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ISO/IEC 15428

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1999-11-01

Information technology — Telecommunications and information exchange between systems — Private Integrated Services Network — Specification, functional model and information flows — Wireless Terminal Location Registration supplementary service and Wireless Terminal Information Exchange additional network feature

Technologies de l'information — Télécommunications et échange d'information entre systèmes — Réseau privé à intégration de services — Spécification, modèle fonctionnel et flux d'information — Service supplémentaire d'enregistrement de localisation de terminal sans fil et caractéristiques de réseau additionnelles pour l'échange d'information de terminal sans fil

Reference number
ISO/IEC 15428:1999(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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

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.

International Standard ISO/IEC 15428 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 6, *Telecommunications and information exchange between systems*.

Annex A of this International Standard is for information only.

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Introduction

This International Standard is one of a series of International 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 particular International Standard specifies the WTLR supplementary service.

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Information technology — Telecommunications and information exchange between systems — Private Integrated Services Network — Specification, functional model and information flows — Wireless Terminal Location Registration supplementary service and Wireless Terminal Information Exchange additional network feature

1 Scope

This International Standard specifies the Wireless Terminal Location Registration supplementary service (SS-WTLR) and the Wireless Terminal Information Exchange additional network feature (ANF-WTINFO), which are applicable to various basic services supported by Private Integrated Services Networks (PISN). Basic services are specified in ISO/IEC 11574.

The Wireless Terminal Location Registration Supplementary Service (SS-WTLR) enables a WTM user to register at, or de-register from, the current location within the PISN. The ability to register at different locations in the PISN at different times enables the WTM user to maintain the provided services (including the ability to make and receive calls) at different access points. De-registration is used to inform the PISN that the WTM user is temporarily unable to make use of the provided services (including the receipt of incoming calls).

The Information Exchange Additional Network Feature (ANF-WTINFO) allows to exchange information about a WTLR user between the Home Data Base and the Visitor Data Base.

Supplementary service and additional network feature specifications are produced in three stages, according to the method described in CCITT Recommendation I.130. This International Standard contains the stage 1 and stage 2 specifications of SS-WTLR and ANF-WTINFO. The stage 1 specification (clause 6 and 7) specifies the service/feature as seen by users of PISNs. The stage 2 specification (clause 8 and 9) identifies the functional entities involved in the service/feature and the information flows between them.

2 Conformance

In order to conform to this International Standard, a stage 3 International Standard shall specify signalling protocols and equipment behaviour that are capable of being used in a PISN which supports the supplementary service or additional network feature specified in this International Standard. This means that, to claim conformance, a stage 3 International Standard is required to be adequate for the support of those aspects of clause 6 and 7 (stage 1) and clause 0 and 9 (stage 2) which are relevant to the interface or equipment to which the stage 3 International Standard applies.

3 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO/IEC 11571:1994, *Information technology - Telecommunications and information exchange between systems - Numbering and sub-addressing in private integrated services networks.*

ISO/IEC 11574:1994, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Circuit-mode 64 kbit/s bearer services - Service description, functional capabilities and information flows.*

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 15432:1999, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network – Specification, functional model and information flows - Wireless Terminal Authentication supplementary services (WTAT and WTAN).*

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

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CCITT Rec. I.130:1988, *Method for the characterization of telecommunication services supported by an ISDN and network capabilities of an ISDN (Blue Book).*

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

ITU-T Rec. Z.100:1993, *Specification and Description Language.*

4 Definitions

For the purposes of this International Standard, the following definitions apply.

4.1 External definitions

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

– Authentication	(ISO/IEC 15432)
– Basic service	(ITU-T Rec. I.210)
– PISN number	(ISO/IEC 11571)
– Private Integrated Services Network (PISN)	(ISO/IEC 11579-1)
– Private Integrated Services Network Exchange (PINX)	(ISO/IEC 11579-1)
– Service	(ITU-T Rec. I.112)
– Signalling	(ITU-T Rec. I.112)
– Supplementary Service	(ITU-T Rec. I.210)
– User	(ISO/IEC 11574)

4.2 Other definitions

Additional Network Feature (ANF): A capability, over and above that of a basic service, provided by a PISN, but not directly to a PISN user.

Directory PINX: A PINX which provides a mapping function to a WTM user's PISN number or permanent identity from another type of identity indicating the same WTM user.

Fixed part (FP): A physical grouping of some or all of the fixed component parts of a mobile radio system. These would include one or more radio equipments attached to an antenna system. It could also include common control functions and interfaces to the PINX.

Home Data Base (HDB): The data base in which the current location and all associated parameters of a wireless terminal are stored.

Home PINX: The PINX which has direct access to the HDB entry for a particular WTM user.

Location Area (LA): The coverage area in which a wireless terminal may receive and make calls as a result of a single location registration.

Network Assigned Identity (NAI): A temporary identity assigned by the PISN to a WTM user. This identity comprises:

- a PISN number sufficient to identify the PINX assigning the NAI; and
- a local identity valid while the user is registered.

PISN authority: The body or its representative responsible for arranging the service with the service provider.

PISN user: The user of the network layer services provided by a PISN.

Service profile: The specific collection of PISN services and service options which a PISN user can utilize.

Visitor Area (VA): The area covered by a single VDB.

Visitor Data Base (VDB): The data base in which all relevant parameters concerning a wireless terminal are stored for as long as the terminal is located in an area controlled by that data base.

Visitor PINX: The PINX which is serving a WTM user in a visitor area.

Wireless Terminal Mobility (WTM): The ability of a wireless terminal to be in continuous motion whilst accessing and using the telecommunication services offered by the PISN, as well as the capability of the network to keep track of the location of the wireless terminal within the coverage area of the radio system used.

WTLR user: The user of Supplementary Service "Wireless Terminal Location Registration" (SS-WTLR).

WTM information: The information for a WTM user managed by a VDB.

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WTM user: The user of a WTM supplementary service.

WTM user's identity: An identifier which is used to identify a WTM user.

5 List of acronyms

ANF Additional Network Feature

CC Call Control (functional entity)

CCA Call Control Agent (functional entity)

FE Functional Entity

FEA Functional Entity Action

FP Fixed Part

HDB Home Data Base

ISDN Integrated Services Digital Network

LA Location Area

NAI Network Assigned Identity

PINX Private Integrated Services Network Exchange

PISN Private Integrated Services Network

SDL Specification and Description Language

SS Supplementary Service

VA Visitor Area

VDB Visitor Data Base

WTM Wireless Terminal Mobility

6 SS-WTLR stage 1 specification

6.1 Description

6.1.1 General description

SS-WTLR makes the location of a WTM user known to the PISN. By updating location information in the PISN, incoming calls can be routed to a WTM user, and the WTM user can access the PISN services from the current location area. WTLR also enables a WTM user to inform the PISN that the current location area is no longer to be used to make and receive calls.

The network may allow the WTM user to perform location registration using a permanent identifier. Alternatively, for security reasons, a procedure supporting the use of temporary identifiers may be used.

SS-WTLR may use an authentication procedure in order to validate the identity provided by the WTM user to the PISN before completing the location registration.

6.1.2 Qualifications on applicability to telecommunication services

This supplementary service is applicable to all basic services defined in ISO/IEC 11574.

6.2 Procedure

6.2.1 Provision/withdrawal

SS-WTLR shall be provided by arrangement with the PISN authority. SS-WTLR shall be withdrawn on user request or for service provider reasons.

6.2.2 Normal procedures

6.2.2.1 Activation/deactivation/registration/interrogation

SS-WTLR shall be activated on provision and deactivated on withdrawal.

Interrogation and registration are not applicable to this supplementary service.

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6.2.2.2 Invocation and operation

The following procedures apply on the basis of individual basic services. On invocation, a unique identification and optionally an indication of the affected basic services shall be provided to the network.

SS-WTLR shall be invoked to register a WTM user's current location area either when the location area has changed or following a period of de-registration.

Location registration shall cause the PISN to register the WTM user at the current location area for the indicated basic services. The location information at the previously visited location area shall be deleted for these basic services, which are identical in the newly and the previously visited location. When the procedures are completed, the location registration is confirmed to the WTM user. As the result of a location registration, the PISN may assign a temporary identity to the WTM user. This identity may be stored by the WTM user and used for identification in a subsequent location registration. The identity is valid until a new location registration has successfully completed and shall be sufficient to access information specific to the WTM user at the previous visitor area from any location area within the PISN.

SS-WTLR may be invoked to de-register a WTM user when the WTM user decides not to use the service or is unable to make use of the services provided by the PISN.

NOTE: The decision to invoke de-registration can be either explicit (e.g. by switching off a wireless terminal) or implicit (e.g. by detecting that the wireless terminal is out of range).

Location de-registration shall cause the PISN to treat the WTM user as unavailable until the WTM user performs location registration again.

6.2.3 Exceptional procedures

6.2.3.1 Activation/deactivation/registration/interrogation

Not applicable.

6.2.3.2 Invocation and operation

Location registration shall be rejected under, at least, the following circumstances:

- user identity not known;
- WTM user not permitted to register in the current location area;
- WTM user failed authentication;
- location registration temporarily not possible.

An indication of the reason for rejection shall be sent to the WTM user.

The rejection cause "WTM user failed authentication" is only applicable if authentication is supported.

If the reason for rejection is "User identity not known" and the identity used was a temporary identifier, SS-WTLR may be invoked again using the WTM user's permanent identity.

Location de-registration shall be rejected if the WTM user was not registered at that location area.

6.3 Interaction with other supplementary services and ANFs

Interactions with other supplementary services and ANFs for which PISN International Standards were available at the time of publication of this International Standard are specified below.

6.3.1 Calling Line Identification Presentation (SS-CLIP)

No Interaction

6.3.2 Connected Line Identification Presentation (SS-COLP)

No interaction

6.3.3 Calling/Connected Line Identification Restriction (SS-CLIR)

No interaction

6.3.4 Calling Name Identification Presentation (SS-CNIP)

No Interaction

6.3.5 Connected Name Identification Presentation (SS-CONP)

No interaction

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6.3.6 Calling/Connected Name Identification Restriction (SS-CNIR)

No interaction

6.3.7 Completion of Calls to Busy Subscriber (SS-CCBS)

If the WTM user is either the served user or the called user in a call completion attempt, the following interactions shall apply.

Location registration may cause call completion to be cancelled.

If the WTM user de-registers, an existing call completion request shall be cancelled. Invocation of call completion on a de-registered WTM user shall be rejected.

6.3.8 Completion of Calls on No Reply (SS-CCNR)

If the WTM user is either the served user or the called user in a call completion attempt, the following interactions shall apply.

Location registration may cause call completion to be cancelled.

If the WTM user de-registers, an existing call completion request shall be cancelled. Invocation of call completion on a de-registered WTM user shall be rejected.

6.3.9 Call Transfer (SS-CT)

No interaction

6.3.10 Call Forwarding Unconditional (SS-CFU)

No interaction

6.3.11 Call Forwarding Busy (SS-CFB)

No interaction

6.3.12 Call Forwarding No Reply (SS-CFNR)

No interaction

6.3.13 Call Deflection (SS-CD)

No interaction

6.3.14 Path Replacement (ANF-PR)

No interaction

6.3.15 Call Offer (SS-CO)

No interaction

6.3.16 Call Intrusion (SS-CI)

No interaction

6.3.17 Do Not Disturb (SS-DND)

No interaction

6.3.18 Do Not Disturb Override (SS-DNDO)

No interaction

6.3.19 Advice of Charge (SS-AOC)

No interaction

6.3.20 Recall (SS-RE)

No interaction

6.3.21 Wireless terminal information exchange (ANF-WTINFO)

SS-WTLR may cause the invocation of ANF-WTINFO.

6.3.22 Wireless terminal incoming call (ANF-WTMI)

An incoming call may be rejected if it occurs between the invocation and completion of the SS-WTLR procedures or if the incoming call occurs during a period of de-registration.

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6.3.23 Wireless terminal outgoing call (ANF-WTMO)

An outgoing call may be rejected if attempted between the invocation and completion of the SS-WTLR procedures or if the outgoing call occurs during a period of de-registration.

6.3.24 Authentication of wireless terminal (SS-WTAT)

SS-WTLR may cause the invocation of SS-WTAT.

6.3.25 Authentication of network (SS-WTAN)

No interaction

6.3.26 Message waiting indication (SS-MWI)

Message waiting indications may be forwarded to the new location.

6.4 Interworking considerations

Not applicable

6.5 Overall SDL

Figure 1 contains the dynamic description of SS-WTLR using the Specification and Description Language (SDL) defined in ITU-T Rec. Z.100. The SDL process represents the behaviour of the PISN in providing SS-WTLR.

Input signals from the right represent primitives from the served user. Output signals to the right represent primitives to the served user.

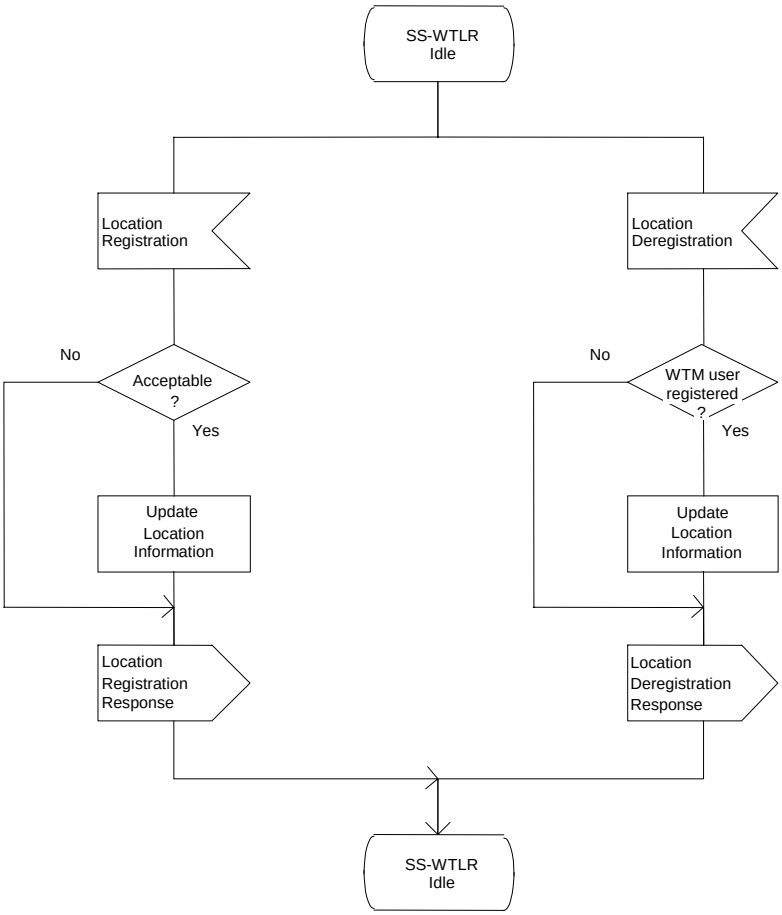


Figure 1: SS-WTLR, overall SDL diagram

7 ANF-WTINFO stage 1 specification

7.1 Description

7.1.1 General description

The ANF-WTINFO enables the exchange of information about a WTLR user between the Home Data Base and the Visitor

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Data Base.

The information transfer may occur at any time.

7.1.2 Qualifications on applicability to telecommunication services

Not applicable.

7.2 Procedure

7.2.1 Provision/withdrawal

ANF-WTINFO shall be provided by arrangement with the PISN authority.

7.2.2 Normal procedures

7.2.2.1 Activation/deactivation/registration/interrogation

ANF-WTINFO shall be permanently activated. Interrogation and registration are not applicable.

7.2.2.2 Invocation and operation

ANF-WTINFO may be invoked at any time, e.g. to initiate a check of the current location information or to transfer information about a WTLR user from the HDB to the VDB.

7.2.3 Exceptional procedures

7.2.3.1 Activation/deactivation/registration/interrogation

Not applicable.

7.2.3.2 Invocation and operation

Not applicable.

7.3 Interaction with other supplementary services and ANFs

Interactions with other supplementary services and ANFs for which PISN International Standards were available at the time of publication of this International Standard are specified below.

7.3.1 Calling Line Identification Presentation (SS-CLIP)

No Interaction

7.3.2 Connected Line Identification Presentation (SS-COLP)

No interaction

7.3.3 Calling/Connected Line Identification Restriction (SS-CLIR)

No interaction

7.3.4 Calling Name Identification Presentation (SS-CNIP)

No Interaction

7.3.5 Connected Name Identification Presentation (SS-CONP)

No interaction

7.3.6 Calling/Connected Name Identification Restriction (SS-CNIR)

No interaction

7.3.7 Completion of Calls to Busy Subscriber (SS-CCBS)

No interaction

7.3.8 Completion of Calls on No Reply (SS-CCNR)

No interaction

7.3.9 Call Transfer (SS-CT)

No interaction

7.3.10 Call Forwarding Unconditional (SS-CFU)

No interaction

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7.3.11 Call Forwarding Busy (SS-CFB)

No interaction

7.3.12 Call Forwarding No Reply (SS-CFNR)

No interaction

7.3.13 Call Deflection (SS-CD)

No interaction

7.3.14 Path Replacement (ANF-PR)

No interaction

7.3.15 Call Offer (SS-CO)

No interaction

7.3.16 Call Intrusion (SS-CI)

No interaction

7.3.17 Do Not Disturb (SS-DND)

No interaction

7.3.18 Do Not Disturb Override (SS-DNDO)

No interaction

7.3.19 Advice of Charge (SS-AOC)

No interaction

7.3.20 Recall (SS-RE)

No interaction

7.3.21 Wireless Terminal Location Registration (SS-WTLR)

SS-WTLR may cause the invocation of ANF-WTINFO.

7.3.22 Incoming WTM Call Handling (ANF-WTMI)

No interaction

7.3.23 Outgoing WTM Call Handling (ANF-WTMO)

No interaction

7.3.24 Authentication of wireless terminal (SS-WTAT)

No interaction

7.3.25 Authentication of network (SS-WTAN)

No interaction

7.4 Interworking considerations

Not applicable

7.5 Overall SDL

Figure 2 contains the dynamic description of ANF-WTINFO using the Specification and Description Language (SDL) defined in ITU-T Rec. Z.100. The SDL process represents the behaviour of the PISN in providing SS-WTLR.

Input signals from the right represent primitives from the ANF-WTINFO user. Output signals to the right represent primitives to the ANF-WTINFO user.

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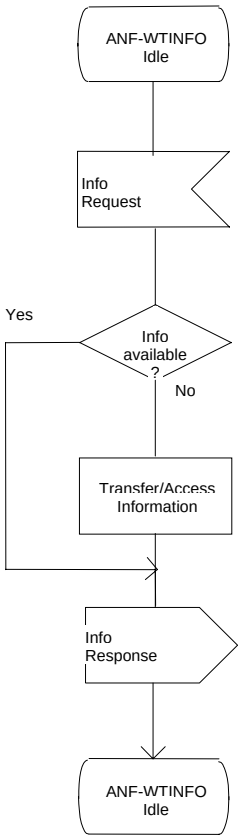


Figure 2: ANF-WTINFO, overall SDL diagram

8 SS-WTLR stage 2 specification

8.1 Functional model

8.1.1 Functional model description

The functional model shall comprise the following Functional Entities (FEs):

FE1: Served user agent;
FE2: VDB function control;
FE3: HDB function control;
FE4: Old VDB function control;
FE5: Old served user agent;
FE6: Identification mapping entity.

The following functional relationships shall exist between these FEs:

ra: between FE1 and FE2;
rb: between FE2 and FE3;
rc: between FE3 and FE4, between FE4 and FE5 and between FE2 and FE5;
rd: between FE2 and FE6.

Figure 3 shows these FEs and relationships.

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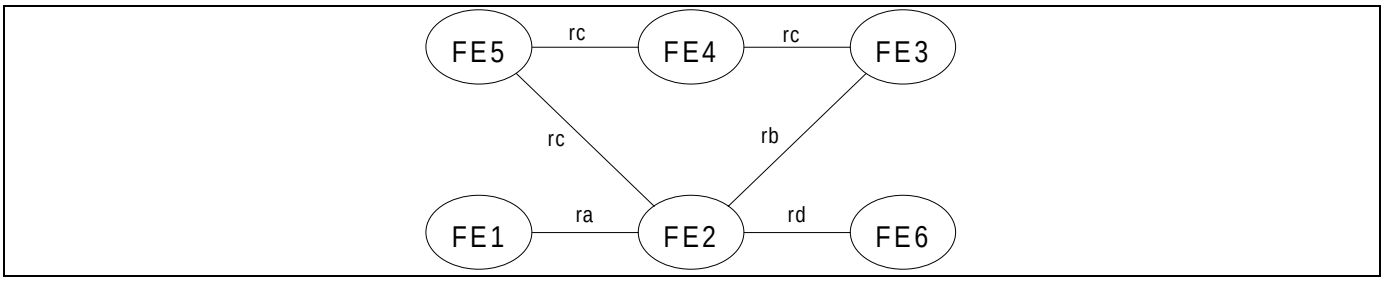


Figure 3: Functional model for SS-WTLR

8.1.2 Description of functional entities

8.1.2.1 Served user agent, FE1

This FE detects the request for location registration and de-registration procedures.

NOTE: The possible information transfer on the radio interface causing FE1 to invoke SS-WTLR is out of scope for this standard.

8.1.2.2 VDB function control, FE2

This FE is responsible for the maintenance of WTM information while the WTM user is registered at the visited location by inserting an entry in the VDB when the WTM user first registers in the visitor area, updating the entry when the WTM user registers to a different location area within the same visitor area, and deleting the entry when the WTM user de-registers.

8.1.2.3 HDB function control, FE3

This FE registers the new visitor area of the WTM user and requests the deletion of location information at the old visited location.

8.1.2.4 Old VDB function control, FE4

This FE is the VDB function control at the previous visited location and is responsible for the deletion of location information that is no longer required.

8.1.2.5 Old served user agent, FE5

This FE is the served user agent at the previously visited location and is responsible for the release of resources that are no longer required.

8.1.2.6 Identification mapping entity, FE6

This FE converts an identity supplied by the WTM user for location registration to the WTM user's PISN number or permanent identity.

8.1.3 Relationship of functional model to basic call functional model

There is no relationship with the basic service.

8.2 Information flows

8.2.1 Definition of information flows

In the tables listing the service elements in information flows, the column headed "Request" indicates which of these service elements are mandatory (M) and which are optional (O) in a request/indication information flow, and the column headed "Confirm" indicates which of these service elements are mandatory (M) and which are optional (O) in a response/confirmation information flow.

8.2.1.1 L-REG

L-REG is a confirmed information flow across relationship ra from FE1 to FE2 which is used to cause FE2 to perform a location registration of the WTM user.

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Table 1: Contents of L-REG

Service elements	Allowed values	Request	Confirm
WTM user's identity	All forms as described in annex A	M	
Basic Service Indicator	Specific service or 'all services'	O (note 1)	
WTM user's new NAI	NAI, form d) as described in annex A		O (note 2)
Result	Accepted or rejected		M
Cause of rejection	- User identity not known - WTM user not permitted to register in the current LA - WTM user failed authentication - Location registration temporarily not possible		O (note 3)

NOTE 1: Omission means 'all services'.
NOTE 2: The new NAI shall be provided if NAI assignment is implemented.
NOTE 3: This service element shall only be included in cases of rejection.

8.2.1.2 L-DREG

L-DREG is a confirmed information flow across relationship ra from FE1 to FE2 which is used to perform a de-registration of the WTM user from the current location.

Table 2: Contents of L-DREG

Service elements	Allowed values	Request	Confirm
WTM user's identity	All forms as described in annex A	M	
Basic Service Indicator	Specific service or 'all services'	O (note)	
Result	Accepted or Rejected		M

NOTE: Omission means 'all services'.

8.2.1.3 LOC-DREG

LOC-DREG is a confirmed information flow across relationship rb from FE2 to FE3 which is used to perform a de-registration of the WTM user from the current location.

Table 3: Contents of LOC-DREG

Service elements	Allowed values	Request	Confirm
WTM user's identity	Permanent identity form a) or b) as described in annex A	M	
Basic Service Indicator	Specific service or 'all services'	O (note)	
Result	Accepted or Rejected		M

NOTE: Omission means 'all services'.

8.2.1.4 LOC-DEL

LOC-DEL is a confirmed information flow across relationship rc from FE3 to FE4, or from FE2 or FE4 to FE5 which is used to request the release of resources allocated to a WTM user.

Table 4: Contents of LOC-DEL

Service elements	Allowed values	Request	Confirm
WTM user's identity	Permanent identity form a) or b) as described in annex A	M	
Basic Service Indicator	Specific service or 'all services'	O (note)	
Result	Accepted or Rejected		M

NOTE: Omission means 'all services'.

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8.2.1.5 LOC-UPD

LOC-UPD is a confirmed information flow across relationship rb from FE2 to FE3 which is used to request an update of the location information in FE3 for a WTM user.

Table 5: Contents of LOC-UPD

Service elements	Allowed values	Request	Confirm
WTM user's identity	Permanent identity form a) or b) as described in annex A	M	
Basic Service Indicator	Specific service or 'all services'	O (note 1)	
Visitor PINX	PISN number	M	
Result	Accepted or Rejected		M
Cause of rejection	- User identity not known - WTM user not permitted to register in the current LA		O (note 2)
NOTE 1: Omission means 'all services'. NOTE 2: This service element shall only be included in cases of rejection.			

8.2.1.6 PISN-ENQ

PISN-ENQ is a confirmed information flow across relationship rd from FE2 to FE6 which is a request for the PISN number or permanent identity of a WTM user identified by an NAI.

Table 6: Contents of PISN-ENQ

Service elements	Allowed values	Request	Confirm
WTM user's temporary identity	NAI (see annex A)	M	
WTM user's identity	Permanent identity form a) or b) (see annex A)		O (note)
Result	Accepted or Rejected		M
NOTE: Mandatory if the request is accepted.			

8.2.2 Relationship of information flows to basic call information flows

All information flows are independent of basic call flows.

8.2.3 Examples of information flow sequences

A stage 3 International Standard for SS-WTLR shall provide signalling procedures in support of the information flow sequences specified below. In addition, signalling procedures should be provided to cover other sequences arising from error situations, interactions with basic call, interactions with other supplementary services, different topologies, etc..

Within a column representing an SS-WTLR functional entity, the numbers refer to functional entity actions listed in 8.3 Functional entity actions. The following abbreviations are used:

req request

ind indication

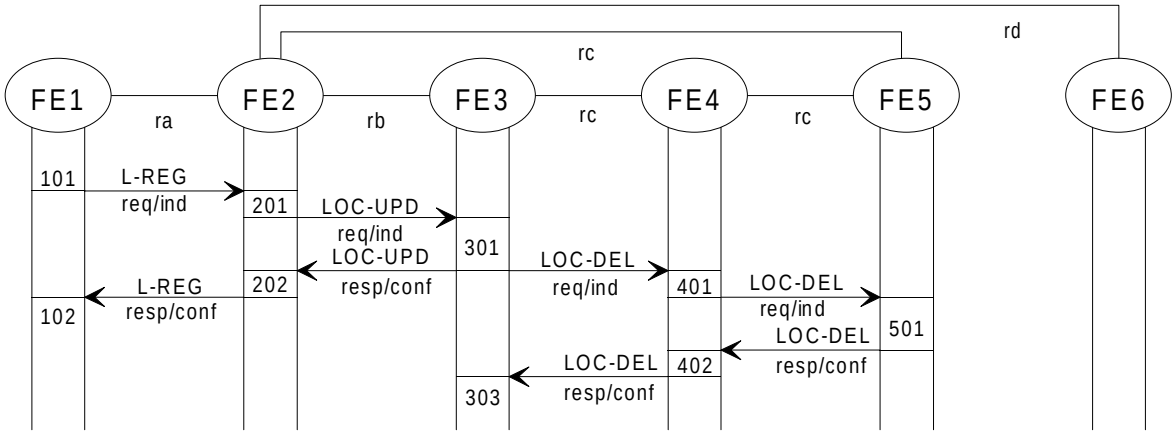
resp response

conf confirmation

8.2.3.1 Location Registration to a new VA without identity enquiry

Figure 4 shows the information flow for a location registration to a new visitor area when the WTM user's permanent identity is not enquired from FE6, because it is e.g. provided by FE1 or not needed.

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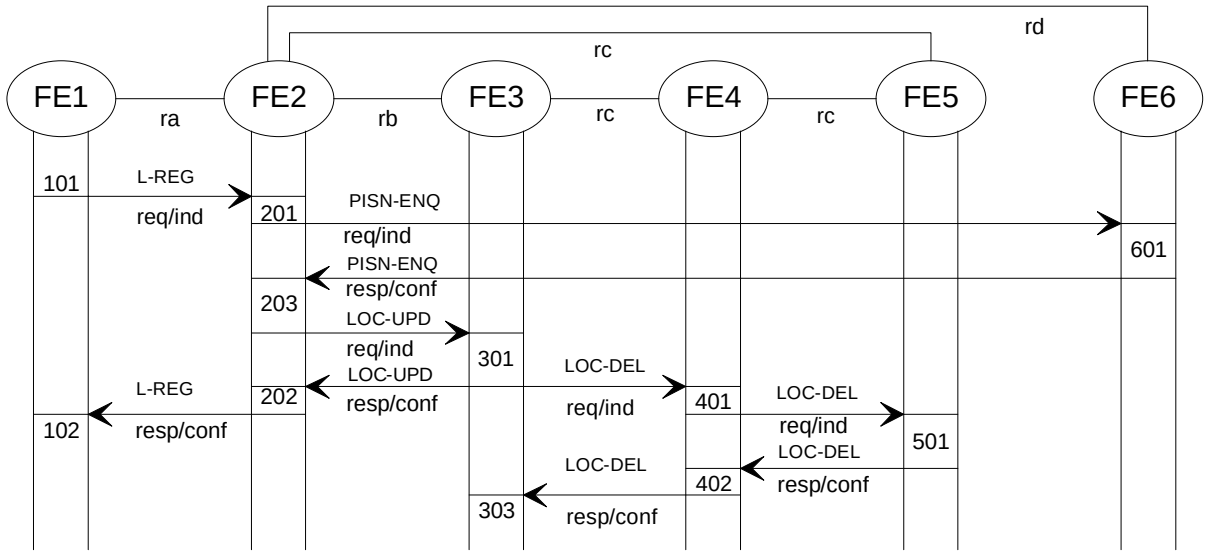


NOTE: Authentication procedures can be activated as part of FEA-201 before allowing the registration to take effect.

Figure 4: Location registration to a new VA without identity enquiry

8.2.3.2 Location registration to a new VA when using identity enquiry

Figure 5 shows the information flow for a location registration to a new visitor area when an enquiry of the WTM user's permanent identity is performed.



NOTE: Authentication procedures can be activated as part of FEA-203 before allowing the registration to take effect.

Figure 5: Location registration to a new VA when using identity enquiry

8.2.3.3 Location registration within the same VA

Figure 6 shows the information flow for a location registration within the current visitor area.

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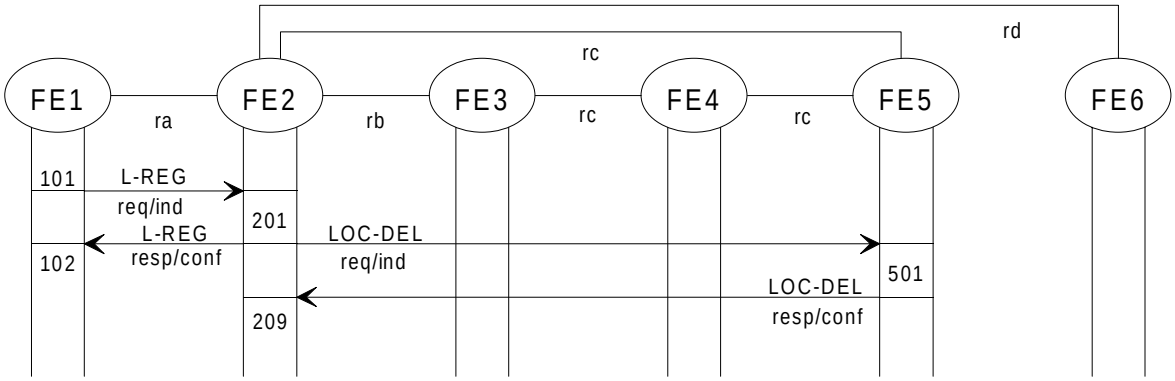


Figure 6: Location registration within the current VA

8.2.3.4 Location de-registration

Figure 7 shows the information flow for a location de-registration.

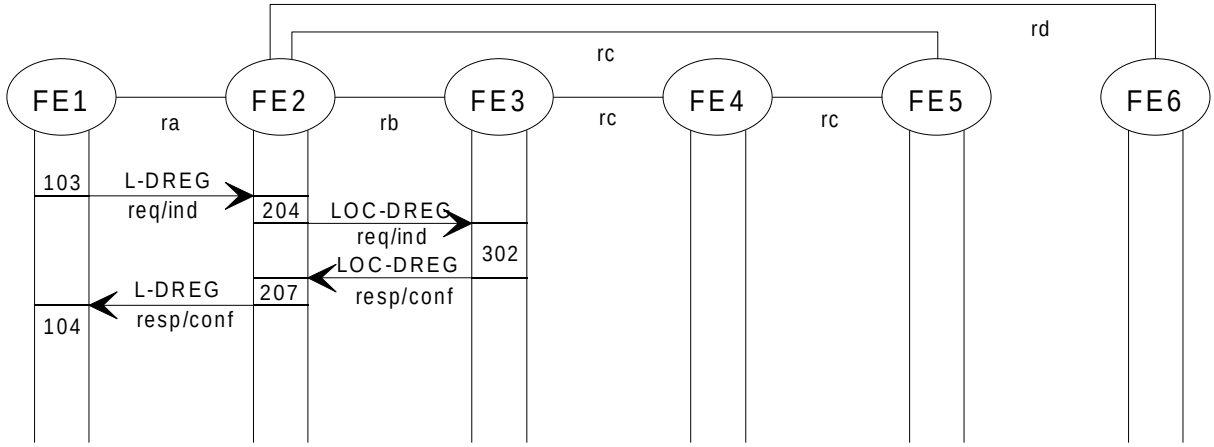


Figure 7: Location deregistration

8.2.3.5 Location registration rejected by FE3

Figure 8 shows the information flow for a failure in location registration using the WTM user's identity when the failure was caused by "User identity not known" or "WTM user not permitted to register in the current LA" detected by FE3.

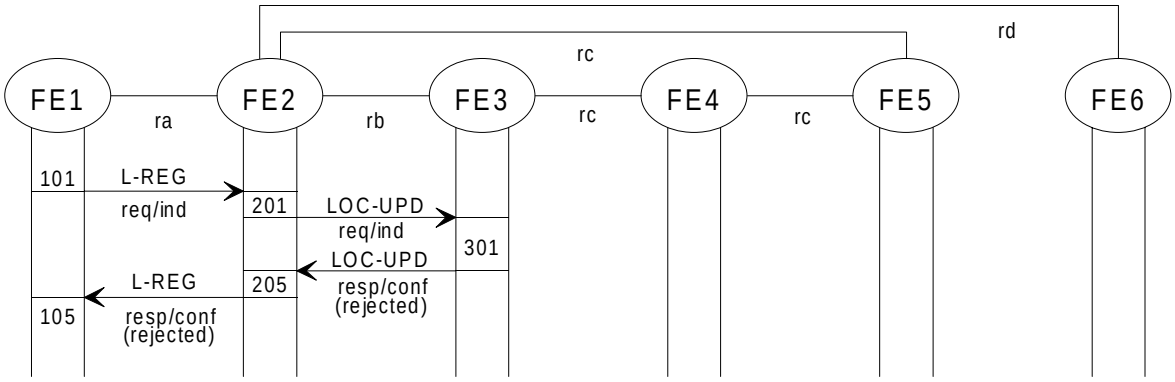


Figure 8: Location registration rejected by FE3

8.2.3.6 Location registration using the WTM user's identity rejected by FE2

Figure 9 shows the information flow for a failure in location registration using the WTM user's identity. The information flow assumes that the failure was caused by "Location registration temporarily not possible" or "WTM user failed authentication" detected by FE2.

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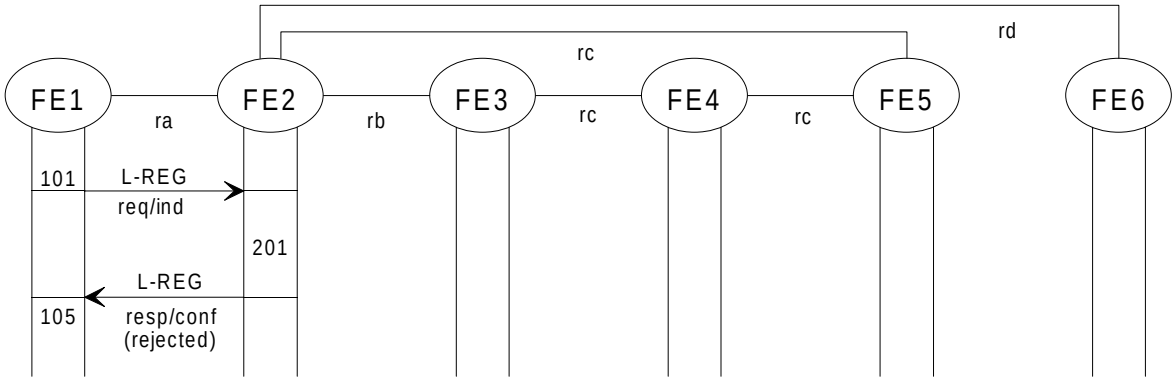


Figure 9: Location registration using the WTM user's identity rejected by FE2

8.2.3.7 Location registration rejected by FE6

Figure 10 shows the information flow for a failure in location registration using enquiry of the WTM user's PISN number. The information flow assumes that the failure was caused by "User identity not known" detected by FE6.

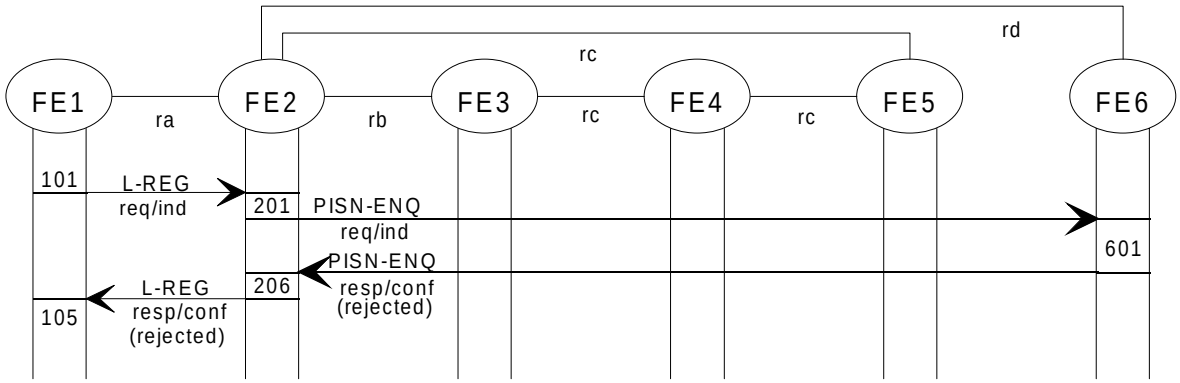


Figure 10: Location registration rejected by FE6

8.2.3.8 Location registration using enquiry of the WTM user's PISN number rejected by FE2

Figure 11 shows the information flow for a failure in location registration when using enquiry of the WTM user's PISN number. The information flow assumes that the failure was caused by "WTM user failed authentication" detected by FE2.

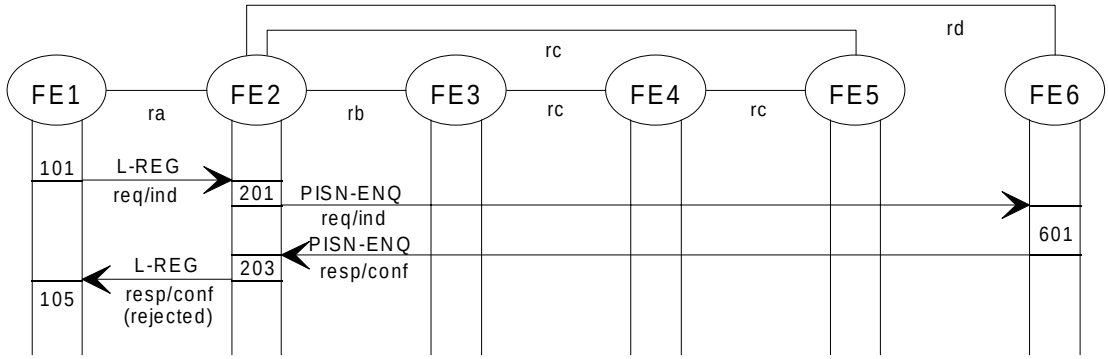


Figure 11: Location registration using enquiry of the WTM user's PISN numberrejected by FE2

8.2.3.9 Location de-registration rejected by FE2

Figure 12 shows the information flow for a failure in location deregistration. The information flow assumes that the failure occurred because the WTM user was not registered.

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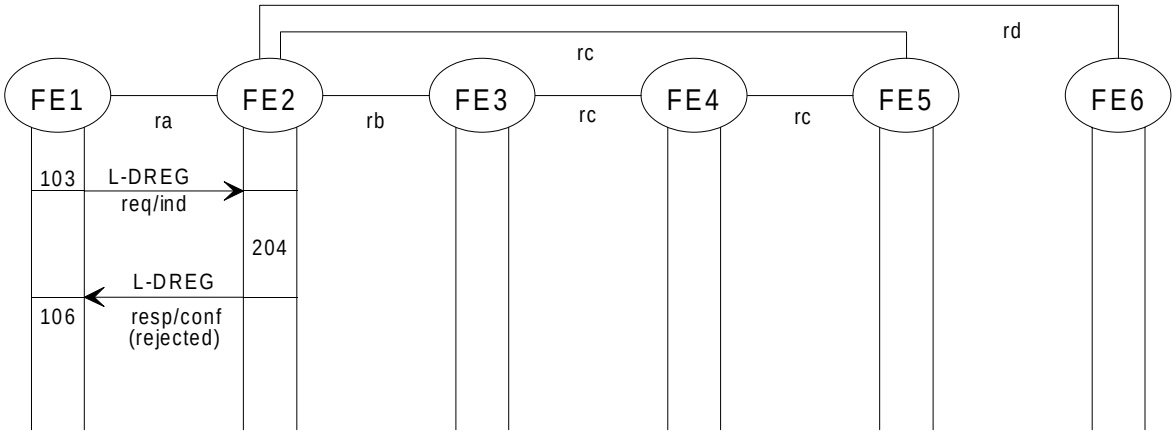


Figure 12: Location deregistation rejected by FE2

8.2.3.10 Location de-registration rejected by FE3

Figure 13 shows the information flow for a failure in location deregistration. The information flow assumes that the request was rejected by FE3.

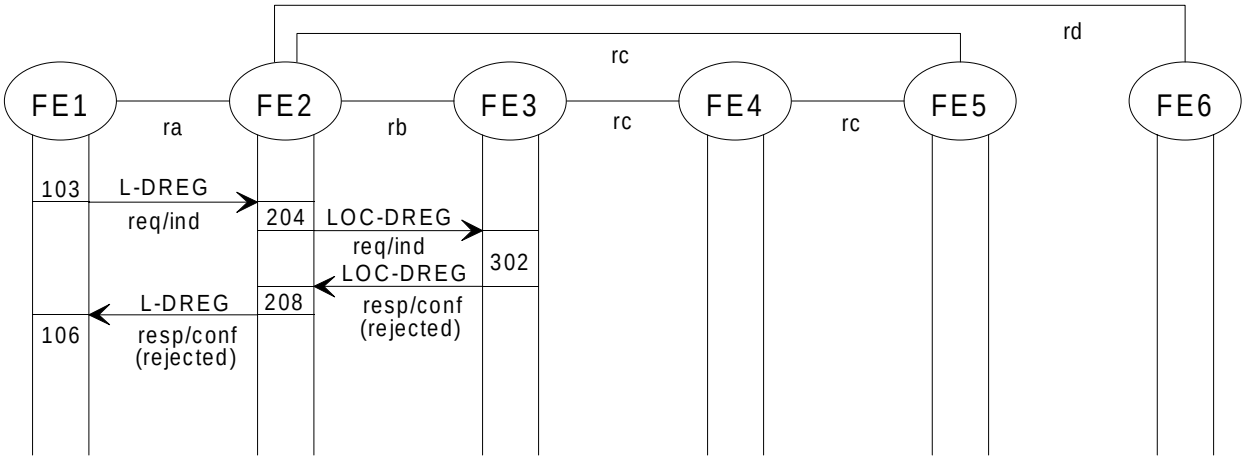


Figure 13: Location deregistation rejected by FE3

8.3 Functional entity actions

The following FE actions shall occur at the points indicated in the figures of 8.2.3.

8.3.1 Functional entity actions of FE1

101 Detect a request for location registration and send L-REG-request to FE2.

102 Accept L-REG-confirm (accepted) from FE2. Store the WTM user's registration information (if received) and report the acceptance of location registration.

103 Detect a request for location de-registration and send L-DREG-request to FE2.

104 Accept L-DREG-confirm (accepted) from FE2. Release the resources for the WTM user.

105 Accept L-REG-confirm (rejected) from FE2. Analyse the reason for the rejection. If the reason was "User identity not known", a temporary identifier was used and a procedure to obtain the WTM user's identity exists, get the WTM user's identity and send L-REG-request to FE2 again. Otherwise, report the rejection of location registration.

106 Accept L-DREG-confirm (rejected) from FE2.

8.3.2 Functional entity actions of FE2

201 Accept L-REG-indication from FE1, and test if the WTM user is already registered within this visitor area.

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If the WTM user is already registered, check that the WTM user can change the registration (this may optionally invoke authentication of the WTM user). If yes, update the access information in the VDB, send L-REG-response to FE1 accepting the location registration and send LOC-DEL-request to FE5 if the LA has changed. If no, send L-REG-response (rejected) to FE1.

If the WTM user is not already registered, check the identity provided. If the WTM user's PISN number or permanent identity is required and has not been provided, send a PISN-ENQ-request to FE6, otherwise check that the WTM user can change the registration (this may optionally invoke authentication of the WTM user). If yes, send a LOC-UPD-request to FE3. If no, send L-REG-response (rejected) to FE1.

202 Accept LOC-UPD-confirm (accepted) from FE3. Insert an entry for the WTM user in the VDB and send L-REG-response (accepted) to FE1.

203 Accept PISN-ENQ-confirm (accepted) from FE6, and read the WTM user's identity. Check that the WTM user can change the registration (this may optionally invoke authentication of the WTM user). If yes, send a LOC-UPD-request to FE3. If no, send L-REG-response (rejected) to FE1.

204 Accept L-DREG-indication from FE1, and test if the WTM user is allowed to de-register (this may optionally invoke authentication of the WTM user). If yes, send LOC-DREG-request to FE3. If no, send L-DREG-response (rejected) to FE1.

205 Accept LOC-UPD-confirm (rejected) from FE3, and send L-REG-response (rejected) to FE1.

206 Accept PISN-ENQ-confirm (rejected) from FE6, and send L-REG-response (rejected, cause = "User identity not known") to FE1.

207 Accept LOC-DREG-confirm (accepted) from FE3, delete the WTM user's entry from the VDB and send L-DREG-response to FE1 accepting the location de-registration.

208 Accept LOC-DREG-confirm (rejected) from FE3, and send L-DREG-response (rejected) to FE1.

209 Accept LOC-DEL-confirm from FE5.

8.3.3 Functional entity actions of FE3

301 Accept LOC-UPD-indication from FE2, and test if the WTM user may update the location information. If yes, update the location information in the HDB, send LOC-UPD-response (accepted) to FE2 and send LOC-DEL-request to FE4 only if the VA has changed. If no, send LOC-UPD-response (rejected) to FE2.

302 Accept LOC-DREG indication from FE2, and check if the WTM user may de-register. If yes, mark the WTM user as de-registered and send LOC-DREG-response (accepted) to FE2. If no, send LOC-DREG-response (rejected) to FE2.

303 Accept LOC-DEL-confirm from FE4.

8.3.4 Functional entity actions of FE4

401 Accept LOC-DEL-indication from FE3, send LOC-DEL-request to FE5 and delete the WTM user's entry from the VDB.

402 Accept LOC-DEL-confirm from FE5, and send LOC-DEL-response to FE3.

8.3.5 Functional entity actions of FE5

501 Accept LOC-DEL-indication from FE2 or FE4, send LOC-DEL-response to FE2 or FE4 respectively and release the resources for the WTM user.

8.3.6 Functional entity actions of FE6

601 Accept PISN-ENQ-indication from FE2, and lookup the WTM user based on the identifier provided. If the WTM user entry was found, get the PISN number or permanent identity, and send PISN-ENQ-response (accepted) to FE2. If the identifier did not indicate a WTM user, send PISN-ENQ-response (rejected) to FE2.

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8.4 Functional entity behaviour

The FE behaviours shown below are intended to illustrate typical FE behaviour in terms of information flows sent and received.

The behaviour of each FE is shown using the Specification and Description Language (SDL) defined in ITU-T Rec. Z.100.

The direction of inputs and outputs (right or left) corresponds to the direction of messages in the flow diagrams. With the exception of internal events, all inputs are tagged with the originating FE(s) and all outputs are tagged with the destination FE. For each input, a reference to the FEA is indicated. The FEA referred to describes all actions until the next waiting state.

8.4.1 Behaviour of FE1

Figure 14 shows the SDL diagram for FE1.

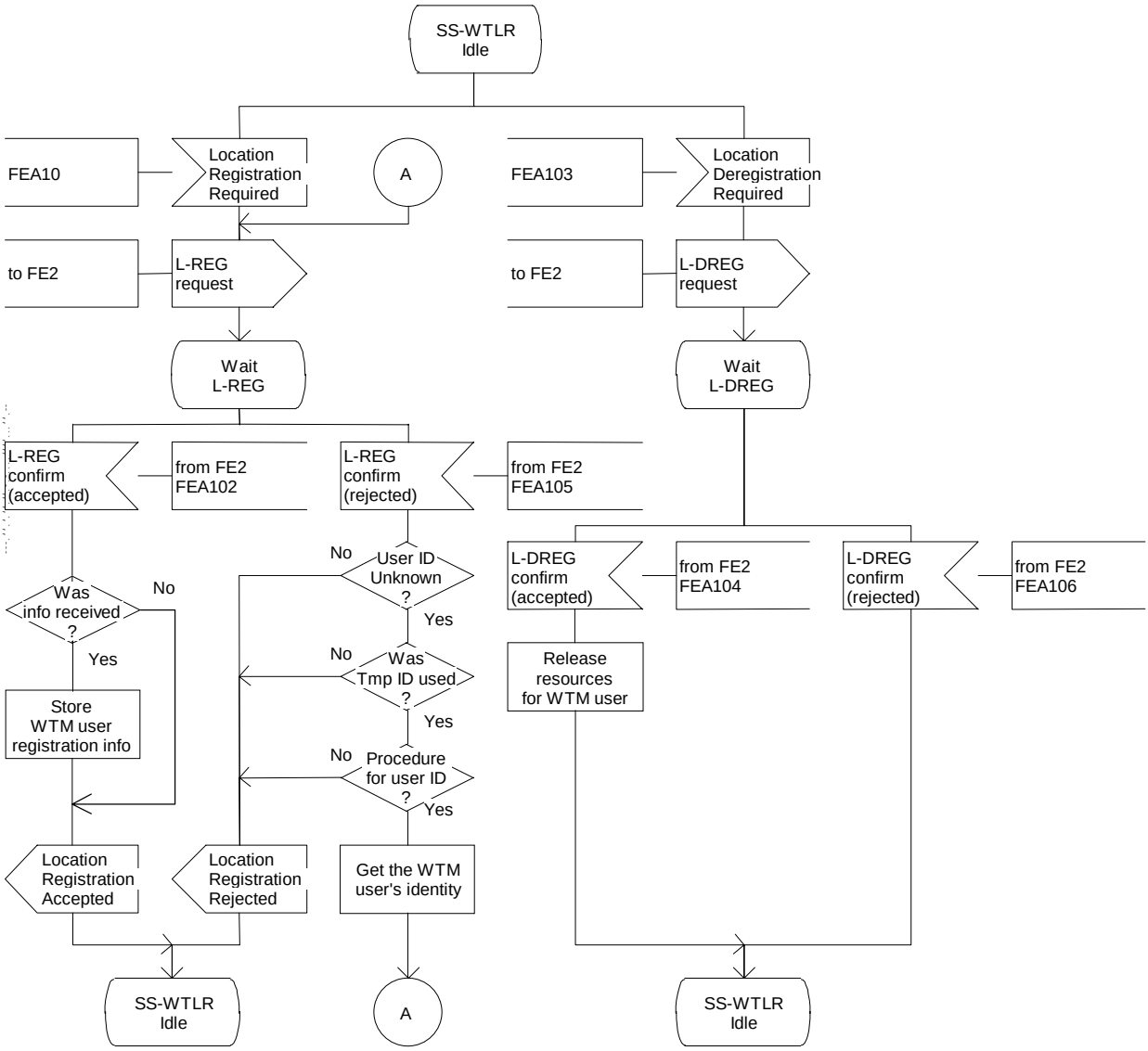


Figure 14: SDL diagram for FE1

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8.4.2 Behaviour of FE2

Figure 15 shows the SDL diagrams for FE2.

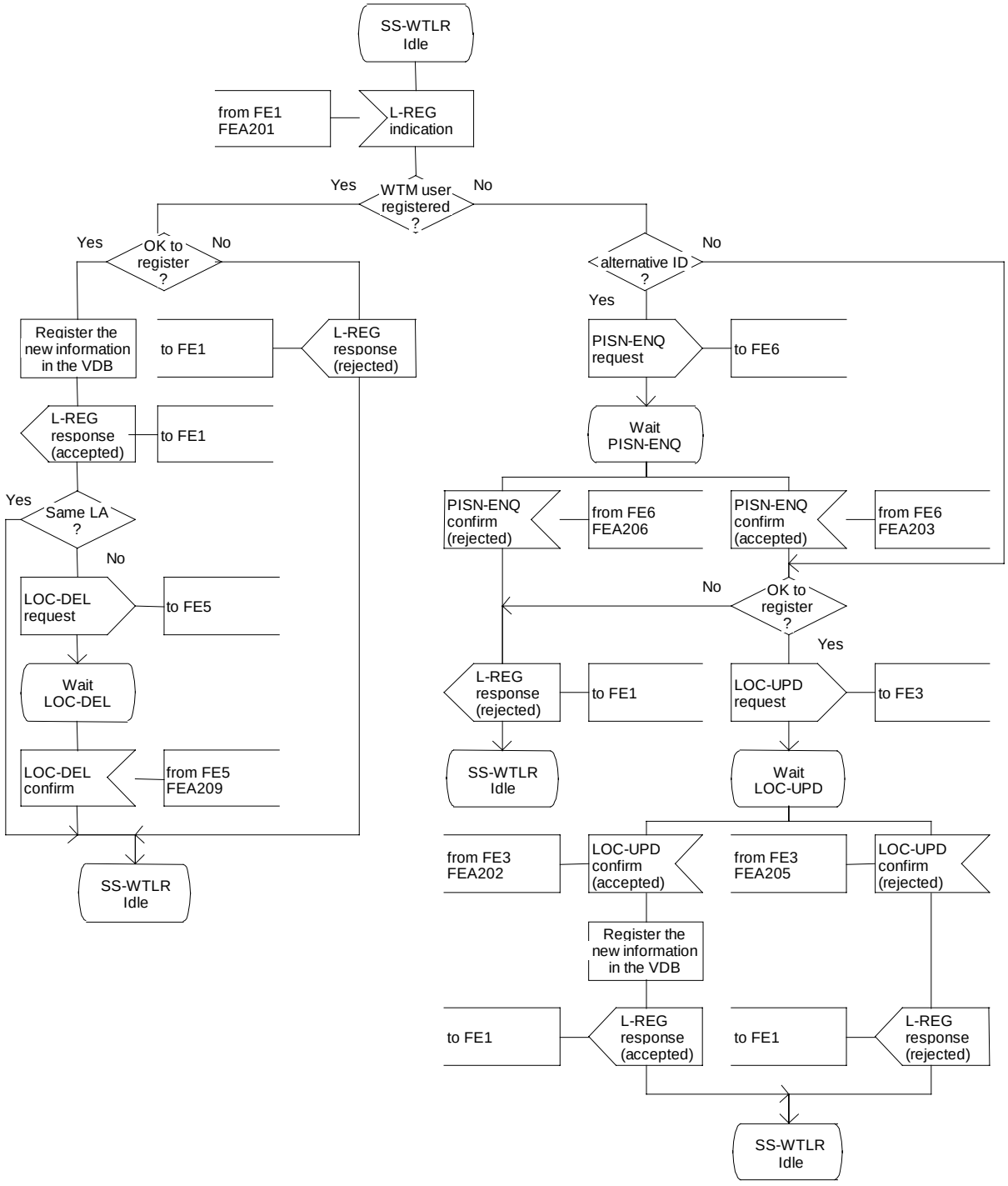


Figure 15 (sheet 1 of 2): SDL diagram for FE2

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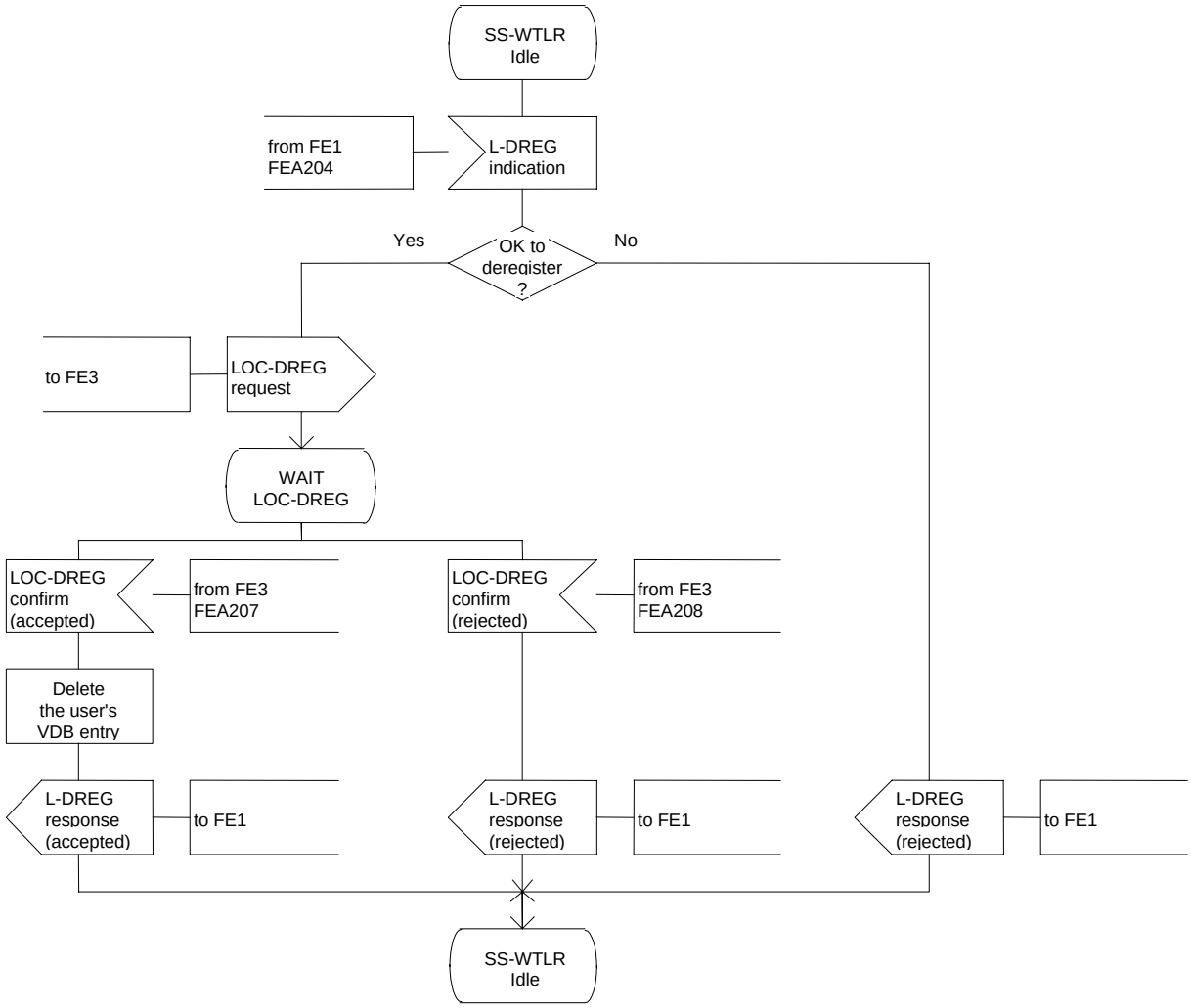


Figure 15 (sheet 2 of 2): SDL diagram for FE2

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8.4.3 Behaviour of FE3

Figure 16 shows the SDL diagram for FE3.

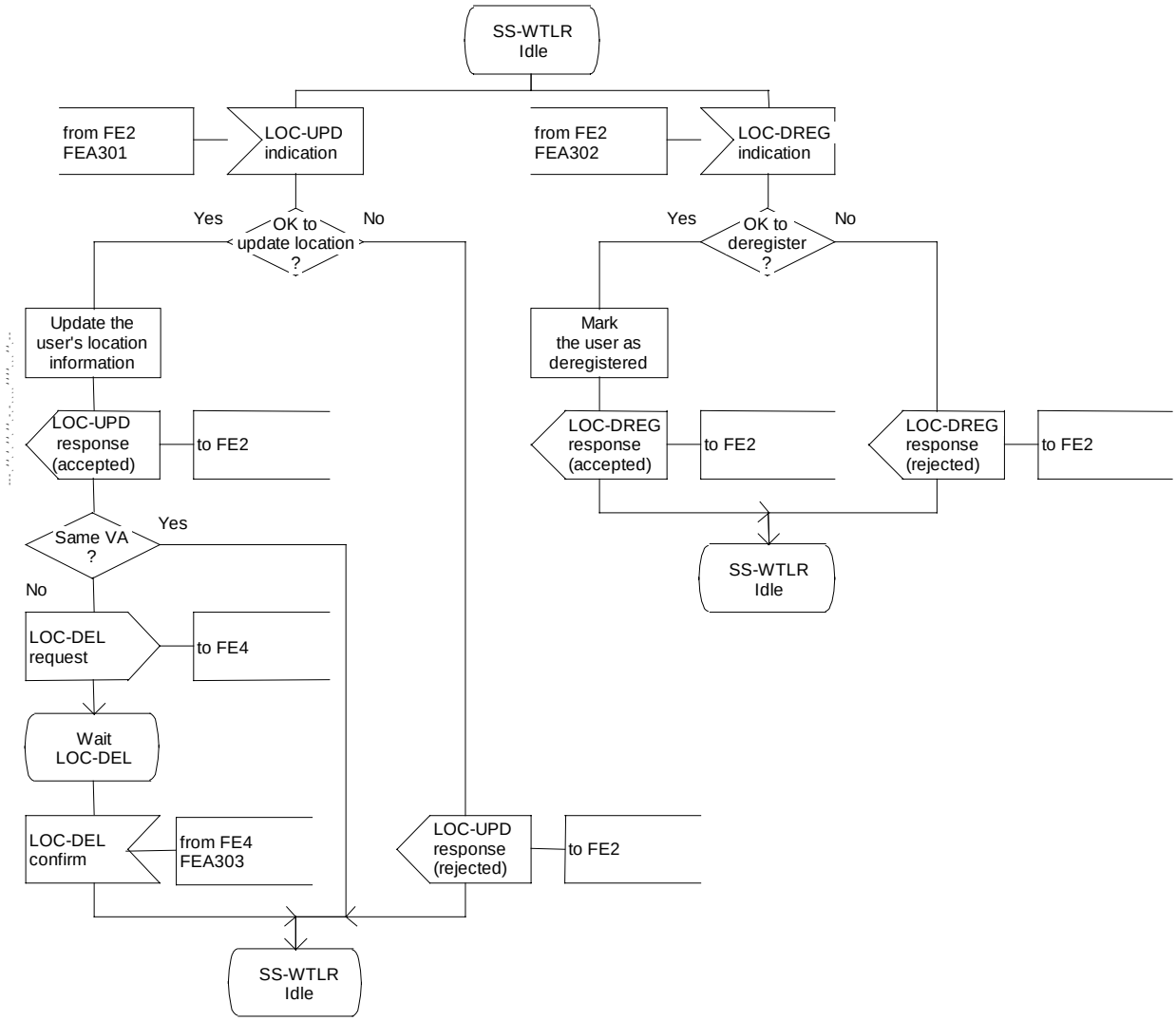


Figure 16: SDL diagram for FE3

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8.4.4 Behaviour of FE4

Figure 17 shows the SDL diagram for FE4.

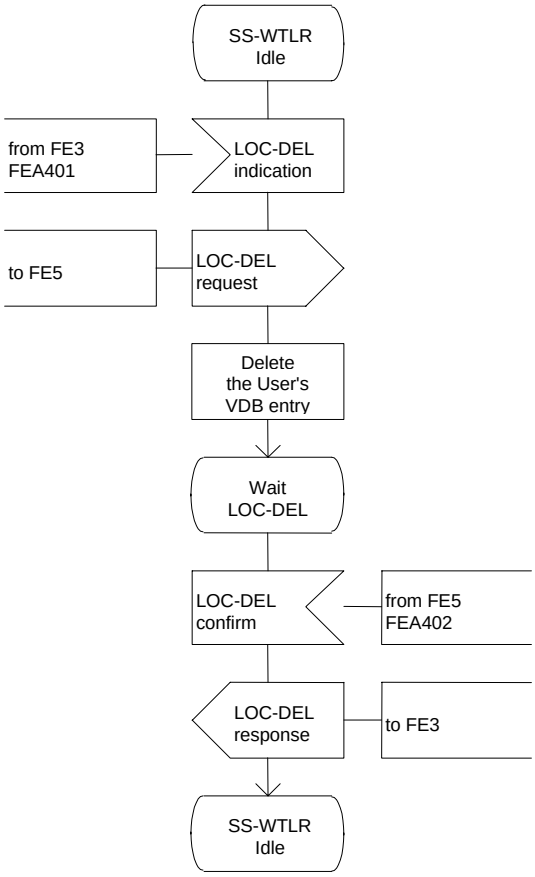


Figure 17: SDL diagram for FE4

8.4.5 Behaviour of FE5

Figure 18 shows the SDL diagram for FE5.

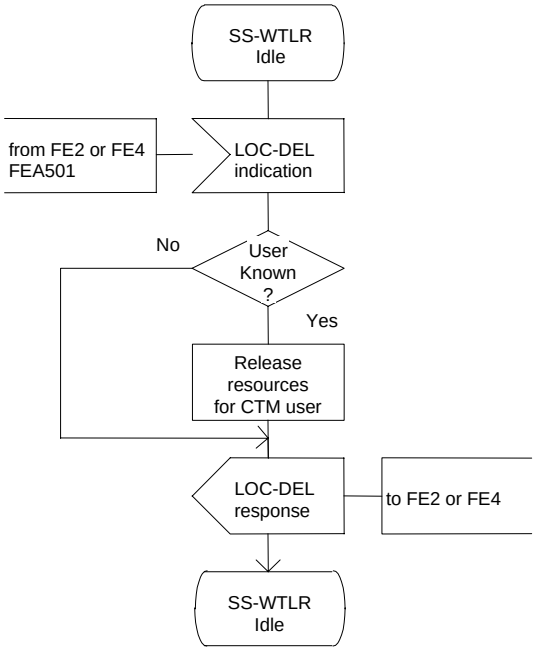


Figure 18: SDL diagram for FE5

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8.4.6 Behaviour of FE6

Figure 19 shows the SDL diagram for FE6.

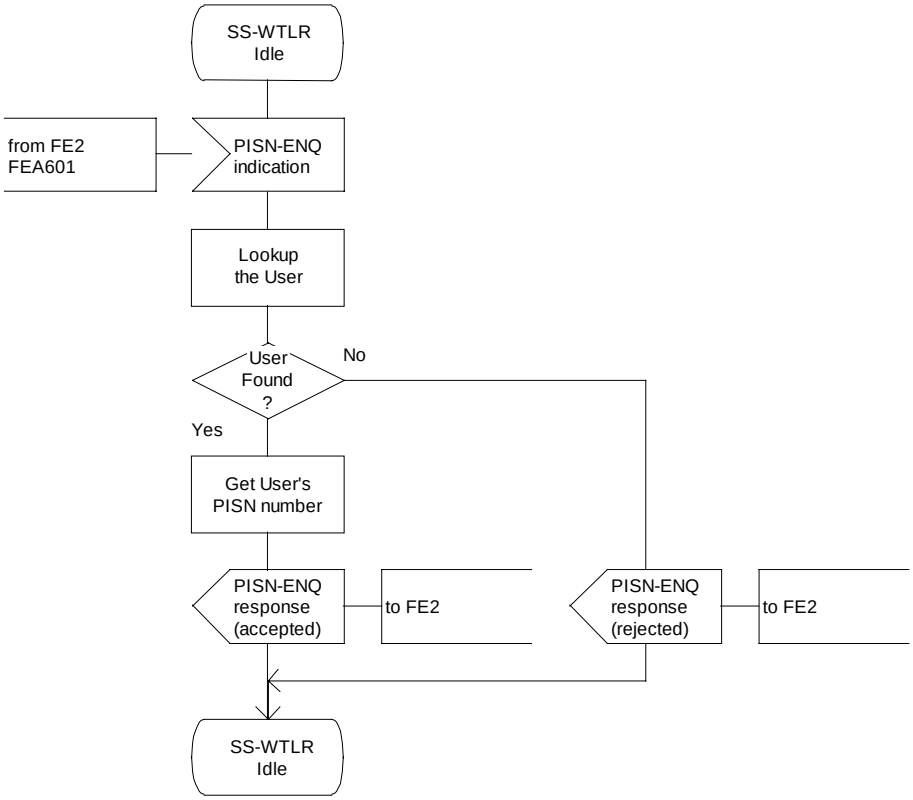


Figure 19: SDL diagram for FE6

8.5 Allocation of functional entities to physical equipment

The allocation of FEs to physical locations is shown in table 7.

Table 7: Scenarios for the allocation of FEs to physical entities

	FE1	FE2	FE3	FE4	FE5	FE6
Scenario 1	FP	Visitor PINX	Home PINX	Old Visitor PINX	Old FP	Old Visitor PINX
Scenario 2	Visitor PINX	Visitor PINX	Home PINX	Old Visitor PINX	Old FP	Old Visitor PINX
Scenario 3	FP	Visitor PINX	Home PINX	Old Visitor PINX	Old Visitor PINX	Old Visitor PINX
Scenario 4	Visitor PINX	Visitor PINX	Home PINX	Old Visitor PINX	Old Visitor PINX	Old Visitor PINX
Scenario 5	FP	Visitor PINX	Home PINX	Old Visitor PINX	Old FP	Directory PINX
Scenario 6	Visitor PINX	Visitor PINX	Home PINX	Old Visitor PINX	Old FP	Directory PINX
Scenario 7	FP	Visitor PINX	Home PINX	Old Visitor PINX	Old Visitor PINX	Directory PINX
Scenario 8	Visitor PINX	Visitor PINX	Home PINX	Old Visitor PINX	Old Visitor PINX	Directory PINX

The "visitor PINX" and the "old visitor PINX" can be the same PINX if the WTM user does a location registration within the same visitor area.

8.6 Interworking considerations

Not applicable.

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9 ANF-WTINFO stage 2 specification

9.1 Functional model

9.1.1 Functional model description

The functional model for ANF-WTINFO shall be as shown in Figure 20.

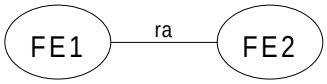


Figure 20: Functional model for ANF-WTINFO

The functional model for ANF-WTINFO shall comprise the following Functional Entities (FEs):

FE1: VDB function control entity;
FE2: HDB function control entity.

The following functional relationship shall exist between these FEs:

ra between FE1 and FE2.

9.1.2 Description of functional entities

9.1.2.1 VDB function control entity, FE1

This FE controls the transfer of WTLR user information at the visited location. It is responsible for initiating the transfer when information is required that is not available at the visited location and shall respond to the request from FE2 for transfer of WTLR user information.

9.1.2.2 HDB function control entity, FE2

This FE controls the transfer of WTLR user information at the home location. It shall respond to the request from FE1 for transfer of WTLR user information. It is responsible for initiating the transfer of WTLR user information to perform a consistency check when required.

9.1.3 Relationship of functional model to basic call functional model

ANF-WTINFO is a call unrelated additional network feature. Therefore, there is no relationship with the basic service.

9.2 Information flows

9.2.1 Definition of information flows

In the tables listing the service elements in information flows, the column headed "Request" indicates which of these service elements are mandatory (M) and which are optional (O) in a request/indication information flow, and the column headed "Confirm" indicates which of these service elements are mandatory (M) and which are optional (O) in a response/confirmation information flow.

9.2.1.1 INFO-XCHG

This confirmed information flow requests a transfer of WTLR user information. It shall be sent across relationship ra from FE1 to FE2.

Table 8: Contents of INFO-XCHG

Service elements	Allowed values	Request	Confirm
WTM user's identity	Permanent identity form a) or b) as described in annex A	M	
Basic Service Indicator	Specific service or ‘all services’	O (note 1)	
WTM user’s identity			O (note 2)
Subscriber class			O
Result	Accepted or Rejected		M
Cause of rejection	- Request not supported - Transfer not authorised		O (note 3)

NOTE 1: Omission means ‘all services’.
NOTE 2: Mandatory if different from WTM user’s PISN number.
NOTE 3: This service element shall only be included in cases of rejection.

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9.2.1.2 INFO-CHECK

This confirmed information flow requests a check of WTLR user's registration information. It shall be sent across relationship ra from FE1 to FE2 or from FE2 to FE1.

Table 9: Contents of INFO-CHECK

Service elements	Allowed values	Request	Confirm
WTM user's identity	Permanent identity form a) or b) as described in annex A	M	
Basic Service Indicator	Specific service or 'all services'	O (note)	
Visitor PINX number	PISN number	M	
Result	Correct or incorrect		M
NOTE: Omission means 'all services'.			

9.2.2 Relationship of information flows to basic call information flows

All information flows are independent of basic call flows.

9.2.3 Examples of information flow sequences

A stage 3 International Standard for ANF-WTINFO shall provide signalling procedures in support of the information flow sequences specified below. In addition, signalling procedures should be provided to cover other sequences arising from error situations, interactions with basic call, interactions with other supplementary services, different topologies, etc.

Within a column representing an ANF-WTINFO functional entity, the numbers refer to functional entity actions listed in 9.3 Functional entity actions. The following abbreviations are used:

req request

ind indication

resp response

conf confirmation

9.2.3.1 WTLR user information transfer

Figure 21 shows the information flow for a transfer of WTLR user information.

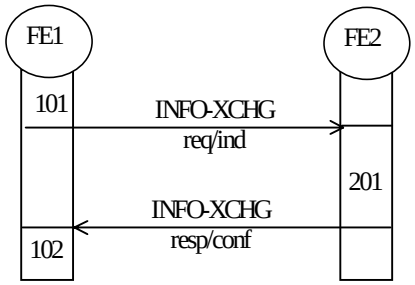


Figure 21: Information transfer

9.2.3.2 WTLR user's registration information check

Figure 22 shows the information flow for a transfer of WTLR user information.

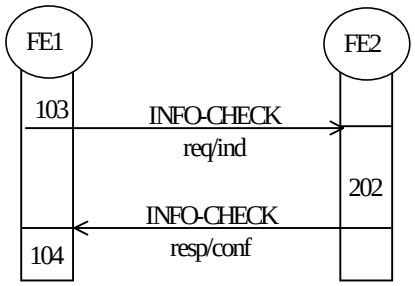


Figure 22: Information check at HDB

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Figure 23 shows the information flow for a transfer of WTLR user information.

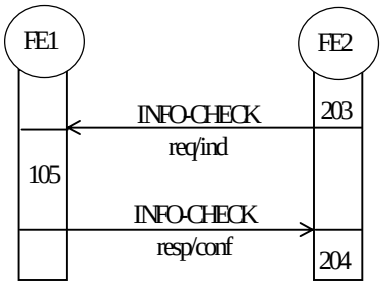


Figure 23: Information check at VDB

9.3 Functional entity actions

The following FE actions shall occur at the points indicated in the figures of 0.

9.3.1 Functional entity actions of FE1

101 Accept an internal request for WTLR user information details which are not present in the VDB. Send a INFO-XCHG-request to FE2 with information of the details to exchange.

102 Accept INFO-XCHG-confirm from FE2, and if any information details are available store them in the VDB. Report the received information details by an internal stimulus.

103 Send INFO-CHECK request/indication to FE2.

104 Receive INFO-CHECK response/confirmation and take note of the result.

105 Receive INFO-CHECK request/indication and return INFO-CHECK response/confirmation with result "correct" if the WTLR user is registered in the VDB and with result "incorrect" otherwise.

9.3.2 Functional entity actions of FE2

201 Accept INFO-XCHG-indication from FE1. Resolve the information details required and send INFO-XCHG-response to FE1.

202 Receive INFO-CHECK request/indication and return INFO-CHECK response/confirmation with result "correct" if the Visitor PINX number is that of the WTLR user's current location and with result "incorrect" otherwise.

203 Send INFO-CHECK request/indication to FE1.

204 Receive INFO-CHECK response/confirmation and take note of the result.

9.4 Functional entity behaviour

The FE behaviours shown below are intended to illustrate typical FE behaviour in terms of information flows sent and received.

The behaviour of each FE is shown using the Specification and Description Language (SDL) defined in ITU-T Rec. Z.100.

The direction of inputs and outputs (right or left) corresponds to the direction of messages in the flow diagrams. With the exception of internal events, all inputs are tagged with the originating FE(s) and all outputs are tagged with the destination FE. For each input, a reference to the FEA is indicated. The FEA referred to describes all actions until the next waiting state.

9.4.1 Behaviour of FE1

Figure 24 shows the SDL diagram for FE1.

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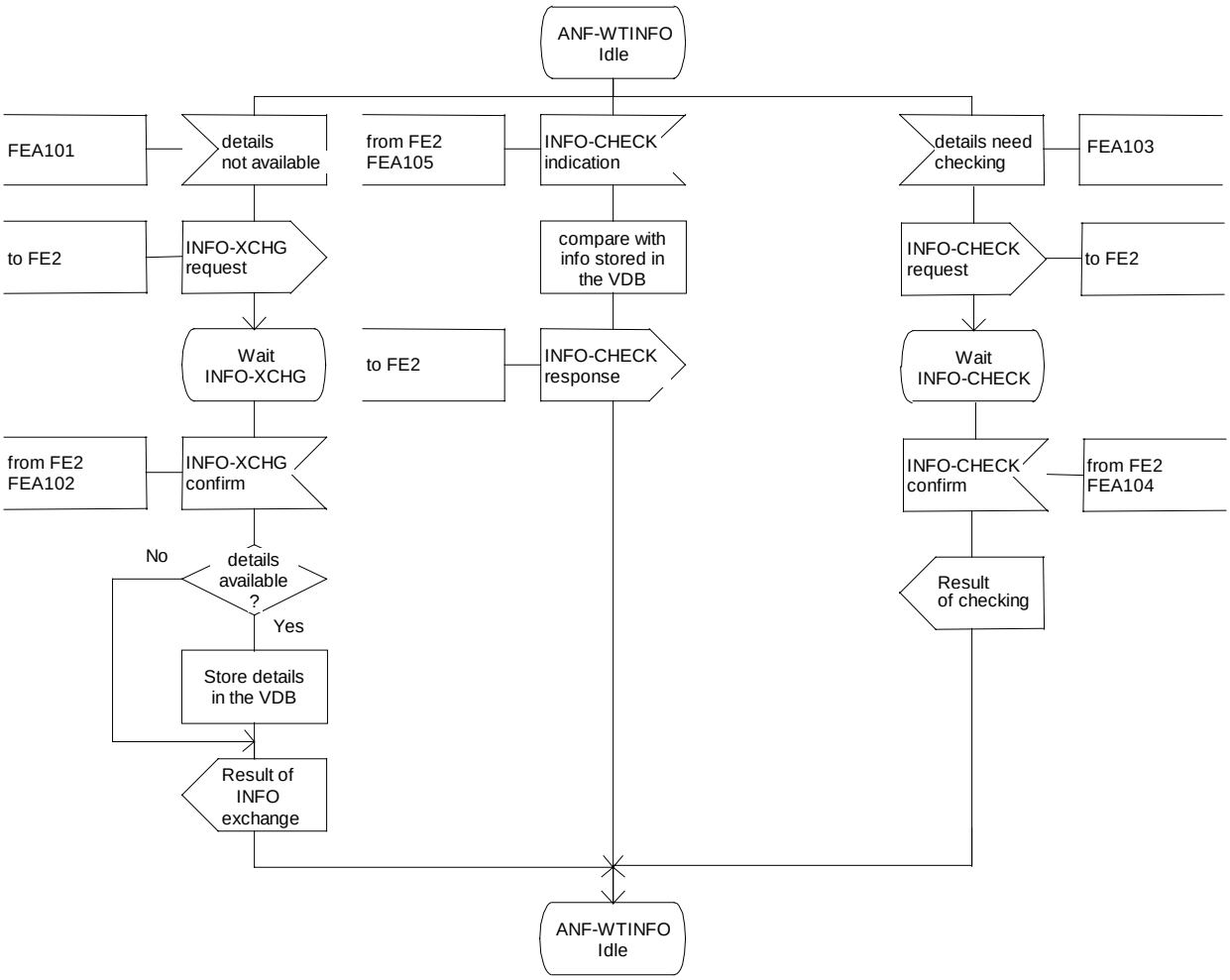


Figure 24: SDL for FE1

9.4.2 Behaviour of FE2

Figure 25 shows the SDL diagram for FE2.

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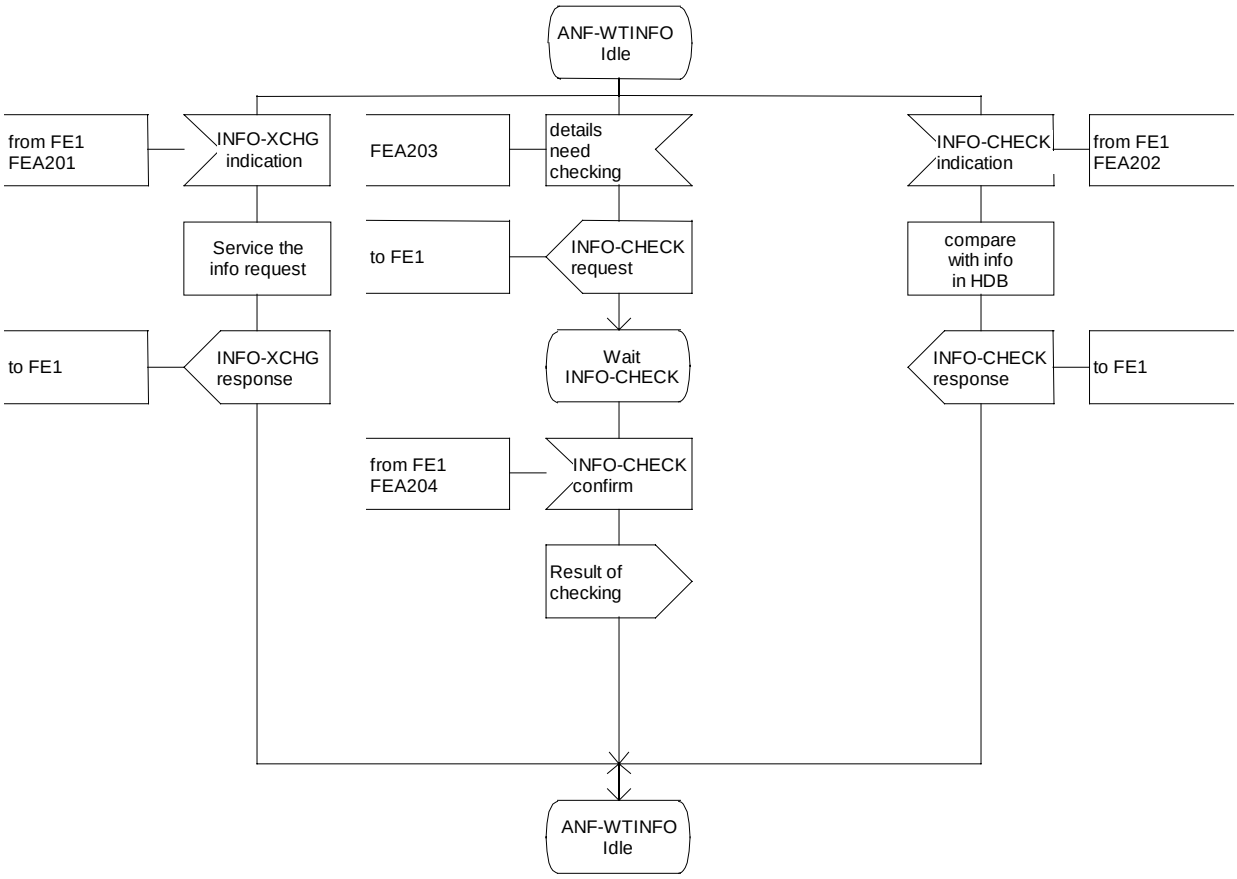


Figure 25: SDL for FE2

9.5 Allocation of functional entities to physical equipment

The allocation of FEs to physical locations is shown in table 10.

Table 10: Allocation of FEs to physical entities

	FE1	FE2
Scenario 1	Visitor PINX	Home PINX

9.6 Interworking considerations

Not applicable.

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Annex A
(informative)

User identifiers

A.1 WTM user's identity

The WTM user's identity is referred to throughout this standard and is considered to have four possible forms:

a) a PISN number as defined in ISO/IEC 11571;

b) a permanent identity equivalent to the PISN number and which is understood for the identification of the WTM user at the Home PINX and partly at the Visitor PINX. This identity can be used throughout the PISN to determine the location of the WTM user's HDB;

c) a permanent identifier which has no immediate meaning to the PISN. This may be the only one available for terminals that do not allow the network operator to enter an identity into the terminal. A directory service is required to translate such an identifier into a PISN number;

d) a temporary identity which is partly understood at each Visitor PINX, and fully understood by the old Visitor PINX where it can be translated into the PISN number. A temporary identity can be used instead of the permanent identity as a security measure such that the user's permanent identity is not transmitted across the air interface. A network assigned identity (NAI) or an equivalent identity may be used.

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