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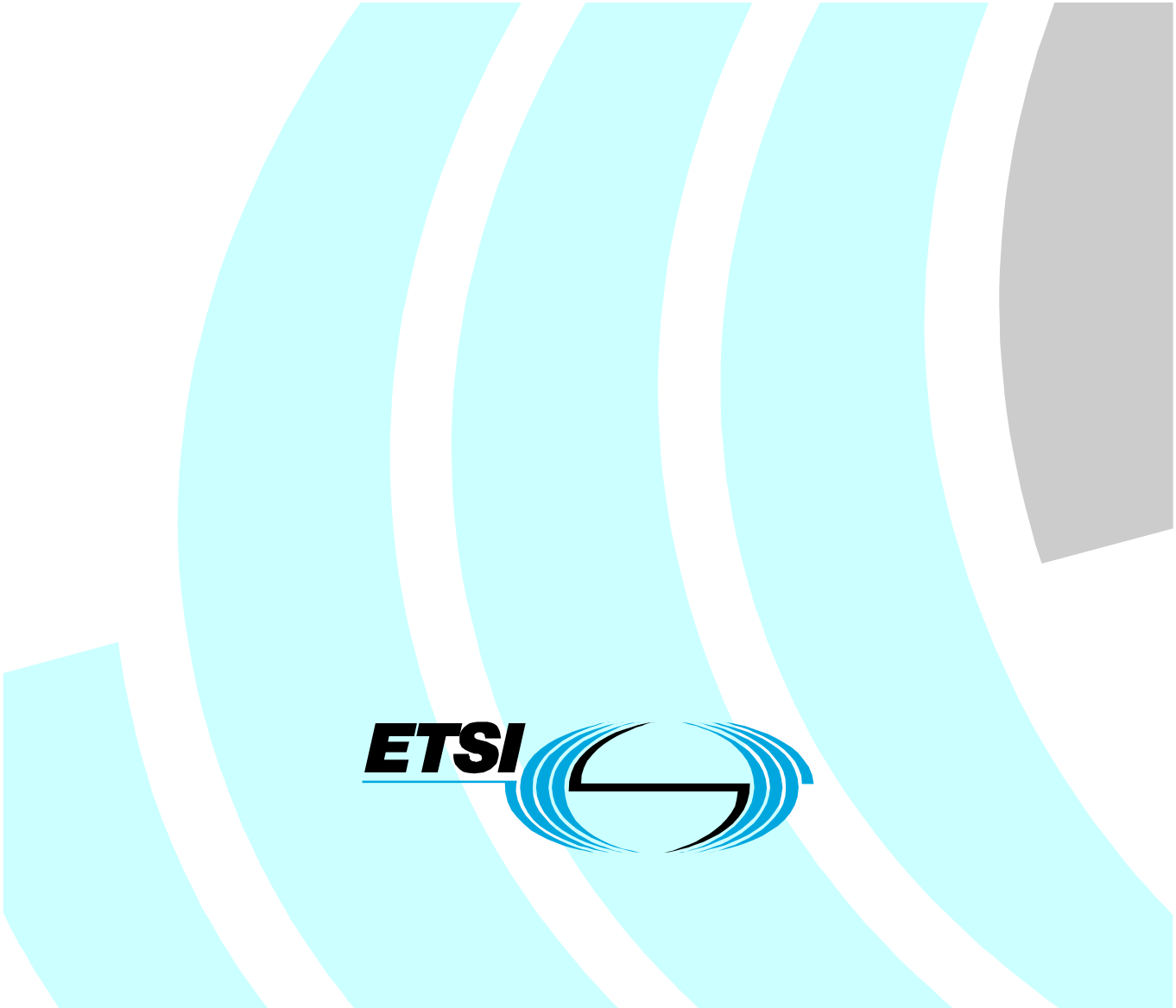
Technical Specification

Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Identifiers (IDs) for NGN



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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN).

Introduction

The present document describes some identifiers used within 3GPP which are considered applicable to TISPAN with the aim to identify a common set of global standard identifiers, at least few of them, that will allow NGN operators to satisfy both TISPAN NGN requirements [19] and quality control, security, authentication, emergency, law interception and privacy requirements, clause 6 of ITU-T Recommendation Y.2001 (see bibliography).

1 Scope

The present document provides an overview of the identifiers used within 3GPP which are considered applicable to NGN. It is intended that the information contained in the present document are not referred to any specific TISPAN Releases, and it shall be used as the basis for defining additional identifiers and related parameters to facilitate the implementation of TISPAN NGN standards.

2 References

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

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- For a specific reference, subsequent revisions do not apply.
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NOTE: While any hyperlinks included in this clause were valid at the time of publication ETSI cannot guarantee their long term validity.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

[1] ETSI TS 122 228: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Service requirements for the Internet Protocol (IP) multimedia core network subsystem (IMS); Stage 1 (3GPP TS 22.228 Release 6)".

[2] IETF RFC 1035: "Domain names - implementation and specification".

[3] IETF RFC 3966: "The tel URI for Telephone Numbers".

[4] ETSI TS 131 102: "Universal Mobile Telecommunications System (UMTS); Characteristics of the Universal Subscriber Identity Module (USIM) application (3GPP TS 31.102 Release 6)".

[5] ETSI TS 122 101: "Universal Mobile Telecommunications System (UMTS); Service aspects; Service principles (3GPP TS 22.101 Release 6)".

[6] ETSI TS 123 003: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Numbering, addressing and identification (3GPP TS 23.003 Release 6)".

[7] ETSI TS 123 228: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); IP Multimedia Subsystem (IMS); Stage 2 (3GPP TS 23.228 Release 6)".

[8] ETSI TS 129 228: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); IP Multimedia (IM) Subsystem Cx and Dx Interfaces; Signalling flows and message contents (3GPP TS 29.228 Release 6)".

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

[10] ITU-T Recommendation E.164: "The international public telecommunication numbering plan".

[11] IETF RFC 3261: "SIP: Session Initiation Protocol".

[12] IETF RFC 3761: "The E.164 to Uniform Resource Identifiers (URI) Dynamic Delegation Discovery System (DDDS) Application (ENUM)".

[13] IETF RFC 1093: "The NSFNET routing architecture".

[14] ETSI ES 282 004: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); NGN Functional Architecture; Network Attachment Sub-System (NASS)".

[15] ETSI ES 282 003: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Resource and Admission Control Sub-system (RACS); Functional Architecture".

[16] ETSI ES 282 001: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); NGN Functional Architecture Release 1".

[17] ETSI ES 282 002: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); PSTN/ISDN Emulation Sub-system (PES); Functional architecture".

[18] IETF RFC 4282: "The Network Access Identifier".

[19] ETSI TS 182 006: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); IP Multimedia Subsystem (IMS); Stage 2 description (3GPP TS 23.228 v7.2.0, modified)".

[20] ITU-T Recommendation E.164.1: "Criteria and procedures for the reservation, assignment and reclamation of E.164 country codes and associated identification codes (ICs)".

[21] ITU-T Recommendation E.164.2: "E.164 numbering resources for trials".

[22] ITU-T Recommendation E.164.3: "Principles, criteria and procedures for the assignment and reclamation of E.164 country codes and associated identification codes for groups of countries".

[23] ITU-T Recommendation E.190: "Principles and responsibilities for the management, assignment and reclamation of E-series international numbering resources".

[24] ITU-T Recommendation E.195: "ITU-T International numbering resource administration".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 180 000 (see bibliography) and the following apply:

address: identifier for a specific termination point and used for routeing to this termination point

E.164 number: string of decimal digits that satisfies the three characteristics of structure, number length and uniqueness specified of ITU-T Recommendation E.164 [10]

NOTE: The number contains the information necessary to route the call to the subscriber or to a point where a service is provided. The hierarchical structures of International E.164-numbers [10] are as follows:

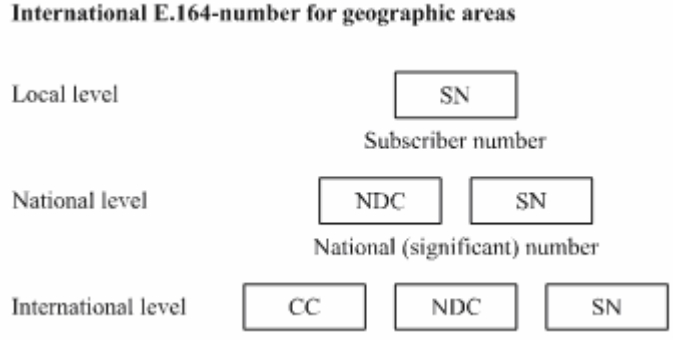

Figure 1

identifier: a series of digits, characters and symbols used to identify uniquely subscriber(s), user(s), network element(s), function(s) or network entity(ies) providing services/applications

NOTE 1: Identifiers can be used for registration or authorization. They can be either public to all networks or private to a specific network (private IDs are normally not disclosed to third parties).

NOTE 2: In 3GPP the term 'Identity' or 'ID' is typically used instead.

identity: identifier allocated to a particular entity, e.g. a particular end-user, provides an Identity for that entity

NOTE: The definition currently provided in TR 180 000 (see bibliography): The attributes by which an entity or person is described, recognized or known.

name: identifier of an entity (e.g. subscriber, network element) that may be resolved/translated into an address

short code: string of digits in the national telephony numbering plan as defined by the national Numbering Plan Administration (NPA) which can be used as a complete dialling sequence on public networks to access a specific type of service/network

NOTE: The short code is a non-E.164 number and its length does not exceed five digits, in exceptional cases six digits. An example is the emergency number 112 used in the EU.

tel URI: representation of an international E.164 number or another number with the context defined (e.g. private number, short code)

NOTE: RFC 3966 [3], which defines the use of the tel URI, also uses the term "local number" , but uses it in a totally different way from E.164.
RFC 3966 [3] recognizes:

- **"Global number"** - which always start with +CC.
- **"Local number"** - which is anything that is not a "**global number**".

Thus what E.164 refers to as national numbers, "local numbers" and short codes (as well as other types such as private numbers) would all be treated by RFC 3966 [3] as "local numbers". In the case of "local numbers", RFC 3966 [3] uses a context qualifier to distinguish the type of number.

In the context of the present document, the term "local number" will be used in the E.164 sense and international/national format issues has to be defined in the SIP context.

3.2 Abbreviations

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

3GPP	3rd Generation Partnership Project
AESA	ATM End System Address
AS	Application Service
ATM	Asynchronous Transfer Mode
BGCF	Breakout Gateway Control Function
CC	Country Code
ccTLD	country code Top Level Domain (e.g. .fr)
CLF	Connectivity session Location and repository Function
CLI	Calling Line Identity
CN	Core Network
CPE	Customer Premises Equipment
CS	Circuit Switched
CS/GPRS	Circuit Switched/General Packet Radio Service
CSCF	Call Session Control Function
DHCP	Dynamic Host Configuration Protocol
DNS	Domain Name System
DSL	Digital Subscriber Line
EDGE	Enhanced Data GSM Environment
ENUM	E.164 Number Mapping
FFS	For Further Study

GERAN	GSM/EDGE Radio Access Network
GPRS	General Packet Radio Service
GRX	GPRS Roaming eXchange
GSM	Global System for Mobile Communication
GSMA	GSM Association
gTLD	generic Top Level Domain (e.g. .org)
HPLMN	Home PLMN
HSS	Home Subscriber Server
ICANN	Internet Corporation for Assigned Names and Numbers
I-CSCF	Interworking CSCF
ID	Identifier/Identity
IIN	Issuer Identifier Number
IM CN	IP Multimedia Core Network
IM	IP Multimedia
IMPU	IMS Public User Identity
IMS	IP Multimedia Subsystem
IMSI	International Mobile Subscriber Identity
IP	Internet Protocol
ISDN	Integrated Services Digital Network
ISIM	IM Services Identity Module
I-WAN	IP-Wide Area Network
LIF	Location Information Forum
LIR	Local Internet Registry
MCC	Mobile Country Code
MGCF	Media Gateway Control Function
MNC	Mobile Network Code
MSIN	Mobile Station Identification Number
MSISDN	Mobile Station ISDN Number
NACF	Network Access Configuration Function
NAI	Network Access Identifier
NASS	Network Attachment SubSystem
NDC	National Destination Code
NGN	Next Generation Network
NIR	National Internet Registry
NPA	Numbering Plan Administration
NRA	National Regulatory Authority
PBX	Private Branch Exchange
P-CSCF	Proxy CSCF
PDBF	Profile Data Base Function
PDN	Public Data Network
PLMN	Public Land Mobile Network
PPP	Point-to-Point Protocol
PSI	Public Service Identifier
PSTN	Public Switched Telephone Network
QoS	Quality of Service
RACS	Resource and Admission Control Subsystem
RAN	Radio Access Network
RFC	Request For Comments
RIR	Regional Internet Registry
S-CSCF	Serving CSCF
SGSN	Serving GPRS Support Node
SIM	Subscriber Identity Module
SIP	Session Initiation Protocol
SLF	Subscription Locator Function
SN	Subscriber Number
SS7	Signalling System No. 7
TETRA	Terrestrial European Trunked Radio
TLD	Top Level Domain
TMSI	Temporary Mobile Subscriber Identity
UE	User Equipment
UICC	Universal Integrated Circuit Card
UML	Unified Modelling Language

UMTS	Universal Mobile Telecommunication System
UPSF	User Profile Server Function
URI	Universal Resource Identifier
USIM	UMTS Subscriber Identity Module
UTRAN	UMTS Radio Access Network
VPLMN	Visited PLMN
WLAN	Wireless Local Area Network
WTSA	World Telecommunication Standardization Assembly

4 Background on identifiers for NGN

NGN must be able to support the existing Naming, Numbering and Addressing plans for fixed and mobile networks. It is therefore important to have a full understanding of how these plans work.

For networks like PSTN/ISDN, GSM-based PLMNs and the Internet there is a common terminology used concerning the present identifiers (IDs) used in these networks. The terms, which are defined in ITU-T Recommendation E.191 (see bibliography), are name, number and address. In the PSTN the ID is the E.164 number [10] and that number is used for identifying and routeing the call to the subscriber/user or services. With the introduction of services based on non-geographic numbers and number portability the function of the number has been split between a name role for identifying the user or service and an address role to indicate how to route the call to the subscriber's network termination point.

In GSM-based PLMNs the E.164 number is often called an MSISDN to indicate that the E.164 number is used for mobile services. Another ID used in GSM networks is the IMSI, based on ITU-T Recommendation E.212 [9]. The IMSI provides a unique identifier of the mobile subscription for registration purposes. It is also used to identify the home PLMN (HPLMN) when the mobile subscriber/terminal is roaming in a visited mobile network (VPLMN). Most of the present SIM cards used in GSM networks are marked with another ID called the Issuer Identifier Number (IIN) according to ITU-T Recommendation E.118 (see bibliography). An introduction to different IDs used in PLMNs based on 3G systems can be found in clause 5.

4.1 Circuit switch network identifiers

For circuit switched networks there are also some IDs used for different network functions. For example Signalling Point Codes for the ITU-T Signalling System No. 7 (SS7). Some of the signalling point codes are used in the international signalling network, ISPCs according to ITU-T Recommendation Q.708 (see bibliography), and some are used as NSPCs between national networks. These addresses can be seen as public IDs but there are also signalling point codes, with Network Indicator 2, used solely as a private ID inside one operator's network and therefore never disclosed to other operators.

4.2 Packet switch network identifiers

For packet switched networks like the Internet and other IP based networks names in the form of Domain Names according to RFC 1035 [2] are well known and used. For the Internet the separation between a name and an address have been used from the early days of the Internet (from the beginning although only IP addresses was the major ID).

The Domain Name is used to identify the user/host and the IP address used for routeing to the interface to which the host is connected (for IP address format IPv4 and IPv6, see clause 7.1.2). The IP address is received through a name resolution with the help of the Domain Name System (DNS). Before the growth and success of the Internet other public data networks (PDN) based on X.25 (see bibliography) and X.21 (see bibliography) was used and some are still in function. For these PDNs a numbering plan based on ITU-T Recommendation X.121 (see bibliography) is used.

For ATM networks there exist specific address resources named ATM End System Addresses (AESA). Different AESAs are used and one (ITU-IND AESA) is administered by the ITU TSB and is based on ITU-T Recommendation E.191 (see bibliography).

There are also IDs from other naming, numbering, addressing or identification plans, like the numbering plan (ITU-T Recommendation F.69, see bibliography) for the diminishing telex service, IDs for TETRA networks and more network specific IDs like NSAPs (Network Service Access Point), but this clause has no intention to cover all kind of IDs in present public networks.

As mentioned in this clause, identifiers are used throughout the network to identify sources/destinations of traffic and also resources within the network and the E.164 number is for example used by PSTN users to identify the destination of a call. In the context of an NGN, E.164 numbers need to be translated into other kind of IDs (e.g. IP addresses) usable within the NGN. This will be further elaborated in the present document.

5 3GPP concept on the use of IDs

In UMTS based PLMNs there are many specific IDs used and they are described in detail in TS 123 003 [6] . The following clauses will highlight some of these 3GPP IDs that also will be applicable in some form in the NGN.

5.1 An Introduction to UICC, USIM, ISIM, Public IDs, Private IDs, Home Domain IDs

This clause provides an understanding to the Universal Integrated Circuit Card (UICC), the UMTS Subscribers Identity Module (USIM), and the IM Services Identity Module (ISIM) and the relationship between all three entities.

With the introduction of the IMS Domain within 3GPP a single level of registration was found to be insufficient. To provide the necessary attributes for registration to IMS to be carried out, an ISIM application was added to the UICC. In summary the USIM application is used to gain access to the UMTS access network (CS/GPRS network) and the ISIM is used to gain access to the IMS Domain (3GPP Release 6 or greater).

A subscriber may access the IMS Domain:

- with the values of the ISIM identifiers derived from the USIM (in the absence of ISIM);
- with the value of the ISIM identifiers provisioned independently from the USIM.

It should be made clear from this clause that to access the IMS Domain an ISIM is required (note that the required private identifier provided and validated by the operator can be derived from the USIM if the ISIM is absent). As stated above, it is possible the ISIM resides or not on a UICC.

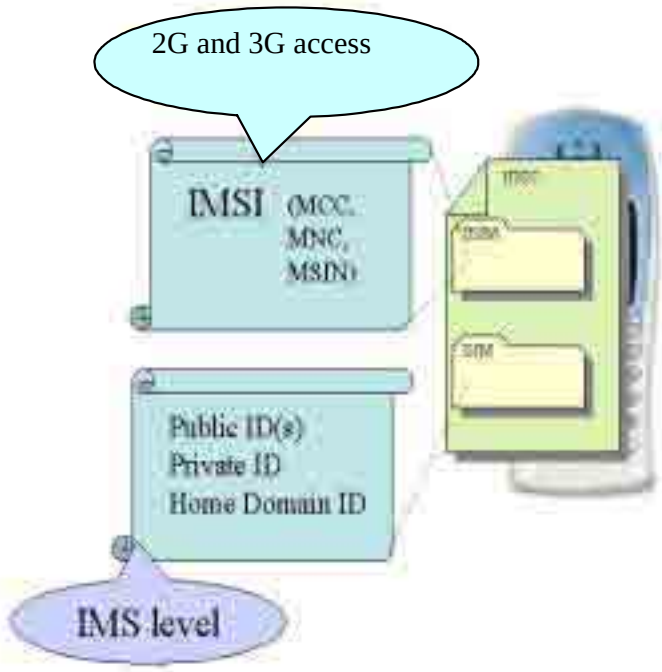

Figure 2: Key 3GPP IDs

The introduction of the SIM card introduced not only a method of uniquely identifying a subscription irrespective of the GSM device being used, but also a higher level of security that was absent from the previous analogue system where cloning the handset was common. Cloning a SIM card is much more complex.

As with the SIM card the UICC resides inside the mobile device. However, whereas the SIM is seen as the physical card together with the software to authenticate, authorize, and identify the subscriber, the UICC merely defines the physical characteristics of the smart card. The USIM and ISIM are seen as software applications resident on the UICC. As previously stated a USIM must be present and an ISIM may be present.

The UICC should remain the property of the mobile network operator who will need to have the authority to decide as to which applications can reside on it, e.g. USIM, ISIM.

NOTE: When accessing IMS over GERAN/UTRAN or I-WAN using ISIM, a USIM needs also to be present to access the rest of the 3GPP system.

The general requirements being that the subscriber can be uniquely identifiable by the network, the service network can authenticate the subscriber, and that if a subscriber is being served by a network other than its home network, the visiting network shall be able to identify the associated home network.

Clause 13 from TS 122 101 [5] provides further clarification of the USIM module and the ISIM module in relationship to the UICC.

5.2 USIM

USIM is an application and not an identifier, this application is to reside on the UICC module. The following is a summary of the requirements for the USIM application:

- Every USIM has a unique identifier and is associated with one and only one home network.
- It is possible for a home network to uniquely identify a subscription by the USIM.
- The USIM is used to provide security features.
- For access to services, provided by Packet Switched or Circuit Switched Core Networks, a valid USIM is required.
- The USIM resides on a UICC. USIM specific information is protected against unauthorized access or alteration.
- Access to the IMS services is possible using the USIM derived private identifier in the event of no ISIM being present on the UICC. If an ISIM is present on the UICC it is used to access the IMS.

The specification does not preclude the support of more than one USIM per UICC associated with the same or different home networks so long as the security problems which arise from such coexistence are solved. However, only one USIM can be active at any given time.

The USIM's private ID is based on the IMSI which contains the Mobile Network Code (MNC) allocated by the appropriate country's NRA. The IMSI (based on ITU-T Recommendation E.212 [9]) can be used for registering the user on Circuit Switched networks and Packet Switched networks.

5.3 ISIM

ISIM is an application and not an identifier, this application is optional to the UICC module. The following is a summary of the requirements for the ISIM application:

- Access to the IMS Domain is possible using an ISIM application.
- The ISIM is sufficient for providing the necessary security features for the IMS.
- The ISIM may reside on a UICC. ISIM specific information is protected against unauthorized access or alteration.

It is recommended that the format of the identifier(s) stored in the ISIM are based on E.164 and/or E.212 resources.

The ISIM consist of Public ID(s), Private ID and Home Domain ID. The Home Domain ID provides the means by which that IMS routes a users" registration request to the Home IMS Network. The Private ID is how the user is authenticated by the user's Home IMS Network and the Public ID is how the user is contactable by other users for IMS based services.

If there is no ISIM application, a backward compatibility mechanism is in place to derive the Home Network Domain name (ID)from the IMSI as described in the following steps:

1) Take the first 5 or 6 digits, depending on whether a 2 or 3 digit MNC is used (see TS 131 102 [4]) and separate them into MCC and MNC; if the MNC is 2 digits then a zero shall be added at the beginning.

2) Use the MCC and MNC derived in step 1 to create the "mnc<MNC>.mcc<MCC>.3gppnetwork.org" Domain Name.

3) Add the label "ims." to the beginning of the domain.

An example of a Home Network Domain Name is:

IMSI in use: 234150999999999;

Where:

MCC = 234;

MNC = 15;

MSIN = 0999999999,

which gives the Home Network Domain Name: ims.mnc015.mcc234.3gppnetwork.org.

NOTE 1: An MCC is assigned by the ITU-T to a member state.

MNCs under this MCC are assigned by the NRA of this member state to an operator.

MSINs are assigned by the operator to its customers.

The use of the Home Domain Name works best in a globally agreed and unique domain name space which all operators (e.g. fixed and mobile) who need to use it can access directly.

NOTE 2: Having to use the Domain Name '3gppnetwork.org' requires access to the 3GPP DNS system. The Domain Name 3gppnetwork.org is controlled by GSMA for registration in a private extranet.

If there is no ISIM application, the private identifier is not known, in that case the private identifier could be derived from the IMSI (TS 123 003 [6] clause 13.3). However, this derived identifier is not visible for end-users and it is replaced by the actual public identifier obtained during the registration procedure (see GSMA IR.65 subclause 8.1, see bibliography)

The following steps show how to build the Private Identifier out of the IMSI:

1) Use the whole string of digits as the username part of the private identifier.

2) Convert the leading digits of the IMSI, i.e. MNC and MCC, into a domain name, as described in clause 6.2.1.1.

The result will be a Private User identifier of the form "<IMSI>@ims.mnc<MNC>.mcc<MCC>.3gppnetwork.org". For example: If the IMSI is 234150999999999 (MCC = 234, MNC = 15), the private user identifier then takes the form 234150999999999@ims.mnc015.mcc234.3gppnetwork.org

The private ID is used only in the Home Domain operator's network.

The approach for 3GPP UEs roaming into the NGN is specified (TS 123 003 [6] clause 13.2).

The realm can take a number format as defined by the Home Domain operator , except in the case where the Private ID (containing the realm) is derived from the IMSI. The whole of the username@realm needs to be unique in the Home Domain operator's network.

5.4 Backward Compatibility

3GPP have provided backward-compatibility with the UMTS Services Identity Module (USIM) and thus with IMSIs and MSISDN numbers.

There are other identifiers that ETSI will need to address in time, but these ones are critical to the whole NGN structure and so are focussed on initially.

Interoperabiltiy betweeen operators who specify their networks by reference to different families of standards, e.g. ETSI TISPAN or 3GPP, is an important issue.

Future work must consider compatibility of identifiers in an environment where such interoperability occurs as there will be an evolution to a fully encompassing NGN.

6 Concept on the use of IDs in NGN

In principle, it should be possible for any user of the ISDN, PSTN, PLMN or an IP-based NGN network to identify users in a global basis. That implies that Public IDs are globally unique.

6.1 Introduction

Due to the ubiquitous use of identifiers, the list below should not be considered as providing a complete list.

Table 1: Overview of Identifiers

	Public ID (User aware)	Format of the Public ID within the network	Private ID (Network Aware)	NGN Layer
User/Service Identifier	Name(s)	• SIP URI	• ID stored in ISIM	Service
	Number(s)	• tel URI • SIP URI with domain operator-provided	• ID stored in ISIM or derived from USIM	
Network Identifier	Address	• Number, and Routeing Number • IP Address	• Network ID • Line ID	Transport

The format SIP URI and tel URI is a means to translate the identifiers used by the network in order to format E.164 numbers in coherence with SIP protocol requirements, as described in table 1.

The NGN Layers are according to [16]:

- **Service Stratum/Layer**
  The different services/applications are located here, together with the databases keeping the user related information and identifiers.

- **Transport Stratum/Layer**
  This part provides for the transport of the media streams and also supports the users in gaining access to the applications and also control of resources and admissions.

- **Customer and Terminal functions**
  This part covers the networking infrastructure at the user's premises.

Figure 3 shows the NGN stratum/layer (more generic than the figure contained in [16].

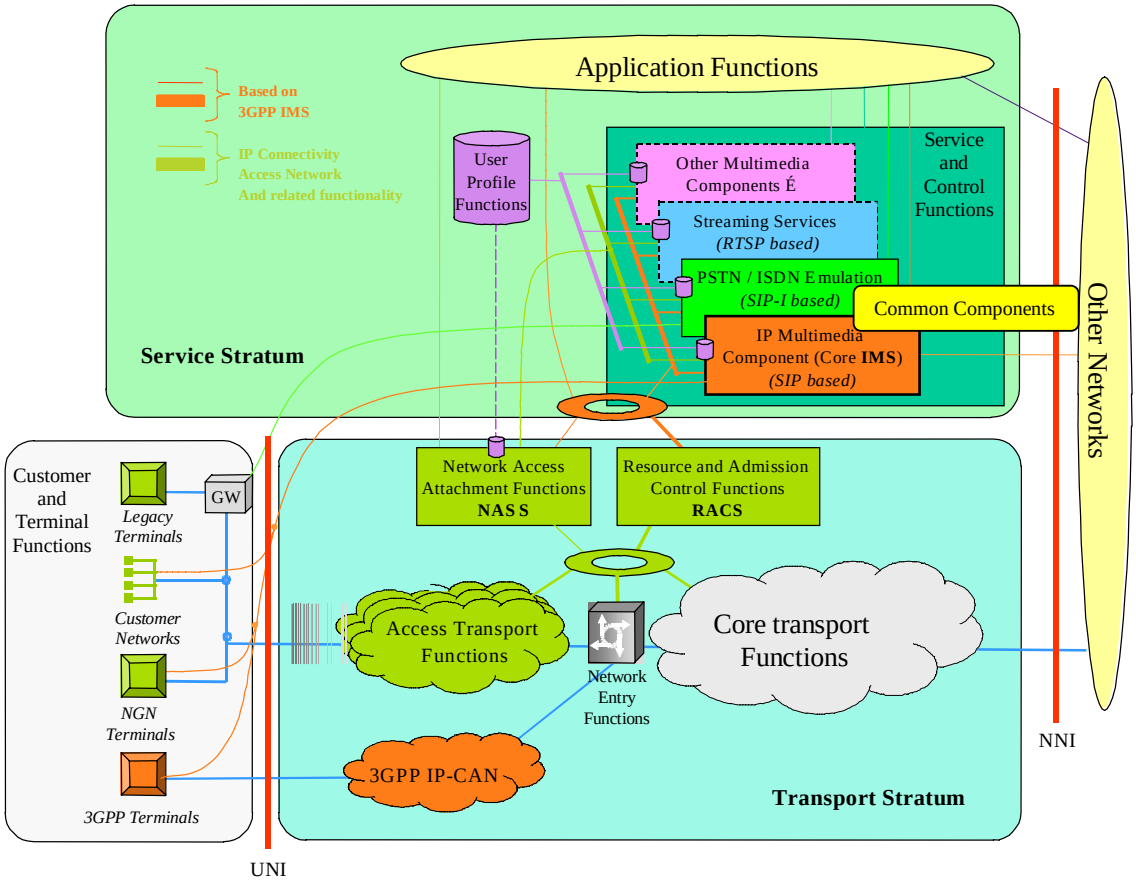

Figure 3: Functional model of the TISPAN NGN

Identifier required:

- User and NGN Terminals IDs.
- NASS IDs: see clause A.2.2.
- RACS IDs: see clause A.2.3.
- Use Data IDs: see clause A.2.1.
- IMS/PES IDs.
- Common components IDs (see [16] and [17]), are used by several subsystems, such as those required for accessing applications, charging functions, user profile management, security management, routeing data (e.g. ENUM), etc.

6.2 IDs used in TISPAN NGN

To enable access to NGN using the existing mobile subscriptions (that are based only on USIM) also a mechanism to derive these values from USIM could be evaluated. This results in the requirement to support Home Domain Names in the 3GPP format based on the use of MNC, MCC.

NOTE: If MNC and MCC are to be used by fixed network operators, this might require changes to national regulations.

6.2.1 IDs for Users

An NGN operator can store User IDs in ISIMs provided to its subscribers or directly inside the terminals, if necessary. 3GPP specify that the ISIM itself is made up of various attributes. The main 3GPP attributes used for registration and authentication are the Home Domain Name, the Public and the Private Identifier. These identifiers are explained below.

6.2.1.1 Home Domain Name

The Home Domain Name is used to identify the home domain of the user. This is used during authentication and registration. The format of the Home Domain Name is based on the Domain Name e.g. *'operator.com'* as specified in RFC 1035 [2]. Note that there is no requirement for having the domain part of the private and public identifier being equal to this Domain Name since the two values are independent, but some operators may choose to link these two identifiers.

The Home Network Domain Name is the parameter which is used to route the initial SIP registration requests to the home operator's IMS network. The Home Network Domain Name is stored in the ISIM. Upon receipt of the register information flow, the P-CSCF examines the Home Network Domain Name to discover the entry point to the home network (i.e. the I-CSCF). Note also that for the initial registration message routeing, the Domain Name resolution mechanism is made available to the user equipment at network attachment when the DHCP provides it with the domain name of a P-CSCF and the address of a Domain Name Server (DNS) that is capable of resolving that P-CSCF name:

- e.g. if there is no ISIM application (i.e. when there is no IMS-specific module), the Home Domain Name must be derived from the data available "locally" to the UE.

6.2.1.2 Private User Identifiers

Every NGN user has at least one private identifier. Private user identifiers are assigned by the home operator and are used to identify the IMS user's subscription. Its main role is to support the authentication procedure during registration/re-registration/de-registration, authorization, administration and accounting purposes at the home IMS. It is also used as the primary means of identifying the user within a dialog between network entities (e.g. UPSF or S-CSCF selection). The private user identifier is not used in SIP call routeing, but is conveyed in all registration requests. A private user identifier is "permanent" (i.e. not tied to a particular call instance/session.) and stored locally in the ISIM (IM Services Identity Module) that will be used to instantiate the registration message parameters. In some cases, the private user identifier may also be instantiated with default values when no ISIM is available.
For its syntax, the private user identifier shall take the form of an NAI, and shall have the form username@realm as specified in clause 2.1 of RFC 4282 [18] in accordance with TS 123 003 [6] and TS 123 228 [7]. In case there is no ISIM on the UICC, the private user ID is derived from the IMSI. The username is replaced with the complete IMSI value. However for the realm the Home Domain Name value is used.

Further, there is no functional requirement for mandating a single private ID structure for a given IMS network.

In IMS, the Home Domain Name, which is part of the private identifier, is used to route from a P-CSCF to the home operator's I-CSCF.

6.2.1.3 Public User Identifiers

Every IMS user has one or more public identifiers, which are primarily used for user-to-user communication. The public identifier serves as a basis for message routeing, possibly after a translation mechanism when appropriate, both for IMS session-based SIP messages (e.g. INVITE) or off-session SIP messages (e.g. NOTIFY). There is at least one public identifier stored in the ISIM, but like the private identifier, in some cases, it may also be instantiated with default values when no such ISIM is available. Note also that public identifiers are not authenticated during registration, but the correspondence between private identifier and public identifier can be checked by the UPSF.

For its syntax, the public identifier shall take the form of either a SIP URI or a tel URI. A SIP URI shall take the form "sip:user@domain" (TS 23.003 or TS 23.228). Note that tel URIs public user identifiers (whether they are based on E.164 (i.e. public) or private number) can not be used for SIP call routeing in IMS and must be translated in SIP URI using ENUM.

Every IM CN subsystem user must have one or more public identifier(s). This identifier is used between users who wish to communicate with each other. Hence this identifier may be found on such items such as business card, web sites etc. It is the equivalent to how a web site or number is used today. However it should be noted that the number is not used to authenticate the user during registration. Neither is it used to identify the user's information within the UPSF.

A public user ID, e.g. stored on the ISIM, is needed by NGN to access ordinary services like e.g. E-mail, Instant messages. Access to e.g. emergency services may be possible without having a public user ID.

The IMS Public User ID (IMPU) is in the format of a SIP URI. However both Internet naming and telephone numbering is supported, so technically the format is either a SIP URI, or a tel URI. At least one IMPU is stored on the ISIM and cannot be modified by the UE. However, additional IMPUs do not have to be stored on the ISIM, although it is recommended.

The IMPU can be registered either explicitly or implicitly, but must be registered before the identifier can be used to originate IMS sessions and IMS session unrelated procedures. The identifier also has to be registered, either explicitly or implicitly, before terminating IMS sessions.

If a UICC is used that does not contain an ISIM then a temporary IMPU can be derived from the USIM's IMSI and used for the initial SIP registration process only. The temporary IMPU takes the format of a SIP URI. The format is as follows:

SIP:<*private user identifier*>;

where <*private user identifier*> is derived as described in clause 6.2.1.2.

NOTE: The ISIM does not need to reside on a UICC for ETSI NGN purposes.

The UPSF provides a public user ID to the user which will be used in the subsequent messages in the 'FROM' field of the SIP INVITE message. As a consequence, the temporary IMPU will never be displayed at the called party's UE.

6.2.1.4 Relationship of Private and Public IDs

An important starting point is to consider the main IDs used by 3GPP IMS and their relationships in the key IMS databases. These issues are considered in clause 4.3.3.4 of TS 123 228 [7] as endorsed by TISPAN in TS 182 006 [19], where object diagrams illustrate some of the required relationships.
For ease of reference the figures 4.5 and 4.6 of TS 123 228 [7] are reproduced below.

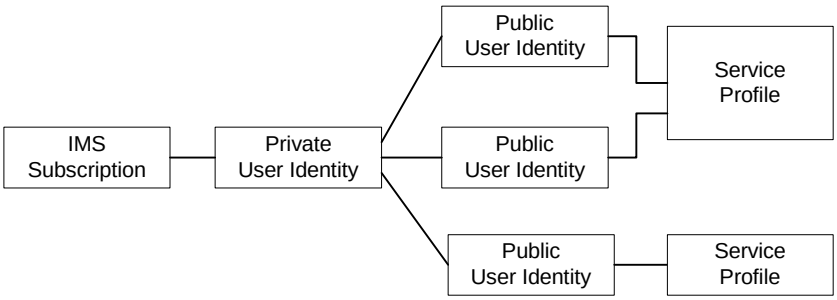

Figure 4: Relationship between the Private User Identity and Public User Identities

Public user identities may be shared across multiple Private User Identities within the same IMS subscription. Hence, a particular Public User Identity may be simultaneously registered from multiple UEs that use different Private User Identities and different contact addresses. If a Public User Identity is shared among the Private User Identities of a subscription, then it is assumed that all Private User Identities in the IMS subscription share the Public User Identity.

The relationship for a shared Public User Identity with Private User Identities, and the resulting relationship with service profiles and IMS subscription, is depicted in figure 5.

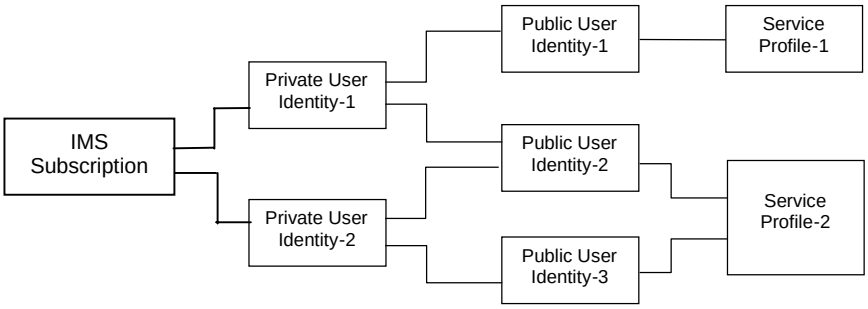

Figure 5: The relation between a shared Public User Identity (Public-ID-2) and Private User Identities

In particular, clause 4.3.3.4 of TS 123 228 [7] identifies that the combination of the Private ID and the Public ID is used to register the users" details to their allocated S-CSCF from their HSS User Profile.

As well as the Public ID used for registration, more Public IDs can be registered and stored in the S-CSCF during this process. Each Public ID is associated with one and only one Service Profile (from clause 4.3.3.4 in TS 123 228 [7]), though a Service Profile can be associated with many public IDs.

Another valuable, though different description of the object relationships is provided for when user data structures are passed from the HSS to the S-CSCF. These are described in the UML in TS 129 228 [8]. These descriptions are not necessarily incompatible, since the data structures passed from the HSS to the S-CSCF are a description of the IDs required for session/call processing, not of the full underlying structure of the database.

These 3GPP descriptions are not necessarily incompatible, since the data structures passed from the HSS to the S-CSCF are a description of the IDs required for session/call processing, not of the full underlying structure of the database.

The implication of the UML in TS 129 228 [8] is that at any one time, only one private ID represents the user for session/call processing. In 3GPP the private ID could only be used to register one single user equipment at one instance of time, whereas in NGN a multiplicity of user equipment should be allowed to use the same private ID for concurrent registration. Thus this conflicts with TISPAN requirements to use private IDs to represent different user roles or for registering from different equipment simultaneously and needs further investigation.

It should be possible to change the private ID without changing the public ID allocated to a subscriber and vice versa.

6.2.1.5 Handling of dialled number formats

The user may use E.164 numbers in local, national or international format. Whenever possible the dialling sequence must be converted into E.164 international numbering format to allow for ENUM lookup. When this is not possible the URI should specify the nature of the format of the sequence of digits that is being conveyed by the URI.

6.2.1.6 Termination of session with the tel URI format Public User ID

If in a terminating session a tel URI is used, the UPSF and the SLF (in the case that more than one independently addressable UPSF is utilized by a network operator) shall support the tel URI format Public User Identifier.

6.2.2 Access IDs in the NGN

The Access up to the User Entity is identified using:

- Identifier for the Access Network.
- Identifier for the Termination Point of the Physical Transport on the Access Network (e.g. Access Link).
- Identifier(s)for the Logical Channel (possibly recursive).
- Identifier(s) for the User Entities (UE) using the same Logical Channel.

Figure 6 shows a simplified view of the above.

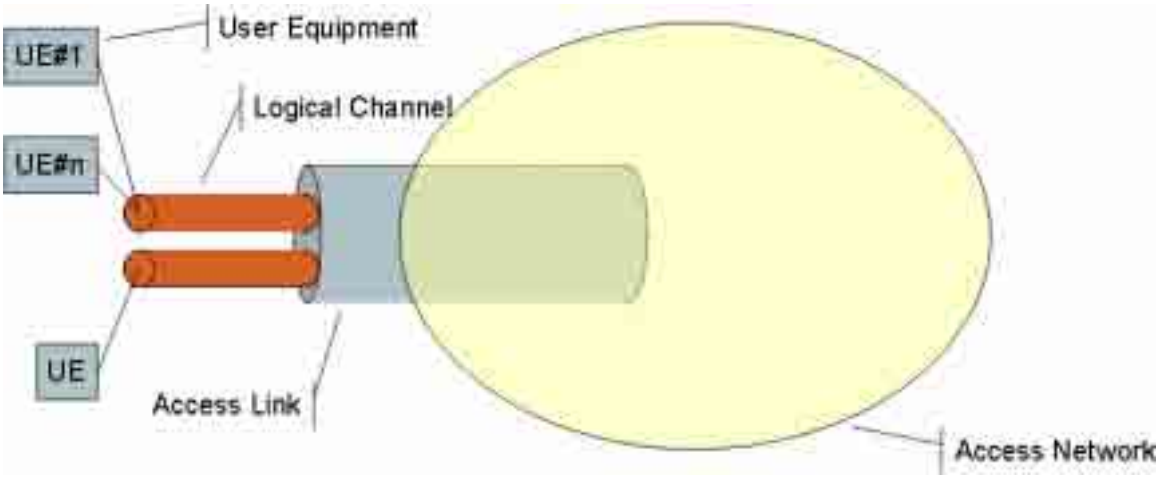

Figure 6: Relation between Access Link, Logical Channel, User Equipment

In later TISPAN Releases the above nested structure of identifiers needs to be supported.

In TISPAN Release 1 Access network level registration involves the access authentication which is authentication and authorization procedures between the UE and the NASS to control the access to the access network. Two authentication types are considered for access networks: **implicit authentication** and **explicit authentication**.

- Explicit authentication is an authentication procedure that is explicitly conducted between the UE and the NASS. It requires a signalling procedure to be performed between the UE and the NASS.
- Implicit authentication does not require the NASS to explicitly conduct an authentication procedure directly with the UE, however the NASS performs the implicit authentication based on identification of the L2 connection the UE is connected to.

It is a matter of operator policy whether implicit authentication or explicit authentication is applied.

There shall be mutual authentication between the UE and the NASS [14] during access network level registration.

Both implicit authentication and explicit authentication may be used independently as network level access authentication mechanism, notwithstanding the fact that implicit authentication may be a consequence of explicit authentication (e.g. the implicit line authentication used together with an explicit method such as Point-to-Point Protocol (PPP) RFC 1661 (see bibliography) in xDSL access).

Authentication between users/subscribers and application/service providers shall be explicit or implicit (based on trust/security assertions).

Through the Network Attachment Subsystem it is possible to:

- Provide registration at access level and initialization of User Equipment (UE) for accessing to the TISPAN NGN services.
- Provide dynamic provisioning of IP address and other user equipment configuration parameters (e.g. using DHCP).
- Authenticate the user, prior or during the IP address allocation procedure.
- Authorize of network access, based on user profile.
- Access network configuration, based on user profile.
- Location management.

The Network Access Configuration Function (NACF) is responsible for the IP address allocation to the UE. It may also distribute other network configuration parameters such as address of DNS server(s), address of signalling proxies for specific protocols (e.g. address of the P-CSCF when accessing to the IMS).

The NACF should be able to provide to the UE an access network identifier. This information uniquely identifies the access network to which the UE is attached.

The Connectivity Session Location and Repository Function (CLF) registers the association between the IP address allocated to the UE and related network location information provided by the NACF, i.e.: access transport equipment characteristics, line identifier (Logical Access ID), IP Edge identity, etc. The CLF interfaces with the NACF to get the association between the IP address allocated by the NACF to the end user equipment and the Line ID. The CLF responds to location queries from service control subsystems and applications. The actual information delivered by the CLF may take various forms (e.g. network location, geographical coordinates, post mail address, etc.), depending on agreements with the requestor and on user preferences regarding the privacy of its location. The CLF holds a number of records representing active sessions.

The definition of this format shall also be lined up with OCG EMTEL who has decided that the LIF (Location Information Forum) is required in certain environments according to regulatory requirements.

Correct operation of a 3GPP IMS based network requires a number of different identifiers to be present in the IMS. The key identifiers, together with the role they fulfil in NGNs and how they come to be present in the system, are shown in table 2.

Table 2: Overview showing the role of different identifiers and associated handling

Identifier	Role within 3GPP	Method of provisioning 3GPP	Method of provision for fixed line access
IP address	Used to support media and signalling stream	Downloaded into terminal from DHCP in access network and uploaded to S-CSCF as part of registration process	Associated with line card as part of service provision process
Private identifier	To identify terminal to system as part of registration / authentication process. Also used for billing	Held in ISIM explicitly or derived from USIM, then loaded into S-CSCF via registration process.	'Pseudo IMSI' provided and held in UPSF as part of service provision process
Public identifier	Used to identify required terminal on incoming calls. Also used as CLI on outgoing calls	Programmed into ISIM and loaded into HSS as part of service provision process.	Programmed into UPSF as part of service provision process.

6.2.3 Identification of Network Nodes

The CSCF, BGCF and MGCF nodes (functionalities I-BCF and IBGF) shall be identifiable using a valid SIP URI (Host Domain Name or Network Address) on those interfaces supporting the SIP protocol, (e.g. Gm, Mw, Mm, and Mg). These SIP URIs would be used when identifying these nodes in header fields of SIP messages. The names should be allocated in the public DNS system, however, this does not require that the nodes be reachable from the global Internet. These URIs will not be resolvable via the public DNS, they will only resolve from within the operators' network.

Globally unique identifiers for certain network elements (e.g. x-CSCFs) will be required so that a shared interconnect model, e.g. a GRX/IPX type interconnect model can be supported. Element identifier can be left to the choice of the service provider since the operator identifier and root domain uniquely identify the service provider. However the element name should be compliant with RFC 1093 [13] and it is possible that further constraints, yet to be identified, may be required.

6.2.4 IDs for Services

Public Service Identifiers shall take the form as defined in TS 123 003 [6].

All public service identifiers need to meet the specific requirements of services such as:

- Voice.
- Instant Messaging Service.
- Presence Service.
- Location Service.

The public service identifier shall take the form of either a SIP URI (see RFC 3261 [11]) or a tel URI (see RFC 3966 [3]).

A public service identifier defines a service, or a specific resource created for a service.

The domain part is pre-defined by the NGN operators and the IMS system provides the flexibility to dynamically create the user part of the PSIs.

The SIP URI shall take the form of a distinct PSI "SIP:service@domain", where 'service' identifies a service.

EXAMPLE: sip:conference@examplenetwork.com.

Generally for SIP URIs three different contexts have to be differentiated:

- international E.164 number;
- private number which must include a context;
- short codes.

6.2.5 IDs for NGN operators

Proposals have been made for a naming scheme for NGN network elements. This takes the format <element id>.<service provider>.<root domain>. The nature of the root domain needs further consideration in the light of recent initiatives outside ETSI (e.g. GSMA). However there is general agreement that this needs to be allocated from within the public DNS name space. A name per operator/service provider will need to allocated, and this must be unique within the root domain if misrouteing is to be avoided. To ensure that uniqueness is achieved, the entity responsible for governance of the route domain will need to be responsible for allocation of SP identifiers. A user friendly name for the root domain is favourable.

Additional requirements may occur in the situation, where same services are supplied to the user from different service providers. In such circumstances separate public service provider identifiers would be required and must be supported by the NGN.

6.3 ID translation in NGN

Identifiers are used throughout the network to identify sources/destinations of traffic and also resources within the network. One special kind of identifier is an E.164 number that is used by PSTN users to identify the destination of a call. In the context of an NGN, E.164 numbers need to be translated into an identifier format usable within the NGN.

6.3.1 E.164 to SIP URI translation for routeing (ENUM)

There is currently no decision that the public DNS/ENUM as specified in RFC 3761 [12] be used. This topic is for further study.

In some cases when the subscriber provided an E.164 number only, 3GPP foresees an E.164 to SIP URI translation especially if the requested E.164 number is not under control of the IMS (e.g. in the case of Interconnection).

Case 1: derived according to TS 123 228 [7]

In the case where the Request-URI of the incoming INVITE request to S-CSCF contains a tel URI [3], it has to be translated to a globally routable SIP-URI before applying it as Request-URI of the outgoing INVITE request. For this address translation the S-CSCF uses the services of an ENUM-DNS protocol based on to RFC 3761 [12]. Database aspects of ENUM are outside the scope of this specification.

Case 2: derived according to TS 122 228 [1]

The S-CSCF shall support the ability to translate the E.164 number contained in a **Request-URI** in the non-SIP URI Tel: URI format RFC 3966 [3] to a SIP routable SIP URI using an ENUM DNS translation mechanism based on RFC 3761 [12]. If this translation fails, then the session may be routed to the PSTN or appropriate notification shall be sent to the mobile, depending on network operator configuration.

Case 3: derived according to TS 123 228 [7]

An Application Service (AS) is hosting Public Service IDs (PSI) and may originate requests with the PSI as the originating party. For such originating requests, the home IMS network shall be capable to perform the following function:

- If the target identifier is a tel URI, ENUM translation needs to be performed, and the **request** shall be routed based on the translation result.

Routeing from the Originating AS hosting the PSI can be performed as follows:

a) The AS may forward the originating request to the destination network without involving an S-CSCF. If this option is applied where the target identifier is a tel URI, the AS shall perform an ENUM query and route the **request** based on the translation result. ENUM support for an AS is optional, therefore, if an AS does not support ENUM and the target identifier is a tel URI, it shall be configured to use b).

b) If the PSI has an S-CSCF assigned, the AS forwards the originating request to this S-CSCF, which then processes the request as per regular originating S-CSCF procedures (including a possible DNS/ENUM query).

6.3.2 Accessibility of ID Translation

TISPAN NGN supports the E.164 number translation based on RFC 3966 [3] for routeing.

3GPP tackles the critical issue of how tel URIs should be used for IMPUs. In particular, for routeing, tel URIs are translated into SIP URIs. This highlights the importance of the location of such an Infrastructure ENUM DNS translation mechanism. This translation mechanism can be located in:

1) Publicly accessible DNS; or

2) Private DNS.

In the first case this is based on RFC 3966 [3]. In the second case this routeing data tree will only be accessible by a single or a group of cooperating operators and needs only to be agreed between the participating operators.

7 Administration of NGN IDs

Identifiers fall into 3 classes (not mutually exclusive):

- Those generated automatically by network elements (e.g. call identifiers). For these, no human intervention is required (or possible).
- Those that may be allocated by operators without reference to external bodies (e.g. customer account number).
- Those for which operators must go to external bodies (e.g. NRA and others) to receive allocations (e.g. E.164 numbers, public IP addresses).

Framework Directive, Article 10.1 (see bibliography) requires that National regulatory authorities control the assignment of all national numbering resources and the management of the national numbering plans. Adequate numbers and numbering ranges shall be provided for all publicly available electronic communications services.

Framework Directive, Article 10.1 (see bibliography) also requires that National regulatory authorities establish objective, transparent and non-discriminatory assigning procedures for national numbering resources.

7.1 Overview on administration

7.1.1 E.164 Numbers

According to the WTSA, ITU-T Study Group 2 ('SG2') is the lead ITU-T Study Group with regard to the Administration of International Numbering Resources. SG2's responsibilities, under this mandate, include overseeing the administration of all such resources in order to ensure uniformity and equity in their assignment, despite the technical responsibilities for these resources being dispersed across multiple ITU-T Study Groups.

Specifically, ITU-T Recommendation E.164 [10], defines the number structure and functionality for four principal categories of numbers used for international public telecommunication – namely geographic areas, Global Services, Networks, and Groups of Countries ('GoCs'). For each of the categories, Recommendation E.164 details the components of the numbering structure and the digit analysis required to successfully route calls. Other specific Recommendation E.164-based global service applications (e.g. Universal International Freephone Numbers), which differ in usage, are defined in separate ITU-T Recommendations related to E.164, include, inter alia:

- ITU-T Recommendation E.164.1 [20]: "Criteria and procedures for the reservation, assignment and reclamation of E.164 country codes and associated Identification Codes (ICs)";
- ITU-T Recommendation E.164.2 [21]: "E.164 numbering resources for trials";
- Determined ITU-T Recommendation E.164.3 [22]: "Principles, criteria and procedures for the assignment and reclamation of E.164 country codes and associated identification codes for Groups of Countries";
- ITU-T Recommendation E.190 [23]: "Principles and responsibilities for the management, assignment and reclamation of E-series international numbering resources";
- ITU-T Recommendation E.195 [24]: "ITU-T International numbering resource administration".

7.1.2 IP Addresses

Currently there are two types of Internet Protocol (IP) addresses in active use: IP version 4 (IPv4) and IP version 6 (IPv6). IPv4 was initially deployed on 1 January 1983 and is still the most commonly used version. IPv4 addresses are 32-bit numbers often expressed as 4 octets in "dotted decimal" notation (for example, 192.0.32.67). Deployment of the IPv6 protocol began in 1999. IPv6 addresses are 128-bit numbers and are conventionally expressed using hexadecimal strings (for example, 1080:0:0:0:8:800:200C:417A).

Both IPv4 and IPv6 addresses are assigned in a delegated manner. Users are assigned IP addresses by Internet service providers (ISPs). ISPs obtain allocations of IP addresses from a local Internet registry (LIR) or national Internet registry (NIR), or from their appropriate Regional Internet Registry (RIR):

- AfriNIC (African Network Information Centre) - Africa Region
- APNIC (Asia Pacific Network Information Centre) - Asia/Pacific Region
- ARIN (American Registry for Internet Numbers) - North America Region
- LACNIC (Regional Latin-American and Caribbean IP Address Registry) - Latin America and some Caribbean Islands
- RIPE NCC (Réseaux IP Européens) - Europe, the Middle East, and Central Asia

The IANA's role is to allocate IP addresses from the pools of unallocated addresses to the RIRs according to their established needs. When an RIR requires more IP addresses for allocation or assignment within its region, the IANA makes an additional allocation to the RIR.

Important links:

- IPv4 Address Space
  (http://www.iana.org/assignments/ipv4-address-space)
- IPv6 Address Allocation and Assignment Policy
  (http://www.iana.org/ipaddress/ipv6-allocation-policy-26jun02)
- IPv6 Address Space
  (http://www.iana.org/assignments/ipv6-address-space)

7.1.3 Domain Names

The Domain Name System (DNS) helps users to find their way around the Internet. Every computer on the Internet has a unique address - just like a telephone number - which is a rather complicated string of numbers: the IP address. However IP addresses are hard to remember. The DNS makes using the Internet easier by allowing a familiar string of letters (the "Domain Name") to be used instead of the arcane IP address.

The Internet Corporation for Assigned Names and Numbers (ICANN - www.icann.org) is an internationally organized, non-profit corporation that has responsibility for gTLD and ccTLD name system management.

The responsibility for operating each TLD (including maintaining a registry of the Domain Names within the TLD) is delegated by ICANN to a particular organization. These organizations are referred to as 'registry operators'. Currently, the gTLD of .aero, .biz, .com, .coop, .info, .museum, .name, .net, .org and .pro are in use, and the corresponding registries are under contract with ICANN. Separate arrangements apply to .edu, .mil, .gov, under United States Government responsibility, and .int which is directly under ICANN's responsibility.

Domain Names can be registered through many companies known as "registrars". The registrar collects various contact and technical information that makes up the user's registration. The registrar keeps then records of the contact information and submit the technical information to the registry operator. The latter provides other computers on the Internet the information necessary to resolve the Domain Name in the correct IP address.

SIP addresses used as public user ID in NGN are based on Domain Names. A SIP address (or a SIP URI) is a type of Uniform Resource Identifier that identifies a communication resource in SIP. A SIP URI usually contains a user name and a host name and is similar in format to an email address (example: user@domain.foo).

7.1.4 International Mobile Subscriber Identity - IMSI (ITU-T Recommendation E.212)

The IMSI is a string of decimal digits, up to a maximum of 15 digits, that identifies a unique mobile terminal or mobile subscriber internationally. IMSIs may also be used for terminal or subscriber identification within fixed or wireline networks that offer mobility services, or to achieve compatibility with networks that have mobility services. The IMSI consists of three fields: the MCC, the MNC, and the MSIN. The IMSI conforms to the ITU-T Recommendation for E.212 numbering.

MCCs are assigned by the ITU in response to formal requests from national administrators of ITU Member States. Additional MCCs will be assigned only in anticipation of exhaust of assigned code(s). MNCs are administered by the designated administrator within each country or by the TSB in the case of shared MCCs. Additional MNCs are assigned to MNC assignees within a shared MCC only for exhaust of the assigned code(s). MSINs are administered by the MNC assignee.

In principle, only one IMSI shall be assigned to each mobile terminal or mobile user. In case of multiple subscriptions (subscriptions to more than one mobility service from one or more service providers), a mobile terminal or mobile user may be assigned a different IMSI for each subscription.

Annex A (normative): 3GPP and TISPAN IDs

A.1 Identifiers already defined in 3GPP

Identifier name	Clause in [6]	Definition in TS 123 003 [6]	TISPAN statements
	2	**Identification of mobile subscribers**	
IMSI	2.2	A unique **International Mobile Subscriber Identity** (IMSI) shall be allocated to each mobile subscriber in the GSM/UMTS system.	Not used within NASS
TMSI	2.4	In order to support the subscriber identity confidentiality service the VLRs and SGSNs may allocate **Temporary Mobile Subscriber Identities** (TMSI) to visiting mobile subscribers. The VLR and SGSNs must be capable of correlating an allocated TMSI with the IMSI of the MS to which it is allocated.	Not used within NASS
P-TMSI	**2.1**	**Packet TMSI** An MS may be allocated two TMSIs, one for services provided through the MSC, and the other for services provided through the SGSN (P-TMSI for short).	Not used within NASS
TLLI	2.6	For addressing on resources used for GPRS, a **Temporary Logical Link Identity** (TLLI) is used. The TLLI to use is built by the MS either on the basis of the P-TMSI (local or foreign TLLI), or directly (random TLLI).	Access network type specific (ID specific to 3GPP networks)
LMSI	2.5	In order to speed up the search for subscriber data in the VLR a supplementary **Local Mobile Station Identity** (LMSI) is defined. The LMSI may be allocated by the VLR at location updating and is sent to the HLR together with the IMSI. The HLR makes no use of it but includes it together with the IMSI in all messages sent to the VLR concerning that MS.	Access network type specific (ID specific to 3GPP networks)
NRI	**2.4**	**Network Resource Identifier** If intra domain connection of RAN nodes to multiple CN nodes as described in 3GPP TS 23.236 is applied in the MSC/VLR or SGSN, then the NRI shall be part of the TMSI. The NRI has a configurable length of 0 to 10 bits. A configurable length of 0 bits indicates that the NRI is not used and this feature is not applied in the MSC/VLR or SGSN. The NRI shall be coded in bits 23 to 14. An NRI shorter than 10 bits shall be encoded with the most significant bit of the NRI field in bit 23.	Access network type specific (ID specific to 3GPP networks)
	3	**Numbering plan for mobile stations**	

MSISDN	**3.3**	**Mobile station international PSTN/ISDN number (E.164)**
		The number consists of:
		- Country Code (CC) of the country in which the MS is registered, followed by:
		- National (significant) mobile number, which consists of:
		  - National Destination Code (NDC); and
		  - Subscriber Number (SN).
			A number of this format (i.e. an E.164 number) is required for NGNs, however, the term MSISDN is 3GPP specific

MSRN	**3.4**	**Mobile station roaming number for PSTN/ISDN routeing (E.164)** The Mobile Station Roaming Number for PLMN/ISDN routing shall have the same structure as MSISDN numbers in the area in which the roaming number is allocated.	Needed only in a circuit switched environment
	3.5	**Mobile station international data number** The structure of MS international data numbers should comply with the data numbering plan of ITU-T Recommendation X.121 as applied in the home country of the mobile subscriber.	Not needed, as all services can be provided using the same number
	3.6	**Handover number** The structure of the handover number is the same as the structure of the MSRN.	Handover implies "session continuity" which is for further study (ffs) in TISPAN

Identifier name	Clause in [6]	Definition in TS 123 003 [6]	TISPAN statements
	4	**Identification of location areas and base stations**	
LAI	**4.1**	**Location Area Identity** The LAI is composed of the following elements: - Mobile Country Code (MCC) identifies the country in which the GSM PLMN is located. The value of the MCC is the same as the three digit MCC contained in international mobile subscriber identity (IMSI); - Mobile Network Code (MNC) is a code identifying the GSM PLMN in that country. The MNC takes the same value as the two or three digit MNC contained in IMSI; - Location Area Code (LAC) is a fixed length code (of 2 octets) identifying a location area within a PLMN. This part of the location area identification can be coded using a full hexadecimal representation except for the following reserved hexadecimal values: - 0000, and - FFFE. These reserved values are used in some special cases when no valid LAI exists in the MS (see 3GPP TS 24.008 , 3GPP TS 31.102 and 3GPP TS 51.011).	Access network type specific (ID specific to 3GPP networks).
RAI	**4.2**	**Routing Area Identity** The RAI is composed of the following elements: - A valid Location Area Identity (LAI) as defined in clause 4.1. Invalid LAI values are used in some special cases when no valid RAI exists in the mobile station (see 3GPP TS 24.008 , 3GPP TS 31.102 and 3GPP TS 51.011). - Routeing Area Code (RAC) which is a fixed length code (of 1 octet) identifying a routeing area within a location area.	Access network type specific (ID specific to 3GPP networks)
CI	4.3.1	The BSS and cell within the BSS are identified within a location area or routeing area by adding a Cell Identity (CI) to the location area or routeing area identification, as shown in figure 5. The CI is of fixed length with 2 octets and it can be coded using a full hexadecimal representation.	Access network type specific (ID specific to 3GPP networks)
CGI	4.3.1	The **Cell Global Identification** is the concatenation of the Location Area Identification and the Cell Identity. Cell Identity shall be unique within a location area.	Access network type specific (ID specific to 3GPP networks)
BSIC	4.3.2	The **Base Station Identity Code** is a local colour code that allows an MS to distinguish between different neighbouring base stations. BSIC is a 6 bit code which is structured as shown in figure 6.	Access network type specific (ID specific to 3GPP networks)
RSZI	4.4	A PLMN-specific regional subscription defines unambiguously for the entire PLMN the regions in which roaming is allowed. It consists of one or more regional subscription zones. The regional subscription zone is identified by a **Regional Subscription Zone Identity** (RSZI). A regional subscription zone identity is composed as shown in figure 7.	Access network type specific (ID specific to 3GPP networks)
	5	**Identification of MSCs, GSNs and location registers**	
GSN address	**5.1**	**GSN: GPRS Support Node address** **SGSN: Serving GPRS Support Node** **GGSN: Gateway GPRS Support Node** MSCs, GSNs and location registers are identified by international PSTN/ISDN numbers and/or Signalling Point Codes ("entity number", i.e., "HLR number", "VLR number", "MSC number", "SGSN number" and "GGSN number") in each PLMN. Additionally SGSNs and GGSNs are identified by GSN Addresses. These are the SGSN Address and the GGSN Address.	Access network type specific (ID specific to 3GPP networks) (similar functionalities required in TISPAN to identify the access to the NGN)
HLR ID	**5.2**	**Home Location Register** HLR may also be identified by one or several "HLR id(s)", consisting of the leading digits of the IMSI (MCC + MNC + leading digits of MSIN).	Not needed in TISPAN Release 1 ffs for later releases

Identifier name	Clause in [6]	Definition in TS 123 003 [6]	TISPAN statements
	6	**International Mobile Station Equipment Identity and Software Version Number**	
IMEI	**6.2.1**	**International Mobile Equipment Identity** The IMEI is composed of the following elements (each element shall consist of decimal digits only): - Type Allocation Code (TAC). Its length is 8 digits; - Serial Number (SNR) is an individual serial number uniquely identifying each equipment within the TAC. Its length is 6 digits; - Spare digit: this digit shall be zero, when transmitted by the MS.	Fixed network terminals need not to contain that ID ffs in later releases
IMEISV	6.2.2	**International Mobile Equipment Identity and Software Version Number** The IMEISV is composed of the following elements (each element shall consist of decimal digits only): - Type Allocation Code (TAC). Its length is 8 digits; - Serial Number (SNR) is an individual serial number uniquely identifying each equipment within the TAC. Its length is 6 digits; - Software VErsion Number (SRV) identifies the software version number of the mobile equipment. Its length is 2 digits.	Fixed network terminals need not to contain that ID ffs in later releases
	7	**Identification of Voice Group Call and Voice Broadcast Call Entities**	
VGCS Group ID VBS Group ID	7.3	Logical groups of subscribers to the **Voice Group Call Service** or to the **Voice Broadcast Service** are identified by a Group Identity (Group ID). Group IDs for VGCS are unique within a PLMN. Likewise, Group IDs for VBS are unique within a PLMN. However, no uniqueness is required between the sets of Group IDs. These sets may be intersecting or even identical, at the option of the network operator.	Access network type specific (ID specific to 3GPP networks)
Group Call Area Identity	7.3	Grouping of cells into specific group call areas occurs in support of both the Voice Group Call Service and the Voice Broadcast Service. These service areas are known by a "**Group Call Area Identity"** (Group Call Area Id). No restrictions are placed on what cells may be grouped into a given group call area.	Access network type specific (ID specific to 3GPP networks)
	9	**Definition of Access Point Name**	
APN Network Identifier	**9.1**	**Access Point Name** The APN Network Identifier; this defines to which external network the GGSN is connected and optionally a requested service by the MS. This part of the APN is mandatory.	Not needed in TISPAN Release 1 ffs in later releases
APN Operator Identifier	9.1.2	The APN Operator Identifier; this defines in which PLMN GPRS backbone the GGSN is located. This part of the APN is optional.	Not needed in TISPAN Release 1 ffs in later releases
	10	**Identification of Cordless Telephony System Entities**	
FPBI	10.3	Every CTS-FP broadcasts a local identity - the **Fixed Part Beacon Identity** (FPBI) - which contains an Access Rights Identity. Every CTS-MS has both an Access Rights Key and a CTS Mobile Subscriber Identity (CTSMSI). These operate as a pair. A CTS-MS is allowed to access any CTS-FP which broadcasts an FPBI which can be identified by any of the CTS-MS Access Rights Keys of that CTS-MS. The CTS-MS Access Rights Key contains the FPBI and the FPBI Length Indicator (FLI) indicating the relevant part of the FPBI used to control access.	Access network type specific (ID specific to Cordless Telephony Systems)
CTSMSI	10.2	Each CTS-MS has one or more temporary identities which are used for paging and to request access. The structure and allocation principles of the **CTS Mobile Subscriber Identities** (CTSMSI) are defined below.	Access network type specific (ID specific to Cordless Telephony Systems)

Identifier name	Clause in [6]	Definition in TS 123 003 [6]	TISPAN statements
IFPEI	10.4	The **International Fixed Part Equipment Identity** (IFPEI) is composed of the following elements (each element shall consist of decimal digits only): - Type Approval Code (TAC). Its length is 6 decimal digits; - Final Assembly Code (FAC). Its length is 2 decimal digits; - Serial NumbeR (SNR). Its length is 6 decimal digits; - Software Version Number (SVN) identifies the software version number of the fixed part equipment. Its length is 2 digits.	Access network type specific (ID specific to Cordless Telephony Systems)
IFPSI	10.5	The **International Fixed Part Subscriber Identity** (IFPSI) is composed of the following elements (each element shall consist of decimal digits only): - Mobile Country Code (MCC) consisting of three digits. The MCC identifies the country of the CTS-FP subscriber (e.g. 208 for France); - CTS Operator Number (CON). Its length is three digits; - Fixed Part Identification Number (FPIN) identifying the CTS-FP subscriber..	Access network type specific (ID specific to Cordless Telephony Systems)
NFPSI	10.5	The **National Fixed Part Subscriber Identity** (NFPSI) consists of the CTS Operator Number and the Fixed Part Identification Number.	Access network type specific (ID specific to Cordless Telephony Systems)
	11	**Identification of Localised Service Area**	
LSAID	11	Cells may be grouped into specific localised service areas. Each localised service area is identified by a **Localised Service Area IDentity** (LSA ID). No restrictions are placed on what cells may be grouped into a given localised service area. The LSA ID can either be a PLMN significant number or a universal identity. This shall be known both in the networks and in the SIM.	Access network type specific (ID specific to 3GPP networks)
	12	**Identification of PLMN, RNC, Service Area, CN domain and shared network Area**	
PLMN-ID	12.1	A PLMN is uniquely identified by its **Public Land Mobile Network Identifier.** PLMN-Id consists of Mobile Country Code (MCC) and Mobile Network Code (MNC). **PLMN-Id = MCC || MNC**	Operator network type specific
CN Domain ID	12.2	**Core Network Domain Identity** A CN Domain Edge Node is identified within the UTRAN by its CN Domain Identifier. The CN Domain identifier is used over UTRAN interfaces to identify a particular CN Domain Edge Node for relocation purposes. The CN Domain identifier for Circuit Switching (CS) consists of the PLMN-Id and the LAC, whereas for Packet Switching (PS) it consists of the PLMN-Id, the LAC, and the RAC of the first accessed cell in the target RNS. The two following CN Domain Identifiers are defined: - **CN CS Domain-Id = PLMN-Id || LAC** - **CN PS Domain-Id = PLMN-Id || LAC || RAC**	Access network type specific (ID specific to 3GPP networks)
CN ID	12.3	Core Network Identity A CN node is uniquely identified within a PLMN by its CN Identifier (CN-Id). The CN-Id together with the PLMN identifier globally identifies the CN node. The CN-Id together with the PLMN-Id is used as the CN node identifier in RANAP signalling over the Iu interface. **Global CN-Id = PLMN-Id || CN-Id** The CN-Id is defined by the operator, and set in the nodes via O&M.	Access network type specific (ID specific to 3GPP networks)

Identifier name	Clause in [6]	Definition in TS 123 003 [6]	TISPAN statements
RNC-Id	12.4	**Radio Network Controller Identity** An RNC node is uniquely identified by its RNC Identifier (RNC-Id). The RNC-Id of an RNC is used in the UTRAN, in a GERAN which is operating in GERAN Iu mode and between them. A BSC which is part of a GERAN operating in Iu mode is uniquely identified by its RNC Identifier (RNC-Id). The RNC-Id of a BSC is used in a GERAN which is operating in GERAN Iu mode, in the UTRAN and between them. RNC-Id together with the PLMN identifier globally identifies the RNC. The RNC-Id on its own or the RNC-Id together with the PLMN-Id is used as the RNC identifier in the UTRAN Iub, Iur and Iu interfaces. The SRNC-Id is the RNC-Id of the SRNC. The C-RNC-Id is the RNC-Id of the controlling RNC. The D-RNC-Id is the RNC Id of the drift RNC. **Global RNC-Id = PLMN-Id || RNC-Id** The RNC-Id is defined by the operator, and set in the RNC via O&M.	Access network type specific (ID specific to 3GPP networks)
SAI	12.5	The **Service Area Identifier** (SAI) is used to identify an area consisting of one or more cells belonging to the same Location Area. Such an area is called a Service Area and can be used for indicating the location of a UE to the CN. The Service Area Code (SAC) together with the PLMN-Id and the LAC constitute the Service Area Identifier. - **SAI = PLMN-Id || LAC || SAC** The SAC is defined by the operator, and set in the RNC via O&M.	Access network type specific (ID specific to 3GPP networks)
SNA-Id	12.6	The **Shared Network Area Identifier (**SNA-Id) is used to identify an area consisting of one or more Location Areas. Such an area is called a Shared Network Area and can be used to grant access rights to parts of a Shared Network to a UE in connected mode (see 3GPP TS 25.401). The Shared Network Area Identifier consists of the PLMN-Id followed by the Shared Network Area Code (SNAC). - **SNA-Id = PLMN-Id || SNAC** The SNAC is defined by the operator.	Access network type specific (ID specific to 3GPP networks)
	13	**Numbering, addressing and identification within the IP multimedia core network subsystem**	
Private User ID	13.3	The private user identity shall take the form of an NAI, and shall have the form username@realm as specified in clause 2.1 of RFC 4282	
Public User ID	13.4	The Public User Identity shall take the form of either a SIP URI (see RFC 3261 or a tel URL (see RFC 3966). A SIP URI for a Public User Identity shall take the form "sip:user@domain". SIP URI comparisions shall be performed as defined in RFC 3261 , section 19.1.4.	
PSI	13.5	The **Public Service Identity** (PSI) shall take the form of either a SIP URI (see RFC 3261) or a tel URL (see RFC 3966). A public service identity defines a service, or a specific resource created for a service.	
	14	**Numbering, addressing and identification** needed to access the 3GPP system supporting the WLAN interworking	
Home network realm	14.2	The home network realm shall be in the form of an Domain Name as specified in RFC1035	
Root NAI	14.3	The Root NAI shall take the form of a NAI, and shall have the form 'username@realm' as specified in clause 2,1 of RFC 4282.	
Decorated NAI	14.4	The Decorated NAI shall take the form of a NAI, and shall have the form 'homerealm!username@otherrealm as specified in clause 2.73 of RFC 4282.	
Temporary Ids	14.5	The Temporary Identities (Pseudonyms and re-authentication identities) shall take the form of a Network Access Identifier (NAI) username as specified in clause 2,1 of the RFC 4282	
Alternative NAI	14.6	The Alternative NAI shall take the form of a NAI, i.e. 'any_username@REALM' as specified in RFC 4282.	

Identifier name	Clause in [6]	Definition in TS 123 003 [6]	TISPAN statements
W-APN Network Identifier	14.7.1	A W-APN Network Identifier may be used to access a service associated with a PDG. This may be achieved by defining: - a W-APN Network Identifier consisting of 3 or more labels and starting with a Reserved Service Label, or a W-APN Network Identifier consisting of a Reserved Service Label alone, which indicates a PDG by the nature of the requested service. Reserved Service Labels and the corresponding services they stand for shall be agreed between operators who have WLAN roaming agreements.	Access network type specific (ID specific to 3GPP networks)
W-APN Operator Identifier	14.7.2	The W-APN Operator Identifier is composed of four labels. The last label shall be "pub.3gppnetwork.org". The second and third labels together shall uniquely identify the PLMN. The first label distinguishes the Domain Name as a W-APN. For each operator, there is a default W-APN Operator Identifier (i.e. Domain Name). This default W-APN Operator Identifier is derived from the IMSI as follows: "w-apn.mnc<MNC>.mcc<MCC>.pub.3gppnetwork.org"	Access network type specific (ID specific to 3GPP networks)
	15	**Identification of Multimedia Broadcast/Multicast Service**	
TMGI	15.2	**Temporary Mobile Group Identity** (TMGI) is used within MBMS to uniquely identify Multicast and Broadcast bearer services.. The TMGI is composed of three parts: 1) MBMS Service ID consisting of three octets. MBMS Service ID uniquely identifies an MBMS bearer service within a PLMN. 2) Mobile Country Code (MCC) consisting of three digits. The MCC identifies uniquely the country of domicile of the BM-SC; 3) Mobile Network Code (MNC) consisting of two or three digits. The MNC identifies the PLMN which the BM-SC belongs to. The length of the MNC (two or three digits) depends on the value of the MCC.	Access network type specific (ID specific to 3GPP networks)
	16	**Numbering, addressing and identification within the GAA subsystem**	
BSF address	16.2	The Bootstrapping Server Function (BSF) address is in the form of a Fully Qualified Domain Name as defined in RFC 1035. The UE shall discover the BSF address from the identity information related to the UICC application that is used during the bootstrapping procedure i.e. IMSI for USIM, or IMPI for ISIM.	Not defined in TISPAN Release 1 ffs in later releases
	17	**Numbering, addressing and identification within the Generic Access Network**	
Home network realm	17.2.1	The home network realm shall be in the form of an Internet domain name, e.g. operator.com, as specified in RFC 1035.	
Full Authentication NAI	17.2.2	The Full Authentication NAI in both EAP-SIM and EAP-AKA shall take the form of an NAI as specified in clause 2.1 of RFC 4282.	Not defined in TISPAN Release 1 ffs in later releases
Fast Re-Authentication NAI	17.2.3	The Fast Re-authentication NAI in both EAP-SIM and EAP-AKA shall take the form of an NAI as specified in clause 2.1 of RFC 4282.	Not defined in TISPAN Release 1 ffs in later releases
Home network Domain Name	17.3.1	The home network Domain Dame shall be in the form of a Domain Name, e.g. operator.com, as specified in RFC 1035.	
Provisioning GANC-SEGW ID	17.3.2	The Provisioning GANC-SEGW identifier shall take the form of a Fully Qualified Domain Name as specified in RFC 1035.	Access network type specific (ID specific to 3GPP networks)
Provisioning GANC ID	17.3.3	The Provisioning GANC identifier shall take the form of a fully qualified domain name (FQDN) as specified in RFC 1035.	Access network type specific (ID specific to 3GPP networks)

A.2 Additional Identifiers necessary for TISPAN NGN

A.2.1 Organization of User Data

This table is taken from TR 182 005 (see bibliography) for TISPAN Release 1.

Parameter	Clause	CLF	PDBF
Assigned IP Address	9.1.1.1	T	
Address Realm	9.1.1.2	T	
Subscriber Id	9.1.2	T	P
Default Subscriber ID	9.1.3	P	
Physical Access ID	9.2.1	T	
Logical Access ID	9.2.2	T	
Access Network Type	9.2.3	P	
Terminal Type	9.2.4	T	
Privacy Indicator	9.3.1	T	P
Location Information	9.3.2	P	
Geographic Location Information	9.3.3	T	
QoS Profile Information	9.4.1	T	P
Initial Gate Settings	9.4.2	T	
RACS Point of Contact	9.5.1	P	
CNCGF address	9.5.2		P
P-CSCF Identity	9.5.3		P
AF Identity	9.5.4	T	

A.2.2 Network Attachment Subsystem (NASS)

Additional IDs in the NASS document ES 282 004 [14] for TISPAN Release 1.

No new additional IDs are contained in the NASS document.

A.2.3 Resource and Admission Control Subsystem (RACS)

Additional ID's in the RACS document ES 282 003 [15] for TISPAN Release 1.

Parameter	Clause
Charging Correlation identifier	5.2.2
RACF identification	5.2.3.1.2
Application function identifier	5.2.3.1.5
Resource Bundle Identifier	5.2.3.1.6
Media Session Identifier	5.2.3.3.2
Flow Identifier	5.3.1.3.1

A.3 Summarization of Access IDs

Following are some access IDs derived from NASS document ES 282 004 [14] for TISPAN Release 1.

- IP Address: The IP address of the attached user equipment.
- Address Realm: The addressing domain in which the IP address is significant.
- Physical Access ID: The identity of the physical access to which the user equipment is connected.
- Logical Access ID: The identity of the logical access used by the attached user equipment. In the xDSL case, the Logical Access ID may explicitly contain the identity of the port, VP and/or VC carrying the traffic.
- Subscriber ID: The identity of the attached user.

- Static Information derived from the Physical access ID:
  - Location Information.
  - Default Subscriber ID.
- Static Information Derived from the Logical Access ID:
  - RACS point of contact: The address of the RACS element where the subscriber profile should be pushed.
  - Access Network Type: The type of access network over which IP connectivity is provided to the user equipment.

Annex B (informative): Bibliography

TISPAN 04bTD036r1: "Key Issues concerning user and network IDs in NGNs and TISPAN WGs".

ITU-T Recommendation E.118 (2001): "The international telecommunication charge card".

ITU-T Recommendation E.191 (2000): "B-ISDN addressing".

ITU-T Recommendation Q.708 (1999): "Assignment procedures for international signalling point codes".

ITU-T Recommendation X.121 (2000): "International numbering plan for public data networks".

ITU-T Recommendation X.25 (1996): "Interface between Data Terminal Equipment (DTE) and Data Circuit-terminating Equipment (DCE) for terminals operating in the packet mode and connected to public data networks by dedicated circuit".

ITU-T Recommendation X.21 (1992): "Interface between Data Terminal Equipment and Data Circuit-terminating Equipment for synchronous operation on public data".

ITU-T Recommendation F.69 (1994): "The International Telex Service - Service and operational provisions of Telex Destinations Codes and Telex Network Identification Codes".

Directive 2002/19/EC of the European Parliament and of the Council of 7 March 2002 on access to, and interconnection of, electronic communications networks and associated facilities (Access Directive).

Directive 2002/21/EC of the European Parliament and of the Council of 7 March 2002 on a common regulatory framework for electronic communications networks and services (Framework Directive).

Directive 2002/22/EC of the European Parliament and of the Council of 7 March 2002 on universal service and users' rights relating to electronic communications networks and services (Universal Service Directive).

The Convention on Mutual Assistance in Criminal Matters between the Member States of the European Union established by Council Act of 29th May 2000 (2000/C197/01).

IETF RFC 1661: "Point-to-Point Protocol (PPP)".

ETSI TR 180 000: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); NGN Terminology".

ETSI TR 182 005: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Organization of user data".

ITU-T Recommendation Y.2001: "General overview of NGN".

GSMA IR.65: "IMS Roaming & Interworking Guidelines".

History

Document history		
V1.1.1	October 2006	Publication