is preserved across system failures, and so is available to allow meaningful recovery.

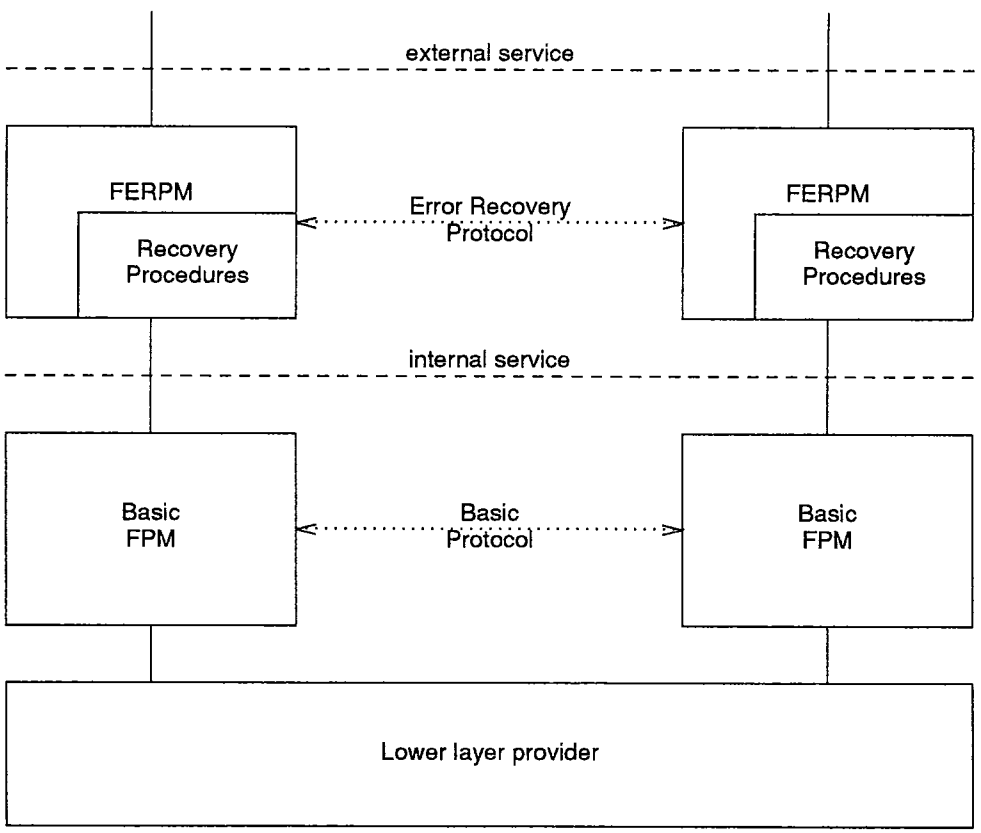

Figure 3 — Extended File Protocol Machine model

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5.5 Correspondence between service primitive names and FPDU names

FPDUs which are sent as a result of a service primitive issued by a user of the supported service have the same name as that service primitive.

Examples:

Service primitive	FPDU
F-INITIALIZE request	F-INITIALIZE request FPDU
F-INITIALIZE response	F-INITIALIZE response FPDU

NOTES

1 Receipt of these FPDUs is signalled to the service user as F-INITIALIZE indication service primitives and F-INITIALIZE confirm service primitives respectively.

2 In some cases, several FPDUs may be grouped into a single PSDU. There is not therefore always a one-to-one correspondence between file service primitives and lower layer service primitives.

5.6 Protocol functional units

The functional units of the file protocol are equivalent to the functional units of the supported service:

a) kernel functional unit;
b) read functional unit;
c) write functional unit;
d) file access functional unit;
e) limited file management functional unit;
f) enhanced file management functional unit;
g) grouping functional unit;
h) FADU locking functional unit;
i) recovery functional unit;
j) restart functional unit.

NOTES

1 Each FPDU in a file protocol functional unit corresponds to the equivalent service primitive in the equivalent service functional unit.

2 Negotiation of a service functional unit implies the negotiation of the equivalent protocol functional unit.

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Section two: Basic file protocol

6 State of the association provided

NOTE - The entities referred to in this section are basic protocol entities.

6.1 Operation of the protocol

The required behaviour of an entity conforming to the basic file protocol is expressed in the following clauses, in terms of the actions to be taken in response to each possible stimulus. Each clause is labelled with the name of the functional unit to which it applies, and the actions in a clause shall not apply if that functional unit is not successfully negotiated.

In specifying responses to service primitives issued by the IFS user, it is assumed that each type of service primitive shall only be received when the association endpoint is in a state in which the file service allows it to be received. Checking that this is the case is a matter of local interface organization.

For each PDU that may be received, the specification enumerates the states of the protocol in which the receiving entity can receive the PDU. If the action specified on receipt of a stimulus would require the issue of a service primitive which could not validly be issued in the current state, the entity concerned shall indicate a protocol error (see 10.2). If a PDU or a presentation service primitive is received under circumstances not enumerated, a protocol error has occurred. If a PDU or presentation service primitive is received that contains parameters with values inconsistent with previous values negotiated or requested during negotiation, then a protocol error has occurred.

6.2 Additional state information

The following sub-clauses define further state information associated with the basic protocol entities.

6.2.1 Expected responses list

The expected responses list records the original state and the operations remaining outstanding during a grouped exchange of PDUs and services (see 8.11, 8.12, 9.11 and 9.12). The expected responses list is an ordered list or "first in/first out queue" and holds the names of successive pending PDUs or primitives during use of the grouping mechanism. Initially the list is empty.

6.2.2 Initial state indicator

The initial state indicator records the state of the entity on invocation of the grouping mechanism. The defined values are the names of the states defined in ISO 8571-4 and "unset". Initially the value is "unset".

6.2.3 Next state indicator

The next state indicator records the next logical regime implied by receipt of grouped responses. The defined values are the state names "initialized", "selected" and "data transfer idle", and "unset". Initially the value is unset.

6.2.4 P-alter indicator

The p-alter indicator is used to record the need for additional alteration of the defined context set. The defined values are "unset" and "set". Initially, the value is "unset".

6.2.5 Bulk data transfer number

The bulk data transfer number identifies the bulk data transfers within an open regime. It is an integer in the range 0 to 999 999. Initially, the value is 0.

NOTE - The use of pieces of state information associated with an entity as an aid to specification does not imply that any distinct realization of such information is required within an entity.

7 File protocol data units

The file PDUs are complex data types defined by an abstract syntax definition (clause 20). This definition includes named parameters corresponding to those parameters in the file service carried directly by FTAM-PCI and those parameters necessary for the operation of the protocol.

For information which is always required default values are defined to avoid unnecessary overhead. The transfer syntax of these data types is negotiated and encoding performed by the presentation service provider.

The PDUs are transmitted as data values, either on a P-DATA primitive or in the user information of a ACSE primitive or in the user data of a Presentation Service primitive. The possible means of transmission of each PDU are listed in tables 2 and 3. (The means of transmission of the bulk data transfer PDUs are listed in table 5.) The PDUs marked with a * in the tables are carried on the response and confirm service primitives. All others are carried on request and indication service primitives.

Table 2 — Protocol Data Units, FTAM regime establishment

Name	Carried by	Functional units
F-INITIALIZE request	A-ASSOCIATE	kernel
F-INITIALIZE response*	A-ASSOCIATE	kernel
F-TERMINATE request	A-RELEASE	kernel
F-TERMINATE response*	A-RELEASE	kernel
F-P-ABORT request	A-ABORT	kernel
F-U-ABORT request	A-ABORT	kernel

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Table 3 — Protocol data units, File regime control

Name	Carried by	Functional units
F-SELECT request	P-DATA	kernel
F-SELECT response	P-DATA	kernel
F-DESELECT request	P-DATA	kernel
F-DESELECT response	P-DATA	kernel
F-CREATE request	P-DATA	limited file management
F-CREATE response	P-DATA	limited file management
F-DELETE request	P-DATA	limited file management
F-DELETE response	P-DATA	limited file management
F-READ-ATTRIB request	P-DATA	limited file management
F-READ-ATTRIB response	P-DATA	limited file management
F-CHANGE-ATTRIB request	P-DATA	enhanced file management
F-CHANGE-ATTRIB response	P-DATA	enhanced file management
F-OPEN request	P-DATA	read, write
F-OPEN response	P-DATA	read, write
F-CLOSE request	P-DATA	read, write
F-CLOSE response	P-DATA	read, write
F-BEGIN-GROUP request	P-DATA	grouping
F-BEGIN-GROUP response	P-DATA	grouping
F-END-GROUP request	P-DATA	grouping
F-END-GROUP response	P-DATA	grouping
F-RECOVER request	P-DATA	recovery
F-RECOVER response	P-DATA	recovery
F-LOCATE request	P-DATA	access
F-LOCATE response	P-DATA	access
F-ERASE request	P-DATA	access
F-ERASE response	P-DATA	access

A P-DATA primitive conveys a series of data values. This series of data values is referred to in ISO 8571 as a Presentation Service Data Unit (PSDU). The protocol specifies, in terms of the circumstances in which the sequence of data values in a PSDU is terminated, the exact contents of each P-DATA issued. The series of data units may not be divided into several P-DATA primitives in ways not specified by this protocol.

File PDUs are transmitted in one particular presentation context, called the FTAM-PCI context. This is defined to be the context used for the user information data value of the ACSE A-ASSOCIATE primitive, and shall be a context corresponding to the FTAM-PCI abstract syntax defined in ISO 8571-4.

NOTE - Data values in any other context are not File PDUs and this fact is used to ensure the transparency of user data.

The receiver recognizes PDUs on the basis that a File PDU shall:

a) be transmitted in the FTAM-PCI context,

b) consist of a single complete value from the FTAM-PCI abstract syntax.

NOTE - A data value which differs in any material way, either by omission of a mandatory parameter, or by addition of an undefined parameter, or by use of an invalid parameter value, from the defined values of the File PDU data types is not a File PDU.

An entity shall signal a protocol error (10.2) if:

c) it receives any ACSE or presentation service primitives not specified for the functional units negotiated;

d) it receives a sequence of data values in the FTAM PCI context which does not form a defined PDU.

e) it receives any PDU which does not belong to the selected functional units.

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8 File initiating entity actions

8.1 FTAM regime establishment (Kernel)

8.1.1 On receiving an F-INITIALIZE request service primitive from the IFS user while in an "idle" state, the entity shall:

a) construct an F-INITIALIZE request PDU based on the parameters of the F-INITIALIZE request service primitive;

b) set the protocol version parameter of that PDU to "version-1" and no other version; the protocol version parameter shall be set so that bits in the parameter corresponding to other versions shall not be set to either "0" or "1" as part of its value;

c) on the basis of local knowledge set the implementation information parameter;

d) add the PDU constructed as user information on an A-ASSOCIATE request, setting the values of the parameters of the A-ASSOCIATE request according to the information in table 4. Set the values of the presentation requirements and session requirements parameters of the A-ASSOCIATE request to propose at least the corresponding functional units as described in table 1 derived from the parameters received. Derive a list of abstract syntaxes from

1) those needed to support the document types and abstract syntaxes named in the contents type list parameter with no syntaxes duplicated;

2) the FTAM PCI context and any EXTERNAL syntaxes referenced from it;

3) any other abstract syntaxes implied by non-FTAM parts of the application context;

and set the value of the application context parameter on A-ASSOCIATE to request this list of abstract syntaxes.

e) enter the "initialize pending" state.

NOTES

1 If the resynchronize functional unit is not successfully negotiated (see clause 17) then in certain situations of flow control blockage the cancel operation may be indefinitely delayed.

2 The implementation information parameter contains information specific to individual implementations. It may be set by omission. Its contents are not used for negotiation.

8.1.2 On receiving an A-ASSOCIATE confirm with an F-INITIALIZE response PDU as user information while in the state "initialize pending", the entity shall:

a) if

1) the result parameter of the A-ASSOCIATE indicates failure,

or

2) the negotiable parameters have values inconsistent with the requested values.

then issue an F-INITIALIZE confirm service primitive to the IFS user, with parameters derived from the A-ASSOCIATE confirm, and thereafter cease to exist;

Consistency is achieved if:

— The returned value of the requested attribute groups parameter refers to a subset of the requested value;

— The returned value of the requested functional units refers to a subset of the requested value;

— The presentation functional units negotiated support the FTAM functional units negotiated;

— The Service Class is one and only one of the Service Classes indicated on the F-INITIALIZE request, or, in the case where the transfer and management service class was requested, then the transfer service class or the management service class is also consistent;

b) if the result parameter of the A-ASSOCIATE primitive indicates success and the negotiable parameter values are consistent as described in (a), then issue an F-INITIALIZE confirm service primitive to the IFS user, with parameters derived from the data values received and from the parameters received on the A-ASSOCIATE confirm;

c) enter the state "initialized".

NOTE - Once initialized it is possible for several presentation contexts supporting the FTAM PCI abstract syntax to exist in the defined context list. The entity shall subsequently interpret only the first presentation context supporting FTAM PCI encountered as FTAM PCI; any other instances do not affect the state of the FPM.

8.1.3 On receiving an A-ASSOCIATE confirm, without user information and with a result parameter indicating failure, while in the state "initialize pending", the entity shall:

a) issue an F-INITIALIZE confirm service primitive to the IFS user with a state and action result parameters indicating failure;

b) thereafter cease to exist.

8.2 FTAM regime termination (orderly) (Kernel)

8.2.1 On receiving an F-TERMINATE request service primitive from the IFS user while in an "initialized" state, the entity shall:

a) send an F-TERMINATE request PDU as user information on an A-RELEASE request primitive;

b) enter the state "terminate pending".

8.2.2 On receiving an F-TERMINATE response PDU while in the state "terminate pending", the entity shall:

a) issue an F-TERMINATE confirm service primitive to the IFS user, with parameters derived from the data values received;

b) thereafter cease to exist.

8.3 File selection (Kernel)

8.3.1 On receiving an F-SELECT request service primitive from the IFS user while in the state "initialized", the entity shall:

a) add an F-SELECT request PDU as a data value to the current PSDU;

b) terminate the PSDU.

c) enter the state "select pending".

8.3.2 On receiving an F-SELECT request service primitive from the IFS user while in the state "grouping" with the expected response list empty and the initial state indicator having value "initialized", the entity shall:

a) add an F-SELECT request PDU as a data value to the current PSDU;

b) add the value "F-SELECT response" to the end of the expected responses list.

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Table 4 — Relationship of F-INITIALIZE parameters to A-ASSOCIATE parameters

A-ASSOCIATE	F-INITIALIZE			
	Request	Indication	Response	Confirm
Called Application Entity Title (8)	Called Application Entity Title	Called Application Entity Title	—	—
Calling Application Entity Title (8)	Calling Application Entity Title	Calling Application Entity Title	—	—
Responding Application Entity Title (8)	—	—	Responding Application Entity Title	Responding Application Entity Title
Application Context Name	Application Context Name(1)	—	Application Context Name	—
Called Presentation address	Called Presentation address	Called Presentation address	—	—
Calling Presentation address	Calling Presentation address	Calling Presentation address	—	—
Responding Presentation address	—	—	Responding Presentation address	Responding Presentation address
Presentation Context Definition List(2)	Derived from Contents Type List(3)	Contents Type List	—	—
Presentation Context Result List	—	—	Derived from Contents Type list(4)	Contents Type List
QoS	CQoS(5)	CQoS	CQoS	CQoS
Presentation Requirements	Derived from Presentation Context Management(6)	—	Derived from Presentation Context Management(6)	—
Session Requirements	Derived from Functional Units(7)	—	Derived from Functional Units(7)	—
Initial Synch Point Serial Number	Set to "1" by FPM	—	—	—
Initial Assignment of Tokens	Set to "Initiator" by FPM	—	—	—
Result	—	—	State Result	State Result

— Request and response columns show how A-ASSOCIATE parameters are set from F-INITIALIZE parameters.
— Indication and confirm columns show how F-INITIALIZE parameters are set from A-ASSOCIATE parameters.
— Dash indicates A-ASSOCIATE parameter not used or has no relationship to an F-INITIALIZE parameter.

NOTES

1 Any Application Context Name must support at least the function implied by the application context identified by "{iso standard 8571 application-context(1) iso-ftam(1)}", (see clause 21); if no value is provided by the user then that object identifier shall be assigned by the FPM, otherwise the Application Context Name shall be derived from the value provided by the IFS user.

2 The Presentation Contexts Definition List must contain at least those presentation contexts needed to support the current application context as implied by FTAM (see clause 21) and the Contents Type List.

3 The Presentation Context Definition list contains "ISO 8571-FTAM PCI" and the abstract syntax names of the Contents Type List.

4 The Contents Type List in these cases may affect the Available Contents Type List activity attribute.

5 CQoS is used as QoS is noted in ACSE and Presentation.

6 Presentation Requirements is set to "Context Management" if the Presentation Context Management parameter of F-INITIALIZE equals True; it is empty otherwise.

7 Session Requirements is set to the union of the session requirements necessary to support the selected protocol functional units.

8 Application Entity Title is used here and elsewhere in ISO 8571 for the collection of naming parameters defined in ISO 8649. The relation between these naming concepts is defined in ISO 7498-3.

9 The A-ASSOCIATE parameters Single Presentation Context, Default Presentation Context Name, Default Presentation Context Result and Session Connection Identifier are not related directly to any F-INITIALIZE parameters.

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8.3.3 On receiving an F-SELECT response PDU while in the state "select pending" and with the negotiable parameters having values returned consistent with the requested values, where the requested access must refer to a subset of the actions requested, the entity shall:

a) issue an F-SELECT confirm service primitive to the IFS user, with parameters derived from the data values received;

b) if the primitive issued did not carry a state result parameter indicating failure, enter the state "selected";

c) if the primitive issued carried a state result parameter indicating failure, then enter the state "initialized".

8.3.4 On receiving an F-SELECT response PDU while in state "grouping" with the first element of the expected responses list having value "F-SELECT response" and with returned parameters consistent as described in 8.3.3, the entity shall:

a) issue an F-SELECT confirm service primitive to the IFS user;

b) if the PDU did not carry a state result indicating failure set the value of the next state indicator to "selected";

c) delete the first element of the expected responses list.

8.4 File deselection (Kernel)

8.4.1 On receiving an F-DESELECT request service primitive from the IFS user while in the state "selected", the entity shall:

a) add an F-DESELECT request PDU as a data value to the current PSDU;

b) terminate the current PSDU;

c) enter the state "deselect pending".

8.4.2 On receiving an F-DESELECT request service primitive from the IFS user while in the state "grouping" with the last element of the expected response list having one of the values "F-CLOSE response", "F-CREATE response", "F-SELECT response", "F-READ-ATTRIB response" or "F-CHANGE-ATTRIB response", the entity shall:

a) add an F-DESELECT request PDU as a data value to the current PSDU;

b) add the value "F-DESELECT response" to the end of the expected responses list.

8.4.3 On receiving an F-DESELECT response PDU while in the state "deselect pending", the entity shall:

a) issue an F-DESELECT confirm service primitive to the IFS user, with parameters derived from the data values received;

b) enter the state "initialized".

8.4.4 On receiving an F-DESELECT response PDU while in state "grouping" with the first element of the expected responses list having value "F-DESELECT response", the entity shall:

a) issue an F-DESELECT confirm service primitive to the IFS user;

b) set the value of the next state indicator to "initialized";

c) delete the first element of the expected responses list.

8.5 File creation (Limited management)

8.5.1 On receiving an F-CREATE request service primitive from the IFS user while in the state "initialized", the entity shall:

a) add an F-CREATE request PDU as a data value to the current PSDU;

b) terminate the current PSDU and enter the state "create pending".

8.5.2 On receiving an F-CREATE request service primitive from the IFS user while in the state "grouping" with the expected response list empty and the initial state indicator having value "initialized", the entity shall:

a) add an F-CREATE request PDU as a data value to the current PSDU;

b) add the value "F-CREATE response" to the end of the expected responses list.

8.5.3 On receiving an F-CREATE response PDU while in the state "create pending" and with the following negotiable parameters having values returned consistent with the requested values:

a) initial attributes are within the requested attribute groups successfully negotiated at filestore initialization and

b) requested access must refer to a subset of the actions requested,

the entity shall:

c) issue an F-CREATE confirm service primitive to the IFS user, with parameters derived from the data values received;

d) if the primitive issued did not carry a state result parameter indicating failure, enter the state "selected";

e) if the primitive issued carried a state result parameter indicating failure, enter the state "initialized".

8.5.4 On receiving an F-CREATE response PDU while in state "grouping" with the first element of the expected responses list having value "F-CREATE response" and with returned parameters consistent as described in 8.5.3, the entity shall:

a) issue an F-CREATE confirm service primitive to the IFS user;

b) if the PDU did not carry a state result indicating failure set the value of the next state indicator to "selected".

c) delete the first element of the expected responses list.

8.6 File deletion (Limited management)

8.6.1 On receiving an F-DELETE request service primitive from the IFS user while in state "selected", the entity shall:

a) add an F-DELETE request PDU as a data value to the current PSDU;

b) terminate the current PSDU;

c) enter the state "delete pending".

8.6.2 On receiving an F-DELETE request service primitive from the IFS user while in the state "grouping" with the last element of the expected response list having one of the

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values "F-CLOSE response", F-CREATE response", "F-SELECT response", "F-READ-ATTRIB response" or "F-CHANGE-ATTRIB response", the entity shall:

a) add an F-DELETE request PDU as a data value to the current PSDU;

b) add the value "F-DELETE response" to the end of the expected responses list.

8.6.3 On receiving an F-DELETE response PDU while in the state "delete pending", the entity shall:

a) issue an F-DELETE confirm service primitive to the IFS user, with parameters derived from the data values received;

b) enter the state "initialized".

8.6.4 On receiving an F-DELETE response PDU while in state "grouping" with the first element of the expected responses list having value "F-DELETE response", the entity shall:

a) issue an F-DELETE confirm service primitive to the IFS user;

b) set the value of the next state indicator to "initialized";

c) delete the first element of the expected responses list.

8.7 Read attributes (Limited management)

8.7.1 On receiving an F-READ-ATTRIB request service primitive from the IFS user while in the state "selected", the entity shall:

a) add an F-READ-ATTRIB request PDU to the current PSDU;

b) terminate the current PSDU;

c) enter the state "read attribute pending".

8.7.2 On receiving an F-READ-ATTRIB request service primitive from the IFS user while in the state "grouping" with the last element of the expected response list having one of the values "F-CLOSE response", "F-CREATE response" or "F-SELECT response" or is empty the entity shall:

a) add an F-READ-ATTRIB request PDU as a data value to the current PSDU;

b) add the value "F-READ-ATTRIB response" to the end of the expected responses list.

8.7.3 On receiving an F-READ-ATTRIB response PDU while in the state "read attribute pending", having successfully negotiated the limited file management functional unit at filestore initialization and with the following negotiable parameters having values returned consistent with the requested values, the entity shall:

a) issue an F-READ-ATTRIB confirm service primitive to the IFS user, with parameters derived from the data values received;

b) enter the state "selected".

The attributes returned are within the requested attribute groups successfully negotiated at filestore initialization and were named in the attribute names parameter on the request PDU sent.

8.7.4 On receiving an F-READ-ATTRIB response PDU while in state "grouping", with the first element of the expected responses list having value "F-READ-ATTRIB response" and with returned parameters consistent as described in 8.7.3, the entity shall:

a) issue an F-READ-ATTRIB confirm service primitive to the IFS user with parameters derived from the data values received;

b) delete the first element of the expected responses list.

8.8 Change attributes (Enhanced management)

8.8.1 On receiving an F-CHANGE-ATTRIB request service primitive from the IFS user while in the state "selected", the entity shall:

a) add an F-CHANGE-ATTRIB request PDU as a data value to the current PSDU;

b) terminate the current PSDU;

c) enter the state "change attribute pending".

8.8.2 On receiving an F-CHANGE-ATTRIB request service primitive from the IFS user while in the state "grouping" with enhanced file management functional unit selected, and with the last element of the expected response list having one of the values "F-READ-ATTRIB response", "F-CLOSE response", "F-CREATE response or "F-SELECT response" or is empty the entity shall:

a) add an F-CHANGE-ATTRIB request PDU as a data value to the current PSDU;

b) add the value "F-CHANGE-ATTRIB response" to the end of the expected responses list.

8.8.3 On receiving an F-CHANGE-ATTRIB response PDU while in the state "change attribute pending" having successfully negotiated the enhanced file management functional unit and suitable access at filestore initialization, and with the negotiable parameters having values returned consistent with the requested values the entity shall:

a) issue an F-CHANGE-ATTRIB confirm service primitive to the IFS user, with parameters derived from the data values received;

b) enter the state "selected".

8.8.4 On receiving an F-CHANGE-ATTRIB response PDU while in state "grouping" with the first element of the expected responses list having value "F-CHANGE-ATTRIB response" and with returned parameters consistent as described in 8.7.3, the entity shall:

a) issue an F-CHANGE-ATTRIB confirm service primitive to the IFS user with parameters derived from the data values received;

b) delete the first element of the expected responses list.

8.9 File open (Read, Write)

8.9.1 On receiving an F-OPEN request service primitive from the IFS user while in state "selected", the entity shall:

a) add an F-OPEN request PDU as a data value to the current PSDU;

b) if

1) the presentation context management functional unit has been successfully negotiated

and

2) the initiating entity wishes to have any abstract syntaxes supported by presentation contexts in the defined context set deleted on the basis of local system

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or network management considerations for the successful establishment of the open regime (see 9.9.4)

then

the associated abstract syntax names should be sent in the remove contexts parameter of the F-OPEN request PDU;

c) if

1) the presentation context management functional unit has been successfully negotiated

and

2) the initiating entity wishes to have presentation contexts for any abstract syntaxes added to defined context set on the basis of local system or network management considerations for the establishment of the open regime (see 9.9.4)

then

the associated abstract syntax names should be sent in the define contexts parameter of the F-OPEN request PDU;

d) terminate the current PSDU,

e) enter the state "open pending".

8.9.2 On receiving an F-OPEN request service primitive from the IFS user while in the state "grouping" with the last element of the expected responses list having one of the values: "F-SELECT response", "F-CREATE response", "F-READ-ATTRIB response" or "F-CHANGE-ATTRIB response" the entity shall:

a) add an F-OPEN request PDU as a data value to the current PSDU;

b) add the value "F-OPEN response" to the end of the expected responses list.

8.9.3 On receiving an F-OPEN response PDU while in the state "open pending" and with the negotiable parameters having values returned consistent with the requested values in accordance with the rules for negotiation given in ISO 8571-3, the entity shall:

a) if the PDU issued carried a state result parameter indicating failure, issue an F-OPEN confirm primitive to the IFS user and enter the state "selected";

b) if the value of the presentation action parameter is true, set the p-alter indicator;

c) if the p-alter indicator is not set issue an F-OPEN confirm primitive to the IFS user, with parameters derived from the data values received, and enter the state "data transfer idle";

d) if the p-alter indicator is set preserve the PDU for further processing and enter the state "p-alter context pending".

The processing mode must imply only those actions permissible by the successfully negotiated functional units and requested access at filestore initialization.

The concurrency control must be at least as restrictive as that successfully negotiated at file selection (see ISO 8571-3).

8.9.4 On receiving an F-OPEN response PDU while in state "grouping" with the first element of the expected responses list having value "F-OPEN response" and with returned parameters consistent as described in 8.9.3, the entity shall:

a) if the PDU did not carry a state result indicating failure and if the value of the presentation action parameter is true, set the p-alter indicator;

b) if the p-alter indicator is not set issue an F-OPEN confirm primitive to the IFS user, with parameters derived from the data values received;

c) if the PDU did not carry a state result indicating failure set the value of the next state indicator to "data transfer idle";

d) if the p-alter indicator is set then preserve the PDU for further processing;

e) delete the first element of the expected responses list.

8.9.5 On receiving a P-ALTER-CONTEXT indication primitive from the presentation service provider while in the state "p-alter context pending" and the p-alter indicator is set, the entity shall:

a) a presentation context definition addition result list indicating which of the proposed presentation contexts can be supported;

b) construct a presentation context deletion result list indicating which of the presentation contexts proposed for deletion may be deleted;

c) issue a P-ALTER-CONTEXT response using both lists constructed in a) and b);

d) unset the p-alter indicator;

e) if a F-OPEN response PDU was being preserve then issue an F-OPEN confirm service primitive to the IFS user.

8.9.6 If an F-OPEN response PDU is being preserved in the state "p-alter context pending", and the p-alter indicator is unset, the entity shall:

a) if the open regime has been established, but presentation contexts supporting the requested abstract syntaxes have not all been successfully negotiated set the action result parameter to indicate a recoverable error, and optionally add a diagnostic describing the context negotiation result based on local management considerations;

b) issue an F-OPEN confirm service primitive to the IFS user, with parameters derived from the data values received;

c) if the primitive issued did not carry a state result parameter indicating failure, enter the state "data transfer idle";

d) if the primitive issued carried a state result parameter indicating failure, enter the state "selected".

NOTE - If the resultant facilities are insufficient, the IFS user should terminate the regime.

8.10 File close (Read, Write)

8.10.1 On receiving an F-CLOSE request service primitive from the IFS user while in a "data transfer idle" state, the entity shall:

a) add an F-CLOSE request PDU to the current PSDU;

b) terminate the current PSDU,

c) enter the state "close pending".

NOTE - F-CLOSE request carries an action result that is used as a signalling mechanism between FERPM peers (see 19.1.3). No action result has any effect on the FPM.

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8.10.2 On receiving an F-CLOSE request service primitive from the IFS user while in the state "grouping" with the expected response list empty and the initial state indicator having value "data transfer idle", the entity shall:

a) add an F-CLOSE request PDU as a data value to the current PSDU;

b) add the value "F-CLOSE response" to the end of the expected responses list.

8.10.3 On receiving an F-CLOSE response PDU while in the state "close pending", the entity shall:

a) issue an F-CLOSE confirm service primitive to the IFS user, with parameters derived from the data values received;

b) enter the state "selected".

8.10.4 On receiving an F-CLOSE response PDU while in state "grouping" with the first element of the expected responses list having value "F-CLOSE response", the entity shall:

a) issue an F-CLOSE confirm service primitive to the IFS user with parameters derived from the data values received;

b) set the value of the next state indicator to "selected";

c) delete the first element of the expected responses list.

8.11 Begin Group (Grouping)

8.11.1 On receiving an F-BEGIN-GROUP request service primitive from the IFS user while in either the state "initialized" or the state "data transfer idle", the entity shall:

a) add an F-BEGIN-GROUP request PDU as a data value to the current PSDU;

b) set the value of the initial state indicator to the current state;

c) enter the state "grouping".

8.11.2 On receiving an F-BEGIN-GROUP response PDU while in the state "group pending", the entity shall:

a) issue an F-BEGIN-GROUP confirm service primitive to the IFS user;

b) enter the state "grouping".

8.12 End Group (Grouping)

8.12.1 On receiving an F-END-GROUP request service primitive from the IFS user while in the state "grouping", the entity shall:

a) add an F-END-GROUP request PDU as a data value to the current PSDU;

b) terminate the current PSDU;

c) enter the state "group pending".

8.12.2 On receiving an F-END-GROUP response PDU while in state "grouping", the entity shall:

a) issue an F-END-GROUP confirm service primitive to the IFS user;

b) if the requested threshold has been attained by counting consecutive primitives with either state result parameters indicating success or no state result parameter and

1) the p-alter indicator is set then enter the state "p-alter context pending"

2) the p-alter indicator is unset then enter the state named by the next state indicator.

c) If the requested threshold has not been attained then enter the state named by the initial state indicator.

d) Clear the expected responses list, unset the next state indicator and unset the initial state indicator.

NOTE - If Class II errors are signalled, the open regime has been established, but not all the necessary abstract syntaxes have corresponding supporting presentation contexts as a result of the preceding P-ALTER-CONTEXT exchange. If the resultant facilities are insufficient, the IFS user may release the regime.

8.13 Recovery (Recovery)

8.13.1 On receiving an F-RECOVER request service primitive from the IFS user while in state "initialized", the entity shall:

a) add an F-RECOVER request PDU as a data value to the current PSDU;

b) if

1) the presentation context management functional unit has been successfully negotiated

and

2) the initiating entity wishes to have presentation contexts for any abstract syntaxes added to defined context set on the basis of local system or network management considerations for the successful establishment of the open regime (see 9.9.4)

then

the associated abstract syntax names should be sent in the define-contexts parameter of the F-RECOVER request PDU;

c) if

1) the presentation context management functional unit has been successfully negotiated

and

2) the initiating entity wishes to have any abstract syntaxes supported by presentation contexts in the defined context set deleted on the basis of local system or network management considerations for the establishment of the open regime (see 9.9.4)

then

the associated abstract syntax names should be sent in the remove contexts parameter of the F-RECOVER request PDU;

d) terminate the current PSDU,

e) enter the state "recover pending".

8.13.2 On receiving an F-RECOVER response PDU while in the state "recover pending" and with the negotiable parameters having values returned consistent with the requested values in accordance with the rules for negotiation given in ISO 8571-3, the entity shall:

a) if the PDU issued carried a state result parameter indicating failure, issue an F-RECOVER confirm primitive to the IFS user and enter the state "initialized";

b) if the value of the presentation action parameter is true, set the p-alter indicator;

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c) if the p-alter indicator is not set issue an F-RECOVER confirm primitive to the IFS user, with parameters derived from the data values received, and enter the state "data transfer idle recover";

d) if the p-alter indicator is set preserve the PDU for further processing and enter the state "p-alter context pending".

The processing mode must imply only those actions permissible by the successfully negotiated functional units and requested access at filestore initialization.

The concurrency control must be at least as restrictive as that successfully negotiated at file selection (see ISO 8571-3).

8.13.3 On receiving a P-ALTER-CONTEXT indication primitive from the presentation service provider while in the state "p-alter context pending" and the p-alter indicator is set, the entity shall:

a) construct a presentation context definition result list indicating which of the proposed presentation contexts can be supported;

b) construct a presentation context deletion result list indicating which of the presentation contexts proposed for deletion may be deleted;

c) issue a P-ALTER-CONTEXT response using both lists constructed in a) and b);

d) unset the p-alter indicator.

8.13.4 If an F-RECOVER response PDU is being preserved in the state "p-alter context pending", and the p-alter indicator is unset, the entity shall:

a) if the open regime has been established, but not all the necessary abstract syntaxes have corresponding supporting presentation contexts as a result of the preceding P-ALTER-CONTEXT exchange then set the action result parameter to indicate a recoverable error, and optionally add a diagnostic describing the context negotiation result based on local management considerations;

b) issue an F-RECOVER confirm service primitive to the IFS user, with parameters derived from the data values received;

c) if the primitive issued did not carry a state result parameter indicating failure, enter the state "data transfer idle recover";

d) if the primitive issued carried a state result parameter indicating failure, enter the state "initialized".

NOTE - If the resultant facilities are insufficient, the IFS user should terminate the regime.

8.14 Locate (Access)

8.14.1 On receiving an F-LOCATE request service primitive from the IFS user while in a "data transfer idle" state, the entity shall:

a) add an F-LOCATE request PDU as a data value to the current PSDU;

b) terminate the current PSDU;

c) enter the state "locate pending".

8.14.2 On receiving an F-LOCATE response PDU while in the state "locate pending", the entity shall:

a) issue an F-LOCATE confirm service primitive to the IFS user, with parameters derived from the data values received;

b) enter the state "data transfer idle".

8.15 Erase (Access)

8.15.1 On receiving an F-ERASE request service primitive from the IFS user while in a "data transfer idle" state, the entity shall:

a) add an F-ERASE request PDU to the current PSDU;

b) terminate the current PSDU

c) enter the state "erase pending".

8.15.2 On receiving an F-ERASE response PDU while in the state "erase pending", the entity shall:

a) issue an F-ERASE confirm service primitive to the IFS user, with parameters derived from the data values received;

b) enter the state "data transfer idle".

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9 File responding entity actions

9.1 FTAM regime establishment (Kernel)

9.1.1 On receiving an F-INITIALIZE request PDU as user information on an A-ASSOCIATE indication while in an "idle" state, the entity shall:

a) if the entity is incapable of establishing the FTAM regime, construct an F-INITIALIZE response PDU with a state result parameter indicating protocol error, and add the PDU constructed as user information on an A-ASSOCIATE response with result parameter set to "rejected by responder (permanent)", issue the A-ASSOCIATE response and and thereafter cease to exist;

b) if the PDU contains a protocol version parameter indicating that the initiating FPM is incompatible with version 1 by not having the "version-1" bit set to "1" then construct an F-INITIALIZE response PDU with state result set to "failure", the action result set to "permanent error" and the protocol version parameter set to indicate that it supports version 1, and add the PDU constructed as user information on an A-ASSOCIATE response with result parameter set to "rejected by responder (permanent)", issue the A-ASSOCIATE response and thereafter cease to exist;

c) issue an F-INITIALIZE indication primitive to the IFS user, with parameters derived from the data values received and from the parameters received on the A-ASSOCIATE indication, such that

1) if the contents type list parameter is not present the list of context definitions to be performed is empty;

2) if the elements of the presentation context definition list of the P-CONNECT indication cannot support items of the contents type list of the F-INITIALIZE request PDU then delete from the contents type list

— those abstract syntaxes that cannot be supported and

— those document types which reference abstract syntaxes that cannot be supported;

d) enter the state "f-initialize pending".

9.1.2 On receiving an F-INITIALIZE response service primitive from the IFS user while in an "f-initialize pending" state, the entity shall:

a) construct an F-INITIALIZE response PDU;

b) set the protocol version parameter of that PDU to "version-1"; other version bits in the parameter corresponding to other versions shall not be set;

c) on the basis of local knowledge set the implementation information parameter;

d) send the PDU constructed as user information on an A-ASSOCIATE response. If the F-INITIALIZE response carries a state result parameter indicating failure, then set the result parameter on the A-ASSOCIATE response to indicate failure, otherwise indicate success;

e) if the F-INITIALIZE response carried a state result parameter indicating failure, thereafter cease to exist.

NOTES

1 Once initialized it is possible for several presentation contexts supporting the FTAM PCI abstract syntax to exist in the defined context list. The entity shall subsequently interpret only the first presentation context supporting the FTAM PCI abstract syntax encountered as FTAM PCI; any data in other presentation contexts does not affect the state of the FPM.

2 The implementation information parameter contains information specific to individual implementations. It may be omitted. Its contents shall not be used for negotiation.

9.2 FTAM regime termination (orderly) (Kernel)

9.2.1 On receiving an F-TERMINATE request PDU while in a "initialized" state, the entity shall:

a) issue an F-TERMINATE indication service primitive to the IFS user, with parameters derived from the data values received;

b) enter the state "f-terminate pending".

9.2.2 On receiving an F-TERMINATE response service primitive from the IFS user while in the state "f-terminate pending", the entity shall:

a) construct an F-TERMINATE response PDU;

b) send the PDU constructed as user information on an A-RELEASE response primitive;

c) thereafter cease to exist.

9.3 File selection (Kernel)

9.3.1 On receiving an F-SELECT request PDU while in a "initialized" state, the entity shall:

a) issue an F-SELECT indication service primitive to the IFS user, with parameters derived from the data values received;

b) enter the state "f-select pending".

9.3.2 On receiving an F-SELECT request PDU while in the state "grouping" with the expected response list empty and the initial state indicator having value "initialized", the entity shall:

a) issue an F-SELECT indication to the IFS user;

b) add the value "F-SELECT response" to the end of the expected responses list.

9.3.3 On receiving an F-SELECT response service primitive from the IFS user while in an "f-select pending" state, the entity shall:

a) add an F-SELECT response PDU as a data value to the current PSDU;

b) terminate the current PSDU;

c) If the PDU contained a state result parameter indicating failure, enter the state "initialized"; otherwise, enter the state "selected".

9.3.4 On receiving an F-SELECT response service primitive from the IFS user while in state "grouping" with the first element of the expected responses list having value "F-SELECT response", the entity shall:

a) add an F-SELECT response PDU as a data value to the current PSDU;

b) if the response did not carry a state result indicating failure set the value of the next state indicator to "selected";

c) delete the first element of the expected responses list.

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9.4 File deselection (Kernel)

9.4.1 On receiving an F-DESELECT request PDU while in a "selected" state, the entity shall:

a) issue an F-DESELECT indication service primitive to the IFS user, with parameters derived from the data values received;

b) enter the state "f-deselect pending".

9.4.2 On receiving an F-DESELECT request PDU while in the state "grouping" with the first element of the expected response list having one of the values "F-CLOSE response", "F-READ-ATTRIB response" or "F-CHANGE-ATTRIB response", the entity shall:

a) issue an F-DESELECT indication to the IFS user;

b) add the value "F-DESELECT response" to the end of the expected responses list.

9.4.3 On receiving an F-DESELECT response service primitive from the IFS user while in the state "f-deselect pending", the entity shall:

a) add an F-DESELECT response PDU as a data value to the current PSDU;

b) terminate the current PSDU;

c) enter the state "initialized".

9.4.4 On receiving an F-DESELECT response service primitive from the IFS user while in state "grouping" with the first element of the expected responses list having value "F-DESELECT response", the entity shall:

a) add an F-DESELECT response PDU to the current PSDU;

b) set the value of the next state indicator to "initialized";

c) delete the first element of the expected responses list.

9.5 File creation (Limited management)

9.5.1 On receiving an F-CREATE request PDU while in a "initialized" state, the entity shall:

a) issue an F-CREATE indication service primitive to the IFS user, with parameters derived from the data values received;

b) enter the state "f-create pending".

9.5.2 On receiving an F-CREATE request PDU while in the state "grouping" with the expected response list empty and the initial state indicator having value "initialized", the entity shall:

a) issue an F-CREATE indication service primitive to the IFS user;

b) add the value "F-CREATE response" to the end of the expected responses list.

9.5.3 On receiving an F-CREATE response service primitive from the IFS user while in the state "f-create pending", the entity shall:

a) add an F-CREATE response PDU as a data value to the current PSDU;

b) terminate the current PSDU;

c) If the PDU contained a state result parameter indicating failure, enter the state "initialized"; otherwise, enter the state "selected".

9.5.4 On receiving an F-CREATE response service primitive from the IFS user while in state "grouping" with the first element of the expected responses list having value "F-CREATE response", the entity shall:

a) add an F-CREATE response PDU to the current PSDU;

b) if the PDU did not carry a state result indicating failure set the value of the next state indicator to "selected";

c) delete the first element of the expected responses list.

9.6 File deletion (Limited management)

9.6.1 On receiving an F-DELETE request PDU while in a "selected" state, the entity shall:

a) issue an F-DELETE indication service primitive to the IFS user, with parameters derived from the data values received;

b) enter the state "f-delete pending"

9.6.2 On receiving an F-DELETE request PDU while in the state "grouping" with with the first element of the expected response list having one of the values "F-CLOSE response", "F-READ-ATTRIB response" or "F-CHANGE-ATTRIB response", the entity shall:

a) issue an F-DELETE indication service primitive to the IFS user;

b) add the value "F-DELETE response" to the end of the expected responses list.

9.6.3 On receiving an F-DELETE response service primitive from the IFS user while in state "f-delete pending", the entity shall:

a) add an F-DELETE response PDU as a data value to the current PSDU;

b) terminate the current PSDU;

c) enter the state "initialized".

9.6.4 On receiving an F-DELETE response service primitive from the IFS user while in state "grouping" with the first element of the expected responses list having value "F-DELETE response", the entity shall:

a) add an F-DELETE response PDU to the current PSDU;

b) set the value of the next state indicator to "initialized";

c) delete the first element of the expected responses list.

9.7 Read attributes (Limited management)

9.7.1 On receiving an F-READ-ATTRIB request PDU while in a "selected" state, the entity shall:

a) issue an F-READ-ATTRIB indication service primitive to the IFS user, with parameters derived from the data values received;

b) enter the state "f-read attribute pending".

9.7.2 On receiving an F-READ-ATTRIB request PDU while in the state "grouping" with the first element of the expected response list having one of the values "F-SELECT-response", "F-CREATE-response" or "F-CLOSE response", the entity shall:

a) issue an F-READ-ATTRIB indication to the IFS user;

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b) add the value "F-READ-ATTRIB response" to the end of the expected responses list.

9.7.3 On receiving an F-READ-ATTRIB response service primitive from the IFS user while in state "f-read attribute pending", the entity shall:

a) add an F-READ-ATTRIB response PDU as a data value to the current PSDU;

b) terminate the current PSDU;

c) enter the state "selected".

9.7.4 On receiving an F-READ-ATTRIB response service primitive from the IFS user while in state "grouping" with the first element of the expected responses list having value "F-READ-ATTRIB response", the entity shall:

a) add an F-READ-ATTRIB response PDU as a data value to the current PSDU;

b) delete the first element of the expected responses list.

9.8 Change attributes (Enhanced management)

9.8.1 On receiving an F-CHANGE-ATTRIB request PDU while in a "selected" state, the entity shall:

a) issue an F-CHANGE-ATTRIB indication service primitive to the IFS user, with parameters derived from the data values received; enter the state "f-change attribute pending".

9.8.2 On receiving an F-CHANGE-ATTRIB request PDU while in the state "grouping" with the first element of the expected response list having one of the values "F-SELECT response", "F-CREATE response", "F-READ-ATTRIB response" or "F-CLOSE response", the entity shall:

a) issue an F-CHANGE-ATTRIB indication service primitive;

b) add the value "F-CHANGE-ATTRIB response" to the end of the expected responses list.

9.8.3 On receiving an F-CHANGE-ATTRIB response service primitive from the IFS user while in the state "f-change attribute pending", the entity shall:

a) add an F-CHANGE-ATTRIB response PDU as a data value to the current PSDU;

b) terminate the current PSDU;

c) enter the state "selected".

9.8.4 On receiving an F-CHANGE-ATTRIB response service primitive from the IFS user while in state "grouping" with the first element of the expected responses list having value "F-CHANGE-ATTRIB response", the entity shall:

a) add an F-CHANGE-ATTRIB response PDU to the current PSDU;

b) delete the first element of the expected responses list.

9.9 File Open (Read, Write)

9.9.1 On receiving an F-OPEN request PDU while in a "selected" state, the entity shall:

a) issue an F-OPEN indication service primitive to the IFS user, with parameters derived from the data values received;

b) enter the state "f-open pending".

9.9.2 On receiving an F-OPEN request PDU while in the state "grouping" with the last element of the expected responses list having one of the values: "F-SELECT response", "F-CREATE response", "F-READ-ATTRIB response" or "F-CHANGE-ATTRIB response" the entity shall:

a) issue an F-OPEN indication to the IFS user;

b) add the value "F-OPEN response" to the end of the expected responses list.

9.9.3 On receiving an F-OPEN response service primitive from the IFS user while in state "grouping" with the first element of the expected responses list having value "F-OPEN response", the entity shall:

a) add an F-OPEN response PDU as a data value to the current PSDU;

b) if the PDU did not carry a state result indicating failure set the value of the next state indicator to "data transfer idle";

c) delete the first element of the expected responses list.

9.9.4 On receiving an F-OPEN response service primitive from the IFS user while in state "f-open pending", the entity shall:

a) if

1) the presentation context management functional unit has been successfully negotiated

and

2) any presentation contexts in the defined context list are to be deleted from the defined context list (see notes below),

then

the associated abstract syntax names shall be included in the presentation context deletion list parameter of the P-ALTER-CONTEXT request (see (f) below), provided they are not required in the new open regime;

b) if

1) the presentation context management functional unit has been successfully negotiated

and

2) a presentation context is to be added to the defined context list on the basis of the contents type name parameter for the successful establishment of the open regime

then

the associated abstract syntax names and presentation context identifications shall be included in the presentation context addition list parameter of the P-ALTER-CONTEXT request (see (f) below);

c) add an F-OPEN response PDU as a data value to the current PSDU; if any necessary actions were identified in (a) or (b) to alter the presentation context, include a presentation action parameter, with value "true";

d) terminate the current PSDU;

e) if the state result parameter on the F-OPEN response primitive received indicates failure of the operation, enter state "selected" and do not execute (f);

f) if the need to alter context was identified in (a) or (b), issue a P-ALTER-CONTEXT request presentation service primitive after any current PSDU has been terminated, and enter the state "presentation action pending"; otherwise enter the state "data transfer idle".

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NOTES

1 If the contents type name is not present then the list of context definitions to be performed is empty.

2 The remove contexts parameter received on the F-OPEN request may be taken into consideration in the construction of the presentation context deletion list. The only relationship between the remove contexts parameter and the presentation context deletion list is implementation dependent.

3 None of the actions relating to the P-ALTER-CONTEXT request shall be selected if the result parameter on the primitive received indicated failure.

9.9.5 On receiving a P-ALTER-CONTEXT confirm primitive from the presentation service provider while in the state "presentation action pending", the entity shall enter the state "data transfer idle".

NOTE - If the P-ALTER-CONTEXT negotiation could not be carried out precisely as requested, the responder waits for the initiator to decide whether the resultant open regime can be used or not.

9.10 File close (Read, Write)

9.10.1 On receiving an F-CLOSE request PDU while in a "data transfer idle" state, the entity shall:

a) issue an F-CLOSE indication service primitive to the IFS user, with parameters derived from the data values received;

b) enter the state "f-close pending".

NOTE - F-CLOSE request carries an action result that is used as a signalling mechanism between FERPM peers (see 19.1.3). No action result has any effect on the FPM.

9.10.2 On receiving an F-CLOSE request PDU while in the state "grouping" with the expected response list empty and the initial state indicator having value "data transfer idle", the entity shall:

a) issue an F-CLOSE indication service primitive to the IFS user;

b) add the value "F-CLOSE response" to the end of the expected responses list.

9.10.3 On receiving an F-CLOSE response service primitive from the IFS user while in an "f-close pending" state, the entity shall:

a) add an F-CLOSE response PDU to the current PSDU;

b) terminate the current PSDU;

c) enter the state "selected".

9.10.4 On receiving an F-CLOSE response service primitive from the IFS user while in state "grouping" with the first element of the expected responses list having value "F-CLOSE response", the entity shall:

a) add an F-CLOSE response PDU to the current PDU.

b) set the value of the next state indicator to "selected";

c) delete the first element of the expected responses list.

9.11 Begin Group (Grouping)

9.11.1 On receiving an F-BEGIN-GROUP request PDU while in either the state "initialized" or the state "data transfer idle", the entity shall:

a) issue an F-BEGIN-GROUP indication to the IFS user;

b) set the value of the initial state indicator to the current state;

c) enter the state "grouping".

9.11.2 On receiving an F-BEGIN-GROUP response service primitive from the IFS user while in the state "group pending", the entity shall:

a) add an F-BEGIN-GROUP response PDU to the current PSDU;

b) enter the state "grouping".

9.12 End Group (Grouping)

9.12.1 On receiving an F-END-GROUP request PDU while in the state "grouping", the entity shall:

a) issue an F-END-GROUP indication to the IFS user;

b) enter the state "group pending".

9.12.2 On receiving an F-END-GROUP response service primitive from the IFS user while in state "grouping", the entity shall:

a) add an F-END-GROUP response PDU as a data value to the current PSDU;

b) terminate the current PSDU;

c) if the requested threshold has been attained by counting consecutive primitives with either state result parameters indicating success or no state result parameter and

1) the p-alter indicator is set then issue a P-ALTER-CONTEXT request with the contexts to be defined or deleted as determined in 9.9.4, then enter the state "presentation alter context pending".

2) the p-alter indicator is unset then enter the state named by the next state indicator;

d) if the requested threshold has not been attained by counting consecutive primitives with either state result parameters indicating success or no state result parameter, enter the state named by the initial state indicator; and clear the expected responses list, unset the next state indicator and unset the initial state indicator.

9.13 Recovery (Recovery)

9.13.1 On receiving an F-RECOVER request PDU while in a "initialized" state, the entity shall:

a) issue an F-RECOVER indication service primitive to the IFS user, with parameters derived from the data values received;

b) enter the state "f-recover pending".

9.13.2 On receiving an F-RECOVER response service primitive from the IFS user while in state "f-recover pending", the entity shall:

a) if

1) the presentation context management functional unit has been successfully negotiated

and

2) any presentation contexts in the defined context set are to be deleted from the defined context set (see notes below),

then

the associated presentation context identifications shall be included in the presentation context deletion list parameter of the P-ALTER-CONTEXT request (see (f)

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below), provided they are not required in the new open regime;

b) if

1) the presentation context management functional unit has been successfully negotiated

and

2) a presentation context is to be added to the defined context set on the basis of the contents type name parameter, for the successful establishment of the open regime.

then

the associated presentation context identifications shall be included in the presentation context addition parameter of the P-ALTER-CONTEXT request (see (f) below);

c) add an F-RECOVER response PDU as a data value to the current PSDU; If any necessary actions were identified in (a) or (b) to alter the presentation context, include a presentation action parameter, with value "true";

d) terminate the current PSDU;

e) if the state result parameter on the F-RECOVER response primitive received indicates failure of the operation, enter state "initialized" and do not execute (f);

f) if the need to alter context was identified in (a) or (b), issue a P-ALTER-CONTEXT request presentation service primitive after any current PSDU has been terminated, and enter the state "presentation action pending", otherwise enter the state "data transfer idle recover".

NOTES

1 If the contents type name is not present then the list of context definitions to be performed is empty.

2 The remove contexts parameter received on the F-RECOVER request may be taken into consideration in the construction of the presentation context deletion list. The only relationship between the remove contexts parameter and the presentation context deletion list is implementation dependent.

3 None of these actions shall be selected if the result parameter on the primitive received indicated failure.

9.13.3 On receiving a P-ALTER-CONTEXT confirm primitive from the presentation service provider while in the state "presentation action pending", the entity shall enter the state "data transfer idle recover".

NOTE - If the P-ALTER-CONTEXT negotiation could not be carried out precisely as requested, the responder waits for the initiator to decide whether the resultant open regime can be used or not.

9.14 Locate (Access)

9.14.1 On receiving an F-LOCATE request PDU while in an "data transfer idle" state, the entity shall:

a) issue an F-LOCATE indication service primitive to the IFS user, with parameters derived from the data values received;

b) enter the state "f-locate pending".

9.14.2 On receiving an F-LOCATE response service primitive from the IFS user while in the state "f-locate pending", the entity shall:

a) add an F-LOCATE response PDU as a data value to the current PSDU;

b) terminate the current PSDU;

c) enter the state "data transfer idle".

9.15 Erase (Access)

9.15.1 On receiving an F-ERASE request PDU while in an "data transfer idle" state, the entity shall:

a) issue an F-ERASE indication service primitive to the IFS user, with parameters derived from the data values received;

b) enter the state "f-erase pending".

9.15.2 On receiving an F-ERASE response service primitive from the IFS user while in the state "f-erase pending", the entity shall:

a) add an F-ERASE response PDU as a data value to the current PSDU;

b) terminate the current PSDU;

c) enter the state "data transfer idle".

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10 File general actions

10.1 FTAM regime termination (abrupt)

10.1.1 On receiving an A-ABORT indication while in any state the entity shall examine the user information and evaluate it as one of the types listed below and then take the corresponding actions listed in 10.1.1.1, 10.1.1.2 and 10.1.1.3. The user information parameter of an A-ABORT indication received by an FTAM entity may be of three forms:

a) an F-U-ABORT PDU (see 10.1.1.1),

b) an F-P-ABORT PDU (see 10.1.1.2) or

c) absent (see 10.1.1.3).

10.1.1.1 If the user information is an F-U-ABORT PDU, the entity shall:

a) issue an F-U-ABORT indication service primitive to the IFS user, with parameters derived from the data values received;

b) thereafter cease to exist.

10.1.1.2 If the user information is an F-P-ABORT PDU, the entity shall:

a) issue an F-P-ABORT indication service primitive to the IFS user, with parameters derived from the data values received;

b) thereafter cease to exist.

10.1.1.3 If the user information is absent, the entity shall:

a) issue an F-P-ABORT indication service primitive to the IFS user, with an action result indicating a transient error.

b) thereafter cease to exist.

NOTE - This may result in a permanent error indication being converted to a temporary error indication.

10.1.2 On receiving an A-P-ABORT indication while in any state, the entity shall:

a) issue an F-P-ABORT indication service primitive to the IFS user, with a diagnostic parameter indicating a lower layer failure.

b) thereafter cease to exist.

10.1.3 On receiving an F-U-ABORT request service primitive from the IFS user while in any state, the entity shall:

a) on the basis of local information regarding the ability of the underlying services to convey unlimited user information by A-ABORT:

1) if the ability exists, construct an F-U-ABORT PDU with values derived from the parameters received and send the PDU as user information on an A-ABORT request service primitive.

2) if the ability does not exist, issue an A-ABORT with no user information.

b) thereafter cease to exist.

10.2 Protocol errors

On detecting a protocol error (see 6.1) while in any state, the entity shall:

a) issue an F-P-ABORT indication to the IFS user, with an action result parameter indicating a protocol error.

b) on the basis of local information regarding the ability of the underlying services to convey unlimited user information by A-ABORT:

1) if the ability exists, construct an F-P-ABORT PDU with a result indicating a protocol error and send the PDU as user information on an A-ABORT request service primitive.

2) if the ability does not exist, issue an A-ABORT request with no user information.

c) thereafter cease to exist.

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Section three: The basic bulk data transfer protocol

11 State of bulk data transfer activity

NOTE - The entities referred to in this section are basic protocol entities.

11.1 State of the connection endpoint

For each PDU that may be received, the specification enumerates the states of the protocol in which the receiving entity can receive the PDU. If the action specified on receipt of a stimulus would require the issue of a service primitive which could not validly be issued in the current state, the entity concerned shall indicate a protocol error (see 10.2).

11.2 Additional state of the entities

The following sub-clauses define the items of state information associated with the basic protocol entities for the purposes of bulk data transfer.

11.2.1 Read/write indicator

The read/write indicator records whether the current bulk data transfer is to or from the initiator. The value is set upon the beginning of the data transfer regime. The defined values are "reading", "writing" and "unset". The initial value is unset.

11.2.2 Discard indicator

The discard indicator is used to signal that data received during cancellation or before recovery is invalid and should be thrown away. If the recovery or restart functional units are selected and presentation resynchronization functional unit has been successfully negotiated, it is used in conjunction with session resynchronization to produce a recovery without user visibility of the error; otherwise it is used during the cancel phase. The defined values are "unset" and "set". Initially, the value is "unset".

11.2.3 Checkpoint identifier expected

The checkpoint identifier expected reflects the sequence of checkpoints within bulk data, and is reset by the start of bulk data transfer and by error recovery mechanisms. The value is incremented when a checkpoint is made. The value is an integer in the range 1 to 999998. Initially, the value is determined by the state of the association.

The checkpoint identifier expected applies only to FTAM regimes for which the use of the restart and/or recovery functional units have been successfully negotiated.

11.2.4 Next synchronization point number

The next synchronization point number reflects the sequence of events in the supporting synchronization services. The number is the serial number of the next session synchronization point to be issued by the session

Table 5 — Protocol Data Units

Name	Carried by	Functional units
F-READ request	P-DATA	read
F-WRITE request	P-DATA	write
data value (see note 1)	P-DATA	read, write
F-DATA-END request	P-DATA	read, write
F-TRANSFER-END request	P-DATA	read, write
F-TRANSFER-END response	P-DATA	read, write
F-CANCEL request	P-RESYNCHRONIZE (abandon) request user data or P-DATA	read, write
F-CANCEL response	P-RESYNCHRONIZE (abandon) request user data or P-DATA	read, write
F-CHECK request	(see note 2)	recovery, restart
F-CHECK response	(see note 2)	recovery, restart
F-RESTART request	P-RESYNCHRONIZE (restart) request user data	restart
F-RESTART response	P-RESYNCHRONIZE (restart) response user data	restart

NOTES

1 The data value corresponds to an F-DATA request service primitive. There is no F-DATA request PDU as such.

2 The F-CHECK request and response primitives are mapped directly onto the P-SYNC-MINOR request and response primitives, There is no additional syntax, and therefore no PDU definition.

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service provider. The value is an integer in the range 0 to 999998. Initially on a newly created session connection, the value is 1.

The next synchronization point number applies only to FTAM regimes for which the use of the presentation minor synchronization functional unit has been successfully negotiated.

11.2.5 Synchronization Offset

The synchronization offset is a constant established when a read or write bulk data transfer is initiated or recovered, which gives the difference between the checkpoint identifier expected and the next resynchronization point number.

The synchronization offset applies only to FTAM regimes for which the use of the presentation minor synchronization functional unit has been successfully negotiated.

NOTE - Except during the issue of a checkpoint, or performance of the restart procedure the value of the synchronization offset is equal to the difference between the expected checkpoint number and the next synchronization point number.

11.2.6 Outstanding checkpoint counter

The outstanding checkpoint counter records the number of checkpoints which are unacknowledged.

12 Bulk data transfer protocol data units

The PDUs are transmitted as user data on a Presentation service primitive. The possible means of transmission of each PDU are listed in table 5.

Any valid bulk data transfer sequence of data values and PDUs carried on P-DATA may be concatenated into a single PSDU, provided no checkpoints need to be inserted in that sequence. The receiver of a PSDU unpacks it into individual data values and/or PDUs, and processes each according to the procedures specified in clauses 13 to 17.

13 Bulk data transfer initiating entity actions

13.1 Read (Read)

13.1.1 On receiving an F-READ request service primitive from the IFS user the entity shall:

a) send an F-READ request PDU as a P-DATA request;

b) if the presentation minor synchronization functional unit has been successfully negotiated, issue P-TOKEN-GIVE request for the synchronize minor token;

c) increment the bulk data transfer number;

d) set the checkpoint identifier expected so that

1) if the open regime was established by a regime recovery service exchange then the value is the value negotiated plus one;

2) if the open regime was not established by a regime recovery service exchange then the value is one;

e) set the outstanding checkpoint counter to 0;

f) if the presentation minor synchronization functional unit has been successfully negotiated, calculate the synchronization offset; this is equal to the next synchronization point number, minus the checkpoint identifier expected, plus one;

g) set the read/write indicator to "reading";

h) if the presentation minor synchronization functional unit has been successfully negotiated, enter the state "first minor synch indication pending"; otherwise enter the state "read data transfer" in the role of receiver.

13.1.2 If a P-SYNC-MINOR indication is received from the presentation service provider while in the state "first minor synch indication pending", the entity shall:

a) issue a P-SYNC-MINOR response to the presentation service provider;

b) increment the next synchronization point serial number;

c) enter the state "read data transfer" in the role of receiver.

13.2 Write (Write)

13.2.1 On receiving an F-WRITE request service primitive from the IFS user while in the state "data transfer idle", the entity shall:

a) send an F-WRITE request PDU as a P-DATA request;

b) increment the bulk data transfer number;

c) set the checkpoint identifier expected so that

1) if the open regime was established by a regime recovery service exchange then the value is the value negotiated plus one;

2) if the open regime was not established by a regime recovery service exchange then the value is one;

d) if the presentation minor synchronization functional unit has been successfully negotiated, calculate the synchronization offset; this is equal to the next synchronization point number, minus the checkpoint identifier expected, plus one;

e) set the outstanding checkpoint counter to 0;

f) if the presentation minor synchronization functional unit has been successfully negotiated, issue a P-SYNC-MINOR (explicit) request primitive to the presentation service provider;

g) if the presentation minor synchronization functional unit has been successfully negotiated, increment the next synchronization point number;

h) set the read/write indicator to "writing";

i) if the presentation minor synchronization functional unit has been successfully negotiated, enter the state "first minor synch indication pending"; otherwise enter the state "write data transfer" in the role of sender.

13.3 Transfer end (Read, write)

13.3.1 On receiving an F-TRANSFER-END request service primitive from the IFS user while in the state "read ending" or state "write ending", the entity shall:

a) add an F-TRANSFER-END request PDU as a data value to the current PSDU;

b) terminate the current PSDU;

c) enter the state "transfer ending read" or "transfer ending write", depending on the value of the read/write indicator.

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13.3.2 On receiving an F-TRANSFER-END response PDU while in the state "transfer ending write" the entity shall:

a) issue an F-TRANSFER-END confirm service primitive to the IFS user;

b) enter the state "data transfer idle".

13.3.3 On receiving an F-TRANSFER-END response PDU while in the state "transfer ending read" the entity shall:

a) if the presentation minor synchronization functional unit has not been successfully negotiated, then issue an F-TRANSFER-END confirm service primitive to the IFS user;

b) if the presentation minor synchronization functional unit has been successfully negotiated, enter the state "p-token pending"; if it has not, enter the state "data transfer idle".

13.3.4 On receiving a P-TOKEN-GIVE indication for the sync-minor token while in the state "p-token pending", the entity shall issue an F-TRANSFER-END confirm service primitive to the IFS user and enter the state "data transfer idle".

14 Bulk data transfer responding entity actions

14.1 Read (Read)

14.1.1 On receiving an F-READ request PDU while in an "data transfer idle" state the entity shall;

a) issue an F-READ indication service primitive to the IFS user, with parameters derived from the data items received;

b) increment the bulk data transfer number;

c) set the checkpoint identifier expected so that

1) if the open regime was established by a regime recovery service exchange then the value is the value negotiated plus one;

2) if the open regime was not established by a regime recovery service exchange then the value is one;

d) set the read/write indicator to "reading";

e) set the outstanding checkpoint counter to 0;

f) if the presentation minor synchronization functional unit has been successfully negotiated, calculate the synchronization offset; this is equal to the next synchronization point number, minus the checkpoint identifier expected, plus one;

g) if the presentation minor synchronization functional unit has been successfully negotiated, enter the state "synch minor token pending"; if it has not, enter the state "read data transfer" in the role of sender.

14.1.2 On receiving a P-TOKEN-GIVE indication for the synchronize minor token while in the state "token pending", the entity shall;

a) issue a P-SYNC-MINOR request to the presentation service provider;

b) increment the next synchronization point number;

c) enter the state "first synch minor confirm pending" in the role of sender.

14.2 Write (Write)

14.2.1 On receiving an F-WRITE request PDU while in an "data transfer idle" state, the entity shall;

a) issue an F-WRITE indication service primitive to the IFS user, with parameters derived from the data items received;

b) increment the bulk data transfer number;

c) set the checkpoint identifier expected so that

1) if the open regime was established by a regime recovery service exchange then the value is the value negotiated plus one;

2) if the open regime was not established by a regime recovery service exchange then the value is one;

d) set the read/write indicator to "writing"

e) set the outstanding checkpoint counter to 0;

f) if the presentation minor synchronization functional unit has been successfully negotiated, calculate the synchronization offset; this is equal to the next synchronization point number, minus the checkpoint identifier expected, plus one;

g) if the presentation minor synchronization functional unit has been successfully negotiated, enter the state "first synch minor indication pending"; if it has not, enter the state "write data transfer" in the role of receiver.

14.2.2 On receiving a P-SYNC-MINOR indication while in the state "write minor synch pending", the entity shall;

a) issue a P-SYNC-MINOR response;

b) increment the next synchronization point number;

c) enter the state "write data transfer" in the role of receiver.

14.3 Transfer end (Read, write)

14.3.1 On receiving an F-TRANSFER-END request PDU while in the "read ending" or "write ending" state, the entity shall;

a) issue an F-TRANSFER-END indication service primitive to the IFS user, with parameters derived from the data items received;

b) enter the state "transfer ending read" or "transfer ending write", depending on the value of the read/write indicator.

14.3.2 On receiving an F-TRANSFER-END response service primitive from the IFS user, the entity shall;

a) send an F-TRANSFER-END response PDU as a P-DATA request;

b) if the read/write indicator is set to read and the presentation minor synchronize functional unit has been successfully negotiated, issue a P-TOKEN-GIVE request service primitive to the presentation service provider;

c) unset the read/write indicator;

d) enter the state "data transfer idle".

14.3.3 On receiving an F-TRANSFER-END request PDU while in the state "cancel pending", the entity shall do nothing.

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15 Bulk data transfer sending entity actions

15.1 Send data (Read, write)

15.1.1 On receiving an F-DATA request primitive from the IFS user while in the state "read data transfer", the state "write data transfer" or the state "first synch minor confirm pending", the sending entity shall

a) add the data element given on the F-DATA request to the current PSDU;

b) check that any data item sent is consistent with any context within the defined context set, and indicate a protocol error if it is not.

Any sequence of data elements given on the F-DATA request primitives, i.e. one or several data elements may be concatenated into a single PSDU, provided no checkpoints need to be inserted in that sequence. In any specific instance of the FTAM protocol the sequence of data elements is determined by local system concerns.

15.1.2 On receiving a P-SYNCH-MINOR confirm while in the state "first synch minor confirm pending", the sending entity shall

a) if an F-CANCEL request service primitive is being preserved, enter the state "read data transfer" or "write data transfer" depending on the value of the read/write indicator, and then immediately perform the actions in 17.2.1;

b) if an F-RESTART request service primitive is being preserved, enter the state "read data transfer" or "write data transfer" depending on the value of the read/write indicator, and then immediately perform the actions in 17.3.1;

c) enter the state "read data transfer" or "write data transfer" depending on the value of the read/write indicator.

15.2 End of data transfer (Read, write)

15.2.1 On receiving an F-DATA-END request service primitive from the IFS user while in the state "read data transfer", the state "write data transfer" or the state "first synch minor confirm pending", the entity shall:

a) add an F-DATA-END request PDU as a data value to the current PSDU;

b) if it is the responding entity then terminate the current PSDU;

c) if the state was "first synch minor confirm pending", enter the state "first synch minor confirm pending at data end";

d) enter the state "read ending" or "write ending" depending on the value of the read/write indicator.

15.2.2 On receiving a P-SYNCH-MINOR confirm while in the state "first synch minor confirm pending at data end", the sending entity shall enter the state "read ending" or "write ending" depending on the value of the read/write indicator.

15.3 Checkpoint insertion (Read, write)

15.3.1 On receiving an F-CHECK request service primitive from the IFS user while in the state "read data transfer", the state "write data transfer" or the state "first synch minor confirm pending", the entity shall:

a) terminate the current PSDU;

b) confirm that the checkpoint identifier given is equal to the checkpoint identifier expected;

c) increment the outstanding checkpoint counter;

d) verify that the checkpoint window has not been exceeded;

e) issue a P-SYNC-MINOR request with the type parameter set to 'optional'. Confirm that the synchronization point serial number received from the Presentation service provider is equal to the next synchronization point serial number;

f) increment the expected checkpoint identifier and the next synchronization point serial number; if the next synchronization point serial number exceeds 999 999 then a protocol error has occurred;

g) if any of the checks in (b), (c), (d), (e) or (f) above fail, then indicate a type II error locally.

15.3.2 On receiving P-SYNC-MINOR confirm while in one of the "read data transfer, "write data transfer", "read ending", "write ending" or "write transfer ending" states the entity shall:

a) issue an F-CHECK confirm service primitive to the IFS user, with parameters derived from the information received. The checkpoint identifier is calculated by subtracting the synchronization offset from the synchronization point serial number.

b) decrement the outstanding checkpoint counter by the difference between the the checkpoint identifier expected minus the synch point serial number received minus the offset.

16 Bulk data transfer receiving entity actions

16.1 Data transfer (Read, write)

16.1.1 On receiving a data element in a context other than FTAM PCI context while in a "read data transfer" or a "write data transfer" state the entity shall issue an F-DATA indication service primitive to the IFS user.

NOTE - This includes receipt of any data element of type File-Contents-Data-Element (see ISO 8571-2 for the definition of an abstract syntax of the access structure of an hierarchical file).

16.2 End of data transfer (Read, write)

16.2.1 On receiving an F-DATA-END request PDU while in the state "read data transfer" or the state "write data transfer" the entity shall:

a) issue an F-DATA-END indication service primitive to the IFS user;

b) enter the state "read ending" or "writing ending" depending on the value of the "read/write indicator";

16.2.2 On receiving an F-DATA-END request PDU while in the state "cancel pending" the entity shall do nothing.

16.3 Checkpoint reception (Read, write)

16.3.1 On receiving a P-SYNC-MINOR indication while in a "read data transfer" or a "write data transfer" state with checkpoints outstanding the entity shall:

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a) verify that the checkpoint window has not been exceeded;

b) increment the outstanding checkpoint counter;

c) check that the synchronization point serial number received equals the next synchronization point serial number;

d) check that the expected checkpoint identifier equals the synchronization point serial number received minus the synchronization offset;

e) If any of the checks in (a), (b) or (c) fails, indicate a protocol error;

f) issue an F-CHECK indication service primitive to the IFS user, with checkpoint id parameters equal to the synchronization point serial number received minus the synchronization offset;

g) increment the checkpoint identifier expected and the next synchronization point serial number.

16.3.2 On receiving an F-CHECK response service primitive from the IFS user, while in a "read data transfer", "write data transfer", "read ending" or "write ending" state, or, if the entity is the responder also in the a "transfer ending write" state the entity shall;

a) issue a P-SYNC-MINOR response with parameter equal to the checkpoint identifier from the service primitive plus the synchronization offset.

b) decrement the outstanding checkpoint counter by the difference between the the checkpoint identifier expected minus the synch point serial number received minus the offset.

17 Bulk data transfer general actions

17.1 Discarding (Read, Write)

17.1.1 If an F-CANCEL request PDU is received or transmitted, either on a P-RESYNCHRONIZE primitive or a P-DATA primitive, or if an F-RESTART request PDU is transmitted on a P-RESYNCHRONIZE primitive, the entity shall set the discard indicator.

17.1.2 On receiving a P-DATA indication which is not in the FTAM-PCI-context that is being used for communication between the FPMs while in a "read data transfer" or a "write data transfer" state with the discard indicator set, the entity shall do nothing.

17.2 Cancel (Read, write)

17.2.1 On receiving an F-CANCEL request service primitive from the IFS user while in the "read data transfer" or the "write data transfer state", the entity shall

a) if the presentation resynchronization functional unit has been successfully negotiated, then issue a P-RESYNCHRONIZE (abandon) request with an F-CANCEL request PDU as user data and set the discard indicator; the P-RESYNCHRONIZE (abandon) request shall convey an F-CANCEL request PDU as user data. Otherwise issue an F-CANCEL request PDU using P-DATA;

b) if the presentation minor synchronization functional unit has been successfully negotiated, and the issuer of the F-CANCEL is the responder, return the sync-minor token to the initiator;

c) set the outstanding checkpoint counter to zero;

d) enter the state cancel response pending.

17.2.2 On receiving an F-CANCEL request service primitive while in the "first synch minor confirm pending" state, the entity shall preserve the service primitive for further processing.

17.2.3 On receiving a P-RESYNCHRONIZE (abandon) indication with user data containing an F-CANCEL request PDU while in the "read data transfer" or the "write data transfer" state, the entity shall:

a) discard any user data which it has not yet delivered, and continue to receive PDUs;

b) issue an F-CANCEL indication service primitive to the IFS user;

c) set the outstanding checkpoint counter to zero;

d) enter the state "f-cancel response pending".

17.2.4 On receiving an F-CANCEL request PDU on a P-DATA indication while in the "read data transfer" or the "write data transfer" state, the entity shall

a) discard any user data which it has not yet delivered, and continue to receive PDUs;

b) issue an F-CANCEL indication service primitive to the IFS user;

c) set the outstanding checkpoint counter to zero;

d) enter the state "f-cancel response pending".

17.2.5 On receiving an F-CANCEL response service primitive from the IFS user, while in the state "f-cancel response pending", the entity shall:

a) if presentation resynchronization functional unit has been successfully negotiated, issue a P-RESYNCHRONIZE (abandon) response with user data containing an F-CANCEL response PDU. Otherwise issue an F-CANCEL response as user data on a P-DATA request;

b) set the checkpoint identifier expected and the expected synchronization number to their values at the beginning of transfer;

c) unset the discard indicator;

d) enter the state "data transfer idle".

17.2.6 On issuing an F-CANCEL confirm service primitive to the IFS user, or on sending an F-CANCEL response PDU, the entity shall unset the discard indicator.

17.2.7 On receiving a P-RESYNCHRONIZE (abandon) confirm with user data containing an F-CANCEL response PDU, while in the "cancel response pending" state, the entity shall

a) issue an F-CANCEL confirm service primitive to the IFS user, with parameters derived from the information received;

b) enter the state "data transfer idle".

17.2.8 On receiving an F-CANCEL response PDU on a P-DATA indication while in the "cancel response pending" state, the entity shall;

a) issue an F-CANCEL confirm service primitive to the IFS user, with parameters derived from the information received;

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b) enter the state "data transfer idle".

17.2.9 Collision of cancel requests carried on P-RESYNCHRONIZE primitives may occur. On receiving a P-RESYNCHRONIZE (abandon) indication with user data containing an F-CANCEL request PDU while in the "cancel response pending" state, the entity shall;

a) issue an F-CANCEL confirm service primitive to the IFS user;

b) issue a P-RESYNCHRONIZE (abandon) response with user data containing an F-CANCEL response PDU and diagnostic from the F-CANCEL request previously issued;

c) enter the state "data transfer idle".

17.2.10 If the presentation resynchronization functional unit has not been successfully negotiated, then collision of cancel requests carried on P-DATA primitives may occur. If an F-CANCEL request PDU is received on a P-DATA indication while in the state "cancel response pending", the entity shall;

a) issue an F-CANCEL confirm service primitive to the IFS user.

b) enter the state "data transfer idle".

17.3 Restarting (Restart data transfer)

17.3.1 On receiving an F-RESTART request service primitive from the IFS user, the entity shall;

a) issue a P-RESYNCHRONIZE (restart) request and set the discard indicator. The user data shall contain an F-RESTART request PDU including a checkpoint identifier equal to the checkpoint id in the F-RESTART primitive, and the parameters shall indicate return of the sync-minor token to the sender. The synchronization point number proposed to the Presentation Service provider shall be equal to the next resynchronization point serial number minus one;

b) set the outstanding checkpoint counter to zero;

c) enter the state "restart response pending".

17.3.2 On receiving a P-RESYNCHRONIZE (restart) indication with user data containing an F-RESTART request PDU while in a "read data transfer" or "write data transfer" state, the entity shall;

a) discard any user data which it has not yet delivered, and continue to receive PDUs;

b) issue an F-RESTART indication service primitive to the IFS user. The checkpoint id shall be equal to the value received in the PDU;

c) set the outstanding checkpoint counter to zero;

d) enter the state "f-restart response pending".

17.3.3 On receiving an F-RESTART response service primitive from the IFS user, the entity shall;

a) issue a P-RESYNCHRONIZE (restart) response with user data containing an F-RESTART response PDU; include a checkpoint id parameter equal to the checkpoint id in the F-RESTART primitive;

b) set the checkpoint identifier expected equal to the checkpoint id received plus one;

c) set the next synchronization point number equal to the resynchronization point number negotiated with the Presentation Service provider;

d) set the synchronization offset to the next synchronization point number minus the checkpoint identifier expected;

e) enter the state "read data transfer" or "write data transfer" depending on the value of the read/write indicator.

17.3.4 On receiving a P-RESYNCHRONIZE (restart) confirm, with user data containing an F-RESTART response PDU, the entity shall;

a) unset the discard indicator;

b) issue an F-RESTART confirm service primitive to the IFS user, with parameters derived from the information received in the PDU;

c) set the checkpoint identifier expected equal to the checkpoint id received plus one;

d) set the next synchronization point number equal to the resynchronization point number negotiated with the Presentation Service provider;

e) set the synchronization offset to the next synchronization point number minus the checkpoint identifier expected;

f) enter the state "read data transfer" or "write data transfer" depending on the value of the read/write indicator.

17.3.5 On receiving a P-RESYNCHRONIZE (restart) indication with user data containing an F-RESTART request PDU while in "restart response pending" state, the entity shall;

a) unset the discard indicator;

b) issue an F-RESTART confirm service primitive to the IFS user. If the entity is the sender, the checkpoint id shall be equal to the value received on the PDU. If the entity is the receiver, the value shall be equal to the value previously transmitted in the F-RESTART request PDU;

c) issue a P-RESYNCHRONIZE (restart) response to the presentation service provider, with user data containing an F-RESTART response PDU with checkpoint id equal to the value determined in (a).

d) set the checkpoint identifier expected equal to the checkpoint id received plus one;

e) set the next synchronization point number equal to the resynchronization point number negotiated with the Presentation Service provider;

f) set the synchronization offset to the next synchronization point number minus the checkpoint identifier expected;

g) enter the state "read data transfer" or "write data transfer" depending on the value of the read/write indicator.

17.3.6 On receiving an F-RESTART request service primitive while in the "first synch minor confirm pending" state, the entity shall preserve the service primitive for further processing.

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Section four: The error recovery protocol

18 Protocol mechanisms

NOTE - The entities referred to in section four are error recovery protocol entities.

18.1 Error detection and reporting

18.1.1 Classes of error

Errors are categorized as follows:

Class I errors	damage	the data transfer regime only.
Class II errors	damage	the select or open regimes.
Class III errors	lose	the association

18.1.2 Error detection mechanisms

Errors are detected either

a) by one of the entities which are operating the error recovery procedure, either as a result of events local to that entity or of consistency checks present in the data transferred; or

b) by the provider of the supporting service. Provider detected errors will be signalled to both the entities using the service by the F-P-ABORT primitive, but the two users will not necessarily be informed at the same time.

NOTES

1 If one entity detects an abnormal condition but is able to apply some correction locally without need for an exchange of protocol, that error is not considered visible within the OSI Environment.

2 Users of the file service may also detect errors and act upon them as appropriate but their resolution is not handled by the error recovery entities.

18.1.3 Error reporting

If the error is detected by the service provider, both service users will be informed and no additional error reporting will be necessary. However, if the error is detected by one of the error recovery entities, the class of error must be reported to the other. This is achieved as follows for transient errors:

a) for class I errors, the class of error is indicated by attempting to negotiate a restart point (see 19.2.1); if the presentation resynchronize functional unit is not available, the class I error is signalled as if it were a class II error;

b) for class II errors, the class of error is indicated by an action result parameter indicating failure, or a suitable optional diagnostic parameter in an F-CANCEL request protocol data unit;

c) for class III errors, the class of error is indicated by a local signal that conveys a transient abort condition to the FPM.

Permanent errors detected by a FERPM are signalled to the IFS user by issuing an F-P-ABORT indication Permanent errors detected by a FERPM are signalled to the peer FERPM by issuing a local signal that conveys a permanent abort condition to the FPM.

18.2 Checkpoints

Recovery makes use of the identification of points in the file to form checkpoints. These are points inserted into the data flow by the sender at appropriate points during the data transfer. The algorithm used by the sender to position checkpoints is a local matter, but on restart or recovery it implies the same point in the data flow as was originally marked by that checkpoint identifier.

Checkpoint acknowledgement is used to limit the number of points at which recovery may be requested, and so to limit commitment of resources. Acknowledgement of a checkpoint also acts as an acknowledgement of any unacknowledged checkpoints received before the checkpoint in question. Each entity states, in the F-INITIALIZE protocol data unit it sends, the maximum number of checkpoints it is prepared to have outstanding when acting as sender; the protocol will not progress if the other entity does not acknowledge checkpoints when that number are outstanding.

18.3 Negotiation of restart point

The responsibility for initiating a recovery action lies with the entity with the most complete information on the stage reached before the error. Thus

a) recovery from class I errors is requested by the receiver;

b) recovery from class II or III errors is requested by the initiator of the activity which failed.

For a class I error, either party may propose a restart; if the receiver makes the proposal, it includes a restart point in the request, and if the sender makes the proposal, the receiver includes a restart point in its response. If resynchronization is not available the error will have been signalled as a class II error, and the following procedure applies.

For a class II or III error, the protocol entity supporting the initiator makes a proposal when re-establishing the file regimes with an F-RECOVER primitive, and the protocol entity supporting the filestore provider may make an overriding proposal on the response if it was the receiver at the time of the error.

NOTE - A restart may imply some real time delay (due, for example, to media repositioning) in some OSIE/RSE mappings.

The time delay before recovery is attempted may be based on the suggested delay value from the diagnostic associated with the failure, if one is present.

18.4 Docket contents

Recovery from class II or III errors necessitates the preservation of a certain collection of information relating to the transfer. The information is associated with the external file service connection when restart or recovery functional units are selected, not the internal file service connection. This requires the management of the following information, referred to here as a docket. A docket makes the following information available;

a) an identifier for the activity; this identifier is not reused if there is a possibility of a resumption;

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b) for the responder, the identity and location of initiator, or for the initiator, the identity and location of responder;

c) a record of the type of the activity (including an indication of read or write if applicable);

d) the bulk data transfer number of the transfer in progress or completed;

e) an indication of the activity state, which may be "starting", "in progress", "data transfer finished" or "finished";

f) a list of checkpoint identifiers and the position in the data flow they correspond to;

g) a count of checkpoints which have not yet been acknowledged;

h) the presentation context for the file content, recorded at file open;

i) the access context for the file content, recorded at start of bulk data transfer;

j) a description of locking mechanisms currently in place for the data;

k) the current location in the file structure.

Use of the term docket does not imply that the information must, in practice, be packaged in a particular way, but is merely a descriptive convenience. However, the reliability depends on the preservation of this body of information, which must exhibit at least the reliability expected of the recovery procedure. An implementation cannot be expected to retain dockets indefinitely; it is a matter of local choice when this procedure is abandoned and dockets deleted. However, for as long as the docket is maintained, concurrency control locking any files recorded in it should be maintained.

19 Specification of the error control protocol

19.1 Normal operation

19.1.1 Issue of service primitives

For every request or response primitive received from the user of the external file service, an error recovery entity shall issue a primitive of the same type, including parameters identical to those received, to the internal file service provider. It may add parameters peculiar to the error control protocol.

For every indication or confirm primitive received from the internal file service provider which

a) is not concerned with error recovery (F-INITIALIZE, F-TERMINATE, F-SELECT, F-CREATE, F-DELETE, F-OPEN, F-LOCATE, F-ERASE, F-READ, F-WRITE or instances of F-DESELECT, F-CLOSE carrying an action result indicating transient error); or

b) carries an action result parameter indicating a permanent error;

an error recovery entity, which is not engaged in a recovery procedure, shall issue a primitive of the same type, including parameters identical to those received, to the external file service user. F-INITIALIZE and F-OPEN may carry parameters relevant to the error control protocol which are not made available to the external file service user.

Any primitive received from the FPM with an action result indicating transient error starts a recovery procedure in the FERPM.

An error recovery entity is defined to be in a recovery procedure from the moment an error is detected until it has negotiated a recovery point and re-sent or received any previously handled data following the recovery point.

19.1.2 FTAM Quality of Service Negotiation

19.1.2.1 Initiating FERPM roles

19.1.2.1.1 Requests

Upon receipt of an F-INITIALIZE request service primitive from the EFS user the entity shall

a) examine the FTAM quality of service parameter and evaluate it on the basis of its value, local knowledge and its capabilities;

b) determine which of the restart and recovery functional units are required to provide the FTAM quality of service that is closest to the requested FTAM quality of service; and

c) add the resulting functional units to the functional unit parameter.

19.1.2.1.2 Responses

Upon receipt of an F-INITIALIZE confirm from the FPM the entity shall

a) note the returned FTAM quality of service;

b) note the functional units negotiated;

c) delete the values "restart" and "recovery" from the functional units parameter if they are present; and

d) issue an F-INITIALIZE confirm service primitive to the EFS user with the FTAM quality of service parameter as modified, the functional units parameter as modified and all other parameters unchanged.

19.1.2.2 Responding FERPM roles

19.1.2.2.1 Indications

Upon receipt of an F-INITIALIZE indication service primitive from the FPM the entity shall

a) examine the FTAM quality of service parameter and evaluate and possible modify it on the basis of its value, local knowledge and its capabilities;

b) determine and remove those requested functional units which cannot be offered;

c) record if the restart or recovery functional units are both requested and available;

d) delete the restart and/or recovery functional units, if present, from the functional unit parameter; and

e) issue an F-INITIALIZE indication, without the restart or recovery functional units, to the EFS user.

19.1.2.2.2 Responses

Upon receipt of an F-INITIALIZE response from the EFS user the entity shall

a) note the returned FTAM quality of service;

b) add to the functional units parameter the restart or recovery functional units if they are recorded as required and available;

c) issue an F-INITIALIZE response service primitive to the IFS provider with the functional units parameter as modified and all other parameters unchanged.

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NOTES

1 There is no formal correspondence between the FQoS negotiated and the functional units finally negotiated. The functional units will depend in part on the perceived reliability of both local systems and known properties of the communications mechanisms in use.

2 A minimal FQoS requiring no error control at all does not imply that there is no FERPM, but only implies that the FERPM provides no error control.

19.1.3 Checkpoint insertion

The sending error recovery entity should insert F-CHECK requests into the sequence of F-DATA primitives it is called upon to transfer.

NOTE - The points at which these primitives are inserted will depend on local management strategies, based on the way the information is received and on the requested quality of service.

19.1.4 Checkpoint acknowledgement

The receiving FERPM shall issue F-CHECK response primitives before the number of outstanding checkpoints exceeds the sending FERPM's checkpoint window.

The sending FERPM shall suspend the issuing of F-DATA request and F-CHECK request primitives to the FPM when the number of outstanding checkpoints equals the sending FERPM's checkpoint window.

19.1.5 Docket management

In the course of a successful transfer, the initiator or responder shall perform the actions described in this clause.

19.1.5.1 After receiving an F-INITIALIZE request from the EFS user and before issuing an F-INITIALIZE request to the IFS provider the initiating FERPM shall retain for inclusion in any docket subsequently created the values of the parameters requested.

19.1.5.2 After receiving an F-INITIALIZE indication from the IFS provider and before issuing an F-INITIALIZE indication to the EFS user the responding FERPM shall retain for inclusion in any docket subsequently created the values of the parameters requested.

19.1.5.3 After receiving an F-INITIALIZE response from the EFS user and before issuing an F-INITIALIZE request to the IFS provider the responding FERPM shall retain for inclusion in any docket subsequently created the values of the parameters returned.

19.1.5.4 After receiving an F-INITIALIZE confirm from the IFS provider and before issuing an F-INITIALIZE confirm to the EFS user the initiating FERPM and shall retain for inclusion in any docket subsequently created the values of the parameters returned.

19.1.5.5 After receiving an F-OPEN request from the external file service user, and before issuing an F-OPEN request to the internal file service provider, the initiating error recovery entity shall create a docket and record in it the following information as defined in 18.4: the activity identifier, the location of the responder, the type of activity, the access context, the presentation context, a null checkpoint list and the state "starting".

19.1.5.6 After receiving an F-OPEN indication from the internal file service provider, and before issuing an F-OPEN indication to the external file service user, the responding error recovery entity shall create a docket and record in it the following information as defined in 18.4: the activity identifier, the location of the initiator, the type of activity, the access context, the presentation context, a null checkpoint list and the state "starting".

19.1.5.7 If immediately following the F-OPEN indication to the external file service user, there is an F-OPEN response with a state result parameter indicating failure from the external file service user, the responding error recovery entity shall delete its docket before issuing the corresponding request to the internal file service provider.

19.1.5.8 On receiving an F-OPEN confirm with a state result indicating an error, the initiator shall delete its docket.

19.1.5.9 On issuing a request or receiving an indication of an F-READ or an F-WRITE, an entity shall record the state as "in progress", and increment and record the bulk data transfer number.

19.1.5.10 The error recovery entity which is sending data shall, on issuing an F-CHECK request primitive, add to the list in its docket the checkpoint identifier in that primitive.

19.1.5.11 The error recovery entity which is receiving data shall, on receiving an F-CHECK indication primitive, add to the list in its docket the checkpoint identifier in that primitive.

19.1.5.12 The error recovery entity which is receiving data shall, on securing the data preceding any F-CHECK indication primitive received, issue an F-CHECK response primitive. If one action which secures data would result in the issue of more than one F-CHECK response, only the response with higher synchronization point number needs to be issued.

19.1.5.13 The error recovery entity which is receiving data shall, on issuing an F-CHECK response primitive, delete from the list in its docket any checkpoint identifiers earlier than the one in that primitive.

19.1.5.14 The error recovery entity which is sending data shall, on receiving an F-CHECK confirm primitive, delete from the list in its docket any checkpoint identifiers earlier than the one in that primitive.

19.1.5.15 The error recovery entities shall record "data transfer finished" in their dockets in the following circumstances:

initiator sending	F-TRANSFER-END confirm
initiator receiving	F-TRANSFER-END request
responder sending	F-TRANSFER-END indication
responder receiving	F-TRANSFER-END response

19.1.5.16 The initiating error recovery entity shall, on issuing an F-CLOSE request without an action result to the internal service provider, record the state "finished" in its docket;

19.1.5.17 If the action result parameter indicates success or permanent error, the responding error recovery entity shall delete its docket on issuing an F-CLOSE response to the internal service provider. Otherwise, the responding error recovery entity shall retain its docket and initiate recovery procedures.

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19.1.5.18 If the action result parameter indicates success or permanent error, the initiating error recovery entity shall delete its docket on receiving an F-CLOSE confirm from the internal file service provider. Otherwise, the initiating error recovery entity shall retain its docket and initiate recovery procedures.

19.2 Recovery from errors

The following clauses specify the error recovery procedures. These procedures are summarized in figures at the start of each clause.

19.2.1 Class I errors

19.2.1.1 If an error recovery entity detects a class I error (see 18.1), it shall issue an F-RESTART request to the internal service provider.

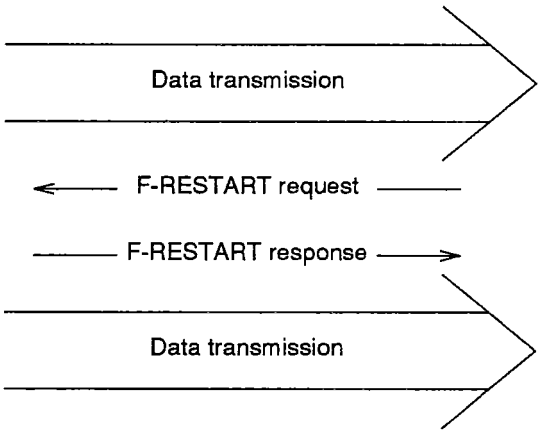

Figure 4 — Procedure for class I errors

19.2.1.2 If an error recovery entity detects a class I error (see 18.1) and the presentation resynchronize functional unit has been successfully negotiated and the restart functional unit has been successfully negotiated then it shall issue an F-RESTART request to the IFS provider. If the restart functional unit is not available, but the recover functional unit is available then it shall perform a recovery following the procedures described in 19.2.2.1. If the entity is a receiving entity, the F-RESTART request shall include a recovery point which is a checkpoint identifier such that:

a) if intermediate restart is not possible, it indicates restart of the activity from the beginning, otherwise

b) it is the most recent checkpoint from the list in the docket.

NOTE - The session synchronization point numbers are related to the checkpoint identifiers by the synchronization offset (see section three).

19.2.1.3 If the entity is a sending entity, it shall not include a recovery point parameter in the F-RESTART request.

19.2.1.4 If a sending error recovery entity receives an F-RESTART indication it shall send an F-RESTART response, and restart data transfer at the checkpoint quoted in the F-RESTART indication.

NOTE - No response should be expected in this case if an F-RESTART request had been issued.

19.2.1.5 If a sending error recovery entity receives an F-RESTART confirm it shall restart data transfer at the recovery point given in the confirm.

19.2.1.6 If a receiving error recovery entity receives an F-RESTART indication, and if it has not previously sent an F-RESTART request which remains unconfirmed, it shall issue an F-RESTART response, quoting a recovery point as in 19.2.1.2.

19.2.1.7 If a receiving error recovery entity receives an F-RESTART indication after sending an F-RESTART request and before receiving an F-RESTART confirm, it shall discard the primitive.

19.2.1.8 If the restart functional unit is not available then class I errors shall be handled as class II errors.

19.2.2 Class II errors

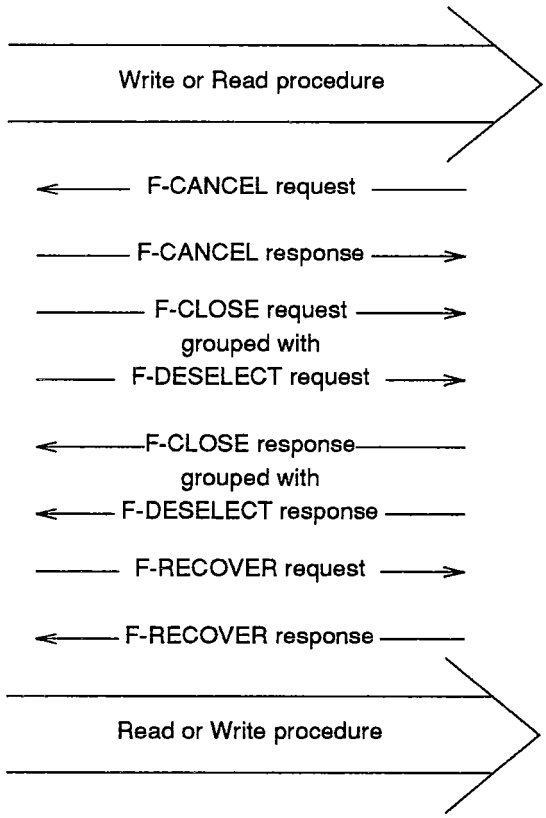

Figure 5 — Procedure for class II errors

NOTE - Figure 5 assumes that grouping of the F-CLOSE and F-DESELECT primitives is being used. This will always be the case in the file transfer service class.

19.2.2.1 If an error recovery entity detects a class II error (see 18.1) it shall issue an F-CANCEL request with an action result parameter indicating a transient (or recoverable) error with optional diagnostic.

19.2.2.2 If an error recovery entity receives an F-CANCEL indication, it shall issue an F-CANCEL response.

19.2.2.3 If an initiating error recovery entity receives an F-CANCEL indication with an action result parameter indicating a class II transient error, or an F-CANCEL confirmation after having signalled a class II transient error,

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it should issue an F-CLOSE request and an F-DESELECT request, and on receiving the F-CLOSE confirm and F-DESELECT confirm it should perform any necessary corrective action. It should then perform an F-RECOVER recovery as specified in 19.2.3.2 and following.

19.2.3 Class III errors

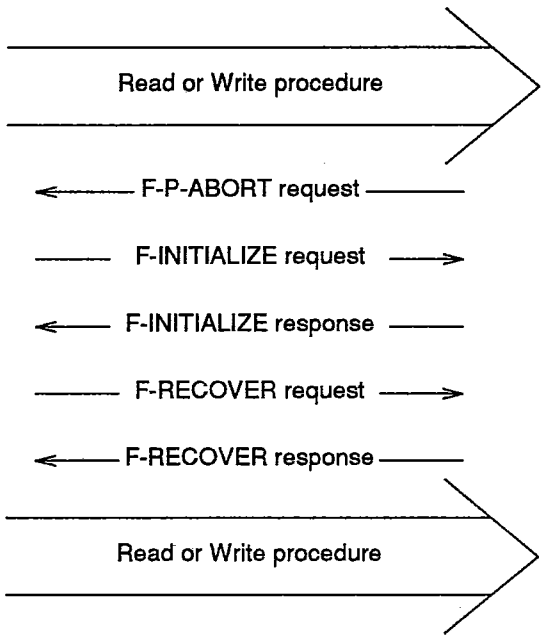

Figure 6 — Procedure for class III errors

19.2.3.1 If an initiating error recovery entity detects a class III error (by receiving an F-P-ABORT or by a local reinitialization) it shall establish an association to the location recorded in its docket by means of an exchange of F-INITIALIZE primitives using the parameter values recorded in its docket when the FTAM regime was first established. If a diagnostic was received with a recommended retry time field and the association cannot be re-established, the entity should delay for the period of time specified in the diagnostic received. If none is specified, it shall delay for a locally defined period of time and attempt the association establishment again.

NOTE - This procedure should be repeated a locally determined number of times before abandoning the activity and deleting the docket.

19.2.3.2 When the association is established, the initiating entity shall issue an F-RECOVER request primitive, quoting the activity identifier from its docket. It shall quote a recovery point and a bulk data transfer number. The checkpoint identifier quoted shall be:

a) if the entity was acting as a sending entity, the oldest checkpoint identifier from the list in its docket;

b) if the entity was acting as a receiving entity, the most recent checkpoint identifier from the list in its docket.

19.2.3.3 A responding error recovery entity which receives an F-RECOVER indication shall respond as follows:

a) if it has a docket for the same activity identifier, issued at the same location, and is prepared to continue the activity, it shall issue an F-RECOVER response. It shall include a recovery point which is:

1) if the entity was acting as a receiving entity, the most recent checkpoint identifier from the list in its docket;

2) if the entity was acting as a sending entity, equal to the value received.

It shall then enter the state "data transfer idle" and proceed as specified in 19.2.3.5.

b) If it is not prepared to continue the activity but because of local system considerations is likely to be able to continue later, it shall issue a F-RECOVER response primitive with an action result parameter indicating a transient error, and optionally with a diagnostic parameter carrying a value for recommended retry time.

c) If it does not have a docket for the activity, or if its recorded bulk data transfer numbers do not correspond it shall issue an F-RECOVER response primitive with an action result parameter indicating a permanent error, and optionally a diagnostic indicating "activity identifier unknown".

19.2.3.4 If an initiating error recovery entity receives an F-RECOVER confirm primitive with an action result parameter indicating a permanent error, it shall examine its own docket and:

a) if the docket state is "starting", restart the complete activity by issuing an F-SELECT request, then an F-OPEN request to the internal file service provider as in 19.1.3.1.

b) if the state is "in progress" or "data transfer finishing", issue an F-P-ABORT to the external file service user with a result parameter indicating a permanent error;

c) if the state is "finished", issue an F-CLOSE confirm to the external file service user, indicating a successful completion, followed by an F-P-ABORT indication to the external file service user and an F-U-ABORT request to the internal file service provider, with a diagnostic parameter indicating the loss of selection.

19.2.3.5 If the F-RECOVER confirm carries an action result indicating success, the entities then take up their respective roles as sender and receiver in the data transfer procedure, starting with the F-READ or F-WRITE primitive and followed by the F-DATA primitive after the agreed recovery point. The receiver resumes the issue of F-DATA indications to the external file service user at the first such primitive which has not previously been issued.

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Section five: Abstract Syntax

20 Abstract Syntax Definition

This clause specifies the abstract syntax for the FTAM protocol information.

NOTES

1 The syntax is defined using a small collection of basic data types that are application independent.

2 The means by which FTAM protocol information is to be transferred (as P-DATA or as user data on other presentation or ACSE service primitives) is defined in sections two and three.

20.1 Conventions

The abstract syntax is defined using the notation specified in ASN.1 (Abstract Syntax Notation One) defined in ISO 8824.

For each of the FTAM service parameters which is to be transferred by an FTAM PDU, there is a PDU field (an ASN.1 NamedType) with the same name as the corresponding service parameter (see ISO 8571-3), except for the differences required by the use of ASN.1, which are that blanks are replaced by hyphens and capitals by their corresponding lower case letters, e. g. "Contents Type" becomes "contents-type".

The same naming convention is used to define the types of the file attributes (see ISO 8571-2).

20.2 Primitive Types

The ASN.1 definition uses the following data types as they are defined in ISO 8824

a) Simple types
   1) BOOLEAN;
   2) INTEGER;
   3) BIT STRING; OCTET STRING;
   4) NULL;
   5) GraphicString;
   6) GeneralizedTime;
   7) EXTERNAL;
   8) OBJECT IDENTIFIER;
   9) ObjectDescriptor

b) Structured types
   1) SEQUENCE;
   2) SEQUENCE OF;
   3) SET;
   4) SET OF;
   5) CHOICE;
   6) Tagged

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20.3 ASN.1 Module Definition

The comments in this ASN.1 module definition form part of the standard, and shall be implemented.

A cross-reference of the module definition is included in annex C.

```
ISO8571-FTAM DEFINITIONS ::=

BEGIN

  PDU ::= CHOICE { FTAM-Regime-PDU, File-PDU, Bulk-Data-PDU }

  FTAM-Regime-PDU ::= CHOICE {
     f-initialize-request  [0] IMPLICIT F-INITIALIZE-request,
     f-initialize-response [1] IMPLICIT F-INITIALIZE-response,
     f-terminate-request   [2] IMPLICIT F-TERMINATE-request,
     f-terminate-response  [3] IMPLICIT F-TERMINATE-response,
     f-u-abort-request     [4] IMPLICIT F-U-ABORT-request,
     f-p-abort-request     [5] IMPLICIT F-P-ABORT-request }

  F-INITIALIZE-request ::= SEQUENCE {
     protocol-version                 Protocol-Version DEFAULT { version-1 },
     implementation-information       Implementation-Information OPTIONAL,
     presentation-context-management [2] IMPLICIT BOOLEAN DEFAULT FALSE,
     service-class                    Service-Class DEFAULT { transfer-class },
      -- Only the valid combinations as specified in ISO 8571-3 are allowed
     functional-units                 Functional-Units,
     attribute-groups                 Attribute-Groups DEFAULT {},
     shared-ASE-information           Shared-ASE-Information OPTIONAL,
     ftam-quality-of-service          FTAM-Quality-Of-Service,
     contents-type-list               Contents-Type-List OPTIONAL,
     initiator-identity               User-Identity OPTIONAL,
     account                          Account OPTIONAL,
     filestore-password               Password OPTIONAL,
     checkpoint-window                [8] IMPLICIT INTEGER DEFAULT 1 }

  F-INITIALIZE-response ::= SEQUENCE {
     state-result                     State-Result  DEFAULT success,
     action-result                    Action-Result DEFAULT success,
     protocol-version                 Protocol-Version DEFAULT { version-1 },
     implementation-information       Implementation-Information OPTIONAL,
     presentation-context-management [2] IMPLICIT BOOLEAN DEFAULT FALSE,
     service-class                    Service-Class DEFAULT { transfer-class },
      -- Only the valid combinations as specified in ISO 8571-3 are allowed
     functional-units                 Functional-Units,
     attribute-groups                 Attribute-Groups DEFAULT {},
     shared-ASE-information           Shared-ASE-Information OPTIONAL,
     ftam-quality-of-service          FTAM-Quality-Of-Service,
     contents-type-list               Contents-Type-List OPTIONAL,
     diagnostic                       Diagnostic OPTIONAL,
     checkpoint-window                [8] IMPLICIT INTEGER DEFAULT 1 }

```

Figure 7 — FTAM regime PDUs

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```
47    Protocol-Version ::= [0] IMPLICIT BIT STRING { version-1 (0) }
48
49    Implementation-Information ::= [1] IMPLICIT GraphicString
50    -- this parameter is provided solely for the convenience of implementors needing
51    -- to distinguish between implementations of a specific version number on different
52    -- equipment, it shall not be the subject of conformance test.
53
54    Service-Class ::= [3] IMPLICIT BIT STRING
55                    { unconstrained-class (0),
56                      management-class (1),
57                      transfer-class (2),
58                      transfer-and-management-class (3),
59                      access-class (4) }
60
61    Functional-Units ::= [4] IMPLICIT BIT STRING
62                    { read (2),
63                      write (3),
64                      file-access (4),
65                      limited-file-management (5),
66                      enhanced-file-management (6),
67                      grouping (7),
68                      fadu-locking (8),
69                      recovery (9),
70                      restart-data-transfer (10) }
71     -- Values 2 to 10 are chosen to align with numbering scheme used in ISO 8571-3
72
73    Attribute-Groups ::= [5] IMPLICIT BIT STRING
74                    { storage (0),
75                      security (1),
76                      private (2) }
77
78    FTAM-Quality-Of-Service ::= [6] IMPLICIT INTEGER
79                    { no-recovery (0),
80                      class-1-recovery (1),
81                      class-2-recovery (2),
82                      class-3-recovery (3) }
83
84    Contents-Type-List ::= [7] IMPLICIT SEQUENCE OF CHOICE
85              { document-type-name   Document-Type-Name,
86                abstract-syntax-name Abstract-Syntax-Name }
87
88    F-TERMINATE-request ::= SEQUENCE {
89        shared-ASE-information Shared-ASE-Information OPTIONAL }
90
91    F-TERMINATE-response ::= SEQUENCE {
92        shared-ASE-information Shared-ASE-Information OPTIONAL,
93        charging               Charging OPTIONAL }
94
95    F-U-ABORT-request ::= SEQUENCE {
96        action-result      Action-Result DEFAULT success,
97        diagnostic         Diagnostic OPTIONAL }
98
99    F-P-ABORT-request ::= SEQUENCE {
100       action-result  Action-Result DEFAULT success,
101       diagnostic     Diagnostic OPTIONAL }
102
103   END
```

Figure 7 (continued) — FTAM regime PDUs

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```
104  ISO8571-FTAM DEFINITIONS ::=
105
106  BEGIN
107
108    File-PDU ::= CHOICE {
109          f-select-request          [ 6] IMPLICIT F-SELECT-request,
110          f-select-response         [ 7] IMPLICIT F-SELECT-response,
111          f-deselect-request        [ 8] IMPLICIT F-DESELECT-request,
112          f-deselect-response       [ 9] IMPLICIT F-DESELECT-response,
113          f-create-request          [10] IMPLICIT F-CREATE-request,
114          f-create-response         [11] IMPLICIT F-CREATE-response,
115          f-delete-request          [12] IMPLICIT F-DELETE-request,
116          f-delete-response         [13] IMPLICIT F-DELETE-response,
117          f-read-attrib-request     [14] IMPLICIT F-READ-ATTRIB-request,
118          f-read-attrib-response    [15] IMPLICIT F-READ-ATTRIB-response,
119          f-change-attrib-request   [16] IMPLICIT F-CHANGE-ATTRIB-request,
120          f-change-attrib-response  [17] IMPLICIT F-CHANGE-ATTRIB-response,
121          f-open-request            [18] IMPLICIT F-OPEN-request,
122          f-open-response           [19] IMPLICIT F-OPEN-response,
123          f-close-request           [20] IMPLICIT F-CLOSE-request,
124          f-close-response          [21] IMPLICIT F-CLOSE-response,
125          f-begin-group-request     [22] IMPLICIT F-BEGIN-GROUP-request,
126          f-begin-group-response    [23] IMPLICIT F-BEGIN-GROUP-response,
127          f-end-group-request       [24] IMPLICIT F-END-GROUP-request,
128          f-end-group-response      [25] IMPLICIT F-END-GROUP-response,
129          f-recover-request         [26] IMPLICIT F-RECOVER-request,
130          f-recover-response        [27] IMPLICIT F-RECOVER-response,
131          f-locate-request          [28] IMPLICIT F-LOCATE-request,
132          f-locate-response         [29] IMPLICIT F-LOCATE-response,
133          f-erase-request           [30] IMPLICIT F-ERASE-request,
134          f-erase-response          [31] IMPLICIT F-ERASE-response }
135
136    F-SELECT-request ::= SEQUENCE {
137       attributes              Select-Attributes,
138       requested-access        Access-Request,
139       access-passwords        Access-Passwords OPTIONAL,
140       concurrency-control     Concurrency-Control OPTIONAL,
141       shared-ASE-information  Shared-ASE-Information OPTIONAL,
142       account                 Account OPTIONAL }
143
144    F-SELECT-response ::= SEQUENCE {
145       state-result            State-Result DEFAULT success,
146       action-result           Action-Result DEFAULT success,
147       attributes              Select-Attributes,
148       shared-ASE-information  Shared-ASE-Information OPTIONAL,
149       diagnostic              Diagnostic OPTIONAL }
150
151    F-DESELECT-request ::= SEQUENCE {
152       shared-ASE-information  Shared-ASE-Information OPTIONAL }
153
154
155    F-DESELECT-response ::= SEQUENCE {
156       action-result           Action-Result DEFAULT success,
157       charging                Charging OPTIONAL,
158            -- Present if and only if the account field was present on
159            -- the PDU which established the selection regime.
160       shared-ASE-information  Shared-ASE-Information OPTIONAL,
161       diagnostic              Diagnostic OPTIONAL }
162
```

Figure 8 — File selection and file open regime PDUs

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```
163    F-CREATE-request ::= SEQUENCE {
164       override                [0] IMPLICIT INTEGER
165                     { create-failure (0),
166                       select-old-file (1),
167                       delete-and-create-with-old-attributes (2),
168                       delete-and-create-with-new-attributes (3) }
169                            DEFAULT create-failure,
170       initial-attributes      Create-Attributes,
171       create-password         Password OPTIONAL,
172            -- Present is an additional password to the filestore password
173            -- is required to allow the file creation.
174       requested-access        Access-Request,
175       access-passwords        Access-Passwords OPTIONAL,
176            -- Present only if required to satisfy access control
177            -- requirement on existing file.
178       concurrency-control     Concurrency-Control OPTIONAL,
179       shared-ASE-information Shared-ASE-Information OPTIONAL,
180       account                 Account OPTIONAL }
181
182    F-CREATE-response ::= SEQUENCE {
183       state-result            State-Result   DEFAULT success,
184       action-result           Action-Result  DEFAULT success,
185       initial-attributes      Create-Attributes,
186       shared-ASE-information Shared-ASE-Information OPTIONAL,
187       diagnostic              Diagnostic     OPTIONAL }
188
189    F-DELETE-request ::= SEQUENCE {
190       shared-ASE-information Shared-ASE-Information OPTIONAL }
191
192    F-DELETE-response ::= SEQUENCE {
193       action-result           Action-Result  DEFAULT success,
194       shared-ASE-information Shared-ASE-Information OPTIONAL,
195       charging                Charging OPTIONAL,
196       diagnostic              Diagnostic OPTIONAL }
197
198    F-READ-ATTRIB-request ::= SEQUENCE {
199       attribute-names      [0] IMPLICIT BIT STRING
200            -- Kernel group
201               { read-filename (0),
202                 read-permitted-actions (1),
203                 read-contents-type (2),
204            -- Storage group
205                 read-storage-account (3),
206                 read-date-and-time-of-creation (4),
207                 read-date-and-time-of-last-modification (5),
208                 read-date-and-time-of-last-read-access (6),
209                 read-date-and-time-of-last-attribute-modification (7),
210                 read-identity-of-creator (8),
211                 read-identity-of-last-modifier (9),
212                 read-identity-of-last-reader (10),
213                 read-identity-of-last-attribute-modifier (11),
214                 read-file-availability (12),
215                 read-filesize (13),
216                 read-future-filesize (14),
217            -- Security group
218                 read-access-control (15),
219                 read-legal-qualifications (16),
220            -- Private group
221                 read-private-use (17) } }
222
```

Figure 8 (continued) — File selection and file open regime PDUs

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```
223    F-READ-ATTRIB-response ::= SEQUENCE {
224       action-result  Action-Result   DEFAULT success,
225       attributes     Read-Attributes OPTIONAL,
226            -- Password values within access control can not be read by means of
227            -- the read attribute action. Whether other parts of the access control
228            -- file attribute can be read by means of the read attribute action is
229            -- decided locally by the responding entity, and it shall not be the
230            -- subject of conformance test.
231       diagnostic     Diagnostic      OPTIONAL }
232
233    F-CHANGE-ATTRIB-request ::= SEQUENCE {
234       attributes     Change-Attributes }
235
236    F-CHANGE-ATTRIB-response ::= SEQUENCE {
237       action-result  Action-Result DEFAULT success,
238       attributes     Change-Attributes     OPTIONAL,
239            -- Password values within access control attribute are never returned.
240            -- Other attributes are returned as an implementation choice.
241       diagnostic     Diagnostic     OPTIONAL }
242
243    F-OPEN-request ::= SEQUENCE {
244       processing-mode         [0] IMPLICIT BIT STRING
245                          { f-read (0),
246                            f-insert (1),
247                            f-replace (2),
248                            f-extend (3),
249                            f-erase (4) } DEFAULT { f-read },
250       contents-type           [1] CHOICE {
251                      unknown  [0] IMPLICIT NULL,
252                      proposed [1] Contents-Type-Attribute },
253       concurrency-control     Concurrency-Control OPTIONAL,
254       shared-ASE-information Shared-ASE-Information  OPTIONAL,
255       enable-fadu-locking     [2] IMPLICIT BOOLEAN DEFAULT FALSE,
256       activity-identifier     Activity-Identifier OPTIONAL,
257            -- Only used in the recovery functional unit.
258       recovery-mode           [3] IMPLICIT INTEGER
259                          { none (0),
260                            at-start-of-file (1),
261                            at-any-active-checkpoint (2) } DEFAULT none,
262       remove-contexts         [4] IMPLICIT SET OF Abstract-Syntax-Name OPTIONAL,
263       define-contexts         [5] IMPLICIT SET OF Abstract-Syntax-Name OPTIONAL }
264
265    F-OPEN-response ::= SEQUENCE {
266       state-result            State-Result DEFAULT success,
267       action-result           Action-Result DEFAULT success,
268       contents-type           [1] Contents-Type-Attribute,
269       concurrency-control     Concurrency-Control OPTIONAL,
270       shared-ASE-information Shared-ASE-Information  OPTIONAL,
271       diagnostic              Diagnostic OPTIONAL,
272       recovery-mode           [3] IMPLICIT INTEGER
273                          { none (0),
274                            at-start-of-file (1),
275                            at-any-active-checkpoint (2) } DEFAULT none,
276       presentation-action     [6] IMPLICIT BOOLEAN DEFAULT FALSE }
277          -- this flag is set if the responder is going to follow this response by
278          -- a P-ALTER-CONTEXT exchange
279
280    F-CLOSE-request ::= SEQUENCE {
281       action-result           Action-Result DEFAULT success,
282       shared-ASE-information  Shared-ASE-Information OPTIONAL,
283       diagnostic              Diagnostic OPTIONAL }
284
```

Figure 8 (continued) — File selection and file open regime PDUs

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```
285     F-CLOSE-response ::= SEQUENCE {
286        action-result           Action-Result DEFAULT success,
287        shared-ASE-information  Shared-ASE-Information  OPTIONAL,
288        diagnostic              Diagnostic OPTIONAL }
289
290     F-BEGIN-GROUP-request ::= SEQUENCE {
291        threshold      [0] IMPLICIT INTEGER }
292
293     F-BEGIN-GROUP-response ::= SEQUENCE { }
294        -- No elements defined, shall be empty
295
296     F-END-GROUP-request ::= SEQUENCE { }
297        -- No elements defined, shall be empty
298
299     F-END-GROUP-response ::= SEQUENCE { }
300        -- No elements defined, shall be empty
301
302     F-RECOVER-request ::= SEQUENCE {
303        activity-identifier  Activity-Identifier,
304        bulk-transfer-number [0] IMPLICIT INTEGER,
305        requested-access     Access-Request,
306        access-passwords     Access-Passwords OPTIONAL,
307        recovery-point       [2] IMPLICIT INTEGER DEFAULT 0,
308           -- zero indicates beginning of file
309           -- point after last checkpoint indicates end of file
310        remove-contexts      [3] IMPLICIT SET OF Abstract-Syntax-Name OPTIONAL,
311        define-contexts      [4] IMPLICIT SET OF Abstract-Syntax-Name OPTIONAL }
312
313     F-RECOVER-response ::= SEQUENCE {
314        state-result        State-Result  DEFAULT success,
315        action-result       Action-Result DEFAULT success,
316        contents-type       [1] Contents-Type-Attribute,
317        recovery-point      [2] IMPLICIT INTEGER DEFAULT 0,
318           -- zero indicates beginning of file
319           -- point after last checkpoint indicates end of file
320        diagnostic          Diagnostic OPTIONAL,
321        presentation-action [6] IMPLICIT BOOLEAN DEFAULT FALSE }
322           -- this flag is set if the responder is going to follow this response by
323           -- a P-ALTER-CONTEXT exchange
324
325     F-LOCATE-request ::= SEQUENCE {
326        file-access-data-unit-identity FADU-Identity,
327        fadu-lock                      FADU-Lock OPTIONAL }
328
329     F-LOCATE-response ::= SEQUENCE {
330        action-result                  Action-Result DEFAULT success,
331        file-access-data-unit-identity FADU-Identity OPTIONAL,
332        diagnostic                     Diagnostic OPTIONAL }
333
334     F-ERASE-request ::= SEQUENCE {
335        file-access-data-unit-identity  FADU-Identity }
336
337     F-ERASE-response ::= SEQUENCE {
338        action-result  Action-Result DEFAULT success,
339        diagnostic     Diagnostic OPTIONAL }
340
341  END
```

Figure 8 (continued) — File selection and file open regime PDUs

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```
342  ISO8571-FTAM DEFINITIONS ::=
343
344  BEGIN
345
346    Bulk-Data-PDU ::= CHOICE {
347          f-read-request          [32] IMPLICIT F-READ-request,
348          f-write-request         [33] IMPLICIT F-WRITE-request,
349               -- There is no F-DATA FPDU, the contents of a file
350               -- are transferred in a diferent presentation context
351               -- and there is therefore no need to define the types
352               -- of file contents in the FTAM PCI abstract syntax.
353               -- File contents data are carried in values of the
354               -- data type Data-Element as defined in ISO 8571-2
355          f-data-end-request      [34] IMPLICIT F-DATA-END-request,
356          f-transfer-end-request  [35] IMPLICIT F-TRANSFER-END-request,
357          f-transfer-end-response [36] IMPLICIT F-TRANSFER-END-response,
358          f-cancel-request        [37] IMPLICIT F-CANCEL-request,
359          f-cancel-response       [38] IMPLICIT F-CANCEL-response,
360
361               -- There is no F-CHECK PDU
362          f-restart-request       [39] IMPLICIT F-RESTART-request,
363          f-restart-response      [40] IMPLICIT F-RESTART-response }
364    F-READ-request ::= SEQUENCE {
365       file-access-data-unit-identity FADU-Identity,
366       access-context                 Access-Context,
367       fadu-lock                      FADU-Lock OPTIONAL }
368
369    F-WRITE-request ::= SEQUENCE {
370       file-access-data-unit-operation [0] IMPLICIT INTEGER
371                         { insert (0),
372                           replace (1),
373                           extend (2) },
374       file-access-data-unit-identity FADU-Identity,
375       fadu-lock                      FADU-Lock OPTIONAL }
376
377    F-DATA-END-request ::= SEQUENCE {
378       action-result  Action-Result DEFAULT success,
379       diagnostic     Diagnostic OPTIONAL }
380
381    F-TRANSFER-END-request ::= SEQUENCE {
382       shared-ASE-information  Shared-ASE-Information OPTIONAL }
383
384    F-TRANSFER-END-response ::= SEQUENCE {
385       action-result          Action-Result DEFAULT success,
386       shared-ASE-information Shared-ASE-Information OPTIONAL,
387       diagnostic             Diagnostic OPTIONAL }
388
389    F-CANCEL-request ::= SEQUENCE {
390       action-result          Action-Result DEFAULT success,
391       shared-ASE-information Shared-ASE-Information OPTIONAL,
392       diagnostic             Diagnostic OPTIONAL }
393
394    F-CANCEL-response ::= SEQUENCE {
395       action-result          Action-Result DEFAULT success,
396       shared-ASE-information Shared-ASE-Information OPTIONAL,
397       diagnostic             Diagnostic OPTIONAL }
398
399    F-RESTART-request ::= SEQUENCE {
400       checkpoint-identifier [0] IMPLICIT INTEGER }
401
402    F-RESTART-response ::= SEQUENCE {
403       checkpoint-identifier [0] IMPLICIT INTEGER }
404
405  END
```

Figure 9 — Bulk data transfer PDUs

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```
ISO8571-FTAM DEFINITIONS ::=

BEGIN

  Abstract-Syntax-Name ::= [APPLICATION 0] IMPLICIT OBJECT IDENTIFIER

  Access-Context ::= [APPLICATION 1] IMPLICIT SEQUENCE {
     access-context [0] IMPLICIT INTEGER
                    { hierarchical-all-data-units (0),      -- HA
                      hierarchical-no-data-units (1),       -- HN
                      flat-all-data-units (2),              -- FA
                      flat-one-level-data-units (3),        -- FL
                      flat-single-data-unit (4),            -- FS
                      unstructured-all-data-units (5),      -- UA
                      unstructured-single-data-unit (6) }, -- US
     level-number   [1] IMPLICIT INTEGER OPTIONAL }
          -- Present if and only if flat-one-level-data-units
          -- (access context FL) is selected.
     -- As defined in ISO 8571-2

  Access-Passwords ::= [APPLICATION 2] IMPLICIT SEQUENCE {
     read-password              [0] IMPLICIT Password,
     insert-password            [1] IMPLICIT Password,
     replace-password           [2] IMPLICIT Password,
     extend-password            [3] IMPLICIT Password,
     erase-password             [4] IMPLICIT Password,
     read-attribute-password    [5] IMPLICIT Password,
     change-attribute-password  [6] IMPLICIT Password,
     delete-password            [7] IMPLICIT Password }

  Access-Request ::= [APPLICATION 3] IMPLICIT BIT STRING
                  { read (0),
                    insert (1),
                    replace (2),
                    extend (3),
                    erase (4),
                    read-attribute (5),
                    change-attribute (6),
                    delete-file (7) }

  Account ::= [APPLICATION 4] IMPLICIT GraphicString

  Action-Result ::= [APPLICATION 5] IMPLICIT INTEGER
              { success (0),
                transient-error (1),
                permanent-error (2) }

  Activity-Identifier ::= [APPLICATION 6] IMPLICIT INTEGER

  Application-Entity-Title ::= [APPLICATION 7] ACSE-1.AE-title
     -- As defined in ISO 8650

  Change-Attributes ::= [APPLICATION 8] IMPLICIT SEQUENCE {
  -- Kernel group
     filename              [ 0] IMPLICIT Filename-Attribute OPTIONAL,
  -- Storage group
     storage-account       [ 3] Account-Attribute OPTIONAL,
     file-availability     [12] File-Availability-Attribute OPTIONAL,
     future-filesize       [14] Filesize-Attribute OPTIONAL,
  -- Security group
     access-control        [15] Access-Control-Change-Attribute OPTIONAL,
     legal-qualification   [16] Legal-Qualification-Attribute OPTIONAL,
  -- Private group
     private-use           [17] Private-Use-Attribute OPTIONAL }
```

Figure 10 — Application wide types

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```
471    Charging ::= [APPLICATION 9] IMPLICIT SEQUENCE OF SEQUENCE {
472       resource-identifier [0] IMPLICIT GraphicString,
473       charging-unit       [1] IMPLICIT GraphicString,
474       charging-value      [2] IMPLICIT INTEGER }
475
476    Concurrency-Control ::= [APPLICATION 10] IMPLICIT SEQUENCE
477                   { read             [0] IMPLICIT Lock,
478                     insert           [1] IMPLICIT Lock,
479                     replace          [2] IMPLICIT Lock,
480                     extend           [3] IMPLICIT Lock,
481                     erase            [4] IMPLICIT Lock,
482                     read-attribute   [5] IMPLICIT Lock,
483                     change-attribute [6] IMPLICIT Lock,
484                     delete-file      [7] IMPLICIT Lock }
485
486    Lock  ::= INTEGER
487           { not-required (0),
488             shared (1),
489             exclusive (2),
490             no-access (3) }
491
492    Constraint-Set-Name ::= [APPLICATION 11] IMPLICIT OBJECT IDENTIFIER
493
494    Create-Attributes ::= [APPLICATION 12] IMPLICIT SEQUENCE {
495    -- Kernel group
496       filename             [ 0] IMPLICIT Filename-Attribute,
497       permitted-actions    [ 1] IMPLICIT Permitted-Actions-Attribute,
498       contents-type        [ 2] Contents-Type-Attribute,
499    -- Storage group
500       storage-account      [ 3] Account-Attribute OPTIONAL,
501       file-availability    [12] File-Availability-Attribute OPTIONAL,
502       future-filesize      [14] Filesize-Attribute OPTIONAL,
503    -- Security group
504       access-control       [15] Access-Control-Attribute OPTIONAL,
505       legal-qualification [16] Legal-Qualification-Attribute OPTIONAL,
506    -- Private group
507       private-use          [17] Private-Use-Attribute OPTIONAL }
508
509    Diagnostic  ::= [APPLICATION 13] IMPLICIT SEQUENCE OF SEQUENCE {
510       diagnostic-type  [0] IMPLICIT INTEGER
511               { informative (0),
512                 transient (1),
513                 permanent (2) },
514       error-identifier [1] IMPLICIT INTEGER,
515            -- As defined in ISO 8571-3
516       error-observer   [2] IMPLICIT Entity-Reference,
517       error-source     [3] IMPLICIT Entity-Reference,
518       suggested-delay  [4] IMPLICIT INTEGER OPTIONAL,
519       further-details  [5] IMPLICIT GraphicString OPTIONAL }
520
521    Entity-Reference ::= INTEGER
522               { no-categorization-possible (0),
523                 initiating-file-service-user (1),
524                 initiating-file-protocol-machine (2),
525                 service-supporting-the-file-protocol-machine (3),
526                 responding-file-protocol-machine (4),
527                 responding-file-service-user (5) }
528       --
529       -- NOTE
530       --  1. The values 0 and 3 are only valid as values in error-source
531       --
532       --  2. The value 5 corresponds to the virtual filestore.
533
534    Document-Type-Name ::= [APPLICATION 14] IMPLICIT OBJECT IDENTIFIER
```

Figure 10 (continued) — Application wide types

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```
535
536     FADU-Identity ::= [APPLICATION 15] CHOICE
537        { first-last  [0] IMPLICIT INTEGER { first (0), last (1) },
538          relative    [1] IMPLICIT INTEGER { previous (0), current (1), next (2) },
539          begin-end   [2] IMPLICIT INTEGER { begin (0), end (1) },
540          single-name [3] IMPLICIT Node-Name,
541          name-list   [4] IMPLICIT SEQUENCE OF Node-Name,
542          fadu-number [5] IMPLICIT INTEGER }
543            -- As defined in ISO 8571-2
544
545     Node-Name ::= EXTERNAL
546       -- The type to be used for Node-Name is defined in ISO8571-FADU
547
548     FADU-Lock ::= [APPLICATION 16] IMPLICIT INTEGER
549                   { off (0), on (1) }
550
551     Password ::= [APPLICATION 17] CHOICE { GraphicString, OCTET STRING }
552
553     Read-Attributes ::= [APPLICATION 18] IMPLICIT SEQUENCE {
554     -- Kernel group
555        filename                    [0] IMPLICIT Filename-Attribute OPTIONAL,
556        permitted-actions           [1] IMPLICIT Permitted-Actions-Attribute OPTIONAL,
557        contents-type               [2] Contents-Type-Attribute OPTIONAL,
558     -- Storage group
559        storage-account             [3] Account-Attribute OPTIONAL,
560        date-and-time-of-creation   [4] Date-and-Time-Attribute OPTIONAL,
561        date-and-time-of-last-modification
562                                    [5] Date-and-Time-Attribute OPTIONAL,
563        date-and-time-of-last-read-access
564                                    [6] Date-and-Time-Attribute OPTIONAL,
565        date-and-time-of-last-attribute-modification
566                                    [7] Date-and-Time-Attribute OPTIONAL,
567        identity-of-creator         [8] User-Identity-Attribute OPTIONAL,
568        identity-of-last-modifier   [9] User-Identity-Attribute OPTIONAL,
569        identity-of-last-reader    [10] User-Identity-Attribute OPTIONAL,
570        identity-of-last-attribute-modifier
571                                   [11] User-Identity-Attribute OPTIONAL,
572        file-availability          [12] File-Availability-Attribute OPTIONAL,
573        filesize                   [13] Filesize-Attribute OPTIONAL,
574        future-filesize            [14] Filesize-Attribute OPTIONAL,
575     -- Security group
576        access-control             [15] Access-Control-Attribute OPTIONAL,
577        legal-qualification        [16] Legal-Qualification-Attribute OPTIONAL,
578     -- Private group
579        private-use                [17] Private-Use-Attribute OPTIONAL }
580
581     Select-Attributes ::= [APPLICATION 19] IMPLICIT SEQUENCE {
582     -- Kernel group
583        filename [0] IMPLICIT Filename-Attribute }
584
585     Shared-ASE-Information ::= [APPLICATION 20] IMPLICIT EXTERNAL
586        -- This field may be used to convey commitment control as
587        -- as described in ISO 8571-3
588
589     State-Result ::= [APPLICATION 21] IMPLICIT INTEGER
590                 { success (0),
591                   failure (1) }
592
593     User-Identity ::= [APPLICATION 22] IMPLICIT GraphicString
594
595   END
```

Figure 10 (continued) — Application wide types

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```
ISO8571-FTAM DEFINITIONS ::=

BEGIN

  Access-Control-Attribute ::= CHOICE {
     no-value-available [0] IMPLICIT NULL,
       -- Indicates partial support of this attribute.
       -- This value shall only appear in response PDUs
     actual-values      [1] IMPLICIT SET OF Access-Control-Element }
     --  The semantics of this attribute is described in ISO 8571-2

  Access-Control-Change-Attribute ::= CHOICE {
     no-value-available [0] IMPLICIT NULL,
       -- Indicates partial support of this attribute.
       -- This value shall only appear in response PDUs
     actual-values      [1] IMPLICIT SEQUENCE {
       insert-values  [0] IMPLICIT SET OF Access-Control-Element OPTIONAL,
            -- This field is used by the change attribute actions to indicate
            -- new values to be inserted in the access control file attribute.
       delete-values  [1] IMPLICIT SET OF Access-Control-Element OPTIONAL} }
            -- This field is used by the change attribute action to indicate
            -- old values to be removed from the access control file attribute.
     --  The semantics of this attribute is described in ISO 8571-2

  Access-Control-Element ::= SEQUENCE {
     action-list        [0] IMPLICIT Access-Request,
     concurrency-access [1] IMPLICIT Concurrency-Access OPTIONAL,
     identity           [2] IMPLICIT User-Identity OPTIONAL,
     passwords          [3] IMPLICIT Access-Passwords OPTIONAL,
     location           [4] IMPLICIT Application-Entity-Title OPTIONAL }

  Concurrency-Access ::= SEQUENCE {
              read             [0] IMPLICIT Concurrency-Key,
              insert           [1] IMPLICIT Concurrency-Key,
              replace          [2] IMPLICIT Concurrency-Key,
              extend           [3] IMPLICIT Concurrency-Key,
              erase            [4] IMPLICIT Concurrency-Key,
              read-attribute   [5] IMPLICIT Concurrency-Key,
              change-attribute [6] IMPLICIT Concurrency-Key,
              delete-file      [7] IMPLICIT Concurrency-Key }

  Concurrency-Key ::= BIT STRING
                    { not-required (0),
                      shared (1),
                      exclusive (2),
                      no-access (3) }

  Account-Attribute ::=  CHOICE {
     no-value-available [0] IMPLICIT NULL,
          -- Indicates partial support of this attribute
          -- This value shall only appear in response PDUs
     actual-values      Account }

  Contents-Type-Attribute ::= CHOICE {
     document-type                    [0] IMPLICIT SEQUENCE {
          document-type-name Document-Type-Name,
          parameter                   [0] ANY OPTIONAL },
     -- The actual types to be used for values of the parameter field
     -- are defined in the named document type.
     constraint-set-and-abstract-syntax [1] IMPLICIT SEQUENCE {
          constraint-set-name  Constraint-Set-Name,
          abstract-syntax-name Abstract-Syntax-Name } }

```

Figure 11 — File attribute types

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```
659    Date-and-Time-Attribute ::= CHOICE {
660       no-value-available [0] IMPLICIT NULL,
661            -- Indicates partial support of this attribute.
662            -- This value shall only appear in response PDUs
663       actual-values      [1] IMPLICIT GeneralizedTime }
664
665    File-Availability-Attribute ::= CHOICE {
666       no-value-available [0] IMPLICIT NULL,
667            -- Indicates partial support of this attribute.
668            -- This value shall only appear in response PDUs
669       actual-values      [1] IMPLICIT INTEGER
670               { immediate-availability (0),
671                 deferred-availability (1) } }
672
673    Filename-Attribute ::= SEQUENCE OF GraphicString
674
675    Filesize-Attribute ::= CHOICE {
676       no-value-available [0] IMPLICIT NULL,
677            -- Indicates partial support of this attribute.
678            -- This value shall only appear in response PDUs
679       actual-values      [1] IMPLICIT INTEGER }
680
681    Legal-Qualification-Attribute ::= CHOICE {
682       no-value-available [0] IMPLICIT NULL,
683            -- Indicates partial support of this attribute.
684            -- This value shall only appear in response PDUs
685       actual-values      [1] IMPLICIT GraphicString }
686
687    Permitted-Actions-Attribute ::= BIT STRING
688            -- Actions available
689               { read (0),
690                 insert (1),
691                 replace (2),
692                 extend (3),
693                 erase (4),
694                 read-attribute (5),
695                 change-attribute (6),
696                 delete-file (7),
697            -- FADU-Identity groups available
698                 traversal (8),
699                 reverse-traversal (9),
700                 random-order (10) }
701
702    Private-Use-Attribute ::= CHOICE {
703       no-value-available            [0] IMPLICIT NULL,
704            -- Indicates partial support of this attribute.
705            -- This value shall only appear in response PDUs
706       abstract-syntax-not-supported [1] IMPLICIT NULL,
707            -- Indicates, that abstract syntax is not available
708       actual-values                 [2] IMPLICIT EXTERNAL }
709
710    User-Identity-Attribute ::= CHOICE {
711       no-value-available [0] IMPLICIT NULL,
712            -- Indicates partial support of this attribute.
713            -- This value shall only appear in response PDUs
714       actual-values      User-Identity }
715
716 END
```

Figure 11 (continued) — File attribute types

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20.4 Abstract Syntax Definition

This International Standard assigns the ASN.1 object identifier value

{ iso standard 8571 abstract-syntax (2) ftam-pci (1) }

as an abstract syntax name for the set of presentation data values, each of which is a value of the ASN.1 type ISO8571-FTAM.PDU. The corresponding ASN.1 object descriptor value shall be

"FTAM PCI"

The ASN.1 object identifier and object descriptor values

{ joint-iso-ccitt asn1 (1) basic-encoding (1) }

and

"Basic Encoding of a single ASN.1 type"

(assigned to an information object in ISO 8825) can be used as a transfer syntax name with this abstract syntax.

21 Application Context Name

For the purpose of being able to run an application which only contains the ACSE and FTAM as ASEs, the object identifier value

{ iso standard 8571 application-context (1) iso-ftam (1) }

and the object descriptor value

"ISO FTAM"

are assigned to an information object of type

ACSE-1.Application-context-name

as defined in ISO 8650.

NOTE - This definition is subject to refinement as a result of on-going work within ISO in the area of the Application Layer structure.

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Section six: Conformance

22 Conformance

A system claiming to implement the procedures specified in this International Standard shall comply with the requirements in 22.1 to 22.3.

22.1 Statement requirements

The following shall be stated by the implementor:

a) which file service classes are supported;

b) which functional units are supported;

c) which values of the recovery mode parameter are supported, in those cases where any error recovery procedures are implemented;

d) whether the system is capable of acting in the role of initiator or responder or both;

e) whether the system is capable of acting in the role of sender or receiver or both;

f) which optional groups of attributes (storage or security) are supported;

g) which level of support is associated with each individual attribute and its optional components (see ISO 8571-2);

h) the range of values supported for each attribute for which values are available;

i) which document types and/or which abstract and transfer syntaxes for the transfer of file contents are supported by the Open System on which the Application Entity resides;

j) whether the hierarchical file model (see ISO 8571-2) is supported, and, if so, which constraint sets and, where relevant, the maximum depth of hierarchy supported;

k) any circumstances under which the existence of a file, its contents, or the values of the supported attributes change between separate accesses using the FTAM protocol;

l) any circumstances under which the modifications to the file contents or the values of the file attributes by FTAM protocol exchanges will not subsequently be available for use;

m) which optional parameters are supported, and the range of values for all parameters;

n) which character sets it supports for FTAM-PCI and for FADU structuring information;

o) the range of values and their meaning and purpose, for the Private Use attribute, if it is supported;

p) which diagnostic codes are used, and in what circumstances.

22.2 Static requirements

The system shall:

a) act in the role of initiator or responder or both; (see ISO 8571-1)

b) support at least the kernel group of attributes; (see ISO 8571-2)

c) support at least the minimum range of values defined for each attribute which is claimed to be supported (see ISO 8571-2). The attributes in the Kernel group shall always be supported;

d) support the transfer syntax derived from the encoding rules specified in ISO 8825 and named

{ joint-iso-ccitt asn1 (1) basic-encoding (1) }

for the purpose of generating and interpreting FTAM protocol information.

e) support one or more of the allowable file service classes and the groups of file service functional units that are implied by those file service classes; no other groupings of functional units shall be supported;

f) if the read and/or write functional unit is supported, the mapping of F-CANCEL to P-DATA must be supported regardless of whether the mapping to P-RESYNCHRONIZE is also supported;

g) support the recovery mode parameter value "start of bulk data transfer" and the corresponding procedures if any error recovery procedures are supported.

22.3 Dynamic requirements

The system shall:

a) follow all procedures relevant to each functional unit that the system claims to implement. The procedures are specified in Annex A and sections two, three and four;

b) support the mapping onto the presentation service defined in clauses 7 and 12;

c) execute any operations (whether invoked using the FTAM protocol or otherwise), which change the contents or values of any attributes of a file, in a manner consistent with virtual filestore operations (as defined in ISO 8571-2), and shall update the values of any supported attributes accordingly;

d) for the purpose of testing, be capable of operating without the use of the Private Use and Legal Qualifications attributes.

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Annex A
Protocol state tables

(This annex forms part of the standard.)

A.1 Introduction

In the event of a discrepancy becoming apparent in the protocol described in the body of this standard and the protocol described in this Annex, this Annex is to take precedence.

These tables describe the operation of the basic file protocol machine (FPM) and error recovery protocol machine (FERPM).

The basic protocol tables are divided into three groups, covering:

a) the FTAM regime management protocol machine;

b) the file regime management protocol machine;

c) the bulk data transfer protocol machine.

The initial and final states of the file regime management protocol machine are also states of FTAM regime management protocol machine. The initial and final states of the bulk data transfer protocol machine are also states of the file regime management protocol machine.

To provide formally complete and consistent description of the FTAM protocol sequences of events are considered indivisible in the model. That indivisibility ensures both that the states used in the description are well defined and that they are sufficient to describe the protocol.

The reception of a service primitive and the generation of dependent actions are considered to be an indivisible action. The reception of an FPDU and the generation of dependent actions are considered to be an indivisible action.

The indivisibility of actions may, in some implementations, cause certain events from file service users to be invalid at some service interface.

The conventions adopted in this Annex are described below.

A.1.1 System model

There are four types of receivers and sources of incoming and outgoing events (see figure 12):

a) The internal file service user, which is the file error recovery protocol machine (FERPM);

b) The external file service user - initiator or responder;

c) The local system environment;

d) The underlying presentation and ACSE service providers.

All primitives to/from the external file service user are passed through as primitives to/from the internal file service user to the basic FPM.

If the FERPM is not null - that is, either the RESTART or the RECOVER functional unit is available - parameters needed for error control and recovery may be added to these primitives.

Signals to/from the local environment group together events signalling errors and events signalling interactions amongst the FERPM, its docket and its local file system. These local signals are

e) L-ERRABT — local signal indicating protocol or other local errors leading to F-P-ABORT, with a permanent error value in the action result parameter;

f) L-PABORT — local signal indicating that a F-P-ABORT request PDU with a transient error value in the action result should be issued;

g) L-ERROR1, L-ERROR2 and L-ERROR3 — local signals indicating class I, class II and class III errors respectively;

h) L-SUSPND — a local signal sent by the sender in the RESTART state to the local file system to suspend the issuing of F-DATA request and F-DATA-END request primitives;

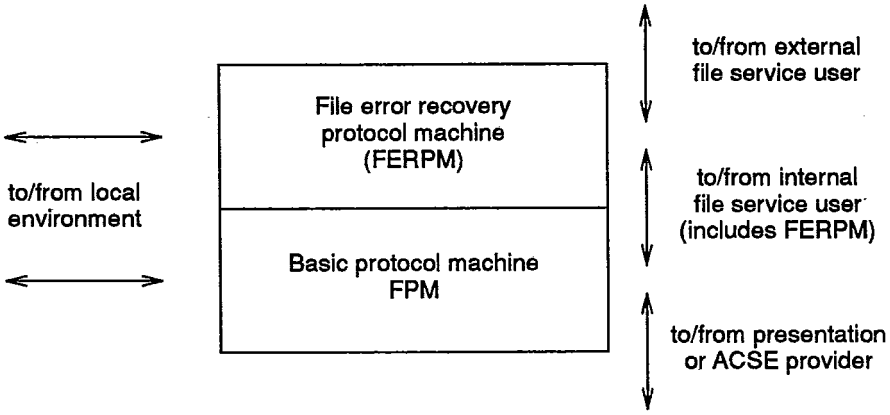

Figure 12 — State machine system model

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i) L-RESUME — a local signal to the local file system to resume the issuing of F-DATA request and F-DATA-END request primitives when a sender has completed its recovery from RESTART and is now back in DATA-XFER state;

j) L-RESEND — a local signal from the FERPM to the sending local file system. This signal includes the negotiated restart checkpoint and eliminates the need to store data values in the docket. Upon receipt of this local signal the local file system can either

1) resend data from the checkpoint if the local file system is aware of the algorithm used by the FERPM to generate the checkpoint; or

2) resend data from the start of the file if it has no knowledge of the checkpoint generating algorithm. The FERPM in the RESTART state will discard all data from the local file system that occurs before the negotiated checkpoint. The FERPM will only forward data past the negotiated checkpoint to the FPM;

k) L-DATRQ — signal representing a re-issued F-DATA request primitive from the local file system;

l) L-DAERQ — signal representing a re-issued F-DATA-END request primitive when a "data-end" marker becomes available from the docket;

m) L-CHKRQ — signal representing a re-issued F-CHECK request primitive when a checkpoint identifier becomes available from the docket;

n) L-EORIN — end of restart indication signal indicating that all checkpoint identifiers, "data-end" markers and all data to be resent have been sent;

o) L-GIVEUP — signal indicating that the responding FERPM should abandon the recovery process. This is introduced so that if the initiating FERPM is unable to re-establish the association then the responding FERPM can inform its users of the irrecoverable error.

p) L-ERRCTX — signal indicating that the P-ALTER-CONTEXT negotiation is unsuccessful. The error is to be processed following the F-OPEN or F-RECOVER confirm as applicable.

A.1.2 Incoming Events

Events in the tables are depicted by abbreviated names. A list of these abbreviations, arranged alphabetically within categories, precedes each table. Wherever possible, these events have been arranged in the order in which a normal error-free sequence of events would occur.

It is assumed that incoming PDUs have been extracted from the user data fields of Presentation or ACSE indication or confirm primitives prior to being considered as incoming events.

The following naming conventions are used:

a) The prefix "F-" (as in F-INIRQ) indicates a primitive issued by the external file service (EFS) user or issued by the FERPM to the EFS user;

b) The prefix "P-" (as in P-CONRQ) indicates a primitive issued by the Presentation Service (PS) provider.

c) The prefix "A-" (as in A-PABIN) indicates a primitive issued by the ACSE provider;

d) the prefix "L-" (as in L-ERRABT) indicates a local signal from the FPM or the FERPM to the local system or from the local system environment to the FPM or the FERPM;

e) the prefix "I-" (as in I-OPNRQ) indicates a primitive issued by the FERPM to the FPM or vice-versa;

f) Where no prefix is used, the event is the receipt of an FTAM PDU or, in the case of GRPRQ and GRPRP, a grouped sequence of PDUs. The only exception is "DATIN" which indicates a data value in user context in the data transfer state.

g) The following suffices indicate the basic types of primitives and PDUs:

"RQ"	request
"IN"	indication
"RP"	response
"CF"	confirm

A.1.3 Outgoing Events

The same naming conventions are used for outgoing events as for incoming events. Where the outgoing event is the issue of a PDU, it will normally give rise to the similarly named incoming event for the other protocol entity. For example, the outgoing event SELRP of the responding entity will become the incoming event SELRP for the initiating entity.

A.1.4 States

The suffix "-PD" indicates a pending state, waiting for some known primitive or PDU type. The suffix "-EX" indicates an expectant state in FERPM, waiting for some expected primitive.

The prefix "P-" normally indicates waiting for a primitive from the Presentation Service provider. Similarly, the prefix "F-" indicates waiting for a primitive from the EFS user. If neither of the above prefices is used, the state normally indicates waiting for a PDU, or a non-pending state.

A.1.5 Predicates

The following symbols used in predicates have their normal Boolean algebraic meanings:

&	AND
|	OR
~	NOT

An incoming event may satisfy more than one predicate, in which case the conditional actions for satisfied predicates will be executed.

Some actions may be conditional upon the negotiation of particular service functional units;

those in the FPM are:

U1:	Kernel functional unit
U2:	Read functional unit
U3:	Write functional unit
U4:	File access functional unit
U5:	Limited management functional unit
U6:	Enhanced management functional unit
U7:	Grouping functional unit
U8:	FADU locking functional unit

those in the FERPM are:

U9:	Recovery functional unit
U10:	Restart data transfer functional unit

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A.1.6 Actions

Actions may be conditional on specified predicates, or they may be unconditional. When a line in a "detailed entries" specification commences with a predicate specifier followed by a colon, this indicates that all actions on that line are conditional upon the indicated predicate. An action may consist of one or more of the following:

a) an outgoing event, indicated by its abbreviated name;

b) a specified action, indicated by a number in square brackets [ ] and separated from any preceding items by a comma;

c) a specified qualifier, indicated by a number in square brackets [ ] following a preceding item without an intervening comma;

Actions and qualifiers are described in a single list preceding the table.

The next state which the protocol entity will enter is indicated by an arrow preceding a state name, e.g. "⇒ SELECTED". For the null transition back to the current state, the notation "⇒ *same state*".

Once a state change occurs, all subsequent actions in that entry are ignored.

A.1.7 Implicit Action

The following entity actions have not been explicitly specified in the State tables, but constitute part of the entity behaviour:

a) A blank square in the table indicates an invalid event.

b) Unless otherwise stated in the tables, an invalid event would cause the action specified in 10.2 to be executed.

c) The Presentation Service is used throughout to identify "active" FTAM PCI from data with an equivalent encoding, but in a "passive" user data context.

d) For each incoming PDU, a check is made that the appropriate functional unit has been negotiated for the connection. If the check fails, the procedures for protocol violation specified in 10.2 are followed.

A.1.8 Additional State Information

The tables make use of the indicators and other state variables defined in 6.2 and 11.2. In addition, the file regime management tables for the initiator make use of a threshold indicator and an expected response list, as a means of specifying the entity state when a concatenated PDU group is outstanding.

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A.2 FTAM regime management protocol machine (Kernel functional unit)

A.2.1 States - FTAM regime management

UNINITIALIZED	FTAM regime ended.
INITIALIZE-PD	Initialize pending; wait for initialize response PDU.
INITIALIZED	FTAM regime started.
TERMINATE-PD	Terminate pending; wait for terminate response PDU.
I-INITIALIZE-PD	Initialize pending; wait for F-INITIALIZE response primitive from the internal file service user
I-TERMINATE-PD	Terminate pending; wait for F-TERMINATE response primitive from the internal file service user
ANY-OTHER	Any other state of the file regime management protocol machine or the bulk data transfer protocol machine.

A.2.2 Incoming events - FTAM regime management

In the following lists, the functional unit in which the event occurs is included after the name, where applicable.

A.2.2.1 Incoming events — PDUs

UABRQ	U-Abort request PDU (on A-ABORT indication primitive)	U1
PABRQ	P-Abort request PDU (on A-ABORT indication primitive)	"
INIRQ	Initialize request PDU	"
INIRP	Initialize response PDU	"
TERRQ	Terminate request PDU	"
TERRP	Terminate response PDU	"

A.2.2.2 Incoming events from the internal file service user

I-UABRQ	F-U-ABORT request primitive
I-INIRQ	F-INITIALIZE request primitive
I-INIRP	F-INITIALIZE response primitive
I-TERRQ	F-TERMINATE request primitive
I-TERRP	F-TERMINATE response primitive

A.2.2.3 Incoming events from the ACSE provider

A-PABIN	A-P-ABORT indication primitive
A-ABIN	A-ABORT indication primitive without user data
A-ASSCF	A-ASSOCIATE confirm primitive without user data (with result indicating reject by ACSE or presentation service provider)

A.2.2.4 Incoming events from the local system

L-ERRABT	Local signal indicating error leading to abort
L-PABORT	Local signal indicating that a F-P-ABORT request PDU and a F-P-ABORT indication primitive to the internal file service user, both with a transient error value.

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A.2.3 Outgoing events — FTAM regime management

A.2.3.1 Outgoing events — PDUs

UABRQ U-Abort request PDU

PABRQ P-Abort request PDU

INIRQ Initialize request PDU

INIRP Initialize response PDU

TERRQ Terminate request PDU

TERRP Terminate response PDU

A.2.3.2 Outgoing events to the internal file service user

I-UABIN F-U-ABORT indication primitive

I-PABIN F-P-ABORT indication primitive

I-ININ F-INITIALIZE indication primitive

I-INICF F-INITIALIZE confirm primitive

I-TERIN F-TERMINATE indication primitive

I-TERCF F-TERMINATE confirm primitive

A.2.4 Specific actions - FTAM regime management

[1] Send the PDU constructed as user data and map parameters on the appropriate ACSE form.

[3] Initialize state information - unset all additional state information indicators, set outstanding checkpoint counter, synch point number to zero.

[4] Set state result parameters to "success".

[5] In case of ACSE provider abort, if any diagnostic indicates communications failure then set the action result to transient error.

[6] Set state result parameter to "failure".

[7] Record the FQOS required and select the restart and/or recovery functional units if necessary.

[12] Establish the list of presentation contexts needed to support FTAM PCI and ACSE PCI abstract syntaxes. If necessary, determine, on the basis of the abstract syntaxes derived from the contents type list supplied by the external file service user, the list of presentation contexts needed to support the file contents, and add it to the previous list. The resultant list is used to construct the presentation context definition list parameter.

[13] Update the value of the contents type list parameter in the F-INITIALIZE indication primitive issued to the internal file service user, according to the abstract syntaxes rejected by the presentation service provider, if necessary.

[14] According to the value of the contents type list on the F-INITIALIZE response primitive received from the internal file service user, construct the presentation context definition result parameter.

[20] Set the action result parameter according to the result parameter of the A-ASSOCIATE confirm service primitive.

[62] Record the peer entity's checkpoint window.

A.2.5 Predicates — FTAM regime management

P1: I-INITIALIZE request primitive is acceptable.

P2: Result parameter of the ACSE confirm primitive indicates success of the operation.

P3: State result parameter of the incoming response primitive indicates success of the operation.

P5: Initialize request PDU is acceptable.

P25: Negotiable parameters have values consistent with request.

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A.2.6 Initiating entity state table FTAM regime management

STATE / EVENT	UNINITIALIZED	INITIALIZE-PD	INITIALIZED	TERMINATE-PD	ANY-OTHER
I-INIRQ	1				
A-ASSCF		10			
INIRP		2			
I-TERRQ			3		
TERRP				4	
A-PABIN		5	5	5	5
A-ABIN		7	7	7	7
UABRQ		6	6	6	6
PABRQ		7	7	7	7
I-UABRQ		8	8	8	8
L-ERRABT		9	9	9	9
L-PABORT		9	9	9	9

A.2.7 Initiating entity state table: detailed entries

1:	P1:	[3],[12],INIRQ[1]	⇒ INITIALIZE-PD
	~P1:	I-INICF[6]	⇒ *same state*
2:	P2&P25:	[62],I-INICF[4],[7]	⇒ INITIALIZED
	P2&~P25:	I-INICF[6],PABRQ[1]	⇒ UNINITIALIZED
	~P2:	I-INICF[6]	⇒ UNINITIALIZED
3:		TERRQ[1]	⇒ TERMINATE-PD
4:		I-TERCF	⇒ UNINITIALIZED
5:		I-PABIN[5]	⇒ UNINITIALIZED
6:		I-UABIN	⇒ UNINITIALIZED
7:		I-PABIN	⇒ UNINITIALIZED
8:		UABRQ[1]	⇒ UNINITIALIZED
9:		PABRQ[1],I-PABIN	⇒ UNINITIALIZED
10:		I-PABIN[20]	⇒ UNINITIALIZED

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A.2.8 Responding entity state table — FTAM regime management

STATE / EVENT	UNINITIALIZED	I-INITIALIZE-PD	INITIALIZED	I-TERMINATE-PD	ANY-OTHER
INIRQ	1				
I-INIRP		2			
TERRQ			3		
I-TERRP				4	
A-PABIN		5	5	5	5
A-ABIN		7	7	7	7
UABRQ		6	6	6	6
PABRQ		7	7	7	7
I-UABRQ		8	8	8	8
L-ERRABT		9	9	9	9
L-PABORT		9	9	9	9

A.2.9 Responding entity state table: detailed entries

1: P5: I-INIIN,[3],[62],[13] ⇒ I-INITIALIZE-PD
~P5: INIRP[6][1] ⇒ *same state*

2: P3: [7],[14],INIRP[1] ⇒ INITIALIZED
~P3: INIRP[6][1] ⇒ UNINITIALIZED

3: I-TERIN ⇒ I-TERMINATE-PD

4: TERRP[1] ⇒ UNINITIALIZED

5: I-PABIN[5] ⇒ UNINITIALIZED

6: I-UABIN ⇒ UNINITIALIZED

7: I-PABIN ⇒ UNINITIALIZED

8: UABRQ[1] ⇒ UNINITIALIZED

9: PABRQ[1],I-PABIN ⇒ UNINITIALIZED

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A.3 File regime management protocol machine

A.3.1 States — file regime management

In the FPM:

INITIALIZED	FTAM regime started
SELECT-PD	Select pending, wait for select response PDU
I-SELECT-PD	Select pending, wait for F-SELECT response primitive from the internal file service user
SELECTED	Selected
DESELECT-PD	Deselect pending, wait for deselect response PDU
I-DESELECT-PD	Deselect pending, wait for F-DESELECT response primitive from the internal file service user
CREATE-PD	Create pending, wait for create response PDU
I-CREATE-PD	Create pending, wait for F-CREATE response primitive from the internal file service user
DELETE-PD	Delete pending, wait for delete response PDU
I-DELETE-PD	Delete pending, wait for F-DELETE response primitive from the internal file service user
READ-ATT-PD	Read attribute pending, wait for read attribute response PDU
I-READ-ATT-PD	Read attribute pending, wait for F-READ-ATTRIB response primitive from the internal file service user
CHG-ATT-PD	Change attribute pending, wait for change attribute response PDU.
I-CHG-ATT-PD	Change attribute pending, wait for F-CHANGE-ATTRIB response primitive from the internal file service user
OPEN-PD	Open pending, wait for open response PDU
I-OPEN-PD	Open pending, wait for F-OPEN response primitive from the internal file service user
P-ALTIN-PD	Presentation alter context pending, wait for P-ALTER-CONTEXT indication primitive.
P-ALTCF-PD	Presentation alter context pending, wait for P-ALTER-CONTEXT confirm primitive.
CLOSE-PD	Close pending, wait for close response PDU
I-CLOSE-PD	Close pending, wait for F-CLOSE response primitive from the internal file service user
DXFRIDLE	Data transfer idle
LOCATE-PD	Locate pending, wait for locate response PDU
I-LOCATE-PD	Locate pending, wait for F-LOCATE response primitive from the internal file service user
ERASE-PD	Erase pending, wait for erase response PDU
I-ERASE-PD	Erase pending, wait for F-ERASE response primitive from the internal file service user
GROUPING	Building PDU group, wait for required primitives
GROUP-PD	Group pending, wait for response PDU group
I-GROUP-PD	Group pending, wait for F-BEGIN-GROUP response primitive from the internal file service user

In the FERPM:

RECOVER-PD	Recover pending, wait for recover response PDU
I-RECOVER-PD	Recover pending, wait for F-RECOVER response primitive from the internal file service user
P-ALTIN-REC-PD	Presentation alter context pending, wait for P-ALTER-CONTEXT indication primitive during recovery.
P-ALTCF-REC-PD	Presentation alter context pending, wait for P-ALTER-CONTEXT confirm primitive during recovery.
DXFRIDLE-REC	Data transfer idle during recovery

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A.3.2 Incoming events — file regime management

A.3.2.1 Incoming events — PDUs

CATRQ	Change-attrib request PDU	U6
CATRP	Change-attrib response PDU	U6
CLORQ	Close request PDU	U2,U3
CLORP	Close response PDU	U2,U3
CRERQ	Create request PDU	U5
CRERP	Create response PDU	U5
DELRQ	Delete request PDU	U5
DELRP	Delete response PDU	U5
DESRQ	Deselect request PDU	U1
DESRP	Deselect response PDU	U1
ERARQ	Erase request PDU	U4
ERARP	Erase response PDU	U4
LOCRQ	Locate request PDU	U4
LOCRP	Locate response PDU	U4
OPNRQ	Open request PDU	U2,U3
OPNRP	Open response PDU	U2,U3
RATRQ	Read-attrib request PDU	U5
RATRP	Read-attrib response PDU	U5
RECRQ	Recover request PDU	U9
RECRP	Recover response PDU	U9
SELRQ	Select request PDU	U1
SELRP	Select response PDU	U1
GRPRQ	A sequence of request PDUs (PDU-Group) preceded by an F-BEGIN-GROUP request PDU and followed by a F-END-GROUP request PDU.	U7
GRPRP	A sequence of response PDUs (PDU-Group) preceded by an F-BEGIN-GROUP response PDU and followed by a F-END-GROUP response PDU.	U7

A.3.2.2 Incoming events from the internal file service user

I-CATRQ	F-CHANGE-ATTRIB request primitive
I-CATRP	F-CHANGE-ATTRIB response primitive
I-CLORQ	F-CLOSE request primitive
I-CLORP	F-CLOSE response primitive
I-CRERQ	F-CREATE request primitive
I-CRERP	F-CREATE response primitive
I-DELRQ	F-DELETE request primitive
I-DELRP	F-DELETE response primitive
I-DESRQ	F-DESELECT request primitive
I-DESRP	F-DESELECT response primitive
I-ERARQ	F-ERASE request primitive
I-ERARP	F-ERASE response primitive
I-LOCRQ	F-LOCATE request primitive
I-LOCRP	F-LOCATE response primitive

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I-OPNRQ F-OPEN request primitive
I-OPNRP F-OPEN response primitive
I-RATRQ F-READ-ATTRIB request primitive
I-RATRP F-READ-ATTRIB response primitive
I-RECRQ F-RECOVER request primitive
I-RECRP F-RECOVER response primitive
I-SELRQ F-SELECT request primitive
I-SELRP F-SELECT response primitive
I-BGPRQ F-BEGIN-GROUP request primitive
I-BGPRP F-BEGIN-GROUP response primitive
I-EGPRQ I-END-GROUP request primitive
I-EGPRP F-END-GROUP response primitive

A.3.2.3 Incoming events from the presentation service provider

P-ALTIN P-ALTER-CONTEXT indication primitive
P-ALTCF P-ALTER-CONTEXT confirm primitive

A.3.3 Outgoing events — file regime management

A.3.3.1 Outgoing events — PDUs

CATRQ Change-attrib request PDU
CATRP Change-attrib response PDU
CLORQ Close request PDU
CLORP Close response PDU
CRERQ Create request PDU
CRERP Create response PDU
DELRQ Delete request PDU
DELRP Delete response PDU
DESRQ Deselect request PDU
DESRP Deselect response PDU
ERARQ Erase request PDU
ERARP Erase response PDU
LOCRQ Locate request PDU
LOCRP Locate response PDU
OPNRQ Open request PDU
OPNRP Open response PDU
PABRQ P-Abort request PDU
RATRQ Read-attrib request PDU
RATRP Read-attrib response PDU
RECRQ Recover request PDU
RECRP Recover response PDU
SELRQ Select request PDU
SELRP Select response PDU

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A.3.3.2 Outgoing events to the internal file service user

I-CATIN F-CHANGE-ATTRIB indication primitive
I-CATCF F-CHANGE-ATTRIB confirm primitive
I-CLOIN F-CLOSE indication primitive
I-CLOCF F-CLOSE confirm primitive
I-CREIN F-CREATE indication primitive
I-CRECF F-CREATE confirm primitive
I-DELIN F-DELETE indication primitive
I-DELCF F-DELETE confirm primitive
I-DESIN F-DESELECT indication primitive
I-DESCF F-DESELECT confirm primitive
I-ERAIN F-ERASE indication primitive
I-ERACF F-ERASE confirm primitive
I-LOCIN F-LOCATE indication primitive
I-LOCCF F-LOCATE confirm primitive
I-OPNIN F-OPEN indication primitive
I-OPNCF F-OPEN confirm primitive
I-PABIN F-P-ABORT indication primitive
I-RATIN F-READ-ATTRIB indication primitive
I-RATCF F-READ-ATTRIB confirm primitive
I-RECIN F-RECOVER indication primitive
I-RECCF F-RECOVER confirm primitive
I-SELIN F-SELECT indication primitive
I-SELCF F-SELECT confirm primitive

A.3.3.3 Outgoing events to the presentation service provider

P-ALTRQ P-ALTER-CONTEXT request primitive
P-ALTRP P-ALTER-CONTEXT response primitive

A.3.3.4 Outgoing events to the local system

L-ERRCTX Local signal indicating P-ALTER-CONTEXT error

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A.3.4 Specific actions — file regime management

[1] Send the PDU constructed as user data and map parameters on the appropriate ACSE form.

[2] Add a PDU to the current PSDU and terminate the current PSDU.

[8] Includes a state result parameter indicating failure.

[9] Set the remove contexts parameter of the F-OPEN or the F-RECOVER request PDU.

[10] Determine, on the basis of the abstract syntax derived from the contents type supplied by the external file service user, the set of presentation contexts necessary to support the file contents. Set the p-alter indicator if the necessary context needs to be defined. All contexts identified in the remove context parameter of the OPNRQ or RECRQ PDUs shall be deleted unless required in the new open regime; optionally the responder may elect to delete any other contexts in the defined context set which are not required.

[11] Set the presentation-action parameter of the OPNRP or RECRP PDU if a P-ALTER-CONTEXT exchange is needed.

[15] Preserve the PDU or PDUs for further processing.

[28] Set the bulk data transfer number to that specified in the F-RECOVER request primitive or PDU.

[31] Set the bulk data transfer number to zero.

[32] Erase the expected response list. Set the threshold indicator to the value given by the primitive parameter. Add an F-BEGIN-GROUP request PDU to the current PSDU.

[33] Add a request PDU corresponding to the primitive function to the current PSDU, and add the corresponding element to the expected response list.

[34] Add an F-END-GROUP request PDU to the current PSDU and terminate the PSDU.

[35] Check that every PDU in the PDU-Group is one of SELRP, CRERP, CLORP, RATRP, CATRP, DESRP, DELRP, or OPNRP; and that the composition and ordering of the PDUs is consistent with the group specified by the expected response list (recognizing that the response group may be truncated because of a detected error).

[36] Check that the number of PDUs in the PDU-Group is consistent with the value of the threshold parameter and that the other parameter values are consistent with negotiation.

[37] Considering each PDU in the PDU-Group, issue the corresponding confirm primitive to the IFS user with parameters derived from the PDU.

[38] Add a response PDU corresponding to the primitive function to the current PSDU.

[39] Add an F-END-GROUP response PDU to the current PSDU and terminate the PSDU.

[40] Check that the composition and ordering of the PDU-Group is consistent with one of the concatenated sequences "A", "C", or "D", as defined in Part 3, Annex E.

[41] Check that the composition and ordering of the PDU-Group is consistent with the concatenated sequence "E" as defined in Part 3, Annex E.

[42] Check that the composition and ordering of the PDU-Group is consistent with the concatenated sequence "B" as defined in Part 3, Annex E.

[43] Considering in turn each PDU in the PDU-Group, issue the corresponding indication primitive to the IFS user with parameters derived from the PDU.

[45] Set the checkpoint identifier expected to the value negotiated plus one.

[49] Set the synchronization offset to the value of the synchronization point serial number minus the checkpoint identifier expected.

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A.3.5 Predicates — file regime management

P4: The state result parameter on the incoming response PDU or response primitive indicates successful execution of operation.

P6: The P-ALTER-CONTEXT negotiation fails.

P7: A group of PDUs is preserved.

P9: The presentation context management functional unit is available and there are presentation contexts to be deleted or defined.

P10: The presentation-action parameter in the OPNRP PDU or in the RECRP PDU is TRUE, in which case the presentation context management functional unit should be available.

P11: The p-alter indicator is set.

P17: The PDU-Group contains a SELRP or CRERP PDU with a state result parameter indicating failure, or a DESRP or DELRP PDU.

P18: Checking the PDU-Group reveals a protocol error.

P19: The PDU-Group contains an OPNRP PDU with a state result parameter indicating success.

P43: The recovery procedure is in progress.

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A.3.6 Initiating entity state table — file regime management

STATE / EVENT	INITIALIZED	SELECT-PD	SELECTED	DESELECT-PD	CREATE-PD	DELETE-PD	READ-ATT-PD	CHG-ATT-PD	OPEN-PD	P-ALTIN-PD	DXFRIDLE	DXFRIDLE-REC	CLOSE-PD	RECOVER-PD	P-ALTIN-REC-PD	LOCATE-PD	ERASE-PD	GROUPING	GROUP-PD
I-SELRQ	1																	28	
SELRP		2																	
I-DESRQ			3															28	
DESRP				4															
I-CRERQ	5																	28	
CRERP					6														
I-DELRQ			7															28	
DELRP						8													
I-RATRQ			9															28	
RATRP							10												
I-CATRQ			11															28	
CATRP								12											
I-OPNRQ			13															22	
OPNRP									14										
P-ALTIN										15					21				
I-CLORQ											17	17						28	
CLORP													18						
I-RECRQ	19																		
RECRP														20					
I-LOCRQ											23	23							
LOCRP																24			
I-ERARQ											25	25							
ERARP																	26		
I-BGPRQ	27		27								27	27							
I-EGPRQ																		29	
GRPRP																			30

A.3.7 Initiating entity state table (Part 2) — detailed entries

1:		SELRQ[2]	⇒ SELECT-PD
2:	P4:	I-SELCF	⇒ SELECTED
	~P4:	I-SELCF[8]	⇒ INITIALIZED
3:		DESRQ[2]	⇒ DESELECT-PD
4:		I-DESCF	⇒ INITIALIZED
5:		CRERQ[2]	⇒ CREATE-PD
6:	P4:	I-CRECF	⇒ SELECTED
	~P4:	I-CRECF[8]	⇒ INITIALIZED
7:		DELRQ[2]	⇒ DELETE-PD
8:		I-DELCF	⇒ INITIALIZED

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9:		RATRQ[2]	⇒ READ-ATT-PD
10:		I-RATCF	⇒ SELECTED
11:		CATRQ[2]	⇒ CHG-ATT-PD
12:		I-CATCF	⇒ SELECTED
13:	P9:	[9], OPNRQ[2],[31]	⇒ OPEN-PD
14:	~P4:	I-OPNCF[8]	⇒ SELECTED
	P4 & ~P10:	I-OPNCF	⇒ DXFRIDLE
	P4 & P10:	[15]	⇒ P-ALTIN-PD
15:	P6:	L-ERRCTX, P-ALTRP,	
	P7:	[37]	⇒ DXFRIDLE
	~P7:	I-OPNCF	⇒ DXFRIDLE
17:		CLORQ[2]	⇒ CLOSE-PD
18:		I-CLOCF	⇒ SELECTED
19:	P9:	[9], RECRQ[2],[28]	⇒ RECOVER-PD
20:	~P4:	I-RECCF[8]	⇒ INITIALIZED
	P4 & ~P10:	[45],I-RECCF	⇒ DXFRIDLE-REC
	P4 & P10:	[15]	⇒ P-ALTIN-REC-PD
21:	P6:	L-ERRCTX, P-ALTRP, [45],I-RECCF	⇒ DXFRIDLE-REC
22:	P9:	[9], [31],[33]	⇒ *same state*
23:		LOCRQ[2]	⇒ LOCATE-PD
24:	~P43:	I-LOCCF	⇒ DXFRIDLE
	P43:	I-LOCCF	⇒ DXFRIDLE-REC
25:		ERARQ[2]	⇒ ERASE-PD
26:	~P43:	I-ERACF	⇒ DXFRIDLE
	P43:	I-ERACF	⇒ DXFRIDLE-REC
27:		[32]	⇒ GROUPING
28:		[33]	⇒ *same state*
29:		[34]	⇒ GROUP-PD
30:		[35],[36],	
	P18:	I-PABIN,PABRQ[1]	⇒ UNINITIALIZED
	P17 & ~P18:	[37]	⇒ INITIALIZED
	~P17 & ~P18 & P19 & ~P10:	[37]	⇒ DXFRIDLE
	~P17 & ~P18 & P19 & P10:	[15]	⇒ P-ALTIN-PD
	~P17 & ~P18 & ~P19:	[37]	⇒ SELECTED

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A.3.8 Responding entity state table — file regime management

STATE / EVENT	INITIALIZED	I-SELECT-PD	SELECTED	I-DESELECT-PD	I-CREATE-PD	I-DELETE-PD	I-READ-ATT-PD	I-CHG-ATT-PD	I-OPEN-PD	P-ALTCF-PD	DXFRIDLE	DXFRIDLE-REC	I-CLOSE-PD	I-RECOVER-PD	P-ALTCF-REC-PD	I-LOCATE-PD	I-ERASE-PD	I-GROUP-PD	GROUPING
SELRQ	1																		
I-SELRP		2																	32
DESRQ			3																
I-DESRP				4															32
CRERQ	5																		
I-CRERP					6														32
DELRQ			7																
I-DELRP						8													32
RATRQ			9																
I-RATRP							10												32
CATRQ			11																
I-CATRP								12											32
OPNRQ			13																
I-OPNRP									14										22
P-ALTCF										15					21				
CLORQ											17	17							
I-CLORP													18						32
RECRQ	19																		
I-RECRP														20					
LOCRQ											24	24							
I-LOCRP																25			
ERARQ											26	26							
I-ERARP																	27		
I-BGPRP																		31	
I-EGPRP																			33
GRPRQ	28		29								30	30							

A.3.9 Responding entity state table (Part 2) — detailed entries

1:		I-SELIN	⇒ I-SELECT-PD
2:	P4:	SELRP[2]	⇒ SELECTED
	~P4:	SELRP[8][2]	⇒ INITIALIZED
3:		I-DESIN	⇒ I-DESELECT-PD
4:		DESRP[2]	⇒ INITIALIZED
5:		I-CREIN	⇒ I-CREATE-PD
6:	P4:	CRERP[2]	⇒ SELECTED
	~P4:	CRERP[8][2]	⇒ INITIALIZED
7:		I-DELIN	⇒ I-DELETE-PD
8:		DELRP[2]	⇒ INITIALIZED

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9:		I-RATIN	⇒ I-READ-ATT-PD
10:		RATRP[2]	⇒ SELECTED
11:		I-CATIN	⇒ I-CHG-ATT-PD
12:		CATRP[2]	⇒ SELECTED
13:		I-OPNIN,[31]	⇒ I-OPEN-PD
14:	~P4:	OPNRP[8][2]	⇒ SELECTED
	P4:	[10],	
	P4 & ~P11:	OPNRP[2]	⇒ DXFRIDLE
	P4 & P11:	[11],OPNRP[2],P-ALTRQ	⇒ P-ALTCF-PD
15:	P6:	L-ERRCTX,	⇒ DXFRIDLE
17:		I-CLOIN	⇒ I-CLOSE-PD
18:		CLORP[2]	⇒ SELECTED
19:		I-RECIN,[28]	⇒ I-RECOVER-PD
20:	~P4:	RECRP[8][2]	⇒ INITIALIZED
	P4:	[10],[45],	
	P4 & ~P11:	RECRP[2]	⇒ DXFRIDLE-REC
	P4 & P11:	[11],RECRP[2],P-ALTRQ	⇒ P-ALTCF-REC-PD
21:	P6:	L-ERRCTX,	⇒ DXFRIDLE-REC
22:		[38],[31]	⇒ *same state*
24:		I-LOCIN	⇒ I-LOCATE-PD
25:	~P43:	LOCRP[2]	⇒ DXFRIDLE
	P43:	LOCRP[2]	⇒ DXFRIDLE-REC
26:		I-ERAIN	⇒ I-ERASE-PD
27:	~P43:	ERARP[2]	⇒ DXFRIDLE
	P43:	ERARP[2]	⇒ DXFRIDLE-REC
28:		[40],	
	P18:	I-PABIN,PABRQ[1]	⇒UNINITIALIZED
	~P18:	[43]	⇒ I-GROUP-PD
29:		[41],	
	P18:	I-PABIN,PABRQ[1]	⇒UNINITIALIZED
	~P18:	[43]	⇒ I-GROUP-PD
30:		[42],	
	P18:	I-PABIN,PABRQ[1]	⇒UNINITIALIZED
	~P18:	[43]	⇒ I-GROUP-PD
31:		[38]	⇒ GROUPING
32:		[38]	⇒ *same state*
33:		[39],	
	P17:		⇒ INITIALIZED
	~P17 & P19:	[10],	
	~P17 & P19 & ~P11:		⇒ DXFRIDLE
	~P17 & P19 & P11:	P-ALTRQ	⇒ P-ALTCF-PD
	~P17 & ~P19:		⇒ SELECTED

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A.4 Bulk data transfer protocol machine

A.4.1 States — bulk data transfer

DXFRIDLE	Data transfer idle
READ	Read data transfer
I-READ-ENDING	Read transfer end, wait for F-TRANSFER-END request primitive from the internal file service user
READ-ENDING	Read transfer ending, wait for transfer end request PDU
I-R-XFR-ENDING	Wait for F-TRANSFER-END response primitive after READ from the internal file service user
R-XFER-ENDING	Wait for transfer-end response PDU after READ
WRITE	Write data transfer
I-WRITE-ENDING	Write transfer-end, wait for F-TRANSFER-END request primitive from the internal file service user
WRITE-ENDING	Write transfer-end, wait for transfer end request PDU
I-W-XFR-ENDING	Wait for F-TRANSFER-END response primitive after WRITE from the internal file service user
W-XFER-ENDING	Wait for transfer-end response PDU after WRITE
CANCEL-PD	Cancel pending, wait for cancel response PDU
I-CANCEL-PD	Cancel pending, wait for F-CANCEL response primitive from the internal file service user
RRESTART-PD	Read restart pending, wait for restart response PDU in read operation
I-RRESTART-PD	Read restart pending, wait for F-RESTART response primitive in read operation from the internal file service user
WRESTART-PD	Write restart pending, wait for restart response PDU in write operation
I-WRESTART-PD	Write restart pending, wait for F-RESTART response primitive in write operation from the internal file service user
P-TOKEN-PD	Wait for sync-minor token
DXFRIDLE-REC	Data transfer idle during recovery
REA-SYMIN-PD	Wait for first P-SYNC-MINOR indication primitive after READ
RES-SYMIN-PD	Wait for first P-SYNC-MINOR indication primitive, restart requested
CAN-SYMIN-PD	Wait for first P-SYNC-MINOR indication primitive, cancel requested
WRT-SYMIN-PD	Wait for first P-SYNC-MINOR indication primitive after WRITE
REA-SYMCF-PD	Wait for first P-SYNC-MINOR confirm primitive after READ
RES-SYMCF-PD	Wait for first P-SYNC-MINOR confirm primitive, restart requested
CAN-SYMCF-PD	Wait for first P-SYNC-MINOR confirm primitive, cancel requested
WRT-SYMCF-PD	Wait for first P-SYNC-MINOR confirm primitive after WRITE
RESTART-CAN-PD	Restart cancel pending, wait for cancel or restart response PDU

A.4.2 Incoming events — bulk data transfer

A.4.2.1 Incoming events — PDUs

CANRP	Cancel response PDU (in user data of P-RESYNC(abandon) confirm if resync functional unit has been negotiated).	U2,U3
CANRQ	Cancel request PDU (in user data of P-RESYNC(abandon) indication if resync functional unit has been negotiated).	U2,U3
DAERQ	Data end request PDU.	U2,U3
TRERP	Transfer end response PDU.	U2,U3
TRERQ	Transfer end request PDU.	U2,U3
RESRQ	Restart request PDU, in user data of P-RESYNC (restart) indication.	U10
RESRP	Restart response PDU, in user data of P-RESYNC (restart) confirm.	U10
REARQ	Read request PDU.	U2
WRTRQ	Write request PDU.	U3
DATIN	data value in user context (not syntactically classed as a PDU).	U2,U3

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A.4.2.2 Incoming events from the internal file service user

I-CANRP	F-CANCEL response primitive.
I-CANRQ	F-CANCEL request primitive.
I-CHKRQ	F-CHECK request primitive.
I-CHKRP	F-CHECK response primitive.
I-DATRQ	F-DATA request primitive.
I-DAERQ	F-DATA-END request primitive.
I-REARQ	F-READ request primitive.
I-RESRQ	F-RESTART request primitive.
I-RESRP	F-RESTART response primitive.
I-TRERQ	F-TRANSFER-END request primitive.
I-TRERP	F-TRANSFER-END response primitive.
I-WRTRQ	F-WRITE request primitive.

A.4.2.3 Incoming events from the presentation service provider

P-SYMIN	P-SYNC-MINOR indication primitive.
P-SYMCF	P-SYNC-MINOR confirm primitive.
P-TOKIN	P-TOKEN-GIVE indication with minor-sync. token.

A.4.3 Outgoing events — bulk data transfer

A.4.3.1 Outgoing events — PDUs

CANRP	Cancel response PDU (in user data of P-RESYNC(abandon) response if resync functional unit has been negotiated)
CANRQ	Cancel request PDU (in user data of P-RESYNC(abandon) request if resync functional unit has been negotiated)
DAERQ	Data end request PDU
TRERP	Transfer end response PDU
TRERQ	Transfer end request PDU
RESRQ	Restart request PDU, in user data of P-RESYNC (restart) request
RESRP	Restart response PDU, in user data of P-RESYNC (restart) response
REARQ	Read request PDU
WRTRQ	Write request PDU

A.4.3.2 Outgoing events to the internal file service user

I-CANCF	F-CANCEL confirm primitive
I-CANIN	F-CANCEL indication primitive
I-CHKIN	F-CHECK indication primitive
I-CHKCF	F-CHECK confirm primitive
I-DATIN	F-DATA indication primitive
I-DAEIN	F-DATA-END indication primitive
I-REAIN	F-READ indication primitive
I-RESIN	F-RESTART indication primitive
I-RESCF	F-RESTART confirm primitive
I-TREIN	F-TRANSFER-END indication primitive
I-TRECF	F-TRANSFER-END confirm primitive
I-WRTIN	F-WRITE indication primitive

A.4.3.3 Outgoing events to the presentation service provider

P-SYMRQ	P-SYNC-MINOR request primitive
P-SYMRP	P-SYNC-MINOR response primitive
P-DATRQ	P-DATA request primitive
P-TOKRQ	P-TOKEN-GIVE request primitive with minor-synch token.

A.4.3.4 Outgoing events to the local system

L-ERRABT Local signal indicating an error leading to abort

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A.4.4 Specific actions — bulk data transfer

[2] Add a PDU to the current PSDU and terminate the current PSDU.

[16] Add a PDU to the current PSDU and optionally terminate the current PSDU, according to local decision.

[15] Preserve the PDU for further processing

[17] Use for the sync point, the checkpoint received plus the offset.

[18] Add the data given on the F-DATA request to the current PSDU. Optionally (depending upon local system considerations) terminate the PSDU.

[19] Use for the checkpoint, the sync point number received minus the offset.

[21] Unset discard indicator

[22] Set discard indicator and set the outstanding checkpoint counter to zero.

[23] Discard any user data not yet delivered.

[24] Add 1 to the sync point number.

[25] Terminate the current PSDU.

[26] If Presentation resynchronize functional unit is available, send PDU as user data on a P-RESYNC(abandon) request or response primitive; otherwise add PDU to the current PSDU and terminate the current PSDU.

[27] Increment the checkpoint identifier expected.

[29] Increment the outstanding checkpoint counter.

[30] Decrement the outstanding checkpoint counter according to the checkpoint number confirmed (see 15.3.2).

[44] Increment the bulk data transfer number.

[45] Set the checkpoint identifier expected to the value negotiated plus one.

[47] Preserve the primitive parameters for subsequent processing. In some states, it happens that, when F-CANCEL primitive is preserved, there is already an F-RESTART primitive preserved: in this case, the F-RESTART primitive shall be discarded.

[48] Set the checkpoint identifier expected to 0.

[49] Set the synchronization offset to the value of the synchronize point serial number minus the checkpoint identifier expected. (In a bulk data transfer that does not involve recovery, the checkpoint identifier is zero, at this point in the protocol).

[50] PDU is sent as user data on a P-RESYNCH (restart) request or response primitive, with a synchronization point serial number equal to the sum of the checkpoint identifier, on the F-RESTART primitive, and the synchronization offset.

[51] The checkpoint identifier shall be equal to the value received on the PDU.

[52] Set the synch point serial number equal to the synch point serial number negotiated with the presentation service provider.

[53] Store the synchronization point serial number provided by the presentation service provider.

A.4.5 Predicates — bulk data transfer

P8: The context is not within the defined context set.

P13: The transfer service class has been negotiated and the bulk data transfer number is greater than 1.

P14: The synchronization point exceeds 999 998, exceeding the session service limitation.

P15: Discard indicator is set

P20: The resync functional unit has been negotiated.

P21: The sync-minor functional unit has been negotiated.

P22: The entity possesses the sync-minor token.

P27: The outstanding checkpoint counter exceeds the agreed maximum.

P41: The expected checkpoint identifier equals the sync point number minus the offset.

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A.4.6 Initiating state table — bulk data transfer

STATE / EVENT	DXFRIDLE	DXFRIDLE-REC	REA-SYMIN-PD	RES-SYMIN-PD	CAN-SYMIN-PD	READ	I-READ-ENDING	R-XFER-ENDING	P-TOKEN-PD	WRT-SYMCF-PD	RES-SYMCF-PD	CAN-SYMCF-PD	WRITE	I-WRITE-ENDING	W-XFER-ENDING	CANCEL-PD	I-CANCEL-PD	RRESTART-PD	WRESTART-PD	I-RRESTART-PD	I-WRESTART-PD	RESTART-CAN-PD
I-REARQ	1	35																				
I-WRTRQ	2	36																				
P-TOKIN	42								3													
I-DATRQ										4			4									
I-DAERQ										5			5									
DATIN						6										41		41				
DAERQ						8										41		41				
I-TRERQ							9							10								
TRERP								11							3							
I-CANRQ			31	31		12	12			34	34		12					38	38	12	12	
CANRP																13						
CANRQ						14							14	14	14	15		14	14	14	14	39
I-CANRP																	16					
I-CHKRQ										17			17									
P-SYMCF										32	22	12	18	37	37							
P-SYMIN			29	21	12	19																
I-CHKRP						20	20															
I-RESRQ			30			21	21			33			22									
RESRP																		23	24			40
RESRQ						25							26	26	26			43	44			
I-RESRP																				27	28	

A.4.7 Initiating entity state table (Part 3) — detailed entries

1:		[44],	
	~P13 & P21:	REARQ[2],P-TOKRQ,[48],[49]	⇒ REA-SYMIN-PD
	~P13 & ~P21:	REARQ[2]	⇒ READ
	P13:	L-ERRABT	⇒ *same state*
2:		[44],	
	P13:	L-ERRABT	⇒ *same state*
	~P13 & ~P21:	WRTRQ[16]	⇒ WRITE
	~P13 & P21:	WRTRQ[16],[24],	
	~P13 & P14 & P21:	L-ERRABT	⇒ *same state*
	~P13 & ~P14 & P21:	P-SYMRQ,[48],[49]	⇒ WRT-SYMCF-PD
3:		I-TRECF	⇒ DXFRIDLE
4:	~P8:	P-DATRQ[18]	⇒ *same state*
	P8:	L-ERRABT	⇒ *same state*
5:		DAERQ[16]	⇒ I-WRITE-ENDING

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6:	P15:		⇒ *same state*
	~P15:	I-DATIN	⇒ *same state*
8:	P15:		⇒ *same state*
	~P15:	I-DAEIN	⇒ I-READ-ENDING
9:		TRERQ[2]	⇒ R-XFER-ENDING
10:		TRERQ[2]	⇒ W-XFER-ENDING
11:	P21:	[15]	⇒ P-TOKEN-PD
	~P21:	I-TRECF	⇒ DXFRIDLE
12:		[22],[23],CANRQ[26]	⇒ CANCEL-PD
13:	P20:	[53], [21],I-CANCF	⇒ DXFRIDLE
14:	P20:	[53], [22],[23],I-CANIN	⇒ I-CANCEL-PD
15:	P20:	CANRP[26],[53], [21],I-CANCF	⇒ DXFRIDLE
16:	P20:	[52], CANRP[26],[21]	⇒ DXFRIDLE
17:		[25],[27],[24],	
	~P14:	P-SYMRQ	⇒ *same state*
	P14:	L-ERRABT	⇒ *same state*
18:		I-CHKCF[19]	⇒ *same state*
19:		[29],	
	~P27 & P41:	I-CHKIN,[24],[27]	⇒ *same state*
	P27 | ~P41:	L-ERRABT	⇒ *same state*
20:		[30],P-SYMRP[17]	⇒ *same state*
21:		[22],RESRQ[50]	⇒ RRESTART-PD
22:		[22],RESRQ[50]	⇒ WRESTART-PD
23:		[52],[45],[49],[27],[21],I-RESCF	⇒ READ
24:		[52],[45],[49],[27],[21],I-RESCF	⇒ WRITE
25:		[23],I-RESIN	⇒ I-RRESTART-PD
26:		I-RESIN	⇒ I-WRESTART-PD
27:		[52],[45],[49],[27],RESRP[50]	⇒ READ

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28:		[52],[45],[49],[27],RESRP[50]	⇒ WRITE
29:		[24],[49],[27],P-SYMRP	⇒ READ
30:		[47],[22]	⇒ RES-SYMIN-PD
31:		[47],[22]	⇒ CAN-SYMIN-PD
32:		[49],[27]	⇒ WRITE
33:		[47],[22]	⇒ RES-SYMCF-PD
34:		[47],[22]	⇒ CAN-SYMCF-PD
35:	P21: ~P21:	REARQ[2],P-TOKRQ,[27],[49] REARQ[2]	⇒ REA-SYMIN-PD ⇒ READ
36:	 P14: P21 & ~P14: ~P21 & ~P14:	WRTRQ[2],[24], L-ERRABT P-SYMRQ,[27],[49]	 ⇒ *same state* ⇒ WRT-SYMCF-PD ⇒ WRITE
37:		I-CHKCF[19]	⇒ *same state*
38:		[47]	⇒ RESTART-CAN-PD
39:	P20:	[52], [21],I-CANCF,CANRP[26]	⇒ DXFRIDLE
40:		CANRQ[26]	⇒ CANCEL-PD
41:			⇒ *same state*
42:			⇒ *same state*
43:		[52],[45],[49],[27],[21],I-RESCF,RESRP[50]	⇒ READ
44:		[52],[45],[49],[27],[21],I-RESCF,RESRP[50]	⇒ WRITE

NOTE - The entries 38, 39, 40 are due to the Session service behaviour in the resynchronize management, in collision cases.

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A.4.8 Responding entity state table — bulk data transfer

STATE / EVENT	DXFRIDLE	DXFRIDLE-REC	P-TOKEN-PD	REA-SYMCF-PD	RES-SYMCF-PD	CAN-SYMCF-PD	READ	READ-ENDING	I-R-XFR-ENDING	WRT-SYMIN-PD	RES-SYMIN-PD	CAN-SYMIN-PD	WRITE	WRITE-ENDING	I-W-XFR-ENDING	CANCEL-PD	I-CANCEL-PD	RRESTART-PD	WRESTART-PD	I-RRESTART-PD	I-WRESTART-PD	RESTART-CAN-PD
REARQ	1	36																				
WRTRQ	2	37																				
P-TOKIN			3																			
I-DATRQ				4			4															
I-DAERQ				5			5															
DATIN													6			42			42			
DAERQ													8			42			42			
TRERQ								9						10								
I-TRERP									11						43							
I-CANRQ				30	30		12			33	33		12	12	12			39	39	12	12	
CANRP																13						
CANRQ				14	14		14	14					14			44		14	14	14	14	40
I-CANRP																	15					
I-CHKRQ				16			16															
P-SYMCF				28	20	12	18	38														
P-SYMIN										31	34	35	17									
I-CHKRP													19	19								
I-RESRQ				29			20			32			21	21	21							
RESRP																		22	23			41
RESRQ				24			24	24	24				25					45	46			
I-RESRP																				26	27	

A.4.9 Responding entity state table (Part 3) — detailed entries

1:		[44],	
	~P13 & P21:	[15],[48],[49]	⇒ P-TOKEN-PD
	~P13 & ~P21:	I-REAIN	⇒ READ
	P13:	L-ERRABT	⇒ *same state*
2:		[44],	
	~P13 & P21:	I-WRTIN,[48],[49]	⇒ WRT-SYMIN-PD
	~P13 & ~P21:	I-WRTIN	⇒ WRITE
	P13:	L-ERRABT	⇒ *same state*
3:		I-REAIN,[24],	
	~P14:	P-SYMRQ	⇒ REA-SYMCF-PD
	P14:	L-ERRABT	⇒ *same state*
4:	P8:	P-DATRQ[18]	⇒ *same state*
	~P8:	L-ERRABT	⇒ *same state*
5:		DAERQ[16]	⇒ READ-ENDING

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6:	P15:		⇒ *same state*
	~P15:	I-DATIN	⇒ *same state*
8:	P15:		⇒ *same state*
	~P15:	I-DAEIN	⇒ WRITE-ENDING
9:	P15:		⇒ *same state*
	~P15:	I-TREIN	⇒ I-R-XFR-ENDING
10:	P15:		⇒ *same state*
	~P15:	I-TREIN	⇒ I-W-XFR-ENDING
11:	P21:	TRERP[2],P-TOKRQ	⇒ DXFRIDLE
	~P21:	TRERP[2]	⇒ DXFRIDLE
12:		[22],[23],CANRQ[26]	⇒ CANCEL-PD
13:	P21 & P22:	P-TOKRQ	⇒ DXFRIDLE
	P20 & (~P21 | ~P22):	[53],	
	~P21 | ~P22:	[21],I-CANCF	⇒ DXFRIDLE
14:		[53],[22],[23],I-CANIN	⇒ I-CANCEL-PD
15:	P21 & P22:	P-TOKRQ,	
	P20:	[52],	
		CANRP[26],[21]	⇒ DXFRIDLE
16:		[25],[27],[24],	
	~P14:	P-SYMRQ	⇒ *same state*
	P14:	L-ERRABT	⇒ *same state*
17:		[29],	
	~P27 & P41:	I-CHKIN,[24],[27]	⇒ *same state*
	P27 | ~P41:	L-ERRABT	⇒ *same state*
18:		I-CHKCF[19]	⇒ *same state*
19:		[30],P-SYMRP[17]	⇒ WRITE
20:		[22],RESRQ[50]	⇒ RRESTART-PD
21:		[22],RESRQ[50]	⇒ WRESTART-PD
22:		[52],[45],[49],[27],[21],I-RESCF	⇒ READ
23:		[52],[45],[49],[27],[21],I-RESCF	⇒ WRITE
24:		I-RESIN	⇒ I-RRESTART-PD
25:		[23],I-RESIN	⇒ I-WRESTART-PD
26:		[52],[45],[49],[27],RESRP[50]	⇒ READ

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27:		[52],[45],[49],[27],RESRP[50]	⇒ WRITE
28:		[49],[27]	⇒ READ
29:		[22],[47]	⇒ RES-SYMCF-PD
30:		[22],[47]	⇒ CAN-SYMCF-PD
31:		[24],[49],[27],P-SYMRP	⇒ WRITE
32:		[22],[47]	⇒ RES-SYMIN-PD
33:		[22],[47]	⇒ CAN-SYMIN-PD
34:		[24],P-SYMRP,[22],RESRQ[50]	⇒ WRESTART-PD
35:		[24],P-SYMRP,[22],CANRQ[26]	⇒ CANCEL-PD
36:	P21: ~P21:	[15],[27],[49] I-REAIN	⇒ P-TOKEN-PD ⇒ READ
37:	P21: ~P21:	I-WRTIN,[27],[49] I-WRTIN	⇒ WRT-SYMIN-PD ⇒ WRITE
38:		I-CHKCF[19]	⇒ *same state*
39:		[22],[47]	⇒ RESTART-CAN-PD
40:	P21 & P22: P20:	P-TOKRQ, [52], [21],I-CANCF,CANRP[26]	⇒DXFRIDLE
41:		CANRQ[26]	⇒ CANCEL-PD
42:			⇒ CANCEL-PD
43:		TRERP[2]	⇒ DXFRIDLE
44:	P21 & P22: P20:	P-TOKRQ, [53],[52], CANRP[26],[21],I-CANCF	⇒ DXFRIDLE
45:		[52],[45],[49],[27],[21],I-RESCF[51],RESRQ[50]	⇒ READ
46:		[52],[45],[49],[27],[21],I-RESCF,RESRQ[50]	⇒ WRITE

NOTE - The entries 14, 39, 40, 41, 45 and 46 are due to the Session service behaviour in the resynchronize management, in collision cases.

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A.5 File error recovery protocol machine (FERPM)

NOTE - The description of the file error recovery protocol machine given here omits the description of grouping, which does not materially affect the recovery behaviour. The transitions for the grouped cases can be derived from those in the basic protocol machine.

A.5.1 States — file error recovery

INIT-PD	Initialize pending, wait for an I-INICF event as an F-INITIALIZE confirm primitive from the IFS.
PASSIVE	The basic file protocol is currently in operation but no transfer of file contents is in progress. It is used when the FERPM becomes inactive in normal error free activity, or when it cannot provide its services any more after issuing an L-ERRABT signal.
XFER-IDLE	Data transfer idle.
XFER	Normal transfer of file contents has been established.
RESTART-PD	Restart pending, wait for an I-RESCF event as an F-RESTART confirm primitive from the IFS.
RESTART	A restart of a data transfer is in progress. A checkpoint identifier has been negotiated, and data following that checkpoint, but prior to the error, is being retransmitted.
CANCEL-PD	Cancel pending, wait for an I-CANCF event as an F-CANCEL confirm primitive from the IFS.
CLOSE-EX	Close expected, wait for an I-CLOIN event as an F-CLOSE indication primitive from the IFS.
DESELECT-EX	Deselect expected, wait for an I-DESIN event as an F-DESELECT indication primitive from the IFS.
RECOVER-PD	Recover pending, wait for an I-RECCF event as an F-RECOVER confirm primitive from the IFS.
SEL-PD	SELECT pending, wait for an I-SELCF event as an F-SELECT confirm primitive from the IFS.
OPN-PD	OPEN pending, wait for an I-OPNCF event as an F-OPEN confirm primitive form the IFS.
SEL-EX	SELECT expected, wait for an I-SELIN event as an F-SELECT indication primitive from the IFS.
OPN-EX	OPEN expected, wait for an I-OPNIN event as an F-OPEN indication primitive form the IFS.
XFER-EX	Data transfer expected, wait for an I-REAIN/I-WRTIN as an F-READ/F-WRITE indication primitive from the IFS.
INIT-EX	Initiation expected, wait for an I-ININ event as an F-INITIALIZE indication primitive from the IFS.
CLOSE-PD	Close pending, wait for an I-CLOCF event as an F-CLOSE confirm primitive from the IFS.
DESELECT-PD	Deselect pending, wait for an I-DESCF event as an F-DESELECT confirm primitive from the IFS.

A.5.2 Incoming events — file error recovery

A.5.2.1 Incoming events from the external file service user

F-OPNRQ	F-OPEN request primitive
F-CLORQ	F-CLOSE request primitive
F-REARQ	F-READ request primitive
F-WRTRQ	F-WRITE request primitive
F-DATRQ	F-DATA request primitive
F-DAERQ	F-DATA-END request primitive
F-TRERQ	F-TRANSFER-END request primitive
F-ANYRQ	[Any of those request primitives implied in 19.1.1a.]
F-OPNRP	F-OPEN response primitive
F-CLORP	F-CLOSE response primitive
F-TRERP	F-TRANSFER-END response primitive
F-ANYRP	[Any of those response primitives implied in 19.1.1a.]

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A.5.2.2 Incoming events from the internal file service

I-INICF	F-INITIALIZE confirm primitive
I-OPNCF	F-OPEN confirm primitive
I-CLOCF	F-CLOSE confirm primitive
I-DATIN	F-DATA indication primitive
I-DAEIN	F-DATA-END indication primitive
I-CHKIN	F-CHECK indication primitive
I-CHKCF	F-CHECK confirm primitive
I-TRECF	F-TRANSFER-END confirm primitive
I-ANYCF	[Any of the confirm primitives implied in 19.1.1a.]
I-SELCF	F-SELECT confirm primitive
I-DESCF	F-DESELECT confirm primitive
I-INIIN	F-INITIALIZE indication primitive
I-SELIN	F-SELECT indication primitive
I-DESIN	F-DESELECT indication primitive
I-OPNIN	F-OPEN indication primitive
I-CLOIN	F-CLOSE indication primitive
I-TREIN	F-TRANSFER-END indication primitive
I-CANIN	F-CANCEL indication primitive
I-CANCF	F-CANCEL confirm primitive
I-PABIN	F-P-ABORT indication primitive
I-RECCF	F-RECOVER confirm primitive
I-RESCF	F-RESTART confirm primitive
I-RECIN	F-RECOVER indication primitive
I-RESIN	F-RESTART indication primitive
I-ANYIN	[Any of the indication primitives implied in 19.1.1a.]
I-REAIN	F-READ indication primitive
I-WRTIN	F-WRITE indication primitive

A.5.2.3 Incoming events from the Local System Environment

L-ERROR1	Class I error (as defined in 18.1)
L-ERROR2	Class II error (as defined in 18.1)
L-ERROR3	Class III error (as defined in 18.1)
L-GIVEUP	Timer for recovery expires
L-DATRQ	Reissued F-DATA request primitive
L-CHKRQ	Reissued F-CHECK request primitive
L-DAERQ	Reissued F-DATA-END request primitive
L-EORIN	Indicates that all checkpoint identifiers and "data end" markers in the docket have been used, and all data to be resent have been sent.

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A.5.3 Outgoing events — file error recovery

A.5.3.1 Outgoing events to the external file service user

F-OPNCF	F-OPEN confirm primitive
F-ANYCF	[Any of the confirm primitives implied in 19.1.1a]
F-CLOCF	F-CLOSE confirm primitive
F-DATIN	F-DATA indication primitive
F-DAEIN	F-DATA-END indication primitive
F-TRECF	F-TRANSFER-END confirm primitive
F-OPNIN	F-OPEN indication primitive
F-WRTIN	F-WRITE indication primitive
F-CLOIN	F-CLOSE indication primitive
F-REAIN	F-READ indication primitive
F-TREIN	F-TRANSFER-END indication primitive
F-ANYIN	[Any of the indication primitives implied in 19.1.1a]
F-PABIN	F-P-ABORT indication primitive

A.5.3.2 Outgoing events to the internal file service

I-SELRQ	F-SELECT request primitive
I-OPNRQ	F-OPEN request primitive
I-CLORQ	F-CLOSE request primitive
I-DATRQ	F-DATA request primitive
I-DAERQ	F-DATA-END request primitive
I-CHKRQ	F-CHECK request primitive
I-TRERQ	F-TRANSFER-END request primitive
I-REARQ	F-READ request primitive
I-WRTRQ	F-WRITE request primitive
I-ANYRQ	[Any of the request primitives implied in 19.1.1a]
I-INIRP	F-INITIALIZE response primitive
I-OPNRP	F-OPEN response primitive
I-SELRP	F-SELECT response primitive
I-CLORP	F-CLOSE response primitive
I-TRERP	F-TRANSFER-END response primitive
I-ANYRP	[Any of the response primitives implied in 19.1.1a]
I-CHKRP	F-CHECK response primitive
I-RESRQ	F-RESTART request primitive
I-RESRP	F-RESTART response primitive
I-CANRQ	F-CANCEL request primitive
I-CANRP	F-CANCEL response primitive
I-DESRQ	F-DESELECT request primitive
I-RECRQ	F-RECOVER request primitive
I-INIRQ	F-INITIALIZE request primitive
I-RECRP	F-RECOVER response primitive
I-DESRP	F-DESELECT response primitive

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A.5.3.3 Outgoing events to the local system environment

L-ERROR2	Signal indicating class II error
L-RESEND	Resend data request to the local file system
L-SUSPND	Suspend issuing of F-DATRQ, F-DAERQ by the local file system
L-RESUME	Resume issuing of F-DATRQ, F-DAERQ by the local file system
L-ERRABT	Signal FPM to issue an F-P-ABORT request PDU, with permanent error value.
L-PABORT	Signal FPM to issue a F-P-ABORT request PDU, and a F-P-ABORT indication primitive to the FERPM, both with transient error value.

A.5.4 Specific actions — file error recovery

[54] Mark the checkpoint identifiers to be reissued.

[55] Delete the docket.

[56] Set the activity state indicator to "finished".

[57] Set the activity state indicator to "in-progress".

[58] Set the activity type indicator to "read".

[59] Set the activity type indicator to "write".

[60] Add the checkpoint identifier to the list in the docket. Increment the count of outstanding checkpoints by one.

[61] Delete from the docket all checkpoint identifiers smaller than the parameter in the primitive received or issued. Decrement the count of outstanding checkpoints by the number of the deleted identifiers.

[64] Set the activity state indicator to "data transfer finishing".

[66] Use the last checkpoint identifier in the docket as the parameter.

[67] Increment the checkpoint identifier count.

[68] Set the checkpoint identifier count to zero.

[69] Record the bulk data transfer number in the docket (the number is maintained by the FPM).

[70] Record which data values have been already delivered to the user.

[71] Use as the parameter the checkpoint identifier available in the docket that is both

a) after the checkpoint identifier negotiated, and
b) not yet reissued during this restart of the BDT.

[72] Use as parameter the checkpoint identifier count.

[73] Use as the parameter the oldest (first) checkpoint identifier in the list in the docket.

[74] Use as the parameter the checkpoint identifier of the primitive received.

[75] Use as the diagnostics parameter "activity identifier unknown".

[76] Record which data values have been sent.

[77] Create a docket and record in it the activity indentifier, the information needed to issue or check an I-INIRQ (including the locations of the initiator and responder), the recovery mode, the access context, the presentation context, a null checkpoint list and set the activity state indicator to "starting".

[78] The issuer of the I-RESRQ or I-RECRQ primitive identifies a checkpoint identifier which is

a) for the sender, the last point acknowledged,
b) for the receiver, the last point received and secured.

[79] The issuer of the I-RESRP primitive identifies a checkpoint identifer which is

c) for the sender, equal to the value provided by the issuer of the request, and
d) for the receiver, the last point received and secured.

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[200] Wait for $2^{\text{Recommended retry time}}$ seconds.

[201] Include a state result indicating failure.

[202] Use the data value specified by the L-DATRQ signal, representing previous F-DATA request primitives, as the parameter.

[203] Use as the parameter the checkpoint identifier negotiated.

[204] Store "data end" marker in the docket.

[206] Delete "data end" marker in the docket.

[207] Include an action result indicating transient error.

[209] Recreate select and open regimes.

[210] Include a action result indicating failure on next response with diagnostic of damage to open/select regime.

[211] Include a diagnostic of damage to open/select regime.

[212] Use as the parameter the bulk data transfer number recorded in the docket.

A.5.5 Predicates — file error recovery

P23: The incoming response or confirm primitive has a state result indicating success.

P24: There are checkpoints that must be confirmed.

P26: An F-DATA indication primitive corresponding to the incoming I-DATA indication has already been issued to the user.

P28: The data value available is after the negotiated checkpoint.

P29: The activity state indicator is set to "in-progress" and the activity type to "read".

P30: The activity state indicator is set to "in-progress" and the activity type to "write".

P31: The activity type indicator is set to "read".

P32: The activity type indicator is set to "write".

P33: The activity state indicator is set to "starting".

P34: The activity state indicator is set to "finished".

P37: A checkpoint identifier is to be inserted in the data stream.

P38: The checkpoint identifier available is marked to be reissued.

P39: The entity has the docket for the activity identifier received, the current initiator matches the location, and the activity can be resumed.

P40: The entity is sender of data.

P100: The recommended retry time field is present on the diagnostic parameter.

P101: The specified recovery is possible and is required.

P102: The specified association is possible.

P103: The incoming request or indication primitive has an action result indicating transient error.

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A.5.6 Initiating entity state table — FERPM — (Normal procedure)

STATE / EVENT	PASSIVE	XFER-IDLE	XFER
F-OPNRQ	1		
I-OPNCF	2		
F-ANYRQ	3	3	
I-ANYCF	4	4	
F-CLORQ		5	
I-CLOCF		6	
F-REARQ		7	
F-WRTRQ		8	
F-DATRQ			9
I-DATIN			10
I-CHKCF			11
I-CHKIN			12
F-DAERQ			13
I-DAEIN			14
F-TRERQ			15
I-TRECF			16

A.5.7 Initiating entity state table — FERPM — detailed entries (normal procedure)

1:		[77],I-OPNRQ	⇒ *same state*
2:	P23:	F-OPNCF	⇒ XFER-IDLE
	~P23:	[55],F-OPNCF[201]	⇒ *same state*
3:		I-ANYRQ	⇒ *same state*
4:		F-ANYCF	⇒ *same state*
5:		[56],I-CLORQ	⇒ *same state*
6:		[55],F-CLOCF	⇒ PASSIVE
7:		[57],[58],[68],I-REARQ,[69]	⇒ XFER
8:		[57],[59],[68],I-WRTRQ,[69]	⇒ XFER
9:	P37:	[67],[60],I-CHKRQ[72], [76],I-DATRQ	⇒ *same state*
10:		[70],F-DATIN	⇒ *same state*
11:		[61]	⇒ *same state*
12:	P24:	[60], I-CHKRP,[61],	⇒ *same state*
13:		[204],I-DAERQ	⇒ *same state*
14:	P24:	I-CHKRP[66],[61], F-DAEIN	⇒ *same state*
15:	P29:	[64], I-TRERQ	⇒ *same state*
16:	P30:	[64], F-TRECF	⇒ XFER-IDLE

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A.5.8 Responding entity state table — FERPM — (normal procedure)

STATE / EVENT	PASSIVE	XFER-IDLE	XFER
I-OPNIN	1		
F-OPNRP	2		
F-ANYRP	3	3	
I-ANYIN	4	4	
I-CLOIN		5	
F-CLORP		6	
I-REAIN		7	
I-WRTIN		8	
F-DATRQ			9
I-DATIN			10
I-CHKCF			11
I-CHKIN			12
F-DAERQ			13
I-DAEIN			14
I-TREIN			15
F-TRERP			16

A.5.9 Responding entity state table — FERPM — detailed entries (Normal procedure)

1:		[77],F-OPNIN	⇒ *same state*
2:	P23:	I-OPNRP	⇒ XFER-IDLE
	~P23:	[55],I-OPNRP[201]	⇒ *same state*
3:		I-ANYRP	⇒ *same state*
4:		F-ANYIN	⇒ *same state*
5:	~P103:	[56],F-CLOIN	⇒ *same state*
6:		[55],I-CLORP	⇒ PASSIVE
7:		[57],[58],[68],F-REAIN,[69]	⇒ XFER
8:		[57],[59],[68],F-WRTIN,[69]	⇒ XFER
9:	P37:	[67],[60],I-CHKRQ[72], [76],I-DATRQ	⇒ *same state*
10:		[70],F-DATIN	⇒ *same state*
11:		[61]	⇒ *same state*
12:	P24:	[60], I-CHKRP,[61],	⇒ *same state*
13:		[204],I-DAERQ	⇒ *same state*
14:	P24:	I-CHKRP[66],[61], F-DAEIN	⇒ *same state*
15:	P30:	[64], F-TREIN	⇒ *same state*
16:	P29:	[64], I-TRERP	⇒ XFER-IDLE

NOTE - The condition "P103" in entry 6 is handled in A.5.17 (in entry 16).

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A.5.10 Initiating entity state table — FERPM — (class I errors)

State / Event	XFER	RESTART-PD	RESTART
L-ERROR1	1		1
I-RESCF		2	
I-RESIN	3		
I-DATIN			4
I-CHKCF			6
I-DAEIN			7
L-DATRQ			9
L-CHKRQ			10
L-DAERQ			11
L-EORIN			12

A.5.11 Initiating entity state table — FERPM — detailed entries (class I errors)

1:	P101 & P40:	L-SUSPND,I-RESRQ[78]	⇒ RESTART-PD
	P101 & ~P40:	I-RESRQ[78]	⇒ RESTART-PD
	~P101:	L-ERROR2	⇒ XFER
2:	~P40:	[61]	⇒ RESTART
	P40:	[54],[61],L-RESEND[74]	⇒ RESTART
3:	~P40:	I-RESRP[79]	⇒ RESTART
	P40:	L-SUSPND,[54],[61],I-RESRP[79],L-RESEND[203]	⇒ RESTART
4:	P26:		⇒ *same state*
	~P26:	F-DATIN	⇒ XFER
6:		[61]	⇒ *same state*
7:	P24:	I-CHKRP[66],[61], F-DAEIN	⇒ XFER
9:	P28:	I-DATRQ[202]	⇒ *same state*
	~P28:		⇒ *same state*
10:	P38:	I-CHKRQ[71],	⇒ *same state*
11:		I-DAERQ[206]	⇒ *same state*
12:		L-RESUME	⇒ XFER

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A.5.12 Responding entity state table — FERPM — (class I errors)

State / Event	XFER	RESTART-PD	RESTART
L-ERROR1	1		1
I-RESCF		2	
I-RESIN	3		
I-DATIN			4
I-CHKCF			6
I-DAEIN			7
L-DATRQ			9
L-CHKRQ			10
L-DAERQ			11
L-EORIN			12

A.5.13 Responding entity state table — FERPM — detailed entries (class I errors)

1:	P101 & P40:	L-SUSPND,I-RESRQ[78]	⇒ RESTART-PD
	P101 & ~P40:	I-RESRQ[78]	⇒ RESTART-PD
	~P101:	L-ERROR2	⇒ XFER
2:	~P40:	[61]	⇒ RESTART
	P40:	[54],[61],L-RESEND[74]	⇒ RESTART
3:	~P40:	I-RESRP[79]	⇒ RESTART
	P40:	L-SUSPND,[54],[61],I-RESRP[79],L-RESEND[203]	⇒ RESTART
4:	P26:		⇒ *same state*
	~P26:	F-DATIN	⇒ XFER
6:		[61]	⇒ *same state*
7:	P24:	I-CHKRP[66],[61], F-DAEIN	⇒ XFER
9:	P28:	I-DATRQ[202]	⇒ *same state*
	~P28:		⇒ *same state*
10:	P38:	I-CHKRQ[71],	⇒ *same state*
11:		I-DAERQ[206]	⇒ *same state*
12:		L-RESUME	⇒ XFER

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A.5.14 Initiating entity state table — FERPM — detailed entries — (class II and III errors)

STATE / EVENT	XFER	RESTART-PD	RESTART	CANCEL-PD	CLOSE-PD	DESELECT-PD	RECOVER-PD	INIT-PD	PASSIVE	SEL-PD	OPN-PD	XFER-IDLE
L-ERROR2	1	1	1									11
I-CANIN	2	2	2									
I-CANCF				3								
I-CLOCF					4							
I-DESCF						5						
I-RECCF							6					
L-ERROR3	7	7	7	7	7	7	7		7	7	7	7
I-PABIN	12	12	12	12	12	12	12		12	12	12	12
I-SELCF										9		
I-OPNCF											10	
I-INICF								8				

A.5.15 Initiating entity state table — FERPM — detailed entries (class II and III errors)

1:	~P101:	[55],L-ERRABT	⇒ PASSIVE
	P101 & ~P40:	I-CANRQ[207]	⇒ CANCEL-PD
	P101 & P40:	L-SUSPND,I-CANRQ	⇒ CLOSE-PD
2:	P103 & ~P40:	I-CANRP,I-CLORQ	⇒ CLOSE-PD
	P103 & P40:	L-SUSPND,I-CANRP,I-CLORQ	⇒ CLOSE-PD
3:		I-CLORQ	⇒ CLOSE-PD
4:		I-DESRQ	⇒ DESELECT-PD
5:		I-RECRQ[212]	⇒ RECOVER-PD
6:	P23 & (P29 | P31) & ~(P30 | P32):	[209],I-REARQ	⇒ RESTART
	P23 & (P30 | P32) & ~(P29 | P31):	[209],I-WRTRQ,L-RESEND[74]	⇒ RESTART
	~P23 & ~P33 & P34:	[55],F-CLOCF[211],L-ERRABT	⇒ PASSIVE
	~P23 & P33 & ~P34:	I-SELRQ	⇒ SEL-PD
	~P23 & P101 & ~(P34 | P33) & (P29 | P30 | P31 | P32):	I-RECRQ[212]	⇒ *same state*
	~P23 & ~P101 & ~(P34 | P33) & (P29 | P30 | P31 | P32):	[55],L-ERRABT	⇒ PASSIVE

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7:	P40:	L-SUSPND,	
	P100 & P101:	L-PABORT[207],[200],I-INIRQ	⇒ INIT-PD
	~P100 & P101:	L-PABORT[207],I-INIRQ	⇒ INIT-PD
	~P101:	[55],L-ERRABT	⇒ PASSIVE
8:	P23 & ~P31 & P32:	I-RECRQ[73][212]	⇒ RECOVER-PD
	P23 & P31 & ~P32:	I-RECRQ[66][212]	⇒ RECOVER-PD
	~P23 & P102:	[200],I-INIRQ	⇒ *same state*
	~P23 & ~P102:	[55],L-ERRABT	⇒ PASSIVE
9:	P23:	I-OPNRQ	⇒ OPN-PD
	~P23:	[55],L-ERRABT	⇒ PASSIVE
10:	P23:		⇒ XFER-IDLE
	~P23:	[55],L-ERRABT	⇒ PASSIVE
11:	~P101:	[55],L-ERRABT	⇒ PASSIVE
	P101:	I-CLORQ[211]	⇒ CLOSE-PD
12:	P40 & P103 & P100 & P101:	L-SUSPND,[200],I-INIRQ	⇒ INIT-PD
	~P40 & P103 & P100 & P101:	[200],I-INIRQ	⇒ INIT-PD
	P40 & P103 & ~P100 & P101:	L-SUSPND,I-INIRQ	⇒ INIT-PD
	~P40 & P103 & ~P100 & P101:	I-INIRQ	⇒ INIT-PD
	~P103 | ~P101:	[55],F-PABIN	⇒ PASSIVE

NOTES

1 To avoid recovery procedures that never terminate the action in entry 6 by the condition P101 or ~P101 effectively allowing the local system to determine the number of times a recovery from any one error will be attempted.

2 The condition P101 in entries 12 and 7 includes the test when FQOS is zero but the FERPM is not null.

3 The condition ~P103 in entry 2 implies that this event is not relevant to the FERPM and that normal actions take over.

4 The predicates which model the activity state indicator are mutually exclusive, so that combinations of them cannot occur. These combinations are not included in the state table entries.

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A.5.16 Responding entity state table — FERPM — (class II and III errors)

STATE / EVENT	XFER	RESTART-PD	RESTART	CANCEL-PD	CLOSE-EX	DESELECT-EX	PASSIVE	XFER-EX	INIT-EX	SEL-EX	OPN-EX	XFER-IDLE
L-ERROR2	1	1	1				14					
I-CANIN	2	2	2									
I-CANCF				3								
I-CLOIN					4							16
I-DESIN						5						
I-RECIN							6					
L-ERROR3	7	7	7	7	7	7	7	7		7	7	7
I-PABIN	17	17	17	17	17	17	17	17		17	17	17
L-GIVEUP							12					
I-INIIN									8			
I-REAIN								13				
I-WRTIN								9				
I-SELIN										10		
I-OPNIN											11	

A.5.17 Responding entity state table — FERPM — detailed entries (class II and III errors)

1:
- ~P101: [55],L-ERRABT ⇒ PASSIVE
- P101 & P40: L-SUSPND,I-CANRQ[207] ⇒ CANCEL-PD
- P101 & ~P40: I-CANRQ[207] ⇒ CANCEL-PD

2:
- P103 & P40: L-SUSPND,I-CANRP ⇒ CLOSE-EX
- P103 & ~P40: I-CANRP ⇒ CLOSE-EX

3: ⇒ CLOSE-EX

4: I-CLORP ⇒ DESELECT-EX

5: I-DESRP ⇒ PASSIVE

6:
- P101 & P31 & ~P32 & ~P33 & P39: [209],I-RECRP[74] ⇒ XFER-EX
- P101 & ~P31 & P32 & ~P33 & P39: [209],I-RECRP[66] ⇒ XFER-EX
- P101 & ~P31 & ~P32 & P33 & P39: I-RECRP[201] ⇒ SEL-EX
- P101 & ~P39: I-RECRP[75][201] ⇒ *same state*
- ~P101: I-RECRP[201] ⇒ *same state*

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7:	P101 & ~P40:	L-PABORT[207]	⇒ INIT-EX
	P101 & P40:	L-PABORT[207],L-SUSPND	⇒ INIT-EX
	~P101:	[55],L-ERRABT	⇒ PASSIVE
8:	P102:	I-INIRP	⇒ PASSIVE
	~P102:	I-INIRP[201]	⇒ PASSIVE
9:	P30:		⇒ RESTART
	~P30:	[55],L-ERRABT	⇒ PASSIVE
10:		I-SELRP	⇒ OPN-EX
11:		I-OPNRP	⇒ XFER-IDLE
12:		[55],L-ERRABT	⇒ *same state*
13:	P29:	L-RESEND[203],L-RESUME	⇒ RESTART
	~P29:	[55],L-ERRABT	⇒ PASSIVE
14:	P101:	[210]	⇒ *same state*
	~P101:	[55],L-ERRABT	⇒ *same state*
16:	P103:	I-CLORP	⇒ DESELECT-EX
17:	P103 & P101 & P40:	L-SUSPND	⇒ INIT-EX
	P103 & P101 & ~P40:		⇒ INIT-EX
	~P103 | ~P101:	[55],F-PABIN	⇒ PASSIVE

NOTES

1 The condition p101 in entries 7 and 17 includes the test when FQOS is zero but the FERPM is not null.

2 The condition ~P103 in entries 2 and 16 implies that this event is not relevant to the FERPM and that normal actions take over.

3 The predicates which model the activity state indicator are mutually exclusive, so that combinations of them cannot occur. These combinations are not included in the state table entries.

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Annex B
Reference to FTAM PDU definitions

(This annex forms part of the standard.)

This annex defines the references to the FTAM PCI abstract syntax necessary to invoke the correct FTAM PDU sequences, in order to cause a file to be transferred. When a distributed application requires the transfer of a request that file transfer be performed, the standards concerned reference the ISO8571-RFCI module defined below.

Four constructs are defined, giving for the "Read" and "Write cases, the information necessary to invoke the transfer, and the information available on completion to indicate the success or otherwise of the transfer.

```
ISO8571-RFCI DEFINITIONS ::=

BEGIN

RefFTAMControlInformation ::= CHOICE{
                    [0]IMPLICIT ReadTransferSpecification,
                    [1]IMPLICIT WriteTransferSpecification,
                    [2]IMPLICIT ReadTransferOutcome,
                    [3]IMPLICIT WriteTransferOutcome}


ReadTransferSpecification ::= SEQUENCE{
                    ISO8571-FTAM.F-SELECT-request,
                    ISO8571-FTAM.F-OPEN-request,
                    ISO8571-FTAM.F-READ-request}


WriteTransferSpecification ::= SEQUENCE{
                    ISO8571-FTAM.F-CREATE-request,
                    ISO8571-FTAM.F-OPEN-request,
                    ISO8571-FTAM.F-WRITE-request}

ReadTransferOutcome ::= SEQUENCE{
                    ISO8571-FTAM.F-SELECT-response,
                    ISO8571-FTAM.F-OPEN-response,
                    CHOICE{ ISO8571-FTAM.F-TRANSFER-END-response,
                                    ISO-FTAM.F-CANCEL-response}}

WriteTransferOutcome ::= ReadTransferOutcome


END
```


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Annex C
ASN.1 cross reference

(This annex does not form part of the standard.)

C.1 Cross reference of types defined/referenced in module ISO8571-FTAM

```
Abstract-Syntax-Name . . . . . defined in line: 410
                             referenced from line: 86
                                              line: 262
                                              line: 263
                                              line: 310
                                              line: 311
                                              line: 657

Access-Context . . . . . defined in line: 412
                             referenced from line: 366

Access-Control-Attribute . . . . . defined in line: 600
                             referenced from line: 504 ([15])
                                              line: 576 ([15])

Access-Control-Change-Attribute . . . defined in line: 607
                             referenced from line: 466 ([15])

Access-Control-Element . . . . . defined in line: 620
                             referenced from line: 604
                                              line: 612
                                              line: 615

Access-Passwords . . . . . defined in line: 426
                             referenced from line: 139
                                              line: 175
                                              line: 306
                                              line: 624 ([3] IMPLICIT)

Access-Request . . . . . defined in line: 436
                             referenced from line: 138
                                              line: 174
                                              line: 305
                                              line: 621 ([0] IMPLICIT)

Account . . . . . defined in line: 446
                             referenced from line: 27
                                              line: 142
                                              line: 180
                                              line: 647

Account-Attribute . . . . . defined in line: 643
                             referenced from line: 462 ([3])
                                              line: 500 ([3])
                                              line: 559 ([3])

Action-Result . . . . . defined in line: 448
                             referenced from line: 33
                                              line: 96
                                              line: 100
                                              line: 146
                                              line: 156
                                              line: 184
                                              line: 193
                                              line: 224
                                              line: 237
                                              line: 267
                                              line: 281
```


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line: 286
line: 315
line: 330
line: 338
line: 378
line: 385
line: 390
line: 395

Activity-Identifier . . . . . defined in line: 453
referenced from line: 256
line: 303

AnyType . . . . . referenced from line: 652 ([0])

Application-Entity-Title . . . . . defined in line: 455
referenced from line: 625 ([4] IMPLICIT)

Attribute-Groups . . . . . defined in line: 73
referenced from line: 22
line: 40

BitStringType . . . . . referenced from line: 47 ([0] IMPLICIT)
line: 54 ([3] IMPLICIT)
line: 61 ([4] IMPLICIT)
line: 73 ([5] IMPLICIT)
line: 199 ([0] IMPLICIT)
line: 244 ([0] IMPLICIT)
line: 436 ([APPLICATION 3] IMPLICIT)
line: 637
line: 687

BooleanType . . . . . referenced from line: 18 ([2] IMPLICIT)
line: 36 ([2] IMPLICIT)
line: 255 ([2] IMPLICIT)
line: 276 ([6] IMPLICIT)
line: 321 ([6] IMPLICIT)

Bulk-Data-PDU . . . . . defined in line: 346
referenced from line: 5

Change-Attributes . . . . . defined in line: 458
referenced from line: 234
line: 238

Charging . . . . . defined in line: 471
referenced from line: 93
line: 157
line: 195

ChoiceType . . . . . referenced from line: 5
line: 7
line: 85
line: 108
line: 250 ([1])
line: 346
line: 537 ([APPLICATION 15])
line: 551 ([APPLICATION 17])
line: 600
line: 607
line: 643
line: 649
line: 659
line: 665
line: 675
line: 681
line: 702
line: 710

Concurrency-Access . . . . . defined in line: 627
referenced from line: 622 ([1] IMPLICIT)

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```
Concurrency-Control . . . . . defined in line: 476
                          referenced from line: 140
                                           line: 178
                                           line: 253
                                           line: 269

Concurrency-Key . . . . . defined in line: 637
                          referenced from line: 628 ([0] IMPLICIT)
                                           line: 629 ([1] IMPLICIT)
                                           line: 630 ([2] IMPLICIT)
                                           line: 631 ([3] IMPLICIT)
                                           line: 632 ([4] IMPLICIT)
                                           line: 633 ([5] IMPLICIT)
                                           line: 634 ([6] IMPLICIT)
                                           line: 635 ([7] IMPLICIT)

Constraint-Set-Name . . . . . defined in line: 492
                          referenced from line: 656

Contents-Type-Attribute . . . . . defined in line: 649
                          referenced from line: 252 ([1])
                                           line: 268 ([1])
                                           line: 316 ([1])
                                           line: 498 ([2])
                                           line: 557 ([2])

Contents-Type-List . . . . . defined in line: 84
                          referenced from line: 25
                                           line: 43

Create-Attributes . . . . . defined in line: 494
                          referenced from line: 170
                                           line: 185

Date-and-Time-Attribute . . . . . defined in line: 659
                          referenced from line: 560 ([4])
                                           line: 562 ([5])
                                           line: 564 ([6])
                                           line: 566 ([7])

Diagnostic . . . . . defined in line: 509
                          referenced from line: 44
                                           line: 97
                                           line: 101
                                           line: 149
                                           line: 161
                                           line: 187
                                           line: 196
                                           line: 231
                                           line: 241
                                           line: 271
                                           line: 283
                                           line: 288
                                           line: 320
                                           line: 332
                                           line: 339
                                           line: 379
                                           line: 387
                                           line: 392
                                           line: 397

Document-Type-Name . . . . . defined in line: 534
                          referenced from line: 85
                                           line: 651

EMPTY SequenceType . . . . . referenced from line: 293
                                           line: 296
                                           line: 299
```


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```
Entity-Reference . . . . . defined in line: 521
                          referenced from line: 516 ([2] IMPLICIT)
                                                line: 517 ([3] IMPLICIT)

ExternalType . . . . . referenced from line: 545
                                                line: 585 ([APPLICATION 20] IMPLICIT)
                                                line: 708 ([2] IMPLICIT)

F-BEGIN-GROUP-request . . . . . defined in line: 290
                          referenced from line: 125 ([22] IMPLICIT)

F-BEGIN-GROUP-response . . . . . defined in line: 293
                          referenced from line: 126 ([23] IMPLICIT)

F-CANCEL-request . . . . . defined in line: 389
                          referenced from line: 358 ([37] IMPLICIT)

F-CANCEL-response . . . . . defined in line: 394
                          referenced from line: 359 ([38] IMPLICIT)

F-CHANGE-ATTRIB-request . . . . . defined in line: 233
                          referenced from line: 119 ([16] IMPLICIT)

F-CHANGE-ATTRIB-response . . . . . defined in line: 236
                          referenced from line: 120 ([17] IMPLICIT)

F-CLOSE-request . . . . . defined in line: 280
                          referenced from line: 123 ([20] IMPLICIT)

F-CLOSE-response . . . . . defined in line: 285
                          referenced from line: 124 ([21] IMPLICIT)

F-CREATE-request . . . . . defined in line: 163
                          referenced from line: 113 ([10] IMPLICIT)

F-CREATE-response . . . . . defined in line: 182
                          referenced from line: 114 ([11] IMPLICIT)

F-DATA-END-request . . . . . defined in line: 377
                          referenced from line: 355 ([34] IMPLICIT)

F-DELETE-request . . . . . defined in line: 189
                          referenced from line: 115 ([12] IMPLICIT)

F-DELETE-response . . . . . defined in line: 192
                          referenced from line: 116 ([13] IMPLICIT)

F-DESELECT-request . . . . . defined in line: 151
                          referenced from line: 111 ([8] IMPLICIT)

F-DESELECT-response . . . . . defined in line: 155
                          referenced from line: 112 ([9] IMPLICIT)

F-END-GROUP-request . . . . . defined in line: 296
                          referenced from line: 127 ([24] IMPLICIT)

F-END-GROUP-response . . . . . defined in line: 299
                          referenced from line: 128 ([25] IMPLICIT)

F-ERASE-request . . . . . defined in line: 334
                          referenced from line: 133 ([30] IMPLICIT)

F-ERASE-response . . . . . defined in line: 337
                          referenced from line: 134 ([31] IMPLICIT)

F-INITIALIZE-request . . . . . defined in line: 15
                          referenced from line: 8 ([0] IMPLICIT)

F-INITIALIZE-response . . . . . defined in line: 31
                          referenced from line: 9 ([1] IMPLICIT)

F-LOCATE-request . . . . . defined in line: 325
                          referenced from line: 131 ([28] IMPLICIT)
```


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```
F-LOCATE-response . . . . . defined in line: 329
                            referenced from line: 132 ([29] IMPLICIT)

F-OPEN-request . . . . . defined in line: 243
                            referenced from line: 121 ([18] IMPLICIT)

F-OPEN-response . . . . . defined in line: 265
                            referenced from line: 122 ([19] IMPLICIT)

F-P-ABORT-request . . . . . defined in line: 99
                            referenced from line: 13 ([5] IMPLICIT)

F-READ-ATTRIB-request . . . . . defined in line: 198
                            referenced from line: 117 ([14] IMPLICIT)

F-READ-ATTRIB-response . . . . . defined in line: 223
                            referenced from line: 118 ([15] IMPLICIT)

F-READ-request . . . . . defined in line: 364
                            referenced from line: 347 ([32] IMPLICIT)

F-RECOVER-request . . . . . defined in line: 302
                            referenced from line: 129 ([26] IMPLICIT)

F-RECOVER-response . . . . . defined in line: 313
                            referenced from line: 130 ([27] IMPLICIT)

F-RESTART-request . . . . . defined in line: 399
                            referenced from line: 362 ([39] IMPLICIT)

F-RESTART-response . . . . . defined in line: 402
                            referenced from line: 363 ([40] IMPLICIT)

F-SELECT-request . . . . . defined in line: 136
                            referenced from line: 109 ([6] IMPLICIT)

F-SELECT-response . . . . . defined in line: 144
                            referenced from line: 110 ([7] IMPLICIT)

F-TERMINATE-request . . . . . defined in line: 88
                            referenced from line: 10 ([2] IMPLICIT)

F-TERMINATE-response . . . . . defined in line: 91
                            referenced from line: 11 ([3] IMPLICIT)

F-TRANSFER-END-request . . . . . defined in line: 381
                            referenced from line: 356 ([35] IMPLICIT)

F-TRANSFER-END-response . . . . . defined in line: 384
                            referenced from line: 357 ([36] IMPLICIT)

F-U-ABORT-request . . . . . defined in line: 95
                            referenced from line: 12 ([4] IMPLICIT)

F-WRITE-request . . . . . defined in line: 369
                            referenced from line: 348 ([33] IMPLICIT)

FADU-Identity . . . . . defined in line: 536
                            referenced from line: 326
                                              line: 331
                                              line: 335
                                              line: 365
                                              line: 374

FADU-Lock . . . . . defined in line: 548
                            referenced from line: 327
                                              line: 367
                                              line: 375
```


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```
File-Availability-Attribute . . . . . defined in line: 665
                                referenced from line: 463 ([12])
                                                 line: 501 ([12])
                                                 line: 572 ([12])

File-PDU . . . . . defined in line: 108
                                referenced from line: 5

Filename-Attribute . . . . . defined in line: 673
                                referenced from line: 460 ([0] IMPLICIT)
                                                 line: 496 ([0] IMPLICIT)
                                                 line: 555 ([0] IMPLICIT)
                                                 line: 583 ([0] IMPLICIT)

Filesize-Attribute . . . . . defined in line: 675
                                referenced from line: 464 ([14])
                                                 line: 502 ([14])
                                                 line: 573 ([13])
                                                 line: 574 ([14])

FTAM-Quality-Of-Service . . . . . defined in line: 78
                                referenced from line: 24
                                                 line: 42

FTAM-Regime-PDU . . . . . defined in line: 7
                                referenced from line: 5

Functional-Units . . . . . defined in line: 61
                                referenced from line: 21
                                                 line: 39

GeneralisedTimeType . . . . . referenced from line: 663 ([1] IMPLICIT)

GraphicStringType . . . . . referenced from line: 49 ([1] IMPLICIT)
                                                 line: 446 ([APPLICATION 4] IMPLICIT)
                                                 line: 472 ([0] IMPLICIT)
                                                 line: 473 ([1] IMPLICIT)
                                                 line: 519 ([5] IMPLICIT)
                                                 line: 551
                                                 line: 593 ([APPLICATION 22] IMPLICIT)
                                                 line: 673
                                                 line: 685 ([1] IMPLICIT)

Implementation-Information . . . . . defined in line: 49
                                referenced from line: 17
                                                 line: 35

IntegerType . . . . . referenced from line: 29 ([8] IMPLICIT)
                                                 line: 45 ([8] IMPLICIT)
                                                 line: 78 ([6] IMPLICIT)
                                                 line: 164 ([0] IMPLICIT)
                                                 line: 258 ([3] IMPLICIT)
                                                 line: 272 ([3] IMPLICIT)
                                                 line: 291 ([0] IMPLICIT)
                                                 line: 304 ([0] IMPLICIT)
                                                 line: 307 ([2] IMPLICIT)
                                                 line: 317 ([2] IMPLICIT)
                                                 line: 370 ([0] IMPLICIT)
                                                 line: 400 ([0] IMPLICIT)
                                                 line: 403 ([0] IMPLICIT)
                                                 line: 413 ([0] IMPLICIT)
                                                 line: 421 ([1] IMPLICIT)
                                                 line: 448 ([APPLICATION 5] IMPLICIT)
                                                 line: 453 ([APPLICATION 6] IMPLICIT)
                                                 line: 474 ([2] IMPLICIT)
                                                 line: 486
                                                 line: 510 ([0] IMPLICIT)
                                                 line: 514 ([1] IMPLICIT)
                                                 line: 518 ([4] IMPLICIT)
                                                 line: 521
                                                 line: 537 ([0] IMPLICIT)
```


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```
                                        line: 538 ([1] IMPLICIT)
                                        line: 539 ([2] IMPLICIT)
                                        line: 542 ([5] IMPLICIT)
                                        line: 548 ([APPLICATION 16] IMPLICIT)
                                        line: 589 ([APPLICATION 21] IMPLICIT)
                                        line: 669 ([1] IMPLICIT)
                                        line: 679 ([1] IMPLICIT)

Legal-Qualification-Attribute . . . . defined in line: 681
                              referenced from line: 467 ([16])
                                        line: 505 ([16])
                                        line: 577 ([16])

Lock . . . . . defined in line: 486
                              referenced from line: 477 ([0] IMPLICIT)
                                        line: 478 ([1] IMPLICIT)
                                        line: 479 ([2] IMPLICIT)
                                        line: 480 ([3] IMPLICIT)
                                        line: 481 ([4] IMPLICIT)
                                        line: 482 ([5] IMPLICIT)
                                        line: 483 ([6] IMPLICIT)
                                        line: 484 ([7] IMPLICIT)

Node-Name . . . . . defined in line: 545
                              referenced from line: 540 ([3] IMPLICIT)
                                        line: 541

NullType . . . . . referenced from line: 251 ([0] IMPLICIT)
                                        line: 601 ([0] IMPLICIT)
                                        line: 608 ([0] IMPLICIT)
                                        line: 644 ([0] IMPLICIT)
                                        line: 660 ([0] IMPLICIT)
                                        line: 666 ([0] IMPLICIT)
                                        line: 676 ([0] IMPLICIT)
                                        line: 682 ([0] IMPLICIT)
                                        line: 703 ([0] IMPLICIT)
                                        line: 706 ([1] IMPLICIT)
                                        line: 711 ([0] IMPLICIT)

ObjectIdentifierType . . . . . referenced from line: 410 ([APPLICATION 0] IMPLICIT)
                                        line: 492 ([APPLICATION 11] IMPLICIT)
                                        line: 534 ([APPLICATION 14] IMPLICIT)

OctetStringType . . . . . referenced from line: 551

Password . . . . . defined in line: 551
                              referenced from line: 28
                                        line: 171
                                        line: 427 ([0] IMPLICIT)
                                        line: 428 ([1] IMPLICIT)
                                        line: 429 ([2] IMPLICIT)
                                        line: 430 ([3] IMPLICIT)
                                        line: 431 ([4] IMPLICIT)
                                        line: 432 ([5] IMPLICIT)
                                        line: 433 ([6] IMPLICIT)
                                        line: 434 ([7] IMPLICIT)

PDU . . . . . defined in line: 5
                                   never referenced

Permitted-Actions-Attribute . . . . . defined in line: 687
                              referenced from line: 497 ([1] IMPLICIT)
                                        line: 556 ([1] IMPLICIT)

Private-Use-Attribute . . . . . defined in line: 702
                              referenced from line: 469 ([17])
                                        line: 507 ([17])
                                        line: 579 ([17])
```


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```
Protocol-Version . . . . . defined in line: 47
                          referenced from line: 16
                                           line: 34

Read-Attributes . . . . . defined in line: 553
                          referenced from line: 225

Select-Attributes . . . . . defined in line: 581
                          referenced from line: 137
                                           line: 147

SequenceOfType . . . . . referenced from line: 88 ([7] IMPLICIT)
                                           line: 476 ([APPLICATION 9] IMPLICIT)
                                           line: 521 ([APPLICATION 13] IMPLICIT)
                                           line: 541 ([4] IMPLICIT)
                                           line: 673

SequenceType . . . . . referenced from line: 15
                                           line: 31
                                           line: 88
                                           line: 91
                                           line: 95
                                           line: 99
                                           line: 136
                                           line: 144
                                           line: 151
                                           line: 155
                                           line: 163
                                           line: 182
                                           line: 189
                                           line: 192
                                           line: 198
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                                           line: 369
                                           line: 377
                                           line: 381
                                           line: 384
                                           line: 389
                                           line: 394
                                           line: 399
                                           line: 402
                                           line: 412 ([APPLICATION 1] IMPLICIT)
                                           line: 426 ([APPLICATION 2] IMPLICIT)
                                           line: 458 ([APPLICATION 8] IMPLICIT)
                                           line: 471
                                           line: 477 ([APPLICATION 10] IMPLICIT)
                                           line: 494 ([APPLICATION 12] IMPLICIT)
                                           line: 509
                                           line: 553 ([APPLICATION 18] IMPLICIT)
                                           line: 581 ([APPLICATION 19] IMPLICIT)
                                           line: 611 ([1] IMPLICIT)
                                           line: 620
```


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```
                                        line: 627
                                        line: 650 ([0] IMPLICIT)
                                        line: 655 ([1] IMPLICIT)

Service-Class . . . . . defined in line: 54
                        referenced from line: 19
                                        line: 37

SetOfType . . . . . referenced from line: 262 ([4] IMPLICIT)
                                        line: 263 ([5] IMPLICIT)
                                        line: 310 ([3] IMPLICIT)
                                        line: 311 ([4] IMPLICIT)
                                        line: 604 ([1] IMPLICIT)
                                        line: 612 ([0] IMPLICIT)
                                        line: 615 ([1] IMPLICIT)

Shared-ASE-Information . . . . . defined in line: 585
                        referenced from line: 23
                                        line: 41
                                        line: 89
                                        line: 92
                                        line: 141
                                        line: 148
                                        line: 152
                                        line: 160
                                        line: 179
                                        line: 186
                                        line: 190
                                        line: 194
                                        line: 254
                                        line: 270
                                        line: 282
                                        line: 287
                                        line: 382
                                        line: 386
                                        line: 391
                                        line: 396

State-Result . . . . . defined in line: 589
                        referenced from line: 32
                                        line: 145
                                        line: 183
                                        line: 266
                                        line: 314

User-Identity . . . . . defined in line: 593
                        referenced from line: 26
                                        line: 623 ([2] IMPLICIT)
                                        line: 714

User-Identity-Attribute . . . . . defined in line: 710
                        referenced from line: 567 ([8])
                                        line: 568 ([9])
                                        line: 569 ([10])
                                        line: 571 ([11])
```

C.2 References to types defined in module ACSE-1

```
AE-title . . . . . referenced from line: 455 ([APPLICATION 7])
```


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ISO 8571-4 : 1988 (E)

UDC 681.3 : 621.39

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