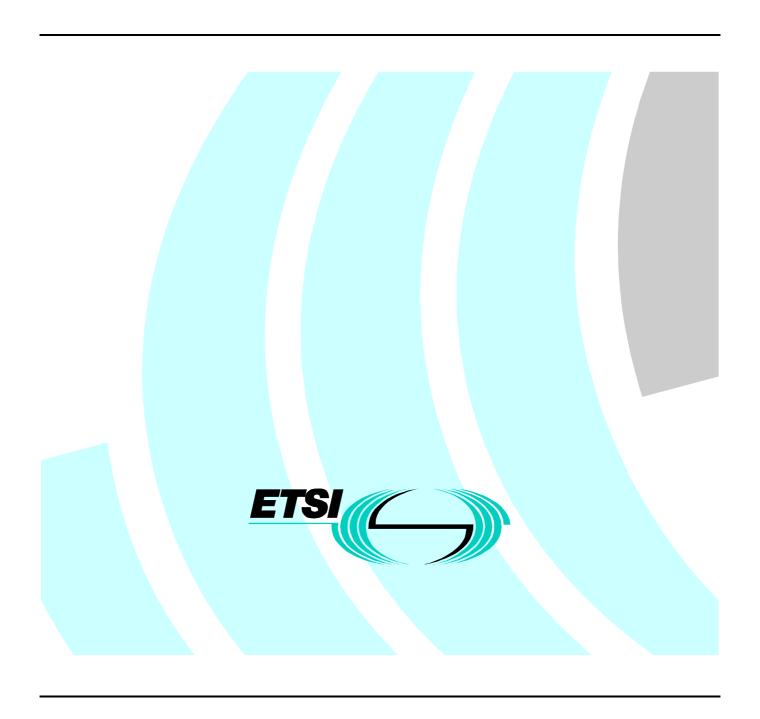# ETSI TR 101 794 V1.1.1 (2000-03)

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Foreword

This Technical Report (TR) has been produced by European Computer Manufacturers Association (ECMA) on behalf of its members and those of the European Telecommunications Standards Institute (ETSI).

1 Scope

The present document identifies various requirements for a mobility service that allow users with Wireless Terminals (WTs) to freely move beyond the domain of their home network and still be able to access the telecommunication services of their own Private Integrated Services Network (PISN), also called the home network. The WTM service described in the present document builds upon/extends the WTM service defined for a single PISN found in the following standards:

- ISO/IEC 15428 Wireless Terminal Location Registration supplementary services;

- ISO/IEC 15430 Wireless Terminal Call Handling supplementary services;

- ISO/IEC 15432 Wireless Terminal Authentication supplementary services.

The intended use of each of the requirements is briefly described in the present document. The requirements are restricted to a WTM service that is provided to private WTM users only regardless where the WTM user may be roaming in his own PISN, to another PISN or into a public telecommunications network supporting WTM.

Inter-working in terms of mobility (e.g. roaming, which may imply identification, authentication and location handling) with analogue networks is outside the scope of the present document.

Requirements for CTM users roaming from a public network into a PISN are, however, outside the scope of the present document.

The document also indicates how some of the requirements may be put together in order to provide a WTM service of a certain ambition level.

Charging principles are not discussed in the present document.

The present document also contains a roadmap for converting existing regional and international standards for wireless terminal mobility in private networks into a unified set of international standards. The proposed roadmap also suggests how new international standards within this filed should be developed.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies.

- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

[1]   ECMA-215 (1997-09): "Private Integrated Services Network (PISN) - Cordless Terminal Mobility (CTM) - Inter-Exchange Signalling Protocol - Cordless Terminal Incoming Call Additional Network Feature (QSIG-CTMI)".

[2]   ECMA-216 (1997-09): "Private Integrated Services Network (PISN) - Cordless Terminal Mobility (CTM) - Inter-Exchange Signalling Protocol - Cordless Terminal Location Registration Supplementary Service (QSIG-CTLR)".

[3]   ECMA-233 (1997-09): "Private Integrated Services Network (PISN) - Cordless Terminal Mobility (CTM) - Inter-Exchange Signalling Protocol - Cordless Terminal Outgoing Call Additional Network Feature (QSIG-CTMO)".

[4]   ECMA-243 (1997-09): "Private Integrated Services Network (PISN) - Cordless Terminal Mobility (CTM) - Inter-Exchange Signalling Protocol - Cordless Terminal Authentication Supplementary Services (QSIG-CTAU)".

[5]   ETSI EG 201 620 (V1.1): "Intelligent Networks (IN); Security studies for Cordless Terminal Mobility (CTM)".

[6]   ETSI EG 202 102 (V1.2): "Private Integrated Services Network (PISN); Service profiles of mobile PISN users; General requirements".

[7]   ETSI ES 201 095 (V1.1): "Cordless Terminal Mobility (CTM); Numbering and identification".

[8]   ETSI ETS 300 415 (1996): "Private Integrated Services Network (PISN); Terms and definitions".

[9]   ETSI ETS 300 691 (1996): "Private Integrated Services Network (PISN); Cordless Terminal Mobility (CTM); Location handling services; Service description".

[10]   ETSI ETS 300 692 (1996): "Private Integrated Services Network (PISN); Cordless Terminal Mobility (CTM); Location handling services; Functional capabilities and information flows".

[11]   ETSI ETS 300 693 (1996): "Private Integrated Services Network (PISN); Inter-exchange signalling protocol; Cordless Terminal Location Registration (CTLR) supplementary service".

[12]   ETSI ETS 300 693/C1 (1998): "Private Integrated Services Network (PISN); Inter-exchange signalling protocol; Cordless Terminal Location Registration (CTLR) supplementary service".

[13]   ETSI ETS 300 694 (1996): "Private Integrated Services Network (PISN); Cordless Terminal Mobility (CTM); Call handling additional network features; Service description".

[14]   ETSI ETS 300 695 (1996): "Private Integrated Services Network (PISN); Cordless Terminal Mobility (CTM); Call handling additional network features; Functional capabilities and information flows".

[15]   ETSI ETS 300 696 (1996): "Private Integrated Services Network (PISN); Inter-exchange signalling protocol; Cordless Terminal Incoming Call additional network feature".

[16]   ETSI ETS 300 816 (1998): "Private Integrated Services Network (PISN); Cordless Terminal Mobility (CTM); Handover Additional Network Feature (ANF); Service description".

[17]   ETSI ETS 300 817 (1998): "Private Integrated Services Network (PISN); Cordless Terminal Mobility (CTM); Handover Additional Network Feature (ANF); Functional capabilities and information flows".

[18]   ETSI I-ETS 300 768 (1997): "Private Integrated Services Network (PISN); Cordless Terminal Mobility (CTM); Authentication; Service description".

[19]   ETSI I-ETS 300 769 (1997): "Private Integrated Services Network (PISN); Cordless Terminal Mobility (CTM); Authentication; Functional capabilities and information flows".

[20]   ETSI I-ETS 300 808 (1997): "Private Integrated Services Network (PISN); Cordless Terminal Mobility (CTM); Inter-exchange signalling protocol; Cordless terminal outgoing call additional network feature".

[21]   ETSI I-ETS 300 809 (1997): "Private Integrated Services Network (PISN); Cordless Terminal Mobility (CTM); Inter-exchange signalling protocol; Cordless terminal authentication supplementary services".

[22]   ISO/IEC 11571:1998: "Information technology - Telecommunications and information exchange between systems - Private Integrated Services Networks - Addressing".

[23]   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".

[24] 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)".

[25] 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".

[26] 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".

[27] 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".

[28] ISO/IEC 15431:1999: "Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Inter-exchange signalling protocol - Wireless terminal call handling additional network features".

[29] 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)".

[30] ISO/IEC 15433:1999: "Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Inter-exchange signalling protocol - Wireless Terminal Authentication supplementary services".

[31] ITU-T Recommendation E.164 (1997): "The international public telecommunication numbering plan".

[32] ITU-T Recommendation E.212 (1998): "The international identification plan for mobile terminals and mobile users".

[33] ITU-T Recommendation I.210 (1993): "Principles of telecommunication services supported by an ISDN and the means to describe them".

[34] ITU-T Recommendation I.112 (1993): "Vocabulary of terms for ISDNs".

3 Definitions and abbreviations

3.1 External definitions

The following external definitions apply:

Address	ISO/IEC 11571 [22]
Additional Network Feature (ANF)	ISO/IEC 15428 [25]
Basic call	ISO/IEC 11574 [23]
Call	ISO/IEC 11574 [23]
Home Data Base	ISO/IEC 15428 [25]
Integrated Services Digital Network (ISDN)	ITU-T Recommendation I.112 [34]
Number	ISO/IEC 11571 [22]
Private Integrated Services Network (PISN)	ISO/IEC 11579-1 [24]
PISN number	ISO/IEC 11579-1 [24]
Private Integrated services Network Exchange (PINX)	ISO/IEC 11579-1 [24]
Supplementary Service	ITU-T Recommendation I.210 [33]
User	ISO/IEC 11574 [23]

3.2   Internal definitions

3.2.1   Access rights

An indication that the wireless terminal has appropriate access allowances to the WTM service.

3.2.2   Authentication

A property by which the correct identity of an entity or party is established with a required assurance.

3.2.3   Call Completion WTM user Not Reachable

An optional subscription service that allows completion of calls to a WTM user that previously was unreachable because the mobile station was switched off, detached or outside radio coverage.

3.2.4   Call Forwarding WTM user Not Reachable

An optional subscription service that directs incoming calls to an answering position whenever the mobile station can not be reached because it is switched off, detached or outside radio coverage.

3.2.5   Calling user

The entity that originates a call to a user.

3.2.6   Coverage area

The area over which reliable radio communication can be established and maintained.

3.2.7   CTM user

A user whose CTM service is provided by a service provider to the general public.

3.2.8   Fixed Part (FP)

A physical grouping that contains all of the WT processes and procedures on the fixed side on the WT air interface. A FP contains the logical elements of one Fixed Radio Termination, plus additional implementation specific elements.

3.2.9   Handover

The process of switching a call in progress from one physical channel to another physical channel.

3.2.10   Location area

The area where a mobile station may receive calls as the result of a single location registration.

3.2.11   Mobile station

A generic term for any type of mobile terminal.

3.2.12   Network operator

An organization that provides the network operating elements and resources for the execution of the applicable service(s).

3.2.13   Optional service feature

An optional function added to a service in order to enhance the service offering.

3.2.14   Private

An attribute indicating that the application of the so qualified item, e.g. a network, a unit of equipment, a service, is offered to or is in the interest of a determined set of users.

NOTE: The term does not include legal or regulatory aspects, nor does it indicate any aspects of ownership.

3.2.15   Private User Mobility (PUM)

A service whereby the static relationship between the user and the terminal providing the telecommunications services is abandoned. PUM makes it possible for the user to change terminal, wired or wireless, whilst retaining the telecommunications services. This change of terminal may take place between calls or during an established call.

NOTE: The intent of PUM is to associate services with users and not terminals. However, the services provided may be limited by the capabilities of the particular terminal at which the user registers.

3.2.16   Public

An attribute indicating that the application of the so qualified item, e.g. a network, a unit of equipment, a service, is offered to the general public.

NOTE: The term does not include legal or regulatory aspects, nor does it indicate any aspects of ownership.

3.2.17   Public ISDN

A public telecommunication network that supports public ISDN services.

3.2.18   Roaming

The movement, without a call in progress of a wireless terminal, from one coverage area to another coverage area.

3.2.19   Service

A telecommunication function that is offered to a customer in order to satisfy a telecommunication requirement.

3.2.20   Service feature

A specific aspect of a telecommunication service that can also be used in conjunction with other telecommunication services or service features as part of a commercial offering. It is either a mandatory part of a telecommunication service or an optional part offered as an enhancement to a telecommunication service.

3.2.21   Service provider

An organization offering a service for subscription. The network operator may be the service provider.

3.2.22   Service profile

A user specific record containing all the services and service options that a user can use.

3.2.23   Service subscriber

A human or organization that subscribes to the service(s) offered by a Service Provider.

3.2.24   Visitor Database (VDB)

The database in which location information concerning a wireless terminal or a mobile user is stored, as long as the wireless terminal or the mobile user is localized in the corresponding visitor area.

3.2.25   Visitor area

The coverage area of a visitor database.

3.2.26   WTM Location area

The area in which a wireless terminal may receive calls as the result of a single location registration.

3.2.27   WTM Location deregistration

A process whereby the wireless terminal is made temporarily unavailable for incoming calls.

3.2.28   WTM Location registration

A process whereby the position of a wireless terminal is determined to the level of one Location Area.

3.2.29   Wireless Terminal Mobility-Authentication of Network

A supplementary service that enables a served WTM user, as a security measure, to validate the identity of the PISN.

3.2.30   Wireless Terminal Mobility-Authentication of Terminal

A supplementary service that enables a PISN, as a security measure, to validate the identity provided by the WTM user.

3.2.31   WTM user

A user whose WTM service provider is with a PISN.

3.2.32   Wireless Terminal Mobility number

A number that uniquely identifies a WTM user (e.g., the WTM user's PISN number or an E.164 [31] number (ITU-T Recommendation E.164 [31]) and which is used by the Calling user to address the call to the WTM user.

3.2.33   Wireless Terminal Mobility User (WTM user)

A user, primarily a human, of a wireless terminal, but also including those entities within both the wireless terminal and Fixed Part (FP) that act on behalf of the user to provide protocol translation and autonomous actions such as location registration requests and responses to authentication requests.

3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

ANF	Additional Network Feature
ANF-WTMI, WTMI	Additional Network feature- Wireless Terminal Mobility Incoming Call
ANF-WTMO, WTMO	Additional Network feature- Wireless Terminal Mobility Outgoing Call
ANF-WTH, WTH	Additional network feature - Wireless Terminal Handover
CCNRc, SS-CCNRc	Call Completion WTM user Not Reachable
CFNRc, SS-CFNRc	Call Forwarding WTM user Not Reachable
CT, SS-CT	Call transfer
CTM	Cordless Terminal Mobility
ETSI	European Telecommunications Standards Institute
FP	Fixed Part
HDB	Home Data Base
IEC	International Electrotechnical Commission
ISDN	Integrated Services Digital Network
ISO	International Organization for Standardization
ITU	International Telecommunication Union
ITU-T	Telecommunication Standardization Sector of ITU
MS	Mobile station
PINX	Private Integrated services Network Exchange
PISN	Private Integrated Services Network
PSTN	Public Switched Telephone Network
PUM	Private User Mobility
SMS	Short Message Service
VDB	Visitor Data Base
WT	Wireless Terminal
WTAN, SS-WTAN,	Supplementary Service- Wireless Terminal Mobility Authentication of Network
WTAT, SS-WTAT	Supplementary Service- Wireless Terminal Mobility Authentication of Terminal
WTINFO, ANF-WTINFO	Additional Network Feature Wireless Terminal Information Exchange
WTLR, SS-WTLR,	Supplementary Service- Wireless Terminal Mobility Location registration
WTM	Wireless Terminal Mobility

4 Description

The intention of the Wireless Terminal Mobility (WTM) service is to enable WTM users with a single service subscription, to make and/or receive calls regardless of the WTM user's current location if:

- radio coverage is provided;

- a roaming agreement exists between the service providers and/or network operators;

- the WTM user has access rights to the relevant radio system.

WTM may be considered as a new "telecommunication service" in a PISN rather than a new supplementary service. However, a particular WTM service offering may be composed of one or more WTM specific supplementary services or ANFs according to the requirements of the service/network provider. This makes it possible to tailor a WTM service offering to specific needs of an organization or user. The present document makes no attempt to mandate any specific implementation of a WTM service but identifies and briefly describes some features that may be combined to offer a WTM service. The Technical Report also suggests some combinations of these requirements in order to provide a complete WTM service according to a specific ambition level.

Ideally the users of the WTM service should not see any differences in the service behaviour due to their current location. It may, however, be a problem for the visited network to identify the WTM user and to determine the correct PISN by the identity provided by the cordless terminal. Further studies are therefore required on PISN and wireless terminal identifiers, see 4.6.5.

The number used to call a roaming WTM user, should be independent of the called WTM user's location i.e., the calling party should not need to know where the called party is currently located. Similarly the visiting WTM user should always have access to the numbering plan and escapes codes of his home network at the visited location. This implies the use of a standardized numbering scheme e.g., ITU-T Recommendation E.164 [31] or the development of features that allows the use of the PISN numbering scheme in a visited network.

> NOTE: The term Wireless Terminal Mobility (WTM) is used throughout the present document in order to differentiate from Cordless Terminal Mobility (CTM) that is a similar service, specified by the European Telecommunications Standards Institute (ETSI), for subscribers of a public telecommunication networks. However, in some old standards the term CTM was also used for the wireless terminal mobility in a single PISN. It is therefore recommended that all relevant standards for PISNs be updated to show this modification thus avoiding any possible confusion with the public CTM service.

Many of the new services identified for WTM in the present document are also relevant for Private User Mobility (PUM). It is therefore suggested that, wherever possible, common standards are developed for the WTM and PUM services rather than duplicating the services in separate WTM and PUM standards.

4.1   Location functions

Location registration functions are used to keep the WTM user's home network updated of the WTM users last known location area within the home PISN or in a visited network.

A WTM service may be implemented by manually invoking the location registration function. However, it is recommended that the WTM service is based on automatic invocation of location registration as this will make the service more user friendly.

4.1.1   WTM Location Registration (WTLR)

Location Registration is a process enabling WTM users to register their current location area with the user's Home Data Base (HDB) thus allowing fast delivery of incoming calls to the WTM user. As an additional service feature, the location registration process may be enhanced by a transfer of the WTM user's service profile to the visited location. The recognition of the WTM user as a valid user is made by an analysis of the WTM identity provided by the WTM user to the visited network during the location registration process. This identity may be the WTM user's PISN number, a standardized terminal identifier or an identifier automatically assigned to the WTM user by the network.

Table 1A: WTM Location Registration standards for the single PISN scenario

Standards organization	Stage 1	Stage 2	Stage 3
ETSI	ETS 300 691 [9]	ETS 300 692 [10]	ETS 300 693 [11]
ECMA	Not applicable (ETS 300 691 [9])	Not applicable (ETS 300 692 [10])	ECMA-216 [2]

Table 1B: International WTM Location Registration standards for the single PISN scenario

Standards organization	Stage 1	Stage 2	Stage 3
ISO/IEC	ISO/IEC 15428 [25]	ISO/IEC 15428 [25]	ISO/IEC 15429 [26]

The standards listed in table 1B build upon and extend the ETSI/ECMA standards in table 1A but, the ETSI stage 1 and 2 services identified in table 1A above contain, in addition to Location Registration, also the service "Transfer of Service Profile details". However, this service was not included in the ECMA-216 [2] and the ETSI 300 693 [11] (stage 3) standards.

The ISO standards contain, instead of "Transfer of Service Profile details", another service called ANF-Wireless Terminal Information Exchange (ANF-WTINFO) that only supports Transfer of Route restriction information in the first issue of the standards. See 4.4.2 for more information on the service "Transfer of Service Profile details".

Table 2: WTM Location Registration standards for the inter networking scenario

Standards organization	Stage 1	Stage 2	Stage 3
ETSI	Endorsement of ISO/IEC standard when available	Endorsement of ISO/IEC standard when available	Endorsement of ISO/IEC standard when available
ECMA	Work in progress	Work in progress	Work in progress
ISO/IEC	Candidate for fast tracking of ECMA standard	Candidate for fast tracking of ECMA standard	Candidate for fast tracking of ECMA standard

4.1.2   WTM Location De-registration

Location De-registration is a process that may be used to make a WTM user temporarily unavailable, e.g., when the WTM user is unable to use the WTM service. Having invoked this service, an incoming call to the WTM user can be informed that the call can not be delivered to the called WTM user. The Location-De-registration is cancelled as soon as the WTM user makes another Location Registration.

Table 3A: WTM Location De-registration standards for the single PISN scenario

Standards organization	Stage 1	Stage 2	Stage 3
ETSI	ETS 300 691 [9]	ETS 300 692 [10]	ETS 300 693 [11] .
ECMA	Not applicable (ETS 300 691 [9])	Not applicable (ETS 300 692 [10])	ECMA-216 [2] .

Table 3B: International WTM Location De-registration standards for the single PISN scenario

Standards organization	Stage 1	Stage 2	Stage 3
ISO/IEC	ISO/IEC 15428 [25]	ISO/IEC 15428 [25]	ISO/IEC 15429 [26]

The standards listed in table 3B build upon and extend the ETSI/ECMA standards in table 3A but the ETSI stage 1 and 2 services identified in table 3A above contain, in addition to Location De-Registration, also the service "Transfer of Service Profile details". However, this service was not included in the ECMA-216 [2] and ETS 300 693 [11] (stage 3) standards.

The ISO standards contain, instead of "Transfer of Service Profile details" another service called ANF-Wireless Terminal Information Exchange (ANF-WTINFO) that only supports Transfer of Route restriction information in the first issue of the standards. See 4.4.2 for more information on the service "Transfer of Service Profile details".

Table 4: WTM Location De-registration standards for the inter networking scenario

Standards organization	Stage 1	Stage 2	Stage 3
ETSI	Endorsement of ISO/IEC standard when available	Endorsement of ISO/IEC standard when available	Endorsement of ISO/IEC standard when available
ECMA	Work in progress	Work in progress	Work in progress
ISO/IEC	Candidate for fast tracking of ECMA standard	Candidate for fast tracking of ECMA standard	Candidate for fast tracking of ECMA standard

4.2   Call handling functions

4.2.1   WTM Incoming call (WTMI)

Incoming call handling allows calls to be routed to the called WTM user's registered location area based on the WTM user's PISN address. This address may be its PISN number or a globally unique identity, e.g., an E.164 [31] number (ITU-T Recommendation E.164 [31]) In the single PISN scenario case it is recommended to use the WTM user's PISN number. Prior to delivering of the call it should, however, be possible to perform a service validation in order to verify that the WTM user actually is permitted to receive the call.

Table 5A: WTM Incoming call handling standards for the single PISN scenario

Standards organization	Stage 1	Stage 2	Stage 3
ETSI	ETS 300 694 [13]	ETS 300 695 [14]	ETS 300 696 [15]
ECMA	Not applicable (ETS 300 694 [13])	Not applicable (ETS 300 695 [14])	ECMA-215 [1]

Table 5B: International WTM Incoming call handling standards for the single PISN scenario

Standards organization	Stage 1	Stage 2	Stage 3
ISO/IEC	ISO/IEC 15430 [27]	ISO/IEC 15430 [27]	ISO/IEC 15431 [28]

The standards listed in table 5B build upon and extend the ETSI/ECMA standards in table 5A.

Table 6: WTM Incoming call handling standards for the inter networking scenario

Standards organization	Stage 1	Stage 2	Stage 3
ETSI	Endorsement of ISO/IEC standard when available	Endorsement of ISO/IEC standard when available	Endorsement of ISO/IEC standard when available
ECMA	Work in progress	Work in progress	Work in progress
ISO/IEC	Candidate for fast tracking of ECMA standard	Candidate for fast tracking of ECMA standard	Candidate for fast tracking of ECMA standard

4.2.2   WTM Outgoing call (WTMO)

Outgoing call handling is a capability provided to a WTM user in order to initiate calls from its current location area. Preferably outgoing calls should be set up by use of the home PINX's dialling plan. Service validation, either at the visited location or by the home PINX, should be possible in order to verify that the WTM user is permitted to use the requested services.

NOTE: Outgoing WTM calls are possible from the visited location without a location registration update. However, the present document recommends that Outgoing calls only should be allowed after, or in conjunction with, a Location Registration as this allows a validation of the call set-up request to take place before seizure of network resources.

Table 7A: WTM Outgoing call handling standards for the single PISN scenario

Standards organization	Stage 1	Stage 2	Stage 3
ETSI	ETS 300 694 [13]	ETS 300 695 [14]	I-ETS 300 808 [20]
ECMA	Not applicable (ETS 300 694 [13])	Not applicable (ETS 300 695 [14])	ECMA-233 [3]

Table 7B: International WTM Outgoing call handling standards for the single PISN scenario

Standards organization	Stage 1	Stage 2	Stage 3
ISO/IEC	ISO/IEC 15430 [27]	ISO/IEC 15430 [27]	ISO/IEC 15431 [28]

The standards listed in table 7B build upon and extend the ETSI/ECMA standards in table 7A.

Table 8: WTM Outgoing call handling standards for the inter networking scenario

Standards organization	Stage 1	Stage 2	Stage 3
ETSI	Endorsement of ISO/IEC standard when available	Endorsement of ISO/IEC standard when available	Endorsement of ISO/IEC standard when available
ECMA	Work in progress	Work in progress	Work in progress
ISO/IEC	Candidate for fast tracking of ECMA standard	Candidate for fast tracking of ECMA standard	Candidate for fast tracking of ECMA standard

4.2.3   WTM Handover (WTH)

Handover is a service that is intended to maintain an active call as the terminal moves within the limits of radio coverage, available network resources and access rights. Due to the complexity of this service it is recommended to develop the standards in three steps.

The first step was to write a standard for handover between radio coverage areas within a single PINX. As the handover in this case is totally within one PINX, a network signalling protocol standard is not needed.

The second step should be to write standards covering the scenario where the radio coverage areas are associated with two different exchanges within one single network.

The third and last step is to write standards covering handover between radio coverage areas associated with exchanges in two different networks. Handover that needs support of two or more switching elements and/or networks is so complex that the time it takes to do the switch over may be too long to maintain the connection. Consequently, active calls may therefore be interrupted and in some cases also be disconnected. Therefore mechanisms should be included in the standard that can inform the users that the call may be disconnected thus allowing the WTM user to remain in the current location area.

Some types of calls, e.g., Data calls, are more susceptible to breaks and disturbances in the connection path than voice. It is therefore recommended that handover may be conditional upon a check of the type of call indication.

Table 9: WTM standards for Handover within a single PINX

Standards organization	Stage 1	Stage 2	Stage 3
ETSI	ETS 300 816 [16]	ETS 300 817 [17]	Not applicable
ECMA	Not applicable	Not applicable	Not applicable
ISO/IEC	Not applicable	Not applicable	Not applicable

Table 10: WTM standards for Handover between PINXs in one single PISN

Standards organization	Stage 1	Stage 2	Stage 3
ETSI	Endorsement of ISO/IEC standard when available	Endorsement of ISO/IEC standard when available	Endorsement of ISO/IEC standard when available
ECMA	Work in progress	Work in progress	Work in progress
ISO/IEC	Candidate for fast tracking of ECMA standard	Candidate for fast tracking of ECMA standard	Candidate for fast tracking of ECMA standard

Table 11: WTM standards for Handover between networks

Standards organization	Stage 1	Stage 2	Stage 3
ETSI	Endorsement of ISO/IEC standard when available	Endorsement of ISO/IEC standard when available	Endorsement of ISO/IEC standard when available
ECMA	New service recommended	New service recommended	New service recommended
ISO/IEC	Candidate for fast tracking of ECMA standard	Candidate for fast tracking of ECMA standard	Candidate for fast tracking of ECMA standard

4.2.4   Emergency call

The Emergency call service is intended to allow WTM user, without access rights, to call a predefined emergency number via any compatible radio access. As a part of this service, the network should remember the WTM user's identity and the address of the radio base station used to access the service. These types of calls should be routed to an emergency centre associated with the ingress exchange, and if possible, given a priority break down functions as well as means to protect the call from being disconnected by other calls.

The geographical location of the base station used to set up the emergency call should either be included as a part of the call set-up information or retrievable by the emergency centre upon request.

As this service relates to any terminal belonging to a PISN, the network signalling protocol standards may need an update in order to support emergency calls in private networks.

Furthermore, the emergency call service may require an update of the relevant radio standards in order to allow unknown wireless terminals to access a telecommunication network.

Table 12: Emergency call handling standards for the single PISN scenario

Standards organization	Stage 1	Stage 2	Stage 3
ETSI	New service recommended	New service recommended	New service recommended
ECMA	New service recommended	New service recommended	New service recommended
ISO/IEC	New service recommended	New service recommended	New service recommended

Table 13: Emergency call handling standards for the inter networking scenario

Standards organization	Stage 1	Stage 2	Stage 3
ETSI	New service recommended	New service recommended	New service recommended
ECMA	New service recommended	New service recommended	New service recommended
ISO/IEC	New service recommended	New service recommended	New service recommended

NOTE: Public regulatory bodies may mandate Support of emergency services in the future also for private networks. Therefore the PISN might be required to support the public emergency service and/or to be able to route emergency calls to the public emergency centres.

4.3   Security functions

Any radio based system is, by nature, vulnerable to unauthorized use or eavesdropping. This fact requires development of various security mechanisms both at the radio side as well as in the network. However, the present document is limited to those problems that are directly related to the radio link itself, see 4.3.1, 4.3.2 and 4.3.3.

The use of terminals based on radio technologies makes it possible to access both the PISN itself as well as the equipment connected to the PISN from the outside world. Inter-networking of WTM increases the security problems even more. PISN security should therefore be studied in detail in order to clarify possible threats and to find means and functions to minimize the risks. The output of this study should be a technical report that can be used to generate work items for WTM security standards.

NOTE: ETSI has already produced a technical guide, EG 201 620 [5] , on security issues for CTM that could be used as a basis for WTM security studies.

Security mechanisms should be considered both by the network operator and the service provider in order to protect against abuse. Possible security issues can e.g., be:

-   fraudulent use of the WTM service;

-   fraudulent access to the networks and/or systems connected to the networks;

-   eavesdropping;

-   denial of service;

-   data integrity;

-   location confidentiality;

-   correct functionality of services;

-   anonymous use of services;

-   malicious behaviour;

-   etc.

This list of security issues is not complete. It is therefore recommended to initiate a detailed study of all security aspects related to introduction of WTM in a PISN. This study should also include inter-networking of WTM as well as inter-working with the public CTM service.

The service providers/network operators may offer different levels of security to its subscribers but a description of actual security systems to be applied in a network is outside the scope of the present document. As a minimum, the following radio related security mechanisms should be provided.

4.3.1 Authentication of WTM users (WTAT)

Authentication of WTM users is a security mechanism activated by the telecommunication network in order to validate the identity provided by the WTM user. It should be possible to invoke wireless terminal authentication at any time (e.g., for outgoing call, incoming call, handover request, etc.).

Table 14A: Standards for the authentication of WTM users for the single PISN scenario

Standards organization	Stage 1	Stage 2	Stage 3
ETSI	I-ETS 300 768 [18]	I-ETS 300 769 [19]	I-ETS 300 809 [21]
ECMA	Not applicable (I-ETS 300 768 [18])	Not applicable (I-ETS 300 769 [19])	ECMA-243 [4]

Table 14B: Standards for the authentication of WTM users for the single PISN scenario

Standards organization	Stage 1	Stage 2	Stage 3
ISO/IEC	ISO/IEC 15432 [29]	ISO/IEC 15432 [29]	ISO/IEC 15433 [30]

The standards listed in table 14B build upon and extend the ETSI/ECMA standards in table 14A.

Table 15: Standards for the authentication of WTM users for the inter networking scenario

Standards organization	Stage 1	Stage 2	Stage 3
ETSI	Endorsement of ISO/IEC standard when available	Endorsement of ISO/IEC standard when available	Endorsement of ISO/IEC standard when available
ECMA	Work in progress	Work in progress	Work in progress
ISO/IEC	Candidate for fast tracking of ECMA standard	Candidate for fast tracking of ECMA standard	Candidate for fast tracking of ECMA standard

4.3.2 Authentication of the telecommunication network (WTAN)

Authentication of the telecommunication network is a security mechanism activated by the WTM user in order to validate the identity of the network in order to avoid the terminal to log on a wrong network and/or revealing confidential information. WTAN should be possible to invoke at any time (e.g., for location registration, outgoing call, incoming call, handover request, etc.).

Table 16A: Standards for the authentication of telecommunication networks for the single PISN scenario

Standards organization	Stage 1	Stage 2	Stage 3
ETSI	I-ETS 300 768 [18]	I-ETS 300 769 [19]	I-ETS 300 809 [21]
ECMA	Not applicable (I-ETS 300 768 [18])	Not applicable (I-ETS 300 769 [19])	ECMA-243 [4]

Table 16B: International standards for the authentication of telecommunication networks for the single PISN scenario

Standards organization	Stage 1	Stage 2	Stage 3
ISO/IEC	ISO/IEC 15432 [29]	ISO/IEC 15432 [29]	ISO/IEC 15433 [30]

The standards listed in table 16B build upon and extend the ETSI/ECMA standards in table 16A.

**Table 17: Standards for the authentication of telecommunication network
for the inter networking scenario**

Standards organization	Stage 1	Stage 2	Stage 3
ETSI	Endorsement of ISO/IEC standard when available	Endorsement of ISO/IEC standard when available	Endorsement of ISO/IEC standard when available
ECMA	Work in progress	Work in progress	Work in progress
ISO/IEC	Candidate for fast tracking of ECMA standard	Candidate for fast tracking of ECMA standard	Candidate for fast tracking of ECMA standard

4.3.3   Encryption of user data and signalling information

Encryption is a security mechanism by which the WTM user's data and signalling information is encrypted over the air interface in order to protect them from eavesdropping. Such functions should be provided by the relevant radio technologies. If not, the use of the particular radio system for the WTM service is not recommended for a PISN. Encryption in the fixed part of the PISN is outside the scope of the present document. However, in the case of inter networking it is suggested that encryption of user data is supported.

Table 18: Encryption standards for the single PISN scenario

Standards organization	Stage 1	Stage 2	Stage 3
ETSI	According to the functions of the relevant radio technology	According to the functions of the relevant radio technology	According to the functions of the relevant radio technology
ECMA	Not applicable	Not applicable	Not applicable
ISO/IEC	Not applicable	Not applicable	Not applicable
ECMA	Initiate studies in order to clarify security issues in general for a single PISN when introducing WTM. Proposed output: Technical report		

Table 19: Encryption standards for the inter networking scenario

Standards organization	Stage 1	Stage 2	Stage 3
ETSI	New service recommended	New service recommended	New service recommended
ECMA	New service recommended	New service recommended	New service recommended
ISO/IEC	New service recommended	New service recommended	New service recommended
ECMA	Initiate studies in order to clarify security issues in general for inter-networking of WTM. Proposed output: Technical report		

4.4   Access to supplementary services for roaming WTM users

4.4.1   General

Any user in a PISN may choose to use either a fixed terminal or a Wireless terminal in order to access his or her telecommunication services. There should also be possible to use both types of terminals with the same PISN number without changes in the available services or user procedures. However, this may not always be possible for Wireless terminals accessing the network via a visiting PINX provided the service logic is with the visited location.

For each user in a PISN, information regarding availability of supplementary services and other facilities (e.g., call barring) is stored by the network. Usually such information will be kept by the user's Home PINX. This information is referred to as the user's service profile. This information must be accessible at or from the WTM user's current location in order to provide the roaming WTM user his normal set of services and a consistent way of operating his/her services. If the visitor PINX is going to provide the service logic this implies that this exchange needs to be supporting the same services as the home PINX. It may also require a uniform numbering scheme throughout the network in order to avoid confusion. If not, the call must be forwarded for processing at another location where this is the case e.g., the home PINX. Various solutions to these problems are identified in this section.

The service profile of a WTM user should at least include the following items of information:

- the WTM user's identity;

- the WTM PISN number;

- the name (including organizational classifications such as Department and Location);

- optional services that are available to the user;

- optional services that are not available to the user;

- options that are enabled for each available service;

- options that can be modified by the user;

- user related parameters that are selected for each service (e.g. intrusion protection and capability levels);

- the current activation status of the service, if applicable.

NOTE: The service profile does not contain details of user access procedures such as digit strings to be used to invoke the service. This information is changed infrequently and can be considered to be configuration data. However, in a particular PISN all exchanges should use the same procedures thus avoiding confusion.

Furthermore the service profile can also contain user specific information that can be changed by the user or the network to alter the effect of a particular service provided. Examples of such information are:

- Call diversion address;

- Abbreviated dialling tables;

- Call barring details.

The telephony-related functions available within a PISN can be categorized into two separate groups:

User services:

The services that can be selected and used by individuals to enable them to process incoming and outgoing calls according to their own business requirements. Examples of these services are:

- Call diversion;

- Call transfer.

Organizational management services:

These services can be selected and configured for groups and individuals to provide overall management and control of the use of a PISN. Examples of such services are:

- Call barring;

- Common use abbreviated dialling.

Detailed information on service profiles for roaming users are found in document "Service profiles of mobile PISN users, General requirements" EG 202 102 [6].

The following methods have been identified for access to the WTM user's service profile from a visited location. Which method to be used in a specific implementation of the WTM service is, however, outside the scope of the present document.

4.4.2   Service Profile Transfer

Transfer of Service Profile to the visited location is a supplementary services that transfer the WTM user's service details from the WTM user's home PINX to the visited node/network. If the visitor exchange requires access to the service profile one possibility is to send the information, in part or as a whole, to the visited location. The following options are realistic:

- sending individual items of the service profile as and when required;

- sending information for one or more services as and when required;

- sending the complete service profile e.g., during location registration.

Table 20A: Service Profile Transfer standards for the single PISN scenario

Standards organization	Stage 1	Stage 2	Stage 3
ETSI	ETS 300 691 [9]	ETS 300 692 [10]	Not available
ECMA	New standard recommended	New standard recommended	New standard recommended
ISO/IEC	Candidate for fast tracking of ECMA standard	Candidate for fast tracking of ECMA standard	Candidate for fast tracking of ECMA standard

The standards ETS 300 691 [9] and ETS 300 692 [10] listed in table 20A above actually contain two services. The Location Registration and the "Transfer of Service Profile details". However, as the actual content of the Service Profile never was standardized an ETSI stage 3 for this service has not yet been made. Furthermore the ETSI stages 1 and 2 were not included in the ECMA and ISO/IEC standards (stage 1, 2 and 3).

As the stage 3 of the "Transfer of Service Profile details" standard is dependent of an agreed content of the Service Profile itself, it is recommended that a stage 1 is developed as indicated in table 20B below. No stage 2 and 3 are relevant for the Service Profile.

It is further recommended that the parts of ETS 300 691 [9] and ETS 300 692 [10] that relate to "Transfer of Service Profile details" are extracted from the existing ETSI standards. This information should be put into a new set of ECMA standards that should be fast tracked to ISO/IEC followed by an endorsement of the international standards as ETSI standards prior to withdrawal of ETS 300 691 [9] and ETS 300 692 [10].

Table 20B: Service Profile Content

Standards organization	Stage 1	Stage 2	Stage 3
ETSI	Endorsement of ISO/IEC standard when available	Not applicable	Not applicable
ECMA	New standard recommended	Not applicable	Not applicable
ISO/IEC	Candidate for fast tracking of ECMA standard	Not applicable	Not applicable

Table 21: Service Profile Transfer standards for the inter networking scenario

Standards organization	Stage 1	Stage 2	Stage 3
ETSI	New service recommended	New service recommended	New service recommended
ECMA	New service recommended	New service recommended	New service recommended
ISO/IEC	New service recommended	New service recommended	New service recommended

4.4.3 Signalling enquiry

This supplementary service allows the visited network to request additional instructions from the WTM user's home network if the visited network is unable to process an action related to the visiting WTM user.

Table 22: Signalling enquiry standards for the single PISN scenario

Standards organization	Stage 1	Stage 2	Stage 3
ETSI	Endorsement of ISO/IEC standard when available	Endorsement of ISO/IEC standard when available	Endorsement of ISO/IEC standard when available
ECMA	Work in progress	Work in progress	Work in progress
ISO/IEC	Candidate for fast tracking of ECMA standard	Candidate for fast tracking of ECMA standard	Candidate for fast tracking of ECMA standard

Table 23: Signalling enquiry standards for the inter networking scenario

Standards organization	Stage 1	Stage 2	Stage 3
ETSI	Endorsement of ISO/IEC standard when available	Endorsement of ISO/IEC standard when available	Endorsement of ISO/IEC standard when available
ECMA	Work in progress	Work in progress	Work in progress
ISO/IEC	Candidate for fast tracking of ECMA standard	Candidate for fast tracking of ECMA standard	Candidate for fast tracking of ECMA standard

4.4.4 Remote access

This service enables incoming and outgoing calls to or from the WTM user, and user initiated commands, to be routed via the WTM user's home PINX. In this way the service logic can be provided by the WTM user's home PINX. Consequently the WTM user will experience a consistent man-machine interface in accordance with the information stored in the WTM user's service profile. This method also allows local services supported by the home PINX to be available for roaming WTM users.

Table 24: Remote access standards for the single PISN scenario

Standards organization	Stage 1	Stage 2	Stage 3
ETSI	Endorsement of ISO/IEC standard when available	Endorsement of ISO/IEC standard when available	Endorsement of ISO/IEC standard when available
ECMA	Work in progress	Work in progress	Work in progress
ISO/IEC	Candidate for fast tracking of ECMA standard	Candidate for fast tracking of ECMA standard	Candidate for fast tracking of ECMA standard

Table 25: Remote access standards for the inter networking scenario

Standards organization	Stage 1	Stage 2	Stage 3
ETSI	Endorsement of ISO/IEC standard when available	Endorsement of ISO/IEC standard when available	Endorsement of ISO/IEC standard when available
ECMA	Work in progress	Work in progress	Work in progress
ISO/IEC	Candidate for fast tracking of ECMA standard	Candidate for fast tracking of ECMA standard	Candidate for fast tracking of ECMA standard

4.4.5   Predefined service profiles

Another alternative to support access to the user's range of services, at the visited location, is to provide fixed, network-defined sets of service capabilities. In this case, the transmitted service profile is just a number that identifies which fixed set of capabilities that applies to the WTM user. The profile may also specify the activation status of selected services (if applicable) and the user parameters associated with the selected services (if applicable).

The service profile number could also be stored in the terminal itself, e.g., as part of the service registration information, thus requiring no information to be retrieved from the Home Data Base (HDB).

Table 26: Predefined service profile standards for the single PISN scenario

Standards organization	Stage 1	Stage 2	Stage 3
ETSI	New service recommended	New service recommended	New service recommended
ECMA	New service recommended	New service recommended	New service recommended
ISO/IEC	New service recommended	New service recommended	New service recommended

Table 27: Predefined service profile standards for the inter networking scenario

Standards organization	Stage 1	Stage 2	Stage 3
ETSI	New service recommended	New service recommended	New service recommended
ECMA	New service recommended	New service recommended	New service recommended
ISO/IEC	New service recommended	New service recommended	New service recommended

4.4.6   User management of service profiles

4.4.6.1   Service profile interrogation

This feature allows the WTM user to interrogate the information stored in the WTM user's service profile. This service may be offered with or without the ability of Service profile modification.

Table 28: WTM Service Profile interrogation standards for the single PISN scenario

Standards organization	Stage 1	Stage 2	Stage 3
ETSI	New service recommended	New service recommended	New service recommended
ECMA	New service recommended	New service recommended	New service recommended
ISO/IEC	New service recommended	New service recommended	New service recommended

Table 29: WTM Service Profile interrogation standards for the inter networking scenario

Standards organization	Stage 1	Stage 2	Stage 3
ETSI	New service recommended	New service recommended	New service recommended
ECMA	New service recommended	New service recommended	New service recommended
ISO/IEC	New service recommended	New service recommended	New service recommended

4.4.6.2 Service profile modification

Service profile modification allows a WTM user to remotely access and modify the user-controlled part of the service profile. If supported, this service should be offered together with Service profile interrogation.

Table 30: WTM Service Profile modification standards for the single PISN scenario

Standards organization	Stage 1	Stage 2	Stage 3
ETSI	New service recommended	New service recommended	New service recommended
ECMA	New service recommended	New service recommended	New service recommended
ISO/IEC	New service recommended	New service recommended	New service recommended

Table 31: WTM Service Profile modification standards for the inter networking scenario

Standards organization	Stage 1	Stage 2	Stage 3
ETSI	New service recommended	New service recommended	New service recommended
ECMA	New service recommended	New service recommended	New service recommended
ISO/IEC	New service recommended	New service recommended	New service recommended

4.5 Recommended new WTM specific supplementary services

4.5.1 Call Completion - WTM user Not Reachable (CCNRc)

This is a service that, if the cordless terminal can not be reached e.g., because the terminal is outside radio coverage, turned off, detached, de-registered, etc., reestablishes the path between the calling user and the called WTM user whenever the called WTM makes its location known to the network again. The new location area of the WTM user may differ from the last known location area. This service should not be invoked if the user has invoked Call Forwarding Unconditionally.

Table 32: Call Completion WTM user Not Reachable standards for the single PISN scenario

Standards organization	Stage 1	Stage 2	Stage 3
ETSI	New service recommended	New service recommended	New service recommended
ECMA	New service recommended	New service recommended	New service recommended
ISO/IEC	New service recommended	New service recommended	New service recommended

Table 33: Call Completion Not Reachable standards for the inter networking scenario

Standards organization	Stage 1	Stage 2	Stage 3
ETSI	New service recommended	New service recommended	New service recommended
ECMA	New service recommended	New service recommended	New service recommended
ISO/IEC	New service recommended	New service recommended	New service recommended

4.5.2   Call Forwarding - WTM user Not Reachable (CFNRc)

This is a service that, if the cordless terminal can not be reached e.g., because the terminal is outside radio coverage, turned off, detached, de-registered, etc., routes incoming WTM calls to an answering position determined by the user (e.g. home telephone, answering machine, etc.). This service should not be invoked if the user has invoked Call Forwarding Unconditionally.

NOTE: The user should have the possibility to modify the Call Forwarding Not Reachable from any phone (fixed or mobile) via the Service Profile modification service.

Table 34: Call Forwarding WTM user Not Reachable standards for the single PISN scenario

Standards organization	Stage 1	Stage 2	Stage 3
ETSI	New service recommended	New service recommended	New service recommended
ECMA	New service recommended	New service recommended	New service recommended
ISO/IEC	New service recommended	New service recommended	New service recommended

Table 35: Call Forwarding Not Reachable standards for the inter networking scenario

Standards organization	Stage 1	Stage 2	Stage 3
ETSI	New service recommended	New service recommended	New service recommended
ECMA	New service recommended	New service recommended	New service recommended
ISO/IEC	New service recommended	New service recommended	New service recommended

4.5.3   WTM Message Waiting

This service may be used to inform WTM users about unread messages, e.g., as a part of the location registration process, that messages about calls routed to the CFNRc number are available at the specified message service centre. It is not intended to use this service to also transfer the message itself to the terminal.

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Table 36: WTM Message waiting standards for the single PISN scenario

Standards organization	Stage 1	Stage 2	Stage 3
ETSI	New service recommended	New service recommended	New service recommended
ECMA	New service recommended	New service recommended	New service recommended
ISO/IEC	New service recommended	New service recommended	New service recommended

Table 37: WTM Message waiting standards for the inter networking scenario

Standards organization	Stage 1	Stage 2	Stage 3
ETSI	New service recommended	New service recommended	New service recommended
ECMA	New service recommended	New service recommended	New service recommended
ISO/IEC	New service recommended	New service recommended	New service recommended

4.5.4 Over the Air subscription registration

Over the air subscription registration is a service that enables to exchange subscription details between the WTM user and the network over the air interface. The intended use of this service is to avoid taking the WTM terminal to a maintenance centre when/if the user's subscription needs to be modified or to initiate a new terminal in the network.

Table 38: Over the air subscription registration standards for the single PISN scenario

Standards organization	Stage 1	Stage 2	Stage 3
ETSI	New service recommended	New service recommended	New service recommended
ECMA	New service recommended	New service recommended	New service recommended
ISO/IEC	New service recommended	New service recommended	New service recommended

Table 39: Over the air subscription registration standards for the inter networking scenario

Standards organization	Stage 1	Stage 2	Stage 3
ETSI	New service recommended	New service recommended	New service recommended
ECMA	New service recommended	New service recommended	New service recommended
ISO/IEC	New service recommended	New service recommended	New service recommended

4.6 Recommended WTM specific data service

4.6.1 General

These services allow WTM users to set up or receive Circuit switched and Packet switched data calls via mobile terminals. Calls may originate either in the home PISN or in another network(s) including calls between terminals visiting another network(s).

Handover may be suppressed for Data calls, e.g., by an analysis of the type of call information. However, this may not always be possible due to lack of available radio resources and/or time constraints during the handover sequence.

4.6.2   Circuit Switched Data

WTM circuit switched data services features are characterized by a set of attributes. A telecommunication service attribute is a specific characteristic of that service whose values distinguish it from other telecommunication services. Particular values are assigned in the relevant standards to each attribute when a given telecommunication service is described and defined.

Communication can be established between a terminal in a PISN and a terminal in the same PISN, another PISN or public network including communications between two terminals in a visited network.

Ideally the supporting telecommunications networks should allow the WTM Data services to make use of all possible data rates supported by the appropriate radio technologies, i.e., the PISN/telecommunication networks should not limit the data rates across the air-interface.

As a minimum PISN network signalling standards supporting the following Unrestricted Digital Information (UDI) services over the air-interface should be developed:

- 64 kbit/s;

- 32 kbit/s.

Table 40: WTM standards for Circuit switched data for the single PISN scenario

Standards organization	Stage 1	Stage 2	Stage 3
ETSI	New service recommended	New service recommended	New service recommended
ECMA	New service recommended	New service recommended	New service recommended
ISO/IEC	New service recommended	New service recommended	New service recommended

Table 41: WTM standards for Circuit switched data for the inter networking scenario

Standards organization	Stage 1	Stage 2	Stage 3
ETSI	New service recommended	New service recommended	New service recommended
ECMA	New service recommended	New service recommended	New service recommended
ISO/IEC	New service recommended	New service recommended	New service recommended

4.6.3   Point-to-Point Protocol (PPP) datagram transport

The purpose of the PPP Inter-working Service is to allow dial-up Internet access and general multi-protocol datagram transport. PPP packet transfers on the air interfaces are specified by the relevant radio packet transmission protocols. Inter-working to the PISN or public ISDN networks may be via a number of bearer services.

This service is aimed at applications requiring the transport of PPP packets to a peer entity. A typical application is the on-demand access to an Internet service provider. The air interface is accessed by means of procedures defined by relevant Data services profiles of the appropriate radio technologies thus establishing a point-to-point connection through the transport network.

Table 42: WTM standards for Packet data for the single PISN scenario

Standards organization	Stage 1	Stage 2	Stage 3
ETSI	New service recommended	New service recommended	New service recommended
ECMA	New service recommended	New service recommended	New service recommended
ISO/IEC	New service recommended	New service recommended	New service recommended

Table 43: WTM standards for Packet data for the inter networking scenario

Standards organization	Stage 1	Stage 2	Stage 3
ETSI	New service recommended	New service recommended	New service recommended
ECMA	New service recommended	New service recommended	New service recommended
ISO/IEC	New service recommended	New service recommended	New service recommended

4.6.4   WTM Point-to-Point Short Message Service

The WTM Point-to-Point Short Message Service (SMS) provides a mean for sending messages of limited size to and from mobile terminals as well as fixed terminals. It is anticipated that the SMS makes use of a Service Centre, that acts as a store and forward centre for the short messages.

The location of the PISN Service Centre is outside the scope of the present document. An implementation may choose to have its own centre, use external service centres or use a combination of these. Furthermore as the SMS is already an important service in the public land mobile systems, a PISN could also choose to use an already existing GSM SMS service centre as its own SMS service centre thus simplifying exchange of short messages between public and private networks.

It is possible to split the WTM SMS into two different point-to-point services:
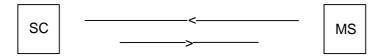
-   mobile originated;

Figure 1: Mobile originated SMS message
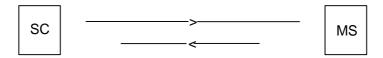
and

-   mobile terminated.

Figure 2: Mobile terminated SMS message

Mobile originated messages are transported from a mobile terminal to a Service Centre. The message may be destined for other mobile users, or for subscribers on a fixed network.

Mobile terminated messages are transported from a Service Centre to a mobile terminal. The messages may have been sent to the Service Centre by other mobile users (e.g., via a mobile originated short message, GSM mobile station, etc.), fixed terminals or by a variety of other sources, e.g. speech, telex, or facsimile.

Table 44: WTM Short message service standards for the single PISN scenario

Standards organization	Stage 1	Stage 2	Stage 3
ETSI	New service recommended	New service recommended	New service recommended
ECMA	New service recommended	New service recommended	New service recommended
ISO/IEC	New service recommended	New service recommended	New service recommended

Table 45: WTM Short message service standards for the inter networking scenario

Standards organization	Stage 1	Stage 2	Stage 3
ETSI	New service recommended	New service recommended	New service recommended
ECMA	New service recommended	New service recommended	New service recommended
ISO/IEC	New service recommended	New service recommended	New service recommended

4.6.5   Other standards related to WTM

Ideally the users of the WTM service should not see any differences in the behaviour of the service just because of a change of location. It may, however, be a problem for the visited network to identify the WTM user and to determine the correct PISN from the WTM identity provided by the cordless terminal.

This problem might be solved by bilateral agreements between the two network operators. However, this is not considered as a practical solution. A standardized WTM identity structure (e.g., like IMSI, ITU-T Recommendation E.212) is therefore recommended when introducing roaming between networks. This problem has been addressed by ETSI in ES 201 095 [7]. However, WTM raises new problems caused by the great number of potential PISNs that might consider implementing WTM. Therefore the solution suggested for the CTM service may not be sufficient for WTM.

Another aspect of the WTM identification is how to administer and assign WTM user identities to PISN network operators, wireless terminal manufacturers and service providers.

These issues therefore need further studies as indicated in table 46 below.

Table 46: Other WTM related standards

Standards organization	Stage 1	Stage 2	Stage 3
ETSI-WTMID	Standardization work on WTM identities recommended	Not applicable	Not applicable
ECMA-WTMID	Standardization work on WTM identities recommended	Not applicable	Not applicable
ISO/IEC-WTMID	Standardization work on WTM identities recommended	Not applicable	Not applicable

5　Packaging of WTM services

In order to help organizations implementing a WTM service of a specific ambition level, it is recommended to develop "profile standards" that specifies which standards that need to be implemented as well as the available options within the standards.

5.1　Roaming within a single PISN

5.1.1　Basic call

This feature package provides a minimum service level and supports only in and outgoing call to/from a roaming Wireless Terminal that roams within the boundaries of a single PISN. Profile standards should be written for Basic Call with at least the following combinations.

5.1.1.1　Basic call with support of Home PINX supplementary services

Support of home PINX supplementary services may be achieved in many ways. At least the following options should be available. However, it is not recommended that more than one option be used at a time in a single PISN:

    a) Remote access;

    b) Signalling enquiry;

    c) Transport of Service Profile to visitor PINX;

    d) Predefined service profiles.

5.1.1.2　Handover between PINXs

Handover between PINXs within a single PISN is a service option that can be offered as an enhancement to service package Basic call with or without the support of supplementary services.

5.1.2　Data calls

Data calls are call unrelated services. Support of voice calls may therefore not be required in Data Terminals. However, it is expected that a voice service may be enhanced with Data calls. Handover may be offered for Data calls, but due to the possibility of breaks in the connection between the terminals and the network a service malfunction may be expected.

5.1.3　Short Message Service (SMS)

The Short Message Service is a call unrelated services that may be combined with voice terminals as well as Data call terminals. Handover is not considered relevant to this service as the reception of a short message always should be acknowledged by the wireless terminal. If the message is not confirmed it should be retransmitted from the message centre.

5.2　Roaming between networks

5.2.1　Basic call

This service package allows for roaming between two PISNs or between a PISN and a public network. The networks may either be directly connected or interconnected via another network (PISN or public network). Roaming into public CTM networks may imply development of inter-working functions between the identification, authentication and location handling processes of the CTM and WTM service. Profile standards should be written for Basic Call with at least the following combinations.

5.2.1.1 Basic call with support of Home PISN supplementary services

Support of supplementary services may be achieved in many ways. At least the following options should be available:

a) Remote access;

b) Signalling enquiry;

c) Transport of Service Profile to visitor PINX;

d) Predefined service profiles.

5.2.1.2 Handover between PISNs

Handover between networks is a service option that can be offered as an enhancement to service package Basic call with or without the support of supplementary services. However, this service should not be given high priority.

5.2.2 Short Message Service (SMS)

The Short Message Service (SMS) is a call unrelated services that may be combined with voice terminals as well as Data call terminals. Handover is not considered relevant to this service as the reception of a short message always should be acknowledged by the wireless terminal. If the message is not confirmed it should be retransmitted from the message centre.

However, this service may fail, as the visited network may not support SMS.

5.2.3 Data calls

Data calls are call unrelated services. Support of voice may therefore not be required in Data Terminals. However, it is expected that a voice service may be enhanced with Data calls.. Handover may be offered for Data calls, but due to the possibility of breaks in the connection between the terminals and the network a service malfunction may be expected.

However, this service may fail, as the visited network may not support Data calls.

6 Interaction with PISN ISDN based supplementary services

Possible interactions with supplementary services in the home or visited PISN should be included in the relevant PISN stage 1 standards for the WTM service.

7 Interaction with ISDN supplementary services

Possible interactions with public ISDN supplementary services should be included in the relevant WTM inter networking WTM standard.

8 Roadmap for the development of WTM standards

WTM standards for PISNs already exist in ETSI, ECMA and ISO/IEC versions. These standards are, from a technical point of view, partly identical but not exact copies of each other. As the goal should be to have only one set of common international standards for WTM, it is suggested to adopt a new procedure for making WTM standards in the future. This does not, however, preclude that the standards may appear under different numbers within the numbering range of each particular standards organization.

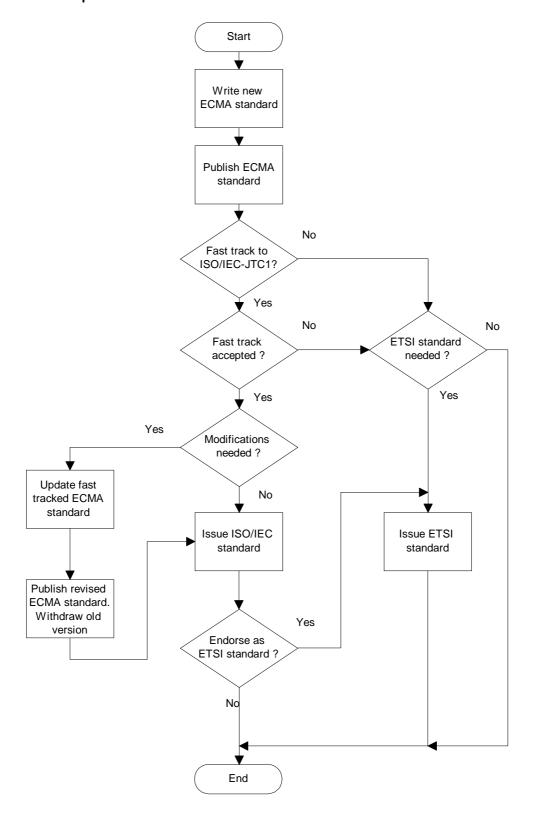## 8.1 Development of new WTM standards

Figure 3: Proposed workflow for new WTM standards

8.2   Proposed handling of old standards

Table 47: Handling of ETSI 's WTM standards on Location Registration/De-registration

Standard	Title	Date issued	Proposed action
ETS 300 691 [9] ed.1	Private Integrated Services Network (PISN); Cordless Terminal Mobility (CTM); Location handling services; Service description	1996-03	To be withdrawn and replaced by endorsement of ISO/IEC 15428 [25] as ETSI standard (see note)
ETS 300 692 [10]	Private Integrated Services Network (PISN); Cordless Terminal Mobility (CTM); Location handling services; Functional capabilities and information flows	1996-04	To be withdrawn and replaced by endorsement of ISO/IEC 15428 [25] as ETSI standard (see note)
ETS 300 693 [11]	Private Integrated Services Network (PISN); Inter-exchange signalling protocol; Cordless Terminal Location Registration (CTLR) supplementary service; ECMA-QSIG-CTLR	1996-03	To be withdrawn and replaced by endorsement of ISO/IEC 15429 [26] as ETSI standard
ETS 300 693/C1 [12] C1 = Corrigendum	Private Integrated Services Network (PISN); Inter-exchange signalling protocol; Cordless Terminal Location Registration (CTLR) supplementary service;	1998-06	To be withdrawn and replaced by endorsement of ISO/IEC 15429 [26] as ETSI standard
NOTE:	The standards ETS 300 691 [9] and ETS 300 692 [10] actually contain two services, the Location Registration and the "Transfer of Service Profile details". However, due to the fact that the content of the Service Profile never was standardized an ETSI stage 3 for this service has not yet been made. For the same reason no ECMA or ISO/IEC standards (stage 1, 2 and 3) exists either. This implies that a cancellation of ETS 300 691 [9] and ETS 300 692 [10] also will erase the "Transfer of Service Profile details" service. In order to preserve this service it is recommended, see 4.4.2, to extract this part of the ETSI standards into a new set of ECMA standards. The new ECMA standards should be processed according to the standard rules i.e., fast tracked to ISO/IEC followed by an endorsement as an ETSI standard before the ETS 300 691 [9] and ETS 300 692 [10] are withdrawn.		

Table 48: Handling of ETSI 's WTM standards on Call Handling

Standard	Title	Date issued	Proposed action
ETS 300 694 [13]	Private Integrated Services Network (PISN); Cordless Terminal Mobility (CTM); Call handling additional network features; Service description	1996-03	To be withdrawn and replaced by endorsement of ISO/IEC 15430 [27] as ETSI standard
ETS 300 695 [14]	Private Integrated Services Network (PISN); Cordless Terminal Mobility (CTM); Call handling additional network features; Functional capabilities and information flows	1996-03	To be withdrawn and replaced by endorsement of ISO/IEC 15430 [27] as ETSI standard
ETS 300 696 [15]	Private Integrated Services Network (PISN); Inter-exchange signalling protocol; Cordless Terminal Incoming Call additional network features; ECMA-QSIG-CTMI	1996-03	To be withdrawn and replaced by endorsement of ISO/IEC 15431 [28] as ETSI standard
I-ETS 300 808 [20]	Private Integrated Services Network (PISN); Cordless Terminal Mobility; Inter-exchange signalling protocol; Cordless terminal outgoing call additional network features	1997-07	To be withdrawn and replaced by endorsement of ISO/IEC 15431 [28] as ETSI standard

Table 49: Handling of ETSI's WTM standards on Handover

Standard	Title	Date issued	Proposed action
ETS 300 816 [16]	Private Integrated Services Network (PISN); Cordless Terminal Mobility (CTM); Handover Additional Network Feature (ANF); Service description	1998-02	No actions to be taken as there will be no corresponding international standard
ETS 300 817 [17]	Private Integrated Services Network (PISN); Cordless Terminal Mobility (CTM); Handover Additional Network Feature (ANF); Functional capabilities and information flows	1998-02	No actions to be taken as there will be no corresponding international standard

Table 50: Handling of ETSI's WTM standards on Authentication

Standard	Title	Date issued	Proposed action
I-ETS 300 768 [18]	Private Integrated Services Network (PISN); Cordless Terminal Mobility (CTM); Authentication; Service description	1997-07	To be withdrawn and replaced by endorsement of ISO/IEC 15432 [29] as ETSI standard
I-ETS 300 769 [19]	Private Integrated Services Network (PISN); Cordless Terminal Mobility (CTM); Authentication; Functional capabilities and information flows	1997-07	To be withdrawn and replaced by endorsement of ISO/IEC 15432 [29] as ETSI standard
I-ETS 300 809 [21]	Private Integrated Services Network (PISN); Cordless Terminal Mobility (CTM); Inter-exchange signalling protocol; Cordless terminal authentication supplementary service	1997-07	To be withdrawn and replaced by endorsement of ISO/IEC 15433 [30] as ETSI standard

Table 51: Handling of ECMA's WTM standards on Location Registration/De-registration

Standard	Title	Date issued	Proposed action
ECMA-216 [2] Second edition	Private Integrated Services Network (PISN) - Cordless Terminal Mobility (CTM) - Inter-Exchange Signalling Protocol - Cordless Terminal Location Registration Supplementary Service (QSIG-CTLR)	September 1997	Fast tracked to ISO/IEC-JTC1. To be aligned with ISO/IEC 15429 [26] and re-issued as ECMA–216 [2], Third edition

Table 52: Handling of ECMA's WTM standards on Call Handling

Standard	Title	Date issued	Proposed action
ECMA-215 [1] Second edition	Private Integrated Services Network (PISN) - Cordless Terminal Mobility (CTM) - Inter-Exchange Signalling Protocol - Cordless Terminal Incoming Call Additional Network Feature (QSIG-CTMI)	September 1997	Fast tracked to ISO/IEC-JTC1. To be aligned with ISO/IEC 15431 [28] and re-issued as ECMA–215 [1], Third edition
ECMA-233 [3] Second edition	Private Integrated Services Network (PISN) - Cordless Terminal Mobility (CTM) - Inter-Exchange Signalling Protocol - Cordless Terminal Outgoing Call Additional Network Feature (QSIG-CTMO)	September 1997	Fast tracked to ISO/IEC-JTC1. To be aligned with ISO/IEC 15431 [28] and re-issued as ECMA–233 [3], Third edition

Table 53: Handling of ECMA's WTM standards on Authentication

Standard	Title	Date issued	Proposed action
ECMA-243 [4] Second edition	Private Integrated Services Network (PISN) - Cordless Terminal Mobility (CTM) - Inter-Exchange Signalling Protocol - Cordless Terminal Authentication Supplementary Services (QSIG-CTAU)	September 1997	Fast tracked to ISO/IEC-JTC1. To be aligned with ISO/IEC 15433 [30] and re-issued as ECMA–243 [4], Third edition

Table 54: Handling of ISO/IEC 's WTM standards on Location Registration/De-registration

Standard	Title	Date issued	Proposed action
ISO/IEC 15428 [25]	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	1999-11	Endorse as ETSI standard and withdraw: ETS 300 691 [9] ETS 300 692 [10]
ISO/IEC 15429 [26]	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	1999-09	Endorse as ETSI standard and withdraw: ETS 300 693 [11] ETS 300 693/C1 [12] Input for modification of: ECMA–216 [2], Second edition

Table 55: Handling of ISO/IEC 's WTM standards on Call Handling

Standard	Title	Date issued	Proposed action
ISO/IEC 15430 [27]	Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Specification, functional model and information flows - Wireless terminal call handling additional network feature	1999-09	Endorse as ETSI standard and withdraw: ETS 300 694 [13] ETS 300 695 [14]
ISO/IEC 15431 [28]	Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Inter-exchange signalling protocol - Wireless terminal call handling additional network feature	1999-09	Endorse as ETSI standard and withdraw: ETS 300 696 [15] I-ETS 300 808 [20] Input for modification of: ECMA–215 [1], Second edition ECMA–233 [3], Second edition

Table 56: Handling of ISO/IEC 's WTM standards on Authentication

Standard	Title	Date issued	Proposed action
ISO/IEC 15432 [29]	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)	1999-09	Endorse as ETSI standard and withdraw: I-ETS 300 768 [18] I-ETS 300 769 [19]
ISO/IEC 15433 [30]	Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Inter-exchange signalling protocol - Wireless Terminal Authentication supplementary services	1999-08	Endorse as ETSI standard and withdraw: I-ETS 300 809 [21] Input for modification of: ECMA–243 [4], Second edition

Table 57: Revision of other standards

Standard	Title	Date issued	Proposed action
ETS 300 415 [8]	Private Integrated Services Network (PISN); Terms and definitions	1996-10	Align, and issue a new version, of the standard with the new terms used in the international standards.

History

Document history		
V1.1.1	March 2000	Publication