INTERNATIONAL STANDARD

ISO/IEC 15506

Third edition
2003-04-01

Information technology — Telecommunications and information exchange between systems — Private Integrated Services Network — Inter-exchange signalling protocol — Message Waiting Indication supplementary service

Technologies de l'information — Télécommunications et échange d'information entre systèmes — Réseau privé à intégration de services — Protocole de signalisation d'interéchange — Service supplémentaire d'indication d'attente de message

Reference number
ISO/IEC 15506:2003(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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the joint technical committee is to prepare International Standards. 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.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

ISO/IEC 15506 was prepared by ECMA (as ACMA-242) and was adopted, under a special "fast-track procedure", by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, in parallel with its approval by national bodies of ISO and IEC.

This third edition cancels and replaces the second edition (ISO/IEC 15506:2000), which has been technically revised.

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Introduction

This International Standard is one of a series of Standards defining services and signalling protocols applicable to Private Integrated Services Networks (PISNs). The series uses ISDN concepts as developed by ITU-T and conforms to the framework of International Standards for Open Systems Interconnection as defined by ISO/IEC.

This International Standard specifies the signalling protocol for use at the Q reference point in support of the Message Waiting Indication supplementary service. The protocol defined in this International Standard forms part of the PSS1 protocol (informally known as QSIG).

This International Standard is based upon the practical experience of ECMA member companies and the results of their active and continuous participation in the work of ISO/IEC JTC 1, ITU-T, ETSI and other international and national standardization bodies. It represents a pragmatic and widely based consensus.

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Information technology — Telecommunications and information exchange between systems — Private Integrated Services Network — Inter-exchange signalling protocol — Message Waiting Indication supplementary service

1 Scope

This International Standard specifies the signalling protocol for the support of the Message Waiting Indication supplementary service (SS-MWI) at the Q reference point between Private Integrated services Network eXchanges (PINXs) connected together within a Private Integrated Services Network (PISN).

The supplementary service MWI enables a Served User to be sent a Message Waiting Indication and also enables this Message Waiting Indication to be cancelled. The Served User may also be permitted to interrogate the Message Centre for any Message Waiting Indication.

The Q reference point is defined in ISO/IEC 11579-1.

Service specifications are produced in three stages and according to the method specified in ETS 300 387. This International Standard contains the stage 3 specification for the Q reference point and satisfies the requirements identified by the stage 1 and stage 2 specifications in ISO/IEC 15505.

The signalling protocol for SS-MWI uses certain aspects of the generic procedures for the control of supplementary services specified in ISO/IEC 11582.

This International Standard also specifies additional signalling protocol requirements for the support of interactions at the Q reference point between SS-MWI and other supplementary services and ANFs.

NOTE 1 - Additional interactions that have no impact on the signalling protocol at the Q reference point can be found in the relevant stage 1 specifications.

This International Standard is applicable to PINXs which can interconnect to form a PISN.

2 Conformance

In order to conform to this International Standard, a PINX shall satisfy the requirements identified in the Protocol Implementation Conformance Statement (PICS) proforma in annex A.

Conformance to this International Standard includes conforming to those clauses that specify protocol interactions between SS-MWI and other supplementary services and ANFs for which signalling protocols at the Q reference point are supported in accordance with the stage 3 standards concerned.

3 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 8601:2000, *Data elements and interchange formats - Information interchange - Representation of dates and times*

ISO/IEC 11579-1:1994, *Information technology - Telecommunications and information exchange between systems - Private integrated services network - Part 1: Reference configuration for PISN Exchanges (PINX)*

ISO/IEC 11582:2002, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Generic functional protocol for the support of supplementary services - Inter-exchange signalling procedures and protocol*

ISO/IEC 13873:2003, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Inter-exchange signalling protocol - Call Diversion supplementary services*

ISO/IEC 15505:2003, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Specification, functional model and information flows - Message Waiting Indication supplementary service*

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ETS 300 387:1994, *Private Telecommunication Network (PTN); Method for the specification of basic and supplementary services*

ITU-T Rec. I.112:1993, *Vocabulary of terms for ISDNs*

ITU-T Rec. I.210:1993, *Principles of telecommunication services supported by an ISDN and the means to describe them*

ITU-T Rec. Q.950:2000, *Supplementary services protocols, structure and general principles*

ITU-T Rec. Z.100:1999, *Specification and description language (SDL)*

4 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

4.1 External definitions

This International Standard uses the following terms defined in other documents:

- Application Protocol Data Unit (APDU) (ISO/IEC 11582)
- Call-Independent (ISO/IEC 11582)
- Gateway PINX (ISO/IEC 11582)
- Originating PINX (ISO/IEC 11582)
- Private Integrated Services Network (PISN) (ISO/IEC 11579-1)
- Private Integrated services Network eXchange (PINX) (ISO/IEC 11579-1)
- Signalling (ITU-T Rec. I.112)
- Supplementary Service (ITU-T Rec. I.210)
- Supplementary Service Control Entity (ISO/IEC 11582)
- Terminating PINX (ISO/IEC 11582)
- Transit PINX (ISO/IEC 11582)

4.2 Other definitions

4.2.1 Message Centre PINX

The PINX serving the Message Centre entity for activation, deactivation.

4.2.2 Served User

The user to whom the Message Waiting Indication is sent on initiative of the Message Centre.

4.2.3 Message Centre

The entity which activates or deactivates the Message Waiting Indication as a result of storage or retrieval of messages.

4.2.4 Message Waiting Indication

An indication to the Served User when messages are waiting for the Served User.

NOTE - The indication may be a lamp, special tone, display etc. This is outside the scope of this International Standard.

5 List of acronyms

ANF	Additional Network Feature
APDU	Application Protocol Data Unit
ASN.1	Abstract Syntax Notation no. 1
ISDN	Integrated Services Digital Network
MWI	Message Waiting Indication
NFE	Network Facility Extension

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PICS	Protocol Implementation Conformance Statement
PINX	Private Integrated services Network eXchange
PISN	Private Integrated Services Network
SDL	Specification and Description Language
SS	Supplementary Service

6 Signalling protocol for the support of SS-MWI

6.1 SS-MWI description

SS-MWI enables a Served User to be sent a Message Waiting Indication and also enables this Message Waiting Indication to be cancelled.

This service also includes an option to interrogate the Message Waiting Indication stored against the Served User.

6.2 SS-MWI operational requirements

6.2.1 Requirements on a Message Centre PINX

Generic procedures for the call-independent control (connection-oriented) of supplementary services, as specified in ISO/IEC 11582 for an Originating PINX and for a Terminating PINX, shall apply.

6.2.2 Requirements on a Served User PINX

Generic procedures for the call-independent control (connection-oriented) of supplementary services, as specified in ISO/IEC 11582 for a Terminating PINX and for an Originating PINX, shall apply.

6.2.3 Requirements on a Transit PINX

Generic procedures for the call-independent control (connection-oriented) of supplementary services, as specified in ISO/IEC 11582 for a Transit PINX, shall apply.

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6.3 SS-MWI coding requirements

6.3.1 Operations

The operations defined in Abstract Syntax Notation number 1 (ASN.1) in table 1 shall apply. The notation is in accordance with ITU-T Rec. X.680 and X.690. The ITU-T Rec. X.208 and X.209 superseded version is in annex E.

Table 1 - Operations in support of SS-MWI

```
MWI-Operations-asn1-97
        { iso (1) standard (0) pss1-message-waiting-indication (15506)  message-waiting-operations-asn1-97 (1)}


DEFINITIONS EXPLICIT TAGS ::=


BEGIN

IMPORTS             OPERATION, ERROR FROM Remote-Operations-Information-Objects
                            {joint-iso-itu-t (2) remote-operations (4) informationObjects (5)
                             version1 (0)}
                    EXTENSION, Extension{} FROM
                            Manufacturer-specific-service-extension-class-asn1-97
                            {iso (1) standard (0)
                            pss1-generic-procedures (11582) msi-class-asn1-97 (11)}

                    basicServiceNotProvided, notActivated, userNotSubscribed, invalidServedUserNr
                    FROM General-Error-List
                            {ccitt recommendation q 950 general-error-list (1) }


                     PartyNumber FROM Addressing-Data-Elements-asn1-97
                            {iso (1) standard (0)    pss1-generic-procedures (11582)
                             addressing-data-elements-asn1-97 (20) }

                     ;

MWI-Operations OPERATION ::= { mWIActivate | mWIDeactivate | mWIInterrogate }


mWIActivate                 OPERATION ::= {
                            ARGUMENT        MWIActivateArg
                            RESULT          DummyRes
                            ERRORS    {     userNotSubscribed |
                                            invalidServedUserNr |
                                            basicServiceNotProvided |
                                            unspecified }
                            CODE            local: 80}
```

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Table 1 - Operations in support of SS-MWI (continued)

```
mWIDeactivate           OPERATION ::= {
                        ARGUMENT        MWIDeactivateArg
                        RESULT          DummyRes
                        ERRORS    {     userNotSubscribed |
                                        invalidServedUserNr |
                                        basicServiceNotProvided |
                                        unspecified }
                        CODE            local: 81}


mWIInterrogate          OPERATION ::= {
                        ARGUMENT        MWIInterrogateArg
                        RESULT          MWIInterrogateRes
                        ERRORS    {     userNotSubscribed |
                                        invalidServedUserNr |
                                        notActivated |
                                        invalidMsgCentreId |
                                        unspecified }
                        CODE            local: 82}

MWIActivateArg      ::= SEQUENCE{
                            servedUserNr        PartyNumber,
                            basicService    BasicService,
                            msgCentreId         MsgCentreId OPTIONAL,
                            nbOfMessages        [3] IMPLICIT NbOfMessages OPTIONAL,
                            originatingNr       [4] PartyNumber OPTIONAL,
                            timestamp           TimeStamp OPTIONAL,
                            priority            [5] IMPLICIT INTEGER (0..9) OPTIONAL,
                             -- The value 0 means the highest priority and 9 the lowest
                            argumentExt         CHOICE {
                                extension           [6] IMPLICIT Extension{{MWIExtSet}},
                                multipleExtension   [7] IMPLICIT SEQUENCE OF
                                                        Extension{{MWIExtSet}}
                                                    } OPTIONAL
                                }

DummyRes            ::= CHOICE {
                            null                NULL,
                            extension           [1] IMPLICIT Extension{{MWIExtSet}},
                            multipleExtension   [2] IMPLICIT SEQUENCE OF
                                                    Extension{{MWIExtSet}}
                            }

MWIDeactivateArg    ::= SEQUENCE{
                            servedUserNr        PartyNumber,
                            basicService    BasicService,
                            msgCentreId         MsgCentreId OPTIONAL,
                            argumentExt         CHOICE {
                                extension           [3] IMPLICIT Extension{{MWIExtSet}},
                                multipleExtension   [4] IMPLICIT SEQUENCE OF
                                                        Extension{{MWIExtSet}}
                                                    } OPTIONAL
                                }
```

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Table 1 - Operations in support of SS-MWI (continued)

```
MWIInterrogateArg       ::=   SEQUENCE{
                                  servedUserNr       PartyNumber,
                                  basicService    BasicService,
                                  msgCentreId        MsgCentreId OPTIONAL,
                                  argumentExt        CHOICE {
                                        extension            [3] IMPLICIT Extension{{MWIExtSet}},
                                        multipleExtension  [4] IMPLICIT SEQUENCE OF
                                                                  Extension{{MWIExtSet}}
                                                      } OPTIONAL
                                        }

MWIInterrogateRes       ::=   SEQUENCE SIZE(1..10) OF MWIInterrogateResElt


MWIInterrogateResElt    ::=   SEQUENCE{
                                  basicServiceBasicService,
                                  msgCentreId    MsgCentreId OPTIONAL,
                                  nbOfMessages [3] IMPLICIT NbOfMessages OPTIONAL,
                                  originatingNr    [4] PartyNumber OPTIONAL,
                                  timestamp        TimeStamp OPTIONAL,
                                  priority         [5] IMPLICIT INTEGER (0..9) OPTIONAL,
                                   -- The value 0 means the highest priority and 9 the lowest
                                  argumentExt        CHOICE {
                                        extension            [6] IMPLICIT Extension{{MWIExtSet}},
                                        multipleExtension  [7] IMPLICIT SEQUENCE OF
                                                                        Extension{{MWIExtSet}}
                                                      } OPTIONAL
                                        }

BasicService            ::=   ENUMERATED {
-- All basic service values which were previously imported from Call Diversion
-- Operations have been retained to allow for backward compatibility with edition 2.
-- A new service value was added for group 2,3 fax and numerous MWI service
-- classes were added for multimedia.

-- MWI Services:
--                      For compatibility among vendors, speech is recommended for voice mail
--                      indications.
                              allServices                    (0),
                              speech                         (1),
                              unrestrictedDigitalInformation (2),
                              audio3100Hz                    (3),
                              telephony                      (32),
                              teletex                        (33),
                              telefaxGroup4Class1            (34),
                              videotextSyntaxBased           (35),
                              videotelephony                 (36),
                              telefaxGroup2-3                (37),
                              reservedNotUsed1               (38),
                              reservedNotUsed2               (39),
                              reservedNotUsed3               (40),
                              reservedNotUsed4               (41),
                              reservedNotUsed5               (42),
```


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Table 1 - Operations in support of SS-MWI (continued)

```
                    --
                    -- MWI Service Classes:
                              email                    (51),
                              video                    (52),
                              fileTransfer             (53),
                              shortMessageService      (54),
                              speechAndVideo           (55),
                              speechAndFax             (56),
                              speechAndEmail           (57),
                              videoAndFax              (58),
                              videoAndEmail            (59),
                              faxAndEmail              (60),
                              speechVideoAndFax        (61),
                              speechVideoAndEmail      (62),


                              speechFaxAndEmail          (63),
                              videoFaxAndEmail           (64),
                              speechVideoFaxAndEmail     (65),
                              multimediaUnknown          (66),
                              serviceUnknown             (67),
                    --
                    -- Reserved for future additions:

                              futureReserve1           (68),
                              futureReserve2           (69),
                              futureReserve3           (70),
                              futureReserve4           (71),
                              futureReserve5           (72),
                              futureReserve6           (73),
                              futureReserve7           (74),
                              futureReserve8           (75)
                                        }

MsgCentreId         ::=     CHOICE {
                              integer         [0] IMPLICIT  INTEGER (0..65535),
                              partyNumber     [1] PartyNumber,
                              -- The party number must be a complete number as required
                              -- for routing purposes.
                              numericString   [2] IMPLICIT  NumericString (SIZE (1..10))
                                 }

NbOfMessages        ::=     INTEGER (0..65535)

TimeStamp           ::=     GeneralizedTime (SIZE (12..19))
                    --  a VisibleString containing:
                    --      - the (local) date in 8 digits (YYYYMMDD),
                    --      - followed by (local) time of day in 4 or 6 digits (HHMM[SS]),
                    --      - optionally followed by the letter "Z" or
                    --        by a local time differential in 5 digits ("+"HHMM or "-"HHMM);
                    --      this date and time representation follows ISO 8601
                    --  Examples:  1) 19970621194530, meaning 21 June 1997, 19:45:30;
                    --             2) 19970621194530Z, meaning the same as 1);
                    --             3) 19970621194530-0500, meaning the same as 1),
                    --                5 hours retarded in relation to UTC time
```

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Table 1 - Operations in support of SS-MWI (concluded)

```
MWIExtSet EXTENSION ::= {...}

invalidMsgCentreId      ERROR     ::=   {     CODE              local:      1018}

unspecified             ERROR     ::=   {     PARAMETER   Extension{{MWIExtSet}}
                                            CODE              local:      1008}


END                     -- of MWI-Operations-asn1-97
```

6.3.2 Information elements

6.3.2.1 Facility information element

The operations defined in 6.3.1 shall be coded in the Facility information element in accordance with ISO/IEC 11582.

When conveying the invoke APDU of operations defined in 6.3.1, the destination Entity data element of the NFE shall contain the value endPINX.

When conveying the invoke APDU of operation mwiActivate, mwiDeactivate and mwiInterrogate, the interpretation APDU shall either be omitted or have the value rejectAnyUnrecognizedInvokePdu.

6.3.2.2 Other information elements

Any other information element (e.g. Calling party number) shall be coded in accordance with ISO/IEC 11582.

6.3.3 Messages

The Facility information element shall be conveyed in messages as specified in clause 10 of ISO/IEC 11582.

6.4 SS-MWI state definitions

6.4.1 States at the Message Centre PINX

The procedures for the Message Centre PINX are written in terms of the following conceptual states existing within the SS-MWI Supplementary Service Control entity in that PINX in association with an activation or deactivation request from the Message Centre entity.

6.4.1.1 State MWI-Mc-Idle

Activation, deactivation is not in progress. The Message Center PINX is ready for receipt of mwiInterrogate invoke APDU.

6.4.1.2 State MWI-Mc-Wait

A mwiActivate or mwiDeactivate invoke APDU has been sent. The Message Centre PINX is waiting for the response.

6.4.2 States at the Served User PINX

The procedures for the Served User PINX are written in terms of the following conceptual states existing within the SS-MWI Supplementary Service Control entity in that PINX in association with a particular call-independent signalling connection for the Served User.

6.4.2.1 State MWI-Ser-Idle

The Served User PINX is ready for receipt of mwiActivate or mwiDeactivate invoke APDU.

6.4.2.2 State MWI-Ser-Wait

A mwiInterrogate invoke APDU has been sent. The Served User PINX is waiting for the response.

6.5 SS-MWI signalling procedures

Examples of message sequences are shown in annex B.

6.5.1 Actions at the Message Centre PINX

The SDL representation of procedures at the Message Centre PINX is shown in clause C.1 of annex C.

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6.5.1.1 Normal procedures

6.5.1.1.1 Activation / deactivation

On receipt of an activation / deactivation request from the Message Centre entity, the Message Centre PINX shall send a mwiActivate/mwiDeactivate invoke APDU to the Served User PINX using the call reference of a call-independent signalling connection. The call-independent signalling connection shall be established (or used, if an appropriate connection is already available) in accordance with the procedures specified in 7.3 of ISO/IEC 11582. The Message Centre PINX shall start timer T1 and enter the MWI-Mc-Wait state. The mwiActivate/mwiDeactivate invoke APDU shall contain the PISN number of the Served User and the service for which the activation / deactivation applies.

The Message Centre PINX may optionally include in the mwiActivate invoke APDU any of the following:

- an identifier for the Message Centre, in the element msgCentreId;
- the number of messages for the Served User in the element nbOfMessages;
- the number of the user that has left a message, in the element originatingNr;
- the time when a message was left, in the element timestamp;
- the highest priority of the messages for the Served User in the element priority.

In state MWI-Mc-Wait, on receipt of a mwiActivate or mwiDeactivate return result APDU, the Message Centre PINX shall stop timer T1, and enter state MWI-Mc-Idle.

NOTE - The Message Centre PINX should indicate acceptance to the Message Centre entity.

The Message Centre PINX is responsible for clearing the call-independent signalling connection towards the Served User PINX. This may occur on receipt of a return result APDU. Alternatively, the signalling connection may be retained for other applications, if appropriate.

6.5.1.1.2 Interrogation

In state MWI-Mc-Idle, on receipt of a mwiInterrogate invoke APDU using the call reference of a call-independent signalling connection (as specified in 7.3 of ISO/IEC 11582) and if the interrogation is possible and the Message Centre identifier, if received, is correct, the Message Centre PINX shall get the status of SS-MWI, send back a mwiInterrogate return result APDU to the Served User PINX and stay in state MWI-Mc-Idle. The information that may be included in the return result APDU is analogous to the mwiActivate invoke APDU as described in 6.5.1.1.1.

6.5.1.2 Exceptional procedures

6.5.1.2.1 Activation / deactivation

In state MWI-Mc-Wait, on receipt of a mwiActivate/mwiDeactivate return error APDU from the Served User PINX, the Message Centre PINX shall stop timer T1 and enter state MWI-Mc-Idle.

If timer T1 expires, the Message Centre PINX shall enter state MWI-Mc-Idle.

NOTE - The Message Centre PINX should indicate rejection to the Message Centre entity.

The Message Centre PINX is responsible for clearing the call-independent signalling connection towards the Served User PINX. This may occur on receipt of a return error APDU or on expiry of timer T1. Alternatively, the signalling connection may be retained for other applications, if appropriate.

6.5.1.2.2 Interrogation

On receipt of a mwiInterrogate invoke APDU using the call reference of a call-independent signalling connection (as specified in 7.3 of ISO/IEC 11582) and if interrogation is not possible or an incorrect Message Centre identifier is included, the Message Centre PINX shall send back a mwiInterrogate return error APDU to the Served User PINX and stay in state MWI-Mc-Idle.

6.5.2 Actions at the Served User PINX

The SDL representation of procedures at the Served User PINX is shown in clause C.2 of annex C.

6.5.2.1 Normal procedures

6.5.2.1.1 Activation / deactivation

On receipt of a mwiActivate/mwiDeactivate invoke APDU using the call reference of a call-independent signalling connection (as specified in 7.3 of ISO/IEC 11582) and if activation / deactivation is possible, the Served User PINX shall activate /

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deactivate SS-MWI and send back a mwiActivate/mwiDeactivate return result APDU to the Message Centre PINX and remain in MWI-Ser-Idle state.

6.5.2.1.2 Interrogation

On receipt of an interrogation request from the Served User, the Served User PINX shall send a mwiInterrogate invoke APDU to the Message Centre PINX using the call reference of a call-independent signalling connection. The call-independent signalling connection shall be established (or used, if an appropriate connection is already available) in accordance with the procedures specified in 7.3 of ISO/IEC 11582. The Served User PINX shall start timer T2 and enter the MWI-Ser-Wait state. The mwiInterrogate invoke APDU shall contain the PISN number of the Served User, the service for which the interrogation applies, and optionally the Message Centre identifier.

In state MWI-Ser-Wait, on receipt of a mwiInterrogate return result APDU, the Served User PINX shall stop timer T2, and enter state MWI-Ser-Idle.

NOTE - The Served User PINX should indicate the result to the Served User.

The Served User PINX is responsible for clearing the call-independent signalling connection towards the Message Centre PINX. This may occur on receipt of a return result APDU. Alternatively, the signalling connection may be retained for other applications, if appropriate.

6.5.2.2 Exceptional procedures

6.5.2.2.1 Activation / deactivation

On receipt of a mwiActivate/mwiDeactivate invoke APDU and if the activation / deactivation request cannot be accepted, the Served User PINX shall send a mwiActivate/mwiDeactivate return error APDU with an appropriate error value and remain in state MWI-Ser-Idle.

6.5.2.2.2 Interrogation

In state MWI-Ser-Wait, on receipt of a mwiInterrogate return error APDU from the Message Centre PINX, the Served User PINX shall stop timer T2, and enter state MWI-Ser-Idle.

If timer T2 expires, the Served User shall enter MWI-Ser-Idle.

NOTE - The Served User PINX should indicate rejection to the Served User.

The Served User PINX is responsible for clearing the call-independent signalling connection towards the Message Centre PINX. This may occur on receipt of a return errorAPDU or on expiry of timer T2. Alternatively, the signalling connection may be retained for other applications, if appropriate.

6.5.3 Actions at a Transit PINX

Not applicable.

6.6 SS-MWI impact of interworking with public ISDNs

When interworking with a public ISDN that offers an equivalent supplementary service, a Gateway PINX shall perform the procedures specified below.

NOTE - The interrogation function is not supported in the corresponding public ISDN service.

6.6.1 Incoming Gateway PINX procedures

If a MWI activation or deactivation request is received from the public ISDN, the Incoming Gateway PINX shall translate the received APDU and convert it into a mwiActivate or mwiDeactivate invoke APDU and the procedures specified in 6.5.1 or 6.5.2 shall apply.

The Incoming Gateway PINX shall translate the mwiActivate or mwiDeactivate return result APDU received from the Served User PINX into corresponding information and send it to the public ISDN.

6.6.2 Outgoing Gateway PINX procedures

The Outgoing Gateway PINX shall translate the mwiActivate or the mwiDeactivate invoke APDU and send it to the public ISDN according to the procedures for the T reference point.

When receiving a response, the Outgoing Gateway PINX shall generate a mwiActivate or mwiDeactivate return result APDU (if the activation / deactivation was accepted) or a mwiActivate or mwiDeactivate return error APDU (if the activation / deactivation was rejected).

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6.7 SS-MWI impact of interworking with non-ISDNs

Not applicable.

6.8 Protocol interactions between SS-MWI and other supplementary services and ANFs

This clause specifies protocol interactions with other supplementary services and ANFs for which stage 3 standards had been published at the time of publication of this International Standard. For interactions with supplementary services and ANFs for which stage 3 standards are published subsequent to the publication of this International Standard, see those other stage 3 standards.

NOTE - Simultaneous conveyance of APDUs for SS-MWI and another supplementary service or ANF in the same message, each in accordance with the requirements of its respective stage 3 standard, does not, on its own, constitute a protocol interaction.

6.8.1 Interaction with Advice Of Charge (SS-AOC)

No interaction.

6.8.2 Interaction with Call Deflection (SS-CD)

No interaction.

6.8.3 Interaction with Call Forwarding Unconditional (SS-CFU)

No interaction.

NOTE - A MWI should not be redirected to the diverted-to user. The indication may be given to the Served User.

6.8.4 Interaction with Call Forwarding Busy (SS-CFB)

No interaction.

NOTE - A MWI should not be redirected to the diverted-to user. The indication may be given to the Served User.

6.8.5 Interaction with Call Forwarding No Reply (SS-CFNR)

No interaction.

NOTE - A MWI should not be redirected to the diverted-to user. The indication may be given to the Served User.

6.8.6 Interaction with Call Interception (ANF-CINT)

No interaction.

6.8.7 Interaction with Call Intrusion (SS-CI)

No interaction.

6.8.8 Interaction with Call Offer (SS-CO)

No interaction.

6.8.9 Interaction with Call Transfer (SS-CT)

No interaction.

6.8.10 Interaction with Calling Name Identification Presentation (SS-CNIP)

No interaction.

6.8.11 Interaction with Connected Name Identification Presentation (SS-CONP)

No interaction.

6.8.12 Interaction with Completion of Call to Busy Subscriber (SS-CCBS)

No interaction.

6.8.13 Interaction with Completion of Call on No Reply (SS-CCNR)

No interaction.

6.8.14 Interaction with Do Not Disturb (SS-DND)

No interaction.

6.8.15 Interaction with Do Not Disturb Override (SS-DNDO)

No interaction.

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6.8.16 Interaction with Path Replacement (ANF-PR)

No interaction.

6.8.17 Interaction with Recall (SS-RE)

No interaction.

6.8.18 Interaction with Route Restriction Class (ANF-RRC)

No interaction.

6.8.19 Interaction with Authentication of the PISN (SS-WTAN)

No interaction.

6.8.20 Interaction with Authentication of a WTM user (SS-WTAT)

No interaction.

6.8.21 Interaction with Wireless Terminal Location Registration (SS-WTLR)

No interaction.

NOTE - A MWI may be directed to the new location.

6.8.22 Interaction with Wireless Terminal Mobility Incoming Call (SS-WTMI)

No interaction.

6.8.23 Interaction with Wireless Terminal Mobility Outgoing Call (SS-WTMO)

No interaction

6.9 SS-MWI parameter values (timers)

6.9.1 Timer T1

Timer T1 shall operate at the Message Centre PINX during state MWI-Mc-Wait. Its purpose is to protect against an absence of response to the mwiActivate or mwiDeactivate invoke APDU.

Timer T1 shall have a value not less than 15 seconds.

6.9.2 Timer T2

Timer T2 shall operate at the Served User PINX during state MWI-Ser-Wait. Its purpose is to protect against an absence of response to the mwiInterrogate invoke APDU.

Timer T2 shall have a value not less than 15 seconds.

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Annex A
(normative)

Protocol Implementation Conformance Statement (PICS) proforma

A.1 Introduction

The supplier of a protocol implementation which is claimed to conform to this International Standard shall complete the following Protocol Implementation Conformance Statement (PICS) proforma.

A completed PICS proforma is the PICS for the implementation in question. The PICS is a statement of which capabilities and options of the protocol have been implemented. The PICS can have a number of uses, including use:

- by the protocol implementor, as a check-list to reduce the risk of failure to conform to the standard through oversight;
- by the supplier and acquirer, or potential acquirer, of the implementation, as a detailed indication of the capabilities of the implementation, stated relative to the common basis for understanding provided by the standard's PICS proforma;
- by the user or potential user of the implementation, as a basis for initially checking the possibility of interworking with another implementation - while interworking can never be guaranteed, failure to interwork can often be predicted from incompatible PICSs;
- by a protocol tester, as the basis for selecting appropriate tests against which to assess the claim for conformance of the implementation.

A.2 Instructions for completing the PICS proforma

A.2.1 General structure of the PICS proforma

The PICS proforma is a fixed-format questionnaire divided into sub-clauses each containing a group of individual items. Each item is identified by an item number, the name of the item (question to be answered), and the reference(s) to the clause(s) that specifies (specify) the item in the main body of this International Standard.

The “Status” column indicates whether an item is applicable and if so whether support is mandatory or optional. The following terms are used:

m	mandatory (the capability is required for conformance to the protocol);
o	optional (the capability is not required for conformance to the protocol, but if the capability is implemented it is required to conform to the protocol specifications);
o.<n>	optional, but support of at least one of the group of options labelled by the same numeral <n> is required;
x	prohibited;
<c.cond>	conditional requirement, depending on support for the item or items listed in condition <cond>;
<item>:m	simple conditional requirement, the capability being mandatory if item number <item> is supported, otherwise not applicable;
<item>:o	simple conditional requirement, the capability being optional if item number <item> is supported, otherwise not applicable.

Answers to the questionnaire items are to be provided either in the “Support” column, by simply marking an answer to indicate a restricted choice (Yes or No), or in the “Not Applicable” column (N/A).

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A.2.2 Additional information

Items of additional information allow a supplier to provide further information intended to assist the interpretation of the PICS. It is not intended or expected that a large quantity will be supplied, and a PICS can be considered complete without any such information. Examples might be an outline of the ways in which a (single) implementation can be set up to operate in a variety of environments and configurations.

References to items of additional information may be entered next to any answer in the questionnaire, and may be included in items of exception information.

A.2.3 Exception information

It may occasionally happen that a supplier will wish to answer an item with mandatory or prohibited status (after any conditions have been applied) in a way that conflicts with the indicated requirement. No pre-printed answer will be found in the Support column for this. Instead, the supplier is required to write into the Support column an x.<i> reference to an item of exception information, and to provide the appropriate rationale in the exception item itself.

An implementation for which an exception item is required in this way does not conform to this International Standard. A possible reason for the situation described above is that a defect in the Standard has been reported, a correction for which is expected to change the requirement not met by the implementation.

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A.3 PICS proforma for ISO/IEC 15506

A.3.1 Implementation identification

Supplier	
Contact point for queries about the PICS	
Implementation name(s) and version(s)	
Other information necessary for full identification, e.g., name(s) and version(s) for machines and/or operating systems; system name(s)	

Only the first three items are required for all implementations; other information may be completed as appropriate in meeting the requirement for full identification.

The terms name and version should be interpreted appropriately to correspond with a suppliers terminology (e.g. type, series, model).

A.3.2 Protocol summary

Protocol version	1.0
Addenda implemented (if applicable)	
Amendments implemented	
Have any exception items been required (see A.2.3)?	No [ ] Yes [ ] (The answer Yes means that the implementation does not conform to this International Standard)

Date of Statement	

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A.3.3 General

Item	Question/feature	References	Status	N/A	Support
A1	Behaviour as Message Centre PINX for activation and deactivation of SS-MWI		o.1		Yes [ ] No[ ]
A2	Behaviour as Message Centre PINX for interrogation of SS-MWI		A1:o	[ ]	Yes [ ] No[ ]
A3	Behaviour as Served User PINX for activation and deactivation of SS-MWI		o.1		Yes [ ] No[ ]
A4	Behaviour as Served User PINX for interrogation of SS-MWI		A3:o	[ ]	Yes [ ] No[ ]
A5	Behaviour as Incoming Gateway PINX for interworking with a public ISDN for activation and deactivation of SS-MWI		o		Yes [ ] No[ ]
A6	Behaviour as Outgoing Gateway PINX for interworking with a public ISDN for activation and deactivation of SS-MWI		o		Yes [ ] No[ ]

A.3.4 Procedures

Item	Question/feature	References	Status	N/A	Support
B1	Support of relevant ISO/IEC 11582 procedures at the Message Centre PINX	6.2.1	A1:m	[ ]	m:Yes [ ]
B2	Support of relevant ISO/IEC 11582 procedures at the Served User PINX	6.2.2	A3:m	[ ]	m:Yes [ ]
B3	Procedures at the Message Centre PINX for activation and deactivation	6.5.1	A1:m	[ ]	m:Yes [ ]
B4	Procedures at the Message Centre PINX for interrogation	6.5.1	A2:m	[ ]	m:Yes [ ]
B5	Procedures at the Served User PINX for activation and deactivation	6.5.2	A3:m	[ ]	m:Yes [ ]
B6	Procedures at the Served User PINX for interrogation	6.5.2	A4:m	[ ]	m:Yes [ ]
B7	Procedures at an Incoming Gateway PINX for interworking with a public ISDN for activation and deactivation	6.6.1	A5:m	[ ]	m:Yes [ ]
B8	Procedures at an Outgoing Gateway PINX for interworking with a public ISDN for activation and deactivation	6.6.2	A6:m	[ ]	m:Yes [ ]

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A.3.5 Coding

Item	Question/feature	References	Status	N/A	Support
C1	Sending of mwiActivate invoke APDU and receipt of mwiActivate return result and error APDU	6.3.1	A1:m	[ ]	m:Yes [ ]
C2	Receipt of mwiActivate invoke APDU and sending of mwiActivate return result and error APDU	6.3.1	A3:m	[ ]	m:Yes [ ]
C3	Sending of mwiDeactivate invoke APDU and receipt of mwiDeactivate return result and error APDU	6.3.1	A1:m	[ ]	m:Yes [ ]
C4	Receipt of mwiDeactivate invoke APDU and sending of mwiDeactivate return result and error APDU	6.3.1	A3:m	[ ]	m:Yes [ ]
C5	Sending of mwiInterrogate invoke APDU and receipt of mwiInterrogate return result and error APDU	6.3.1	A4:m	[ ]	m:Yes [ ]
C6	Receipt of mwiInterrogate invoke APDU and sending of mwiInterrogate return result and error APDU	6.3.1	A2:m	[ ]	m:Yes [ ]

A.3.6 Timers

Item	Question/feature	References	Status	N/A	Support
D1	Support of timer T1	6.9.1	A1:m	[ ]	m:Yes [ ]
D2	Support of timer T2	6.9.2	A4:m	[ ]	m:Yes [ ]

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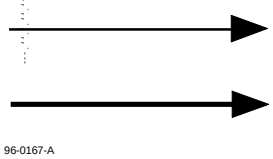
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Annex B
(informative)

Examples of Message Sequences

This annex describes some typical message flows for SS-MWI. The following conventions are used in the figures of this annex.

1. The following notation is used:



2. The figures show messages exchanged via Protocol Control between PINXs involved in SS-MWI. Only messages relevant to SS-MWI are shown.
3. Only the relevant information content (e.g. remote operation APDUs, notifications, information elements) is listed below each message name. The Facility and Notification indicator information elements containing remote operation APDUs and notifications are not explicitly shown. Information with no impact on SS-MWI is not shown.

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B.1 Example message sequence for activation of SS-MWI

Figure B.1 shows an example of activation of SS-MWI where the connection is not cleared by the Message Centre PINX after the first activation of MWI.

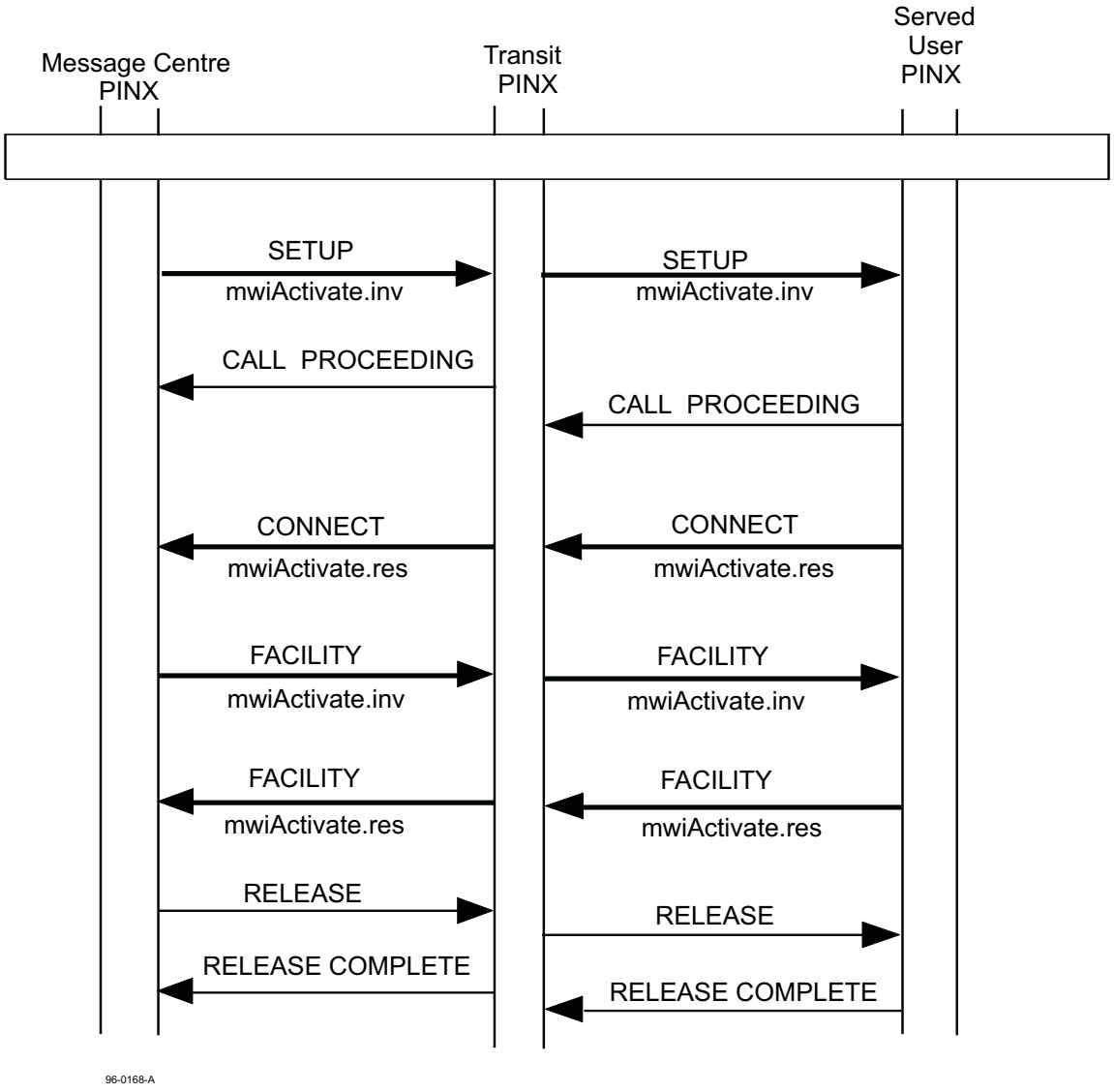


Figure B.1 - Example of activation of SS-MWI

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B.2 Example message sequence for deactivation of SS-MWI

Figure B.2 shows an example of deactivation of SS-MWI.

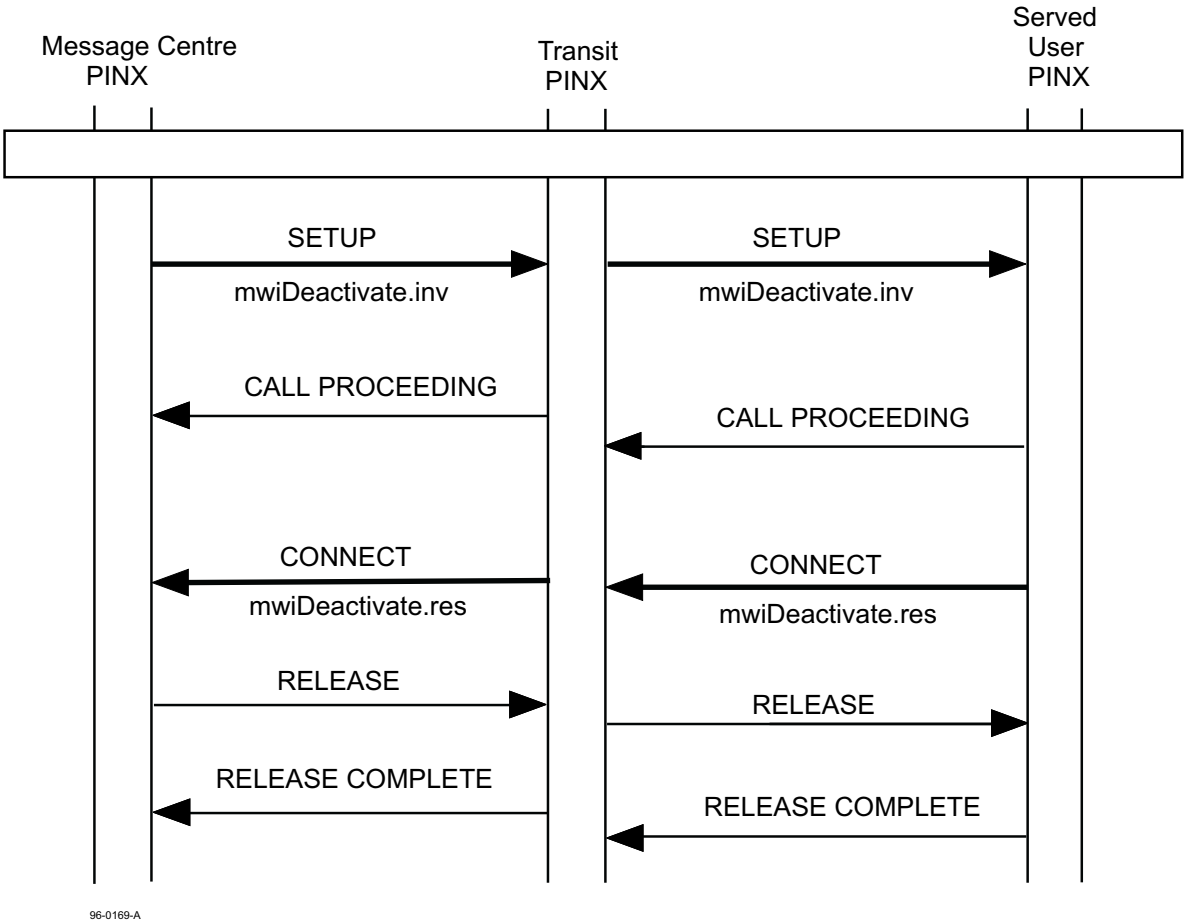


Figure B.2 - Example of deactivation of SS-MWI

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B.3 Example message sequence for interrogation of SS-MWI

Figure B.3 shows an example of interrogation of SS-MWI.

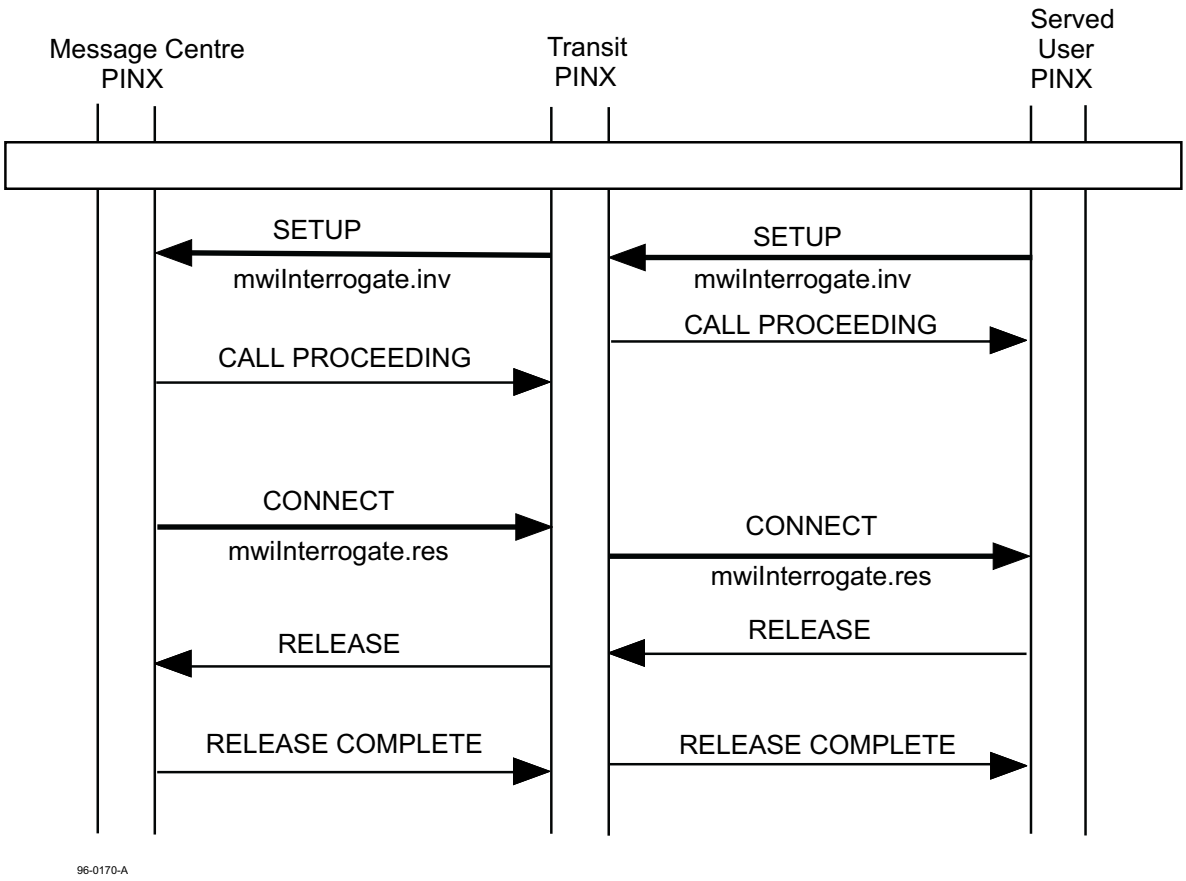


Figure B.3 - Example of interrogation of SS-MWI

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Annex C
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Specification and Description Language (SDL)
Representation of Procedures

The diagrams in this annex use the Specification and Description Language defined in ITU-T Rec. Z.100 (1999).

Each diagram represents the behaviour of an SS-MWI Supplementary Service Control entity at a particular type of PINX. In accordance with the protocol model described in ISO/IEC 11582, the Supplementary Service Control entity uses, via the Coordination Function, the services of Generic Functional Procedures Control.

Where an output symbol represents a primitive to the Coordination Function, and that primitive results in a message being sent, the output symbol bears the name of the message and any remote operations APDU(s) or notification(s) contained in that message.

Where an input symbol represents a primitive from the Coordination Function, and that primitive is the result of a message being received, the input symbol bears the name of the message and any remote operations APDU(s) or notification(s) contained in that message. The following abbreviations are used:

inv. invoke APDU

res. return result APDU

err. return error APDU

rej. reject APDU

C.1 SDL representation of SS-MWI at the Message Centre PINX

Figures C.1, C.2 and C.3 show the behaviour of an SS-MWI Supplementary Service Control entity within the Message Centre PINX.

Input signals from the left and output signals to the left represent primitives from and to the Message Centre.

Input signals from the right and output signals to the right represent primitives from and to the Coordination Function in respect of messages received and sent. Also protocol timer expiry is indicated by an input signal from the right.

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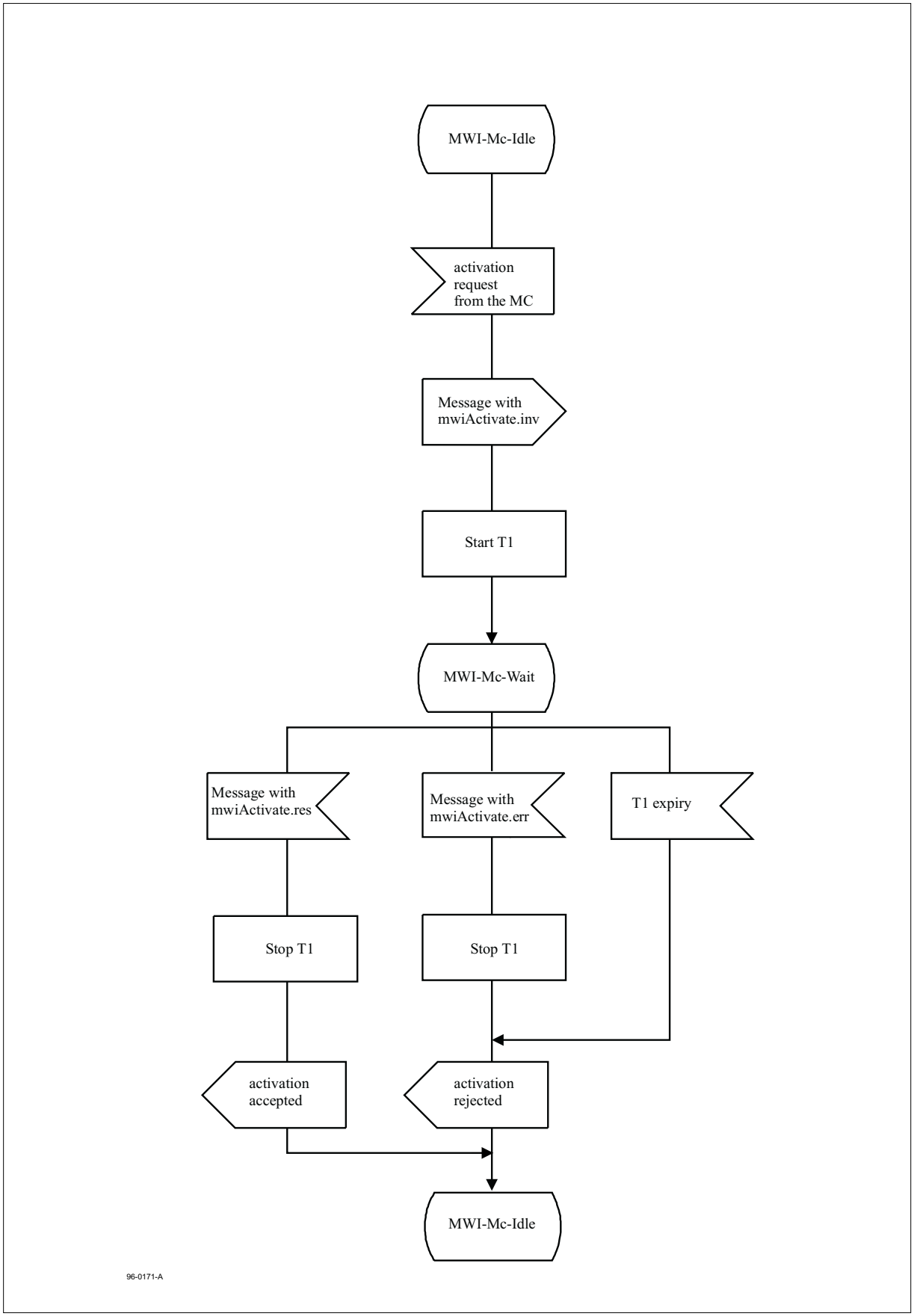


Figure C.1 - SDL representation of SS-MWI activation at the Message Centre PINX

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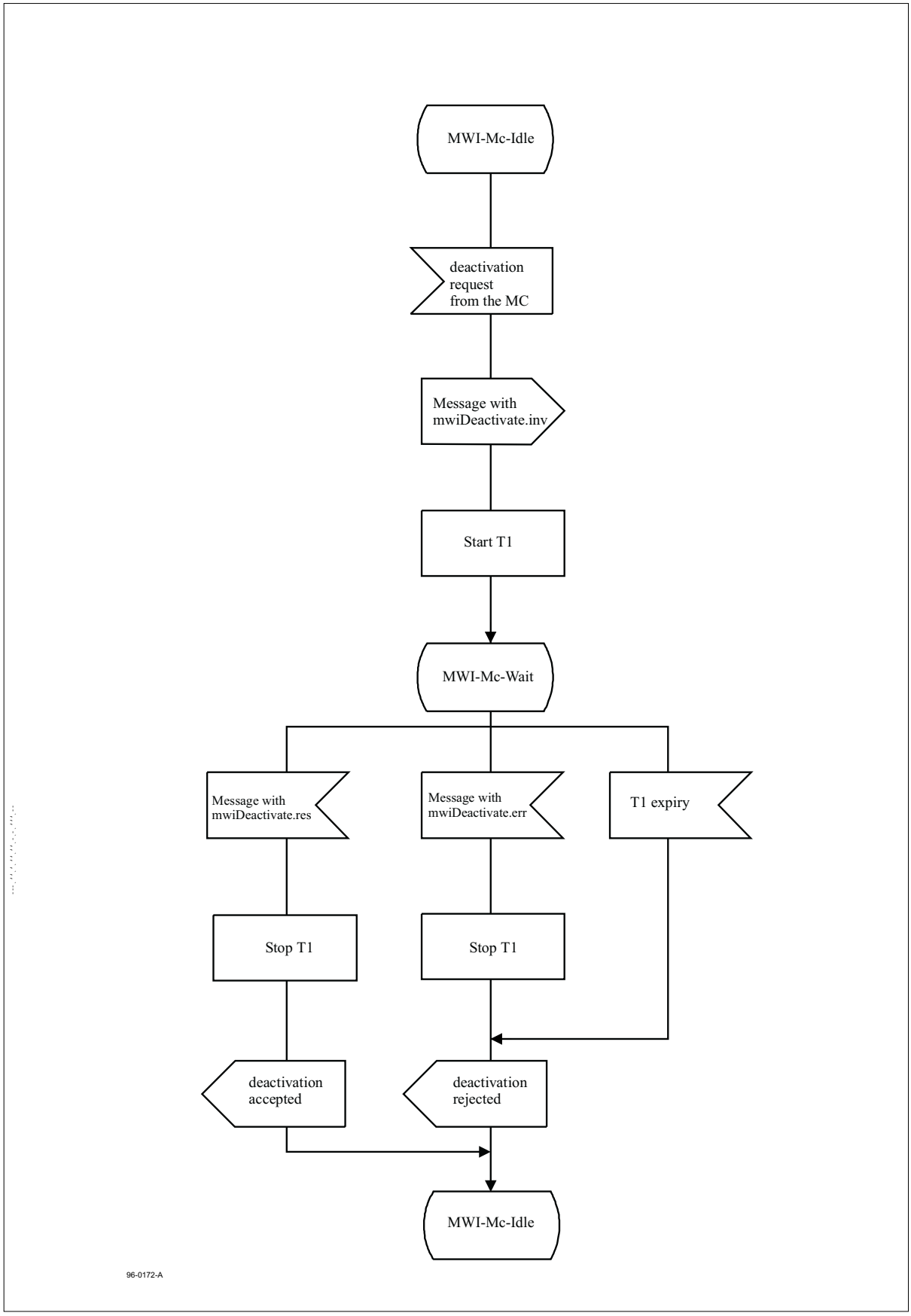


Figure C.2 - SDL representation of SS-MWI deactivation at the Message Centre PINX

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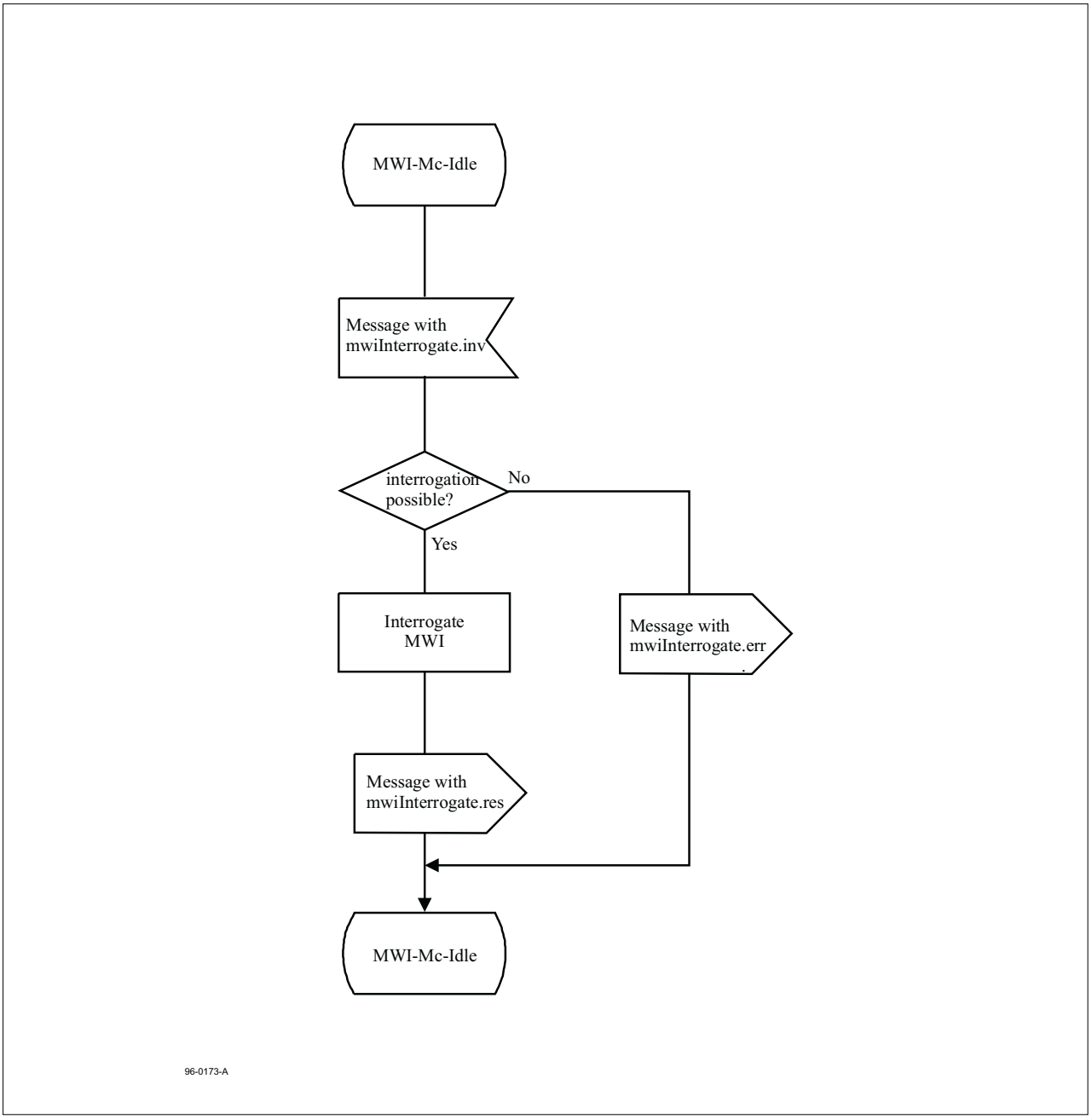


Figure C.3 - SDL representation of SS-MWI interrogation at the Message Centre PINX

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C.2 SDL representation of SS-MWI at the Served User PINX

Figures C.4 and C.5 show the behaviour of an SS-MWI Supplementary Service Control entity within the Served User PINX.

Input signals from the right and output signals to the right represent primitives from and to the user.

Input signals from the left and output signals to the left represent primitives from and to the Coordination Function in respect of messages received and sent.

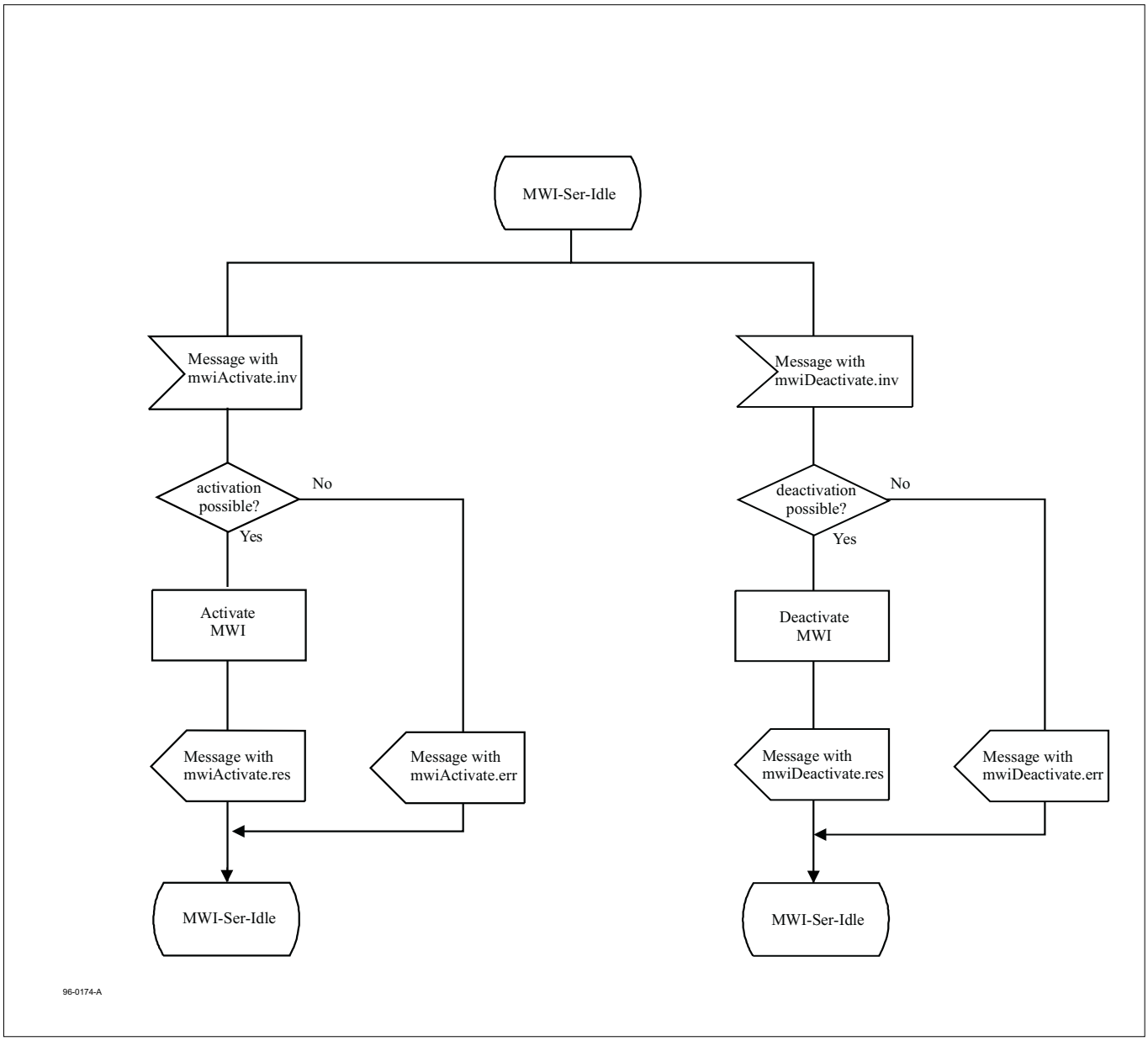


Figure C.4 - SDL representation of SS-MWI activation / deactivation at the Served User PINX

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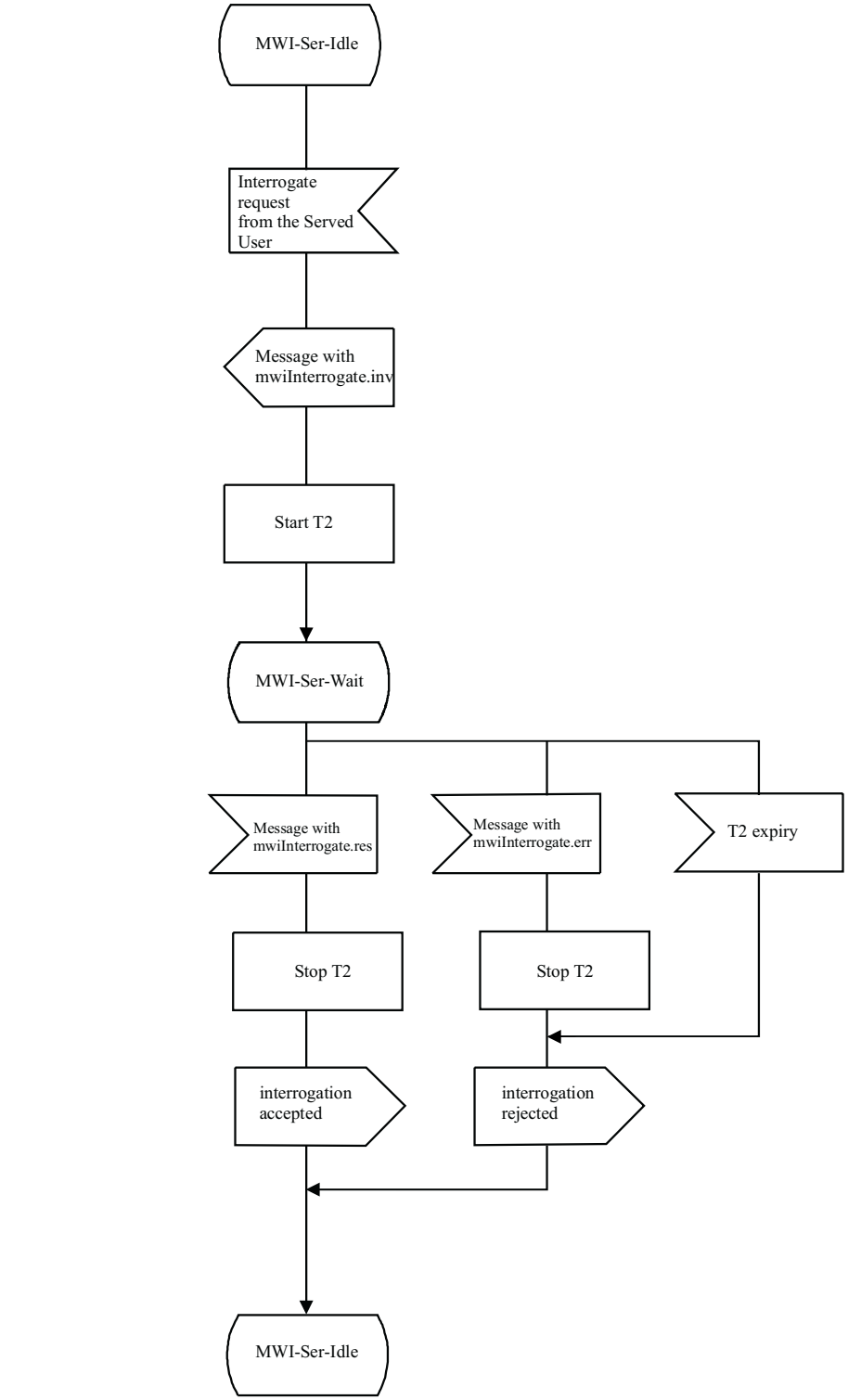


Figure C.5 - SDL representation of SS-MWI interrogation at the Served User PINX

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Annex D
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Imported ASN.1 definitions

The content of this annex has been deleted to remove duplicate ASN.1 definitions defined elsewhere.

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Annex E
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ASN.1 definitions according to ITU-T Recs. X.208 / X.209

This annex lists all ASN.1 modules as they were defined in the second edition of ISO/IEC 15506, i.e. based on ITU-T Recommendations X.208 / X.209. Starting with this edition the ASN.1 modules within ISO/IEC 15506 comply with ITU-T Recommendations X.680 / X.690. Please note that regardless of which version of these modules is used as a base of a QSIG implementation, the line encoding remains unchanged. Changes in future editions to modules based on X.680 / X.690 ASN.1 are not reflected in the modules in this annex.

Table E.1 - SS-MWI-Operations – based on ITU-T Recs. X.208 / X.209

```
SS-MWI-Operations
        { iso (1) standard (0)   pss1-message-waiting-indication (15506)  message-waiting-operations (0)}


DEFINITIONS EXPLICIT TAGS ::=


BEGIN

IMPORTS                 OPERATION, ERROR FROM Remote-Operation-Notation
                                {joint-iso-ccitt (2) remote-operations (4) notation (0)}
                        Extension FROM Manufacturer-specific-service-extension-definition
                                {iso (1) standard (0)
                                pss1-generic-procedures (11582) msi-definition (0)}

                        basicServiceNotProvided, notActivated, userNotSubscribed, invalidServedUserNumber
                        FROM General-Error-List
                                {ccitt (2) recommendation (0) q (17) 950 general-error-list (1) }


                         PartyNumber FROM Addressing-Data-Elements
                                {iso (1) standard (0)
                                pss1-generic-procedures (11582) addressing-data-elements (9) }

                        ;

MWIActivate             ::=     OPERATION
                                ARGUMENT        MWIActivateArg
                                RESULT          DummyRes
                                ERRORS    {     userNotSubscribed,
                                                invalidServedUserNumber,
                                                basicServiceNotProvided,
                                                unspecified                     }
```

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Table E.1 - SS-MWI-Operations – based on ITU-T Recs. X.208 / X.209 (continued)

```
MWIDeactivate       ::=   OPERATION
                          ARGUMENT       MWIDeactivateArg
                          RESULT         DummyRes
                          ERRORS    {    userNotSubscribed,
                                         invalidServedUserNumber,
                                         basicServiceNotProvided,
                                         unspecified }
MWIInterrogate      ::=   OPERATION
                          ARGUMENT       MWIInterrogateArg
                          RESULT         MWInterrogateRes
                          ERRORS    {    userNotSubscribed,
                                         invalidServedUserNumber,
                                         notActivated,
                                         invalidMsgCentreId,
                                         unspecified }

MWIActivateArg      ::=   SEQUENCE{
                              servedUserNr       PartyNumber,
                              basicService    BasicService,
                              msgCentreId        MsgCentreId OPTIONAL,
                              nbOfMessages       [3] IMPLICIT NbOfMessages OPTIONAL,
                              originatingNr      [4]  PartyNumber OPTIONAL,
                              timestamp          TimeStamp OPTIONAL,
                              priority           [5] IMPLICIT INTEGER (0..9) OPTIONAL,
                               -- The value 0 means the highest priority and 9 the lowest
                              argumentExt        CHOICE {
                                   extension          [6] IMPLICIT Extension,
                                   multipleExtension  [7] IMPLICIT SEQUENCE OF Extension
                                                      } OPTIONAL
                                   }

DummyRes            ::=   CHOICE {
                              null               NULL,
                              extension          [1] IMPLICIT Extension,
                              multipleExtension  [2] IMPLICIT SEQUENCE OF Extension
                              }

MWIDeactivateArg    ::=   SEQUENCE{
                              servedUserNr       PartyNumber,
                              basicService    BasicService,
                              msgCentreId        MsgCentreId OPTIONAL,
                              argumentExt        CHOICE {
                                   extension          [3] IMPLICIT Extension,
                                   multipleExtension  [4] IMPLICIT SEQUENCE OF Extension
                                                      } OPTIONAL
                                   }
```


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Table E.1 - SS-MWI-Operations – based on ITU-T Recs. X.208 / X.209 (continued)

```
MWIInterrogateArg       ::=     SEQUENCE{
                                        servedUserNr        PartyNumber,
                                        basicService    BasicService,
                                        msgCentreId         MsgCentreId OPTIONAL,
                                        argumentExt         CHOICE {
                                                extension               [3] IMPLICIT Extension,
                                                multipleExtension       [4] IMPLICIT SEQUENCE OF Extension
                                                                        } OPTIONAL
                                                }

MWIInterrogateRes       ::=     SEQUENCE SIZE(1..10) OF MWIInterrogateResElt

MWIInterrogateResElt    ::=     SEQUENCE{
                                        basicServiceBasicService,
                                        msgCentreId     MsgCentreId OPTIONAL,
                                        nbOfMessages    [3] IMPLICIT NbOfMessages OPTIONAL,
                                        originatingNr   [4] PartyNumber OPTIONAL,
                                        timestamp       TimeStamp OPTIONAL,
                                        priority        [5] IMPLICIT INTEGER (0..9) OPTIONAL,
                                         -- The value 0 means the highest priority and 9 the lowest
                                        argumentExt         CHOICE {
                                                extension               [6] IMPLICIT Extension,
                                                multipleExtension       [7] IMPLICIT SEQUENCE OF Extension
                                                                        } OPTIONAL
                                                }

BasicService            ::=     ENUMERATED {
                        -- All basic service values which were previously imported from Call Diversion
                        -- Operations have been retained to allow for backward compatibility with edition 2.
                        -- A new service value was added for group 2,3 fax and numerous MWI service
                        -- classes were added for multimedia.

                        -- MWI Services:
                        --      For compatibility among vendors, speech is recommended for voice mail
                        --      indications.
                                        allServices                     (0),
                                        speech                          (1),
                                        unrestrictedDigitalInformation  (2),
                                        audio3100Hz                     (3),
                                        telephony                       (32),
                                        teletex                         (33),
                                        telefaxGroup4Class1             (34),
                                        videotextSyntaxBased            (35),
                                        videotelephony                  (36),
                                        telefaxGroup2-3                 (37),
                                        reservedNotUsed1                (38),
                                        reservedNotUsed2                (39),
                                        reservedNotUsed3                (40),
                                        reservedNotUsed4                (41),
                                        reservedNotUsed5                (42),
                        --
```

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Table E.1 - SS-MWI-Operations – based on ITU-T Recs. X.208 / X.209 (continued)

```
                    -- MWI Service Classes:
                              email                       (51),
                              video                       (52),
                              fileTransfer                (53),
                              shortMessageService         (54),
                              speechAndVideo              (55),
                              speechAndFax                (56),
                              speechAndEmail              (57),
                              videoAndFax                 (58),
                              videoAndEmail               (59),
                              faxAndEmail                 (60),
                              speechVideoAndFax           (61),
                              speechVideoAndEmail         (62),
                              speechFaxAndEmail           (63),
                              videoFaxAndEmail            (64),
                              speechVideoFaxAndEmail      (65),
                              multimediaUnknown           (66),
                              serviceUnknown              (67),
                    --
                    -- Reserved for future additions:

                              futureReserve1              (68),
                              futureReserve2              (69),
                              futureReserve3              (70),
                              futureReserve4              (71),
                              futureReserve5              (72),
                              futureReserve6              (73),
                              futureReserve7              (74),
                              futureReserve8              (75)
                                   }

MsgCentreId         ::=   CHOICE {
                              integer          [0] IMPLICIT  INTEGER (0..65535),
                              partyNumber      [1] PartyNumber,
                              -- The party number must be a complete number as required
                              -- for routing purposes.
                              numericString    [2] IMPLICIT  NumericString (SIZE (1..10))
                                 }

NbOfMessages        ::=   INTEGER (0..65535)

TimeStamp           ::=   GeneralizedTime (SIZE (12..19))
                    -- a VisibleString containing:
                    --    - the (local) date in 8 digits (YYYYMMDD),
                    --    - followed by (local) time of day in 4 or 6 digits (HHMM[SS]),
                    --    - optionally followed by the letter "Z" or
                    --      by a local time differential in 5 digits ("+"HHMM or "-"HHMM);
                    --    this date and time representation follows ISO 8601
                    -- Examples:  1) 19970621194530, meaning 21 June 1997, 19:45:30;
                    --            2)  19970621194530Z, meaning the same as 1);
                    --            3)  19970621194530-0500, meaning the same as 1),
                    --                5 hours retarded in relation to UTC time
```


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Table E.1 - SS-MWI-Operations – based on ITU-T Recs. X.208 / X.209 (concluded)

mwiActivate	MWIActivate	::=	localValue 80
mwiDeactivate	MWIDeactivate	::=	localValue 81
mwiInterrogate	MWIInterrogate	::=	localValue 82
invalidMsgCentreId	ERROR	::=	localValue 1018
unspecified	Unspecified	::=	localValue 1008
Unspecified	::= ERROR PARAMETER Extension		
END	-- of SS-MWI-Operations		

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