

Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Infrastructure ENUM Options for a TISPAN IPX

iTeh STANDARD PREVIEW
(standards.iteh.ai)
Full standard:
<https://standards.iteh.ai/catalog/standards/sist/d31e8335-1bb9-4fcd-939a-8b3378e0a276/etsi-tr-184-008-v2.1.1-2009-02>



Reference

DTR/TISPAN-04012-NGN-R2

Keywords

DNS, enum

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Important notice

Individual copies of the present document can be downloaded from:

<http://www.etsi.org>

The present document may be made available in more than one electronic version or in print. In any case of existing or perceived difference in contents between such versions, the reference version is the Portable Document Format (PDF). In case of dispute, the reference shall be the printing on ETSI printers of the PDF version kept on a specific network drive within ETSI Secretariat.

Users of the present document should be aware that the document may be subject to revision or change of status. Information on the current status of this and other ETSI documents is available at

<http://portal.etsi.org/tb/status/status.asp>

If you find errors in the present document, please send your comment to one of the following services:

http://portal.etsi.org/chaicor/ETSI_support.asp

Copyright Notification

No part may be reproduced except as authorized by written permission.
The copyright and the foregoing restriction extend to reproduction in all media.

© European Telecommunications Standards Institute 2009.
All rights reserved.

DECT™, **PLUGTESTS™**, **UMTS™**, **TIPHON™**, the TIPHON logo and the ETSI logo are Trade Marks of ETSI registered for the benefit of its Members.

3GPP™ is a Trade Mark of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners.

LTE™ is a Trade Mark of ETSI currently being registered

for the benefit of its Members and of the 3GPP Organizational Partners.

GSM® and the GSM logo are Trade Marks registered and owned by the GSM Association.

Contents

Intellectual Property Rights	4
Foreword.....	4
1 Scope	5
2 References	5
2.1 Normative references	5
2.2 Informative references.....	5
3 Definitions and abbreviations.....	6
3.1 Definitions.....	6
3.2 Abbreviations	7
4 Introduction	7
5 Types of ENUM.....	7
5.1 User ENUM.....	7
5.2 Infrastructure ENUM	8
5.2.1 Infrastructure ENUM within the public DNS	8
5.2.2 Infrastructure ENUM within private DNS.....	9
6 Infrastructure ENUM requirements in TISPAN NGN.....	9
6.1 Top level requirements.....	9
6.2 Detailed Requirements	11
7 Architectural considerations.....	11
7.1 ENUM Architecture within TISPAN	12
7.2 Implementing ENUM using public or private Infrastructure	12
7.2.1 Using Public DNS (Public internet).....	12
7.2.2 Using Private DNS	13
7.3 Top level architecture.....	14
7.4 Routeing implementation within each carrier network and within national boundaries.....	16
8 Evaluation of options.....	16
9 Conclusions and proposed way forward	17
History	18

Intellectual Property Rights

IPRs essential or potentially essential to the present document may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: "*Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards*", which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (<http://webapp.etsi.org/IPR/home.asp>).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Foreword

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

ITeH STANDARD PREVIEW
(standards.iteh.ai)
Full standard:
<https://standards.iteh.ai/catalog/standards/sist/d31e8335-1bb9-4fcd-939a-8b3378e0a276/etsi-tr-184-008-v2.1.1-2009-02>

1 Scope

The present document provides an overview of some of the relevant options that can be used to implement Infrastructure ENUM (I-ENUM), which in the present document is defined as the use of the technology specified in RFC 3761 [i.1] by the carrier of record to map a telephone number into a URI. That URI then identifies a specific point of interconnection to that communication provider's network that could enable the originating party to establish communication over an IPX to the associated terminating party.

An assessment of the options is given and recommendations made in order to provide a secure and reliable implementation of I-ENUM for TISpan networks to facilitate routing and interconnection within NGNs.

2 References

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

- For a specific reference, subsequent revisions do not apply.
- Non-specific reference may be made only to a complete document or a part thereof and only in the following cases:
 - if it is accepted that it will be possible to use all future changes of the referenced document for the purposes of the referring document;
 - for informative references.

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

NOTE: While any hyperlinks included in this clause were valid at the time of publication ETSI cannot guarantee their long term validity.

2.1 Normative references

The following referenced documents are indispensable for the application of the present document. For dated references, only the edition cited applies. For non-specific references, the latest edition of the referenced document (including any amendments) applies.

Not applicable.

2.2 Informative references

The following referenced documents are not essential to the use of the present document but they assist the user with regard to a particular subject area. For non-specific references, the latest version of the referenced document (including any amendments) applies.

- [i.1] IETF RFC 3761: "The E.164 to Uniform Resource Identifiers (URI); Dynamic Delegation Discovery System (DDDS) Application (ENUM)".
- [i.2] IETF RFC 1034: "Domain Names - Concepts and Facilities".
- [i.3] IETF RFC 1035: "Domain Names - Implementation and Specification".
- [i.4] ITU-T Recommendation E.164: "The International Public Telecommunication Numbering Plan".
- [i.5] ETSI ES 282 002: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISpan); PSTN/ISDN Emulation Sub-system (PES); Functional architecture".

[i.6] IETF RFC 5067: "Infrastructure ENUM Requirements".

[i.7] IETF RFC 3263: "Session Initiation Protocol (SIP)".

[i.8] IAB instructions to RIPE NCC.

NOTE: Available at: <http://www.ripe.net/enum/instructions.html>.

[i.9] ETSI TS 102 051: "ENUM Administration in Europe".

[i.10] ETSI TR 184 007: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Naming/Numbering Address Resolution (NAR)".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

Carrier of Record:

- the communication provider to which the E.164 number was allocated for end user assignment, whether by the National Regulatory Authority (NRA) or the International Telecommunication Union (ITU), for instance a code under "International Networks" (+882) or "Universal Personal Telecommunications (UPT)" (+878); or
- if the number is ported, the communication provider to which the number was ported; or
- where numbers are assigned directly to end users, the communication provider that the end user number assignee has chosen to provide a Public Switched Telephone Network/Public Land Mobile Network (PSTN/PLMN) point-of-interconnect for the number.

It is understood that the definition of carrier-of-record within a given jurisdiction is subject to modification by NRAs (National Regulatory Authorities).

E.164 number: string of decimal digits that, for a geographic country code, uniquely identifies a subscriber or a point where a service is provided

For the case of a global service code, it identifies the subscriber of the service. For Networks, it identifies a subscriber of the Network.

An international E.164 number can act in the "role" of both a name and an address. Portability is reducing a number's role as an address. Numbers are increasingly acting in the role of a name only.

The number, which includes the country code and subsequent digits, but not the international prefix, contains the information necessary to route the call to this termination point on a public network (it may also contain the supplementary information necessary to forward it on a private network).

NOTE: It is sometimes referred to as an "international number", "international public telecommunication number" or "E.164 number".

Name Number Address Resolution (NAR):

The terms "address resolution" and "name resolution" are synonymous and are used in the IP world in different manners:

In IP network, there are two types of Address Resolutions defined:

- The first is the conversion from a domain name into an IP address (see DNS).
- The second is from the IP address to the Ethernet Address Resolution – this is not in the scope of the present document.

Private: any arrangement between parties (specific to a communication provider or shared between consenting groups of communication providers e.g. federation) that is outside of the public Internet

TISPAN IPX:ETSI TISPAN defined inter-operator IP backbone network that is compliant with TISPAN standards and is transparent to subscribers

NOTE: This is able to support connectivity between any type of Service Provider, for interworking, a range of IP services on a bilateral basis with end-to-end QoS and interconnection charging.

3.2 Abbreviations

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

CP	Communications Provider
DDOS	Distributed Denial Of Service attack
DNS	Domain Name System
I-ENUM	Infrastructure ENUM
IPX	IP Packet eXchange
ITU	International Telecommunications Union
NAPTR	Number Authority Pointer
NAR	Naming/Numbering Addressing Resolution
NGN	Next Generation Network
PoI	Point of Interconnection
PSTN	Public Switched Telephone Network
RRs	Resource Records
SIP	Session Initiation Protocol
URI	Uniform Resource Identifier
PLMN	Public Land Mobile Network
NRA	National Regulatory Authorities
CC	Country Code

4 Introduction

Within ETSI TISPAN work is progressing on Next Generation Networks (NGNs). A Next Generation Network (NGN) is a packet-based network able to provide services including Telecommunication Services and is able to make use of multiple broadband, QoS-enabled transport technologies in which service-related functions are independent from underlying transport-related technologies. It offers unrestricted access by users to different communication providers. It supports generalized mobility which will allow consistent and ubiquitous provision of services to users.

The realization of those capabilities requires a numbering and routing capability and the use of DNS protocols and functionality. The present document focuses on the use of Infrastructure ENUM to map a telephone number into a URI that could identify a specific point of interconnection (PoI) to that communication provider's network that could enable the originating party to establish communication with the associated terminating part through an IPX.

5 Types of ENUM

ENUM (RFC 3761 [i.1]) is a capability that transforms E.164 numbers into domain names and then uses the DNS (Domain Name System) to discover NAPTR records that specify the services available for a specific domain name. There are basically two broad variants of ENUM, User ENUM and Infrastructure ENUM.

5.1 User ENUM

User ENUM as originally defined was based on the end-user opt-in principle, where the explicit consent of the user who has the rights to use a specific telephone number is required in order to insert that number into the ENUM system. The user also has the right to specify the ENUM capabilities that are provided against that number e.g. what is inserted in the associated NAPTRs that facilitate the ENUM services delivered. The standardized implementation of User ENUM

utilizes the public Internet and the .e164.arpa domain name as specified within RFC 3761 [i.1]. Procedures about administration of User ENUM have been specified by ETSI [i.9].

5.2 Infrastructure ENUM

Infrastructure ENUM is defined in the present document as the use of the technology specified in RFC 3761 [i.1] by the carrier of record to map a telephone number into a URI that identifies a specific point of interconnection to that communication provider's network that could enable the originating party to establish communication with the associated terminating party. Other concepts may also apply for I-ENUM in the NGN.

The present document, also embraces the ENUM concept and protocol when it is implemented within a private DNS environment e.g. when it does not use the global public DNS.

In either case no user data is inserted in the database. Only information required to identify the carrier responsible for the called number, or in some cases additional information to route the call is inserted within the database and remains under the control of the relevant carrier.

Figure 1 depicts the main differences between user and infrastructure ENUM and variants within those categories.

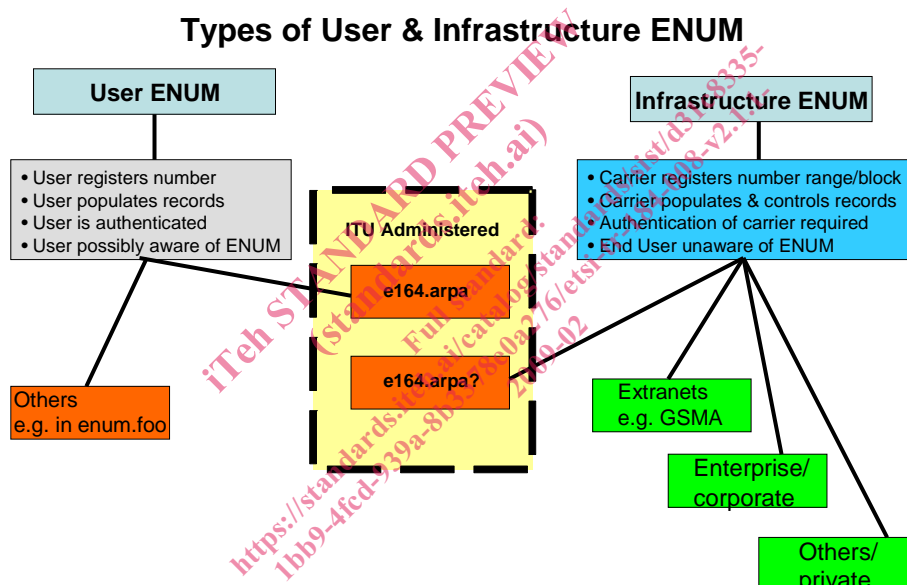


Figure 1: Types of User and Infrastructure ENUM

It shows that both User and Infrastructure ENUM can be provided in a number of forms.

For User ENUM implementations could occur within a national environment using e164.arpa once the appropriate National Regulatory Authority has signalled their approval of this delegation to the ITU-TSB in accordance with the instructions issued by the Internet Architecture Board (IAB) to RIPE-NCC regarding how to proceed with any requests received by RIPE-NCC. Those instructions can be found at <http://www.ripe.net/enum/instructions.html> [i.8] and at the ITU web site at <http://www.itu.int/ITU-T/inr/enum/procedures.html>.

A number of different but complimentary implementations of ENUM will exist using both public (e.g. Internet) and private DNS infrastructure. It is for communications providers to decide which of these best meets their needs.

5.2.1 Infrastructure ENUM within the public DNS

This option is where the resolution of the initial ENUM look-up to identify interconnection points within or between networks is resolved within servers that form part of the public Internet. In some cases the information required may be cached within local network servers.

Within the public Internet, theoretically it is possible to utilize different parts of the name space for infrastructure ENUM, however the adoption of a common approach would radically reduce interworking difficulties.

It should be noted that it is possible for a group of communication providers to share a common part of the public segment that can be made more secure, even though the existing infrastructure is used, however this still raises some issues over the degree of security that can be maintained as no part of the public Internet is totally immune from DDOS attacks.

5.2.2 Infrastructure ENUM within private DNS

A private DNS implementation is where the DNS servers can only be accessed by a communication provider (or group or federation of communication providers) within their own environment. The supporting infrastructure also remains private and cannot be accessed via the public Internet, therefore this implementation can be viewed as an extranet. The choice of domain name is under the control of the communication provider(s) concerned.

Enterprise and corporate networking requirements can also be realized as both extranets and intranets, dependent upon their needs. However access to and from networks outside of those arrangements will remain a key requirement.

Other arrangements will also emerge where third party ENUM providers will facilitate detailed routing information that will support peer to peer networking, including IP PBX capabilities.

6 Infrastructure ENUM requirements in TISPAN NGN

As detailed in clause 4 Infrastructure ENUM is distinguished from user ENUM as defined in RFC 3761 [i.1] in which the entity or person having the right-to-use a number has the sole discretion about the content of the associated domain and thus the zone content. From a domain registration perspective, the end user number assignee is thus the registrant. As VoIP evolves and becomes pervasive, E.164-addressed telephone calls need not necessarily traverse the Public Switched Telephone Network (PSTN). Therefore, VoIP service providers have an interest in using I-ENUM to facilitate both intra and inter-carrier routing capabilities, thus keeping VoIP traffic on IP networks on an end-to-end basis. Different implementations of Infrastructure ENUM can facilitate this requirement. For NGN the usage of TISPAN IPX can be seen as one option.

NGN architecture requires a name, number, addressing and routing capability to be in place to facilitate the resolution of numbers names and addresses to facilitate connectivity both within, and between networks. The ENUM protocol as defined within RFC 3761 [i.1] provides a method of achieving that.

There is a need to process dialled digits that have been entered by the originating party in order to identify a called party or service, these digits are transmitted as a dial string to the NGN. To facilitate the routing of calls the dial string is analysed and inserted in ENUM as tel URI in the international format (an E.164 number) e.g. +44nnnnnnnnnn for processing within Infrastructure ENUM (I-ENUM). The output from the I-ENUM resolution process would be an URI that could identify a specific point of interconnection to the communication provider's network that could enable the originating party to establish communication with the associated terminating part through an IPX.

It should be appreciated that at this stage specific route determination may require more information.

6.1 Top level requirements

The top level requirements for I-ENUM and the interworking capabilities it provides as specified within ETSI TISPAN are listed below:

- Adherence to relevant standards:

All implementations are expected to comply with the same basic elements defined with relevant standards documents and IETF RFCs. In particular adherence to RFC 3761 [i.1] for detailed ENUM protocol requirements is mandatory except for the choice of the top level domain name, if an approach is adopted that uses private rather than public DNS e.g. an approach that does not use the basic internet for ENUM look ups.