

TELECOMMUNICATIONS NUMBERING ADVISORY COMMITTEE

Development of ENUM

Introduction

This paper briefly introduces the latest development of ENUM for Internet Protocol (IP) telephony or Voice over IP (VoIP) applications.

What is ENUM

2. ENUM is a protocol currently under development and discussion jointly by the ENUM Working Group of the Internet Engineering Task Force (IETF) and the Study Group 2 (SG2) of the International Telecommunication Union (ITU) for the purpose of allowing interworking between the IP-based networks and the Public Switched Telephone Networks (PSTN) in the applications of IP telephony or VoIP by assigning and using E.164 numbers at the IP devices. The goal of the Working Group is to define a Domain Name System (DNS) based architecture and protocol to map the E.164 numbers to Uniform Resource Indicators (URI). In other words, the ENUM protocol aims to translate E.164 telecommunications numbers to Internet Domain Names. IETF is a task force of the Internet Architecture Board, the standards development organization of the Internet society.

3. E.164 is the recommendation of the Telecommunication Sector of the ITU (ITU-T) that describes the format of the international public telecommunications numbering plan. For example, +852 29616333 is the telephone number of the OFTA help-desk expressed in E.164 format.

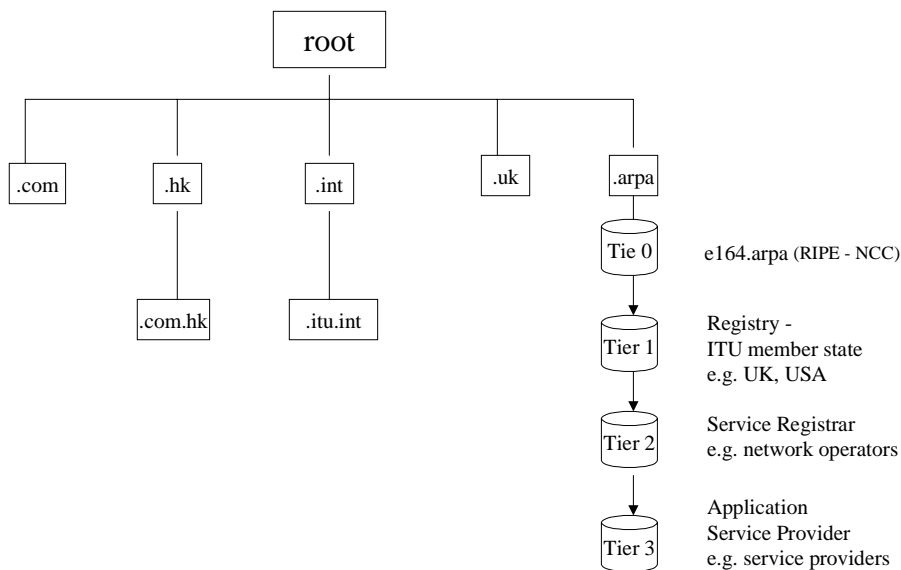
Mapping of E.164 numbers to DNS

4. According to the recommendation of the IETF, the domain zone "e164.arpa" would be deployed to provide the infrastructure in DNS for storage of E.164 numbers. The following procedure, as described in RFC 2916 of the IETF, illustrates how the E.164 number +852 29616333 is converted to DNS:

- Remove all non-digit characters with the exception of the leading '+': +85229616333
- Remove all characters with the exception of the digits: 85229616333
- Put dots (".") between each digit: 8.5.2.2.9.6.1.6.3.3.3.3
- Reverse the order of the digits: 3.3.3.6.1.6.9.2.2.5.8
- Append the string ".e164.arpa" to the end:
3.3.3.6.1.6.9.2.2.5.8.e164.arpa

5. Recently, the RIPE NCC (Reseaux IP Europeens Network Coordination Centre) has set up the server for the "e164.arpa" root level domain. (RIPE NCC is one of the 3 Regional Internet Registries in the world, providing allocation and registration services which support the operation of the Internet globally.)

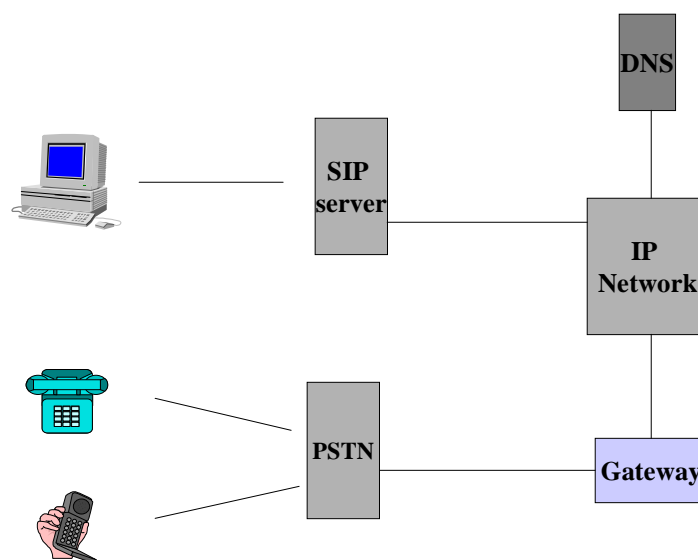
6. In order to facilitate distributed operations, the "e164.arpa" domain could be divided into sub-domains. Sub-domain names within this zone are to be delegated to parties according to the ITU recommendation E.164. The names allocated should be hierarchic in accordance with ITU Recommendation E.164, and the codes should assigned in accordance with that Recommendation. For example, the sub-domain for Hong Kong is "2.5.8.e164.arpa" and for France is "3.3.e164.arpa". The following diagram illustrates the DNS hierarchy structure for ENUM.



ENUM - DNS Structure & Hierarchy

Session Initialization Protocol (SIP)

7. The Session Initiation Protocol (SIP) plays a key role in the implementation of ENUM. SIP is an application-layer control protocol that could establish, modify and terminate multi-media sessions or calls. These multi-media sessions include multi-media conferences, videophones, Internet telephony and similar applications. SIP transparently supports name mapping and redirection services, allowing the implementation of ISDN and Intelligent Network telephony subscriber services. These facilities also enable personal mobility. The following generic diagram shows the routing of calls across PSTN and IP networks via the SIP server.



Routing of Calls over PSTN and IP Networks

Implication of ENUM on telecommunications services

8. Telephone numbers are used to access to various telecommunications services such as phones, fax machines, pagers, data communications, etc. Using DNS-based architecture, a person could put a single number into an ENUM registry and associate with it several addresses, such as their email address and fax number. This single ENUM number could then be used to contact the individuals by either email or fax. As the addresses of additional devices are added to the ENUM registry, those devices will become accessible through the same number. As individuals change their email addresses or

phone numbers, it is only necessary to change the user profile in the ENUM registry, with the ENUM number remains intact.

9. Among the services mentioned above, ENUM has significant impact on the IP telephony service. During the past few years, much effort has been spent by the ITU and IETF on the technical standards of Voice over IP. The integration of the addressing systems - telephone number in the PSTN and the DNS in the IP network is still under development. It is considered that ENUM could provide the mapping function between these two separate and distinct addressing systems. In order to ensure its effectiveness, it is necessary to have an administrative framework, coordinated at the global level, to secure the consistency of mapping between the two addressing systems.

Recent Activities

10. There are a number of recent activities related to ENUM. They are:

- 17 January 2001: ITU ENUM workshop hosted by ITU;
- 12 February 2001: ITU Member States are currently discussing the responsibility, delegation and authority for the ENUM "root zone". While discussions have been initiated on this topic at the recent ITU-T SG2 meeting in January/February 2001, they have yet to be concluded;
- 22 February 2001: Telecommunication Standardization Bureau (TSB) of the ITU has issued a circular to all Member States and Sector Members on "ENUM Awareness" (Annex 1); and
- 7-9 March 2001: World Telecommunication Policy Forum 2001 held to discuss the Secretary-General's Report on IP Telephony.

Way forward

11. OFTA will continue to keep track of the ENUM development and would report the status to the Telecommunications Numbering Advisory Committee in future. OFTA would also look into the following issues which

are relevant to the implementation of ENUM for IP telephony or VoIP services and applications in Hong Kong:

- establishment of the local ENUM DNS registry for the zone 2.5.8.e164.arpa
- the impact to our available number resources to meet the potential demand arising from the requirements of IP telephony or VoIP services and applications in Hong Kong

References

12. The following websites are related to the development of ENUM. Interested members might visit these websites to obtain update information about ENUM development.

- <http://www.itu.int/infocom/enum/index.html>
- <http://www.ietf.org/html.charters/enum-charter.html>

Office of the Telecommunications Authority
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INTERNATIONAL TELECOMMUNICATION UNION

Telecommunication
Standardization Bureau



Geneva, 22 February 2001

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- To Administrations of Member States of the Union;
- To ITU-T Sector Members;
- To ITU-T Associates;

Copy:

- To the Chairman, Deputy Chairman and Vice-Chairmen of Study Group 2;
- To the Director of the Telecommunication Development Bureau;
- To the Director of the Radiocommunication Bureau

Subject: **ENUM Awareness**

Dear Sir/Madam,

Within the telecommunications world much attention is currently focusing on an initiative which will enable E.164 numbers (public telephone numbers) to be mapped into the Internet's Domain Name System (DNS).

Through this mechanism, telephone numbers can be employed by users to look up a variety of addresses, including those used for phone, fax and email, by which the target user can be contacted. This also enables end users to tailor the manner in which they may be contacted through a single E.164 number. This additional contact information can also be easily added to or amended without changing the number used for access.

“ENUM” is the acronym that has been adopted to describe this capability — it is also the name given to the Internet Engineering Task Force (IETF) Working Group that defined the protocol.¹

¹ The ENUM protocol developed by the Internet Engineering Task Force (IETF) is specified in RFC2916.

This initiative will facilitate both-way interworking between the PSTN² and Internet Protocol (IP) based networks; e.g., by using ENUM to translate a number into a domain name and then using this to look up a corresponding IP address to complete the connection.

Such use of E.164 numbers demands careful control and strict administration procedures from national number plan managers and regulatory authorities involved in this process. The ITU has initiated a number of focused activities to assist member states in their consideration of national ENUM operational and administrative issues and ensure the integrity of the E.164 numbering plan³ (for example, by publishing informational guidelines). The purpose of this letter is to raise awareness of these activities, provide an overview of the status of this work, and the expected timeframe for completion.

The ITU and the IETF have made a number of common understandings, which should ensure technical and administrative coherence. Details are contained in the documents referenced in the **Annex**. It is strongly recommended that a firm appreciation of the principles defined and an understanding of the status of ongoing developments is gained before any decisions related to the insertion of E.164 numbers in the DNS are undertaken.

Information in this letter will help Member States understand the implications and possibilities concerning ENUM. It could also assist Member States in their decision making, particularly when considering whether to undertake the DNS administration for the sub domain in ENUM that corresponds to the E.164 Country Code assigned to them.

Yours faithfully

H. Zhao
Director of the Telecommunication
Standardization Bureau

² The term PSTN (Public Switched Telephone Network) is used in this document as a synonym for traditional circuit-switched telephone networks offered by Public Telecommunication Operators (PTOs), as well as Integrated Services Digital Networks (ISDN), and Public Land Mobile Networks (PLMN).

³ ITU-T Recommendation E.164 titled “The International Public Telecommunications Numbering Plan” specifies the format and types of use of public telephone numbers.

ANNEX 1
(to TSB Circular 26)

ENUM activities completed and on-going within ITU-T

<i>Activity</i>	ITU ENUM Workshop
<i>Brief overview</i>	The focus of the workshop was to raise awareness of the ENUM initiative and to identify issues for administration. The Chairman's Report and related materials for the ITU ENUM Workshop, held on January 17, 2001, are now available at: http://www.itu.int/infocom/enum/workshopjan01/
<i>Status/planned completion</i>	Workshop complete Issues being dealt with in appropriate forums

<i>Activity</i>	Liaison Statement* from: ITU-T SG2 WP1/2 Oct2000 Meeting Berlin. To: IETF/ISOC
<i>Brief overview</i>	Sets out understandings made on administration and other aspects. Details can be found at http://www.itu.int/infocom/enum/wp1-39_rev1.htm
<i>Status/planned completion</i>	Understandings made between ITU-SG2 WP1/2 and the IETF/ISOC will form the basis for on-going studies

<i>Activity</i>	Draft proposed ITU-T SG2 supplement: Operational and Administrative issues associated with the implementation of ENUM
<i>Brief overview</i>	Work has been initiated at the January 2001 meeting of SG2 to provide background, tutorial, guidance, consequence, considerations and information on operational and administrative issues.
<i>Status/planned completion</i>	(Initial) Draft status ITU-T SG2 meeting Jan 2001 Completion scheduled - ITU-T SG2 meeting Sept 2001

* France did not support the liaison statement to the IETF (see Report Com 2-R 1, Part II, Section 3.7.1, Page 17)

<i>Activity</i>	ITU-T SG2 meeting Jan 2001
<i>Brief overview</i>	Details of progress and on-going activities can be extracted from the SG2 and WP1/2 meeting reports.
<i>Status/planned completion</i>	On-going work will be progressed at the September 2001 (Geneva) meeting of SG2

<i>Activity</i>	World Telecommunication Policy Forum: IP Telephony
<i>Brief overview</i>	Focuses on broad aspects of IP policy Details are available at http://www.itu.int/wtpf/ . Particularly see references to ENUM in the Secretary-General's Report which is the sole input document to the WTPF at http://www.itu.int/wtpf/sgreport/index.html .