INTERNATIONAL STANDARD

ISO/IEC 15431

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Information technology — Telecommunications and information exchange between systems — Private Integrated Services Network — Inter-exchange signalling protocol — Wireless terminal call handling additional network features

Technologies de l'information — Télécommunications et échange d'information entre systèmes — Réseau privé à intégration de services — Protocole de signalement d'interéchange — Caractéristiques de réseau additionnelles pour le traitement d'appel de terminal sans fil

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Contents

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 15431 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 6, *Telecommunications and information exchange between systems*.

Annex A forms a normative part of this International Standard. Annexes B to D are for information only.

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 is one of a series of signalling protocol standards that together specify Private Signalling System Number 1 (PSS1) (informally known as QSIG) for use at the Q reference point between Private Integrated Services Network Exchanges (PINXs). This International Standard supports the Wireless Terminal Call Handling additional network features.

Information technology — Telecommunications and information exchange between systems — Private Integrated Services Network — Inter-exchange signalling protocol — Wireless terminal call handling additional network features

1 Scope

This International Standard specifies the signalling protocol for the support of the Wireless terminal call handling additional network features (ANF-WTMI and ANF-WTMO) at the Q reference point between Private Integrated Services Network Exchanges (PINX) connected together within a Private Integrated Services Network (PISN).

ANF-WTMI is a feature that directs incoming calls to a WTMI user within the PISN regardless of the WTMI user's geographical location within the PISN, provided that the WTMI user's location is known. Roaming outside the PISN is outside the scope of this edition of this International Standard.

ANF-WTMO permits the PISN to process call requests from a WTMO user at the home location, if required.

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 CCITT Recommendation I.130. 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 15430.

The signalling protocol for ANF-WTMI and ANF-WTMO operates on top of the signalling protocol for basic circuit switched call control, as specified in ISO/IEC 11572, and 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 ANF-WTMI / ANF-WTMO and other supplementary services and ANFs.

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.

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 11572, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Circuit mode bearer services - Inter-exchange signalling procedures and protocol.*

ISO/IEC 11574:1994, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network – Circuit-mode 64k bit/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 11582:1995, *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 13241:1997, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Inter-exchange signalling protocol - Route Restriction Class additional network feature.*

ISO/IEC 13868:1995, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Inter-exchange signalling protocol - Name identification supplementary services.*

ISO/IEC 13873:1995, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Inter-exchange signalling protocol - Call diversion supplementary services.*

ISO/IEC 13874:1995, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Inter-exchange signalling protocol - Path replacement additional network feature.*

ISO/IEC 14843:1996, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Inter-exchange signalling protocol - Call offer supplementary service.*

ISO/IEC 14844:1996, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Inter-exchange signalling protocol - Do not disturb and do not disturb override supplementary services.*

ISO/IEC 14846:1996, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Inter-exchange signalling protocol - Call intrusion supplementary service.*

ISO/IEC 15050:1997, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Inter-exchange signalling protocol - Advice of charge supplementary services.*

ISO/IEC 15054:1997, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Inter-exchange signalling protocol - Call Interception additional network feature.*

ISO/IEC 15056:1997, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Inter-exchange signalling protocol - Transit counter additional network feature.*

ISO/IEC 15430:1999, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Specification, functional model and information flows - Wireless terminal call handling additional network features.*

ISO/IEC 15506:1997, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Inter-exchange signalling protocol - Message waiting indication supplementary service.*

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

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. Q.850:1993, *Usage of cause and location in the digital subscriber signalling system No. 1 and the signalling system No. 7 ISDN user part.*

ITU-T Rec. Q.950:1993, *Digital Subscriber Signalling System No. 1 (DSS1) - Supplementary services protocols, structure and general principles.*

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

4 Terms and 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:

- Additional Network Feature (ANF) (ISO/IEC 11582)
- Application Protocol Data Unit (APDU) (ISO/IEC 11582)
- Basic service (ITU-T Rec. I.210)
- Call, Basic call (ISO/IEC 11582)
- Call independent (ISO/IEC 11582)
- Call independent signalling connection (ISO/IEC 11582)
- Call related (ISO/IEC 11582)
- Complete number (ISO/IEC 11571)
- Co-ordination function (ISO/IEC 11582)
- End PINX (ISO/IEC 11582)
- Incoming Gateway PINX (ISO/IEC 11572)
- Incoming WTM call (ISO/IEC 15430)
- Interpretation APDU (ISO/IEC 11582)
- Network Facility Extension (NFE) (ISO/IEC 11582)
- Originating PINX (ISO/IEC 11572)
- Private Integrated Services Network (PISN) (ISO/IEC 11579-1)
- Private Integrated Services Network Exchange (PINX) (ISO/IEC 11579-1)
- PISN number (ISO/IEC 11571)

— Signalling (ITU-T Rec. I.112)

— Supplementary service (ITU-T Rec. I.210)

— Supplementary Service Control Entity (ISO/IEC 11582)

— Subsequent PINX (ISO/IEC 11572)

— Terminating PINX (ISO/IEC 11572)

— Transit PINX (ISO/IEC 11572)

— User (ISO/IEC 11574)

— WTMI user (ISO/IEC 15430)

— WTMO user (ISO/IEC 15430)

4.2 Other definitions

4.2.1
Alternative identifier: An identifier, other than the PISN number, which identifies the WTMI user uniquely.

4.2.2
Home data base (HDB): The data base in which the current location and all associated parameters of a wireless terminal are stored.

4.2.3
Home PINX: The PINX which has direct access to the HDB entry for a particular WTMI or WTMO user.

4.2.4
Rerouteing PINX: The PINX which executes the rerouteing of the incoming WTM call to the current Visitor PINX.

NOTE In case of rerouteing, the Rerouteing PINX is either the Originating PINX or the Incoming Gateway PINX. In case of forward switching, the Rerouteing PINX is the WTMI-detect PINX.

4.2.5
Visitor data base (VDB): The data base in which all relevant parameters concerning a wireless terminal are stored for as long as it is located in an area controlled by this data base.

4.2.6
Visitor PINX: The PINX which has direct access to the VDB entry for a particular WTMI or WTMO user.

4.2.7
WTMI-detect PINX: The PINX which detects that an incoming call is to a WTMI user.

NOTE The WTMI-detect PINX is either the Home PINX, a Transit PINX, the Incoming Gateway PINX or the Originating PINX.

5 Symbols and abbreviated terms

ANF	Additional Network Feature
ANF-CINT	Call Interception additional network feature
ANF-PR	Path Replacement additional network feature
ANF-RRC	Route Restriction Class additional network feature
ANF-TC	Transit counter additional network feature

(ANF-)WTMI	Wireless Terminal Incoming Call (additional network feature)
(ANF-)WTMO	Wireless Terminal Outgoing Call (additional network feature)
APDU	Application Protocol Data Unit
ASN.1	Abstract Syntax Notation no. 1
HDB	Home Data Base
ISDN	Integrated Services Digital Network
NFE	Network Facility Extension
PICS	Protocol Implementation Conformance Statement
PINX	Private Integrated Services Network Exchange
PISN	Private Integrated Services Network
SDL	Specification and Description Language
SS-AOC	Advice Of Charge supplementary services
SS-CD	Call Deflection supplementary service
SS-CFB	Call Forwarding Busy supplementary service
SS-CFNR	Call Forwarding No Reply supplementary service
SS-CFU	Call Forwarding Unconditional supplementary service
SS-CI	Call Intrusion supplementary service
SS-CNIP	Calling Name Identification Presentation supplementary service
SS-CO	Call Offer supplementary service
SS-DNDO	Do Not Disturb Override supplementary service
SS-MWI	Message Waiting Indication supplementary service
VDB	Visitor Data Base
WTM	Wireless Terminal Mobility

6 Signalling protocol for the support of ANF-WTMI

6.1 ANF-WTMI description

ANF-WTMI enables calls to be directed to a WTMI user within the PISN. As there is no predetermined PINX for the connection of a WTMI user to the PISN, the directing of such calls requires that information regarding the location of the user is available.

6.2 ANF-WTMI operational requirements

6.2.1 Requirements on the Rerouteing PINX

ISO/IEC 11572 protocol control procedures for call establishment at the outgoing side of an inter-PINX link shall apply to the establishment of the connection to the Visitor PINX. ISO/IEC 11572 protocol control procedures for call clearing shall apply to the release of the connection to the WTMI-detect PINX.

Generic procedures for the call related control of supplementary services, as specified in ISO/IEC 11582 for an End PINX, shall apply.

6.2.2 Requirements on the WTMI-detect PINX

ISO/IEC 11572 protocol control procedures for call establishment at the incoming side of an inter-PINX link shall apply to the establishment of the connection from the Originating or Incoming Gateway PINX. ISO/IEC 11572 protocol control procedures for call clearing shall apply to the release of the connection to the Rerouteing PINX.

Generic procedures for the call related control of supplementary services, as specified in ISO/IEC 11582 for an End PINX, shall apply.

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

6.2.3 Requirements on the Home PINX

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

6.2.4 Requirements on the Visitor PINX

ISO/IEC 11572 protocol control procedures for call establishment at the incoming side of an inter-PINX link shall apply to the establishment of the connection from the Rerouteing PINX.

Generic procedures for the call related control of supplementary services, as specified in ISO/IEC 11582 for an End PINX, shall apply.

6.2.5 Requirements on a Transit PINX

Basic call procedures for call establishment and call clearing at a Transit PINX, as specified in ISO/IEC 11572, shall apply.

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

6.3 ANF-WTMI coding requirements

6.3.1 Operations

The operations wtmiEnquiry, wtmiDivert and wtmiInform defined in Abstract Syntax Notation number 1 (ASN.1) in Table 1 shall apply.

Table 1 - Operations in support of call handling additional network features

```
Wireless-Terminal -Call-Handling-Operations
  { iso (1)  standard (0)  pss1-wtm-call-handling (15431)  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) }
                PSS1InformationElement FROM Generic-parameters-definition
                    { iso (1) standard (0)
                    pss1-generic-procedures (11582) pss1-generic-parameters (6) }
                Name FROM Name-Operations
                    { iso (1) standard (0)
                    pss1-name (13868) name-operations (0) }
                basicServiceNotProvided, invalidServedUserNumber, notAvailable FROM
                    General-Error-List
                    { ccitt (0) recommendation (0) q (17) 950 general-error-list (1) }
                Address, PartyNumber, PartySubaddress, PresentedNumberScreened FROM
                    Addressing-Data-Elements
                    { iso (1) standard (0) pss1-generic-procedures (11582)
                    addressing-data-elements (9) };
-- Operations for ANF-WTMI: --
WtmiEnquiry ::= OPERATION
                -- Sent from the WTMI-detect PINX to the Home PINX.
                    ARGUMENT    EnquiryArg
                    RESULT      EnquiryRes
                    ERRORS      { invalidServedUserNumber, locationNotKnown,
                                notAvailable, basicServiceNotProvided, unspecified }
WtmiDivert ::=  OPERATION
                -- Sent from the WTMI-detect PINX to the Rerouteing PINX.
                    ARGUMENT    DivertArg
                    RESULT      DummyRes
                    ERRORS      { notAvailable, unspecified }
WtmiInform ::=  OPERATION
                -- Sent from the Rerouteing PINX to the Visitor PINX.
                    ARGUMENT    InformArg

EnquiryArg ::=  SEQUENCE        { pisnNumber        PartyNumber,
                                -- The PISN number of the WTMI user
                                qSIGInfoElement     PSS1InformationElement,
                -- The basic call information elements Bearer capability, High layer compatibility,
                -- Low layer compatibility can be embedded in the qSIGInfoElement
                -- in accordance with clause 6.5.2.1.
                                argExtension        WtmiExtension OPTIONAL }
DivertArg ::=   SEQUENCE        { visitPINX         PartyNumber,
                                -- The PISN number of the Visitor PINX,
                                -- always a Complete Number.
                                callingNumber       PresentedNumberScreened,
                                wtmIdentity         WtmIdentity,
                                -- The PISN number (always a Complete Number)
                                -- and/or an alternative identifier of the WTMI user.
                                qSIGInfoElement     PSS1InformationElement,
                -- The basic call information elements Bearer capability, High layer compatibility,
                -- Low  layer compatibility, and Progress indicator
                -- can be embedded in the qSIGInfoElement in accordance with clause 6.5.2.1.
                                callingUserSub      [ 1 ] PartySubaddress OPTIONAL,
                                callingName         [ 2 ] Name OPTIONAL,
```

```
                                    wtmUserSub      [ 3 ] PartySubaddress OPTIONAL,
                                    argExtension    WtmiExtension OPTIONAL }
InformArg ::=       SEQUENCE        { wtmIdentity   WtmIdentity,
                                    -- The PISN number (always a Complete Number)
                                    -- and/or an alternative identifier of the WTMI user.
                                    argExtension    WtmiExtension OPTIONAL }
EnquiryRes ::=      CHOICE          { currLocation  [ 1 ] IMPLICIT CurrLocation,
                                    cfuActivated    [ 2 ] IMPLICIT CfuActivated }
CurrLocation  ::=   SEQUENCE        { visitPINX     PartyNumber,
                                    -- The PISN number of the Visitor PINX,
                                    -- always a Complete Number.
                                    wtmIdentity     WtmIdentity,
                                    -- The PISN number (always a Complete Number)
                                    -- and/or an alternative identifier of the WTMI user
                                    argExtension    WtmiExtension OPTIONAL }
CfuActivated  ::=   SEQUENCE        { divToAddress  Address,
                                    divOptions      SubscriptionOption,
                                    wtmName         [ 1 ] Name OPTIONAL,
                                    argExtension    WtmiExtension OPTIONAL }
SubscriptionOption ::= ENUMERATED   { noNotification (0),
                                    notificationWithoutDivertedToNr (1),
                                    notificationWithDivertedToNr (2) }
DummyRes ::=        CHOICE          { null          NULL,
                                    extension       [ 1 ] IMPLICIT Extension,
                                    sequOfExtn      [ 2 ] IMPLICIT SEQUENCE OF Extension }
WtmiExtension ::=   CHOICE          { extension     [ 4 ] IMPLICIT Extension,
                                    sequOfExtn      [ 5 ] IMPLICIT SEQUENCE OF Extension }
WtmIdentity  ::=    CHOICE          { pisnNumber    PartyNumber,
                                    alternativeId   [ 10 ] IMPLICIT AlternativeId,
                                    both            [ 11 ] IMPLICIT SEQUENCE
                                                    { pisnNumber    PartyNumber,
                                                      alternativeId AlternativeId } }
AlternativeId ::=   OCTET STRING(SIZE(1..20))

-- Operation for ANF-WTMO --
WtmoCall ::=        OPERATION
                    ARGUMENT        WtmoArg
WtmoArg ::= SEQUENCE { destinationNumber    [0]  PartyNumber  OPTIONAL,
                    sendingComplete         [1]  IMPLICIT NULL     OPTIONAL,
                    extension               CHOICE
                                            {single         [2] IMPLICIT Extension,
                                            multiple        [3] IMPLICIT SEQUENCE OF Extension
                    }       OPTIONAL    }

wtmiEnquiry                         WtmiEnquiry     ::=     localValue  54
wtmiDivert                          WtmiDivert      ::=     localValue  55
wtmiInform                          WtmiInform      ::=     localValue  56
wtmoCall                            WtmoCall        ::=     localValue  71
locationNotKnown                    ERROR           ::=     localValue  1015
unspecified                         Unspecified     ::=     localValue  1008
Unspecified         ::=             ERROR           PARAMETER Extension

END                 -- of Wireless-Terminal-Call-Handling-Operations
```

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 destinationEntity data element of the NFE shall contain value endPINX.

When conveying the invoke APDU of operations defined in 6.3.1, the Interpretation APDU shall either be omitted or be included with value rejectAnyUnrecognisedInvokePdu.

6.3.2.2 Other information elements

Any other information elements (e.g. Calling party number, Called party number) shall be coded in accordance with the rules of ISO/IEC 11572 and ISO/IEC 11582.

6.3.3 Messages

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

Messages used for call establishment shall be as specified in ISO/IEC 11572.

6.4 ANF-WTMI state definitions

6.4.1 States at the Rerouteing PINX

The procedures for the Rerouteing PINX are written in terms of the following conceptual states existing within the ANF-WTMI Supplementary Service Control entity in that PINX in association with a particular call.

6.4.1.1 State ExecIdle

Ready for receipt of a wtmiDivert APDU.

6.4.2 States at the WTMI-detect PINX

The procedures for the WTMI-detect PINX are written in terms of the following conceptual states existing within the ANF-WTMI Supplementary Service Control entity in that PINX in association with a particular call.

6.4.2.1 State WTMI-Idle

ANF-WTMI is not operating.

6.4.2.2 State WTMI-Detected

A call to a WTMI user has been detected and a wtmiEnquiry invoke APDU requesting the current location of the WTMI user has been sent to the Home PINX.

6.4.2.3 State WTMI-Divert

The current location of the WTMI user is known and a wtmiDivert invoke APDU has been sent to the Rerouteing PINX.

6.4.3 States at the Home PINX

The procedures for the Home PINX are written in terms of the following conceptual states existing within the ANF-WTMI Supplementary Service Control entity.

6.4.3.1 State HomeIdle

Ready for receipt of a wtmiEnquiry APDU.