
**Information technology —
Telecommunications and information
exchange between systems —
Private Integrated Services Network —
Inter-exchange signalling protocol —
Wireless Terminal Authentication
supplementary services**

*Technologies de l'information — Télécommunications et échange
d'information entre systèmes — Réseau privé à intégration de services —
Protocole de signalement d'interéchange — Services supplémentaires
d'authentification de terminal sans fil*



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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 15433 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 Authentication supplementary services.

Information technology — Telecommunications and information exchange between systems — Private Integrated Services Network — Inter-exchange signalling protocol — Wireless Terminal Authentication supplementary services

1 Scope

This International Standard specifies the signalling protocol for the support of the Wireless Terminal Authentication supplementary services (SS-WTAT and SS-WTAN) at the Q reference point between Private Integrated Services Network Exchanges (PINXs) connected together within a Private Integrated Services Network (PISN).

Authentication of a WTM user (SS-WTAT) is a supplementary service that enables a PISN, as a security measure, to validate the identity provided by the WTM user.

Authentication of the PISN (SS-WTAN) is a supplementary service that enables a served WTM user, as a security measure, to validate the identity of the PISN.

The mechanisms used in these services are based on the challenge and response method of authentication.

Authentication algorithms to be used by these supplementary services are outside the scope of this International Standard.

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 15432.

The signalling protocol for SS-WTAT and SS-WTAN 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-WTAT / SS-WTAN 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 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 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 15428:1999, *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*.

ISO/IEC 15429:1999, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Inter-exchange signalling protocol - Wireless Terminal Location Registration supplementary service and Wireless Terminal Information exchange additional network feature*.

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*.

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*.

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

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:

- Application Protocol Data Unit (APDU) (ISO/IEC 11582)
- Coordination Function (ISO/IEC 11582)
- End PINX (ISO/IEC 11582)
- Home Data Base (HDB) (ISO/IEC 15428)

– Home PINX	(ISO/IEC 15428)
– Interpretation APDU	(ISO/IEC 11582)
– Network Facility Extension (NFE)	(ISO/IEC 11582)
– Originating PINX	(ISO/IEC 11582)
– PISN Number	(ISO/IEC 11571)
– 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 Services Control Entity	(ISO/IEC 11582)
– Terminating PINX	(ISO/IEC 11582)
– Transit PINX	(ISO/IEC 11582)
– User	(ISO/IEC 11574)
– Visitor area	(ISO/IEC 15428)
– Visitor PINX	(ISO/IEC 15428)
– WTM user	(ISO/IEC 15432)
– WTM user's identity	(ISO/IEC 15428)

4.2 Other definitions

4.2.1

Authentication Server PINX

the PINX that contains the functionality to compute a challenge for a WTM user

5 Symbols and abbreviated terms

ANF	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-WTAN	Supplementary service - Authentication of a PISN
SS-WTAT	Supplementary service - Authentication of a WTM user
WT	Wireless Terminal
WTM	Wireless Terminal Mobility

6 Signalling protocol for the support of SS-WTAT

6.1 SS-WTAT description

SS-WTAT is a supplementary service which enables the PISN, as a security measure, to validate the identity provided by the WTM user. This is done by sending specific information to the WTM user and awaiting a response. If the received response is the expected response then authentication has passed successfully.

6.2 SS-WTAT operational requirements

6.2.1 Requirements on a Visitor PINX

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

6.2.2 Requirements on a Home PINX

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

6.2.3 Requirements on the Authentication Server 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 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.

6.3 SS-WTAT coding requirements

6.3.1 Operations

The operations authWtmUser, getWtatParam, wtatParamEnq and transferAuthParam defined in Abstract Syntax Notation number 1 (ASN.1) in Table 1 shall apply.

Table 1 — Operations in support of Authentication services

WTM-Authentication -Operations	
{iso standard pss1- authentication (15433) authentication -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 standard
pss1-generic-procedures (11582) msi-definition (0)}
invalidServedUserNumber FROM General-Errors-List
{ccitt recommendation q 950 general-error-list (1)}
PartyNumber FROM Addressing-Data-Elements
{iso(1) standard(0) pss1-generic-procedures(11582)
addressing-data-elements(9)};

-- The following three operations shall apply to SS-WTAT --

AuthWtmUser ::=	OPERATION ARGUMENT RESULT ERRORS	-- from Home PINX to Visitor PINX-- AuthWtmArg AuthWtmRes { temporarilyUnavailable, invalidServedUserNumber, notAuthorized, paramNotAvailable, unspecified}
GetWtatParam ::=	OPERATION ARGUMENT RESULT ERRORS	-- from Visitor PINX to Home PINX -- WtatParamArg WtatParamRes { invalidServedUserNumber, notAuthorized, paramNotAvailable, temporarilyUnavailable, unspecified}
WtatParamEnq ::=	OPERATION ARGUMENT RESULT ERRORS	-- from Home PINX to Authentication Server PINX-- WtatParamArg WtatParamRes { invalidServedUserNumber, paramNotAvailable, unspecified}
AuthWtmArg ::=	SEQUENCE	{ wtmUserId WtmUserId, calcWtatInfo [1] IMPLICIT CalcWtatInfo OPTIONAL, dummyExtension DummyExtension OPTIONAL}
AuthWtmRes ::=	SEQUENCE	{ ENUMERATED {auth-res-correct (0), auth-res-incorrect (1) }, dummyExtension DummyExtension OPTIONAL}
WtatParamArg ::=	SEQUENCE	{ wtmUserId WtmUserId, canCompute CanCompute OPTIONAL, authChallenge AuthChallenge OPTIONAL, dummyExtension DummyExtension OPTIONAL}

-- The presence of element canCompute indicates that the Visitor PINX is able to --
-- compute a challenge and the expected response from session key information --

WtatParamRes ::=	SEQUENCE	{wtatParamInfo WtatParamInfo, dummyExtension DummyExtension OPTIONAL}
------------------	----------	--

-- The following two operations shall apply to SS-WTAN --

GetWtanParam ::=	OPERATION ARGUMENT RESULT ERRORS	-- from Visitor PINX to Home PINX -- WtanParamArg WtanParamRes { invalidServedUserNumber, notAuthorized, paramNotAvailable, temporarilyUnavailable, unspecified}
WtanParamEnq ::=	OPERATION ARGUMENT RESULT ERRORS	-- from Home PINX to Authentication Server PINX-- WtanParamArg WtanParamRes { invalidServedUserNumber, paramNotAvailable, unspecified}

WtanParamArg ::=	SEQUENCE	{ wtmUserId authChallenge authAlgorithm canCompute dummyExtension	WtmUserId, AuthChallenge, AuthAlgorithm, CanCompute OPTIONAL, DummyExtension OPTIONAL}
-- The presence of element canCompute indicates that the Visitor PINX is able to -- -- compute the response from session key information --			
WtmUserId ::=	CHOICE	{ pismNumber -- The PISN number of the WTM user, -- always a Complete Number. alternativeld	PartyNumber Alternativeld }
Alternativeld ::=	OCTET STRING	(SIZE(1..20))	
WtanParamRes ::=	SEQUENCE	{wtanParamInfo dummyExtension	WtanParamInfo, DummyExtension OPTIONAL}
-- The following unconfirmed operation shall apply when interaction between SS-WTAT and ANF-WTINFO --			
TransferAuthParam ::=	OPERATION ARGUMENT	-- from Home PINX to Visitor PINX -- SEQUENCE {wtatParamInfo dummyExtension	WtatParamInfo, DummyExtension OPTIONAL}
WtatParamInfo ::=	SEQUENCE	{authAlgorithm CHOICE { authSessionKeyInfo calcWtatInfo authKey challLen	AuthAlgorithm, [1] IMPLICIT AuthSessionKeyInfo, [2] IMPLICIT CalcWtatInfo, [3] IMPLICIT AuthKey, [4] IMPLICIT INTEGER(1..8) }
AuthKey ::=	OCTET STRING	(SIZE(1-16)) -- Authentication key --	
WtanParamInfo ::=	CHOICE	{authSessionKeyInfo calcWtanInfo	[1] IMPLICIT AuthSessionKeyInfo, [2] IMPLICIT CalcWtanInfo}
AuthSessionKeyInfo ::=	SEQUENCE	{authSessionKey calculationParam	AuthSessionKey, CalculationParam}
CalcWtatInfo ::=	SEQUENCE	SIZE(1..5) OF CalcWtatInfoUnit	
CalcWtatInfoUnit ::=	SEQUENCE	{authChallenge authResponse derivedCipherKey calculationParam	AuthChallenge, AuthResponse, [1] IMPLICIT DerivedCipherKey OPTIONAL, [2] IMPLICIT CalculationParam OPTIONAL}
-- included if required by the authentication algorithm in use --			
CalcWtanInfo ::=	SEQUENCE	{authResponse calculationParam	AuthResponse, CalculationParam OPTIONAL}
-- included if required by the authentication algorithm in use --			
DummyExtension ::=	CHOICE	{extension sequOfExtn	[5] IMPLICIT Extension, [6] IMPLICIT SEQUENCE OF Extension}
AuthAlgorithm ::=	SEQUENCE	{ authAlg	INTEGER { ct2 (0), dect (1), gsm (2), pci (3), pwt (4), us-gsm (5), phs (6), tetra (7) } (0..255), ANY DEFINED by authAlg OPTIONAL}

AuthChallenge ::=	OCTET STRING (SIZE(1-8))	-- Randomly generated parameter --
AuthResponse ::=	OCTET STRING (SIZE(1-4))	-- WTAT: Expected response value -- -- WTAN: Response value from network --
AuthSessionKey ::=	OCTET STRING (SIZE(1-16))	-- Authentication session key--
CalculationParam ::=	OCTET STRING (SIZE(1-8))	-- Parameter used when calculating -- -- the authentication session key from -- -- the real authentication key. It may be -- -- transferred to the WTM user during -- -- both WTAT and WTAN. --
CanCompute ::=	NULL	-- indicates capability of computing -- -- challenge and/or response value --
DerivedCipherKey ::=	OCTET STRING (SIZE(1-8))	-- derived cipher key may be computed -- -- when computing challenge and -- -- expected response values--
authWtmUser	AuthWtmUser	::= localValue 72
getWtatParam	GetWtatParam	::= localValue 73
wtatParamEnq	WtatParamEnq	::= localValue 74
getWtanParam	GetWtanParam	::= localValue 75
wtanParamEnq	WtanParamEnq	::= localValue 76
transferAuthParam	TransferAuthParam	::= localValue 77
notAuthorized	ERROR	::= localValue 1007
paramNotAvailable	ERROR	::= localValue 1017
temporarilyUnavailable	ERROR	::= localValue 1000
unspecified	Unspecified	::= localValue 1008
Unspecified ::=	ERROR PARAMETER Extension	
END	-- of WTM-Authentication -Operations	

6.3.2 Information elements

6.3.2.1 Facility information element

APDUs of 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 APDUs of operations defined in 6.3.1, the destinationEntity data element of the NFE shall contain value endPINX.

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

6.4 SS-WTAT state definitions

6.4.1 States at the Home PINX for initiation of SS-WTAT

The procedures for the Home PINX for initiation of SS-WTAT are written in terms of the following conceptual states existing within the SS-WTAT Supplementary Service Control entity in that PINX in association with a particular request for authentication of a WTM user.

6.4.1.1 State `WtatHomeInitIdle`

Initiation of SS-WTAT in the Home PINX is not in progress.

6.4.1.2 State `WtatHomeInitiating`

An `authWtmUser` invoke APDU has been sent to the Visitor PINX.

6.4.2 States at the Home PINX for requesting authentication parameters

The procedures for the Home PINX for requesting authentication parameters are written in terms of the following conceptual states existing within the SS-WTAT Supplementary Service Control entity in that PINX in association with a particular request for authentication of a WTM user.

6.4.2.1 State `WtatHomeRequestIdle`

Ready for receipt of a `getWtatParam` invoke APDU from the Visitor PINX.

6.4.2.2 State `WtatHomeRequesting`

A `getWtatParam` invoke APDU has been received from the Visitor PINX.

6.4.3 States at the Home PINX when fetching authentication parameters

The procedures for the Home PINX when fetching authentication parameters are written in terms of the following conceptual states existing within the SS-WTAT Supplementary Service Control entity in that PINX in association with a particular request for authentication of a WTM user.

6.4.3.1 State `WtatHomeFetchIdle`

Fetching of authentication parameters from the Authentication Server PINX during SS-WTAT is not in progress.

6.4.3.2 State `WtatHomeFetching`

A `wtatParamEnq` invoke APDU has been sent to the Authentication Server PINX.

6.4.4 States at the Visitor PINX for execution of SS-WTAT

The procedures for the Visitor PINX for execution of SS-WTAT are written in terms of the following conceptual states existing within the SS-WTAT Supplementary Service Control entity in that PINX in association with a particular request for authentication of a WTM user.

6.4.4.1 State `WtatVisitExecIdle`

Execution of SS-WTAT is not in progress.

6.4.4.2 State `WtatVisitExecuting`

An `authWtmUser` invoke APDU has been received from the Home PINX and execution of SS-WTAT is in progress.

6.4.5 States at the Visitor PINX for requesting authentication parameters

The procedures for the Visitor PINX for requesting authentication parameters are written in terms of the following conceptual states existing within the SS-WTAT Supplementary Service Control entity in that PINX in association with a particular request for authentication of a WTM user.

6.4.5.1 State *WtatVisitRequestIdle*

Request for authentication parameters from the Home PINX during SS-WTAT is not in progress.

6.4.5.2 State *WtatVisitRequesting*

A *getWtatParam* invoke APDU has been sent to the Home PINX.

6.4.6 States at the Authentication Server PINX

The procedures for the Authentication Server PINX are written in terms of the following conceptual states existing within the SS-WTAT Supplementary Service Control entity in that PINX in association with a particular request for authentication of a WTM user.

6.4.6.1 State *WtatAuthenticationIdle*

Ready for receipt of a *wtatParamEnq* invoke APDU from the Home PINX.

6.5 SS-WTAT Signalling procedures

Examples of message sequences are shown in annex C.

6.5.1 Actions at the Home PINX for initiation of SS-WTAT

The SDL representation of procedures at the Home PINX for initiation of SS-WTAT is shown in D.1 of annex D.

6.5.1.1 Normal procedures

On determining that SS-WTAT is to be invoked without providing challenge and response values to the Visitor PINX, the Home PINX shall send an *authWtmUser* invoke APDU to the Visitor PINX where element *calcWtatInfo* is omitted.

On determining that the SS-WTAT is to be invoked with challenge and response values provided to the Visitor PINX, the Home PINX shall use the procedures of 6.5.3 for enquiry to the Authentication Server PINX to fetch challenge and response values. On receipt of challenge and response values from the Authentication Server PINX, the Home PINX shall send an *authWtmUser* invoke APDU to the Visitor PINX containing the element *calcWtatInfo*.

The *authWtmUser* invoke APDU shall be sent to the Visitor 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 Home PINX shall enter state *WtatHomeInitiating* and start timer T1.

On receipt of the *authWtmUser* return result APDU, the Home PINX shall stop timer T1 and enter state *WtatHomeInitIdle*.

NOTE 1 Confirmation of the authentication of the WTM user should be indicated to the initiating entity.

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

6.5.1.2 Exceptional procedures

On receipt of an *authWtmUser* return error or reject APDU from the Visitor PINX, the Home PINX shall stop timer T1 and enter state *WtatHomeInitIdle*.