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SERIES E: OVERALL NETWORK OPERATION, TELEPHONE SERVICE, SERVICE OPERATION AND HUMAN FACTORS

International operation – Numbering plan of the international telephone service

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The international public telecommunication numbering plan

Supplement 4: Operational and administrative issues associated with the implementation of ENUM for non-geographic country codes

ITU-T Recommendation E.164 – Supplement 4

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ITU-T Recommendation E.164

The international public telecommunication numbering plan

Supplement 4

Operational and administrative issues associated with the implementation of ENUM for non-geographic country codes

Summary

This ITU-T Supplement provides background, tutorial and guidance information on a broad range of operational and administrative issues associated with the inclusion of E.164 numbers corresponding to non-geographic country codes into the DNS (i.e., the inclusion of ENUM domain names based on E.164 numbers). It contains considerations of, and potential consequences arising from, such issues.

Source

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Supplements are only informative and are, therefore, not considered to be an integral part of any Recommendation. They do not imply any agreement on the part of the ITU-T 2.4/A.13 (10/2000). For further information, please consult the referenced Recommendation: Organization of the work of the ITU-T: ITU-T Rec. A.13, "Supplements to ITU-T Recommendations," October 2000.

NOTE – The insertion of E.164 numbers in the Top Level Domain (TLD) (e.g., in .e164.tld) and the designation of an ENUM Tier 0 Registry (presently RIPE-NCC) remain an open issue at this stage. However, for consistency, reference to this TLD and this registry at the ENUM Root Level are made throughout this Supplement. This Supplement is aligned with the instruction existing at the time of its publication.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this publication, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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Introduction

The Internet Engineering Task Force (IETF) has developed the Telephone Number Mapping (ENUM) protocol (see RFC 2916) as a mechanism for mapping E.164 numbers onto Uniform Resource Identifiers (URIs; see RFC 2396). The E.164 number might also be used as the "key" within the ENUM protocol to produce a listing of the various applications (e.g., email, fax, telephony) that could be used to communicate with a specific subscriber. This Supplement provides an overview of the ENUM concept and describes various issues that are national and international matters and that need to be addressed when including the portion of the E.164 numbering plan corresponding to non-geographic country codes within the Domain Name System (DNS; see RFC 1591), as part of the envisaged implementation described by RFC 2916.

Non-geographic country codes for Global Services (e.g., 800, 979, 878, 808), and their subtending numbers are administrated by the ITU-TSB. Numbers associated with codes for Networks (881 and 882), codes for groups of countries (388), and codes for trial purposes (991), are administered by the assignees of these codes, or parties to whom they have delegated this responsibility. The decision to support the ENUM DNS corresponding to non-geographic country code numbers is determined by the number assignee. This decision is then conveyed to, and implemented by, the Administrator of the respective numbering resource. For some of the non-geographic country code numbers, the Administrator and the assignee may be the same party but, playing different roles.

ITU-T Recommendation E.164

The international public telecommunication numbering plan

Supplement 4

Operational and administrative issues associated with the implementation of ENUM for non-geographic country codes

1 Scope

This ITU-T Supplement provides background, tutorial and guidance information on a broad range of operational and administrative issues associated with the inclusion of E.164 numbers corresponding to non-geographic country codes into the DNS (i.e., the inclusion of ENUM domain names based on E.164 numbers). It contains considerations of, and potential consequences arising from, such issues.

Non-geographic country code numbers have been allocated as codes that apply worldwide and are not technically restricted in their use to specific geographic locations. Therefore, an important factor to consider when addressing the applicability of the association of ENUM DNS with these numbers is the ENUM registrant's ability to access the specific applications and services associated with these non-geographic numbers to and from all locations worldwide.

2 References

2.1 ITU-T

– ITU-T Recommendation E.152 (2001), *International freephone service*.

– ITU-T Recommendation E.154 (1998), *International Shared Cost Service*.

– ITU-T Recommendation E.155 (1998), *International Premium Rate Service*.

– ITU-T Recommendation E.164 (1997), *The International public telecommunications numbering plan*.

– ITU-T Recommendation E.164 – Supplement 3 (2002), *Operational and administrative issues associated with national implementations of the ENUM functions*.

– ITU-T Recommendation E.164.1 (1998), *Criteria of procedures for the reservation, assignment and reclamation of E.164 country codes and associated Identification Codes (ICs)*.

ITU-T Recommendation E.164.2 (2001), *E.164 numbering resources for trials*.

– ITU-T Recommendation E.164.3 (2001), *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.168 (2002), *Application of E.164 numbering plan for UPT*.

– ITU-T Recommendation E.169.1 (2001), *Application of Recommendation E.164 numbering plan for universal international freephone numbers for international freephone service*.

– ITU-T Recommendation E.169.2 (2000), *Application of Recommendation E.164 numbering plan for universal international premium rate numbers for the international premium rate service*.

– ITU-T Recommendation E.169.3 (2000), *Application of Recommendation E.164 numbering plan for universal international shared cost numbers for international shared cost service*.

– ITU-T Recommendation E.190 (1997), *Principles and responsibilities for the management, assignment and reclamation of E-series international numbering resources*.

– ITU-T Recommendation E.195 (2000), *ITU-T International numbering resource administration*.

– ITU-T Recommendation F.850 (1993), *Principles of Universal Personal Telecommunication (UPT)*.

– ITU-T Recommendation H.323 (2003), *Packet-based multimedia communications systems*.

– [proposed draft] ITU-T Recommendation E.A-ENUM, *[on ITU Administrative Control of Tier 0]*.

2.2 IETF

– RFC 1034 (1987), *Domain Names – Concepts And Facilities* – http://www.ietf.org/rfc/rfc1034.txt.

– RFC 1591 (1994), *Domain Name System Structure and Delegation* – http://www.ietf.org/rfc/rfc1591.txt.

– RFC 2396 (1998), *Uniform Resource Identifiers (URI): Generic Syntax* – http://www.ietf.org/rfc/rfc2396.

– RFC 2826 (2000), *IAB Technical Comment on the Unique DNS Root* – http://www.ietf.org/rfc/rfc2826.txt.

– RCF 3403 (2002), *Dynamic Delegation Discovery System (DDDS) Part 3: The Domain Name System (DNS) Database* – http/www.ietf.org/rfc/rfc3403.txt.

– RFC 2916 (2000), *E.164 number and DNS* – http://www.ietf.org/rfc/rfc2916.txt.

3 Definitions

3.1 **address**: An address is a string or combination of digits and symbols which identifies the specific network termination points of a connection and is used for routing.

3.2 **administration**: Any governmental department or service responsible for discharging the obligations undertaken in the Constitution of the International Telecommunication Union, in the Convention of the International Telecommunication Union and in the Administrative Regulations.

3.3 **administrator** *(see Note A)*: The organization entrusted with the administration of a resource derived from an international numbering plan.

3.4 **application service provider**: Entity that provides specific application(s) (e.g., e-mail or voice messaging) direct to the ENUM subscriber.

3.5 **assignee** *(see Note A)*: The applicant to whom E-Series international numbering resources have been assigned.

3.6 **assignment** *(see Note A)*: The process for providing an international numbering resource to an eligible applicant.

3.7 **country** *(see Note A)*: A specific country, a group of countries in an integrated numbering plan or a specific geographical area.

3.8 delegation of a domain *(see Note B)*: The process of separating a sub-domain, which was contained in a zone, into its own zone.

3.9 DNS root level *(see Note B)*: The base of the inverted tree that forms the Internet domain name space. Sometimes represented as ".".

3.10 domain *(see Note B)*: A set of host names consisting of a single domain name and all the domain names below it.

3.11 domain name *(see Note B)*: A set of labels delimited by "."s.

3.12 e164. TLD: The second level domain (SLD) used as the ENUM root level for ENUM domain names corresponding to E.164 numbers.

3.13 E.164 number *(see Note A)*: A string of decimal digits that satisfies the three characteristics of structure, number length and uniqueness specified in Annex A/E.164. The number contains the information necessary to route the call to a specific termination point associated with this number.

3.14 ENUM function: The capability to map E.164 numbers into Uniform Resource Identifiers (URIs) as described in RFC 2916.

3.15 ENUM CC level: A level in the tiered architecture (Tier 1) for ENUM, that corresponds to the E.164 Country code (CC).

3.16 ENUM domain name: The domain name for an E.164 number, the primary point of reference in ENUM.

3.17 ENUM registrant: The subscriber to an E.164 number who has chosen to subscribe to ENUM functions.

3.18 ENUM registrar: An organization that interacts with subscribers or their agents to establish ENUM registration for the subscriber's assigned E.164 numbers.

3.19 ENUM root level: A level in the tiered architecture (Tier 0) for ENUM, that corresponds to the base of the inverted tree that forms the Internet domain name space designated for ENUM, i.e., .e164.tld.

3.20 ENUM tier 0 manager: The entity responsible for the management of the domain for the ENUM Root Level.

3.21 ENUM tier 0 registry: The entity, under the administrative direction of the ITU-TSB, which acts as the Registry for the ENUM Root Level, in accordance with Recommendation E.A.ENUM.

3.22 ENUM tier 0 registrar: The entity (TSB) acting as the Registrar for the ENUM Root Level.

3.23 ENUM tier 1 manager: The entity (ITU Member State(s) or Administration(s)) responsible for the management of the domain for the ENUM CC Level.

3.24 ENUM tier 1 registry: The entity acting as the Registry for the ENUM CC Level.

3.25 member state: A State that is considered to be a Member of the International Telecommunication Union in application of article 2 of the Constitution.

3.26 name: A combination of characters (e.g., numbers, letters and symbols) which is used to identify end users.

3.27 name space *(see Note B)*: The structure of the domain names in the DNS.

3.28 name server *(see Note B)*: A DNS component that stores information about one zone (or more) of the DNS name space.

3.29 **registrant** *(see Note B)*: A subscriber who wants to register a domain name in the DNS. This is normally done via a Registrar and after the registration is done the Registrant becomes the domain name holder.

3.30 **registrar** *(see Note B)*: An organization that provides direct services to domain name Registrants by processing name registrations to the Registry.

3.31 **registry** *(see Note B)*: The organization that maintains the authoritative DNS Registry database, is responsible for master and slave servers, and also creates the zone file for this domain. There is only one Registry per DNS zone.

3.32 **RIPE-NCC**: The organization that presently acts as the ENUM Tier 0 Registry for the ENUM Root Level.

3.33 **subscriber** *(see Note A)*: A person or entity (i.e., Registrant) that is assigned an E.164 number.

3.34 **telephony** *(see Note A)*: A form of telecommunication primarily intended for the exchange of information in the form of speech.

3.35 **Tier 0**: ENUM level in the tiered architecture corresponding to the ENUM root, i.e., e164.tld. Records at this level contain pointers to Tier 1 for an E.164 Country Code or portion thereof.

3.36 **Tier 1**: ENUM level in the tiered architecture corresponding to the E.164 Country Code (CC), i.e., <CC>.e164.tld. Records at this level contain pointers to Tier 2 for an E.164 number.

3.37 **Tier 2**: ENUM level in the tiered architecture corresponding to the E.164 number, i.e., <N(S)N>.<CC>.e164.tld. Records at this level contain NAPTR pointers for an E.164 number.

3.38 **zone** *(see Note B)*: A domain (sometime called the *child zone*) that has been delegated from another domain (sometimes called the *parent zone*). A zone includes all sub-domains below it except for those sub-domains that have themselves been delegated. A domain name belongs to exactly one zone.

Notes to the Definitions:

NOTE A – This term is used in the context of E.164 numbering.

NOTE B – For the purposes of this Supplement, this term is generally understood to be used in the context of DNS.

4 Abbreviations

arpa	The Address Routing Parameters Area top level domain (TLD), used for network infrasructure
ASP	Application Service Provider
CC	E.164 Country Code (as specified in ITU-T Rec. E.164)
DNS	Domain Name System
ENUM	TElephone NUmber Mapping – both a protocol and an IETF Working Group
IAB	Internet Architecture Board
IANA	Internet Assigned Numbers Authority
IETF	Internet Engineering Task Force
IP	Internet Protocol
ITU-T	International Telecommunication Union – Telecommunication Standardization Sector

NAPTR	Naming Authority Pointer
NDC	National Destination Code
NPA	Numbering Plan Area – a national destination code in the North American Numbering Plan Area
NS	Name Server
PSTN	Public Switched Telephone Network
RFC	Request For Comments – the name for an Internet standards-related specification
RIPE-NCC	Réseaux IP Européens Network Coordination Centre
SLD	Second Level Domain
TLD	Top Level Domain
TSB	Telecommunication Standardization Bureau of the ITU
UIFS	Universal International Freephone Service
UIPRS	Universal International Premium Rate Service
UISCS	Universal International Shared Cost Service
UPTS	Universal Personal Telecommunication Service
URI	Uniform Resource Identifier – a Uniform Resource Locator is one type of URI
WG	Working Group

5 Background

Study Group 2 has chosen specific global country code numbering resources to designate particular services (e.g., 800 for UIFS, 878 for UPTS, 979 for UIPRS, and 808 for UISCS). By making such assignments, Study Group 2 has given a specific meaning to the numbers allocated under these specific country codes. As a result, all calls in the Public Switched Telephone Network (PSTN) are treated in a particular manner specified by these codes. They are routed, billed and understood by the public in a specific context. Assignees have paid for the processing of their applications and the assignment of these numbers. There have been service descriptions written to describe the particular services supported by these numbers, and an effort has, and will be made, for the public to identify these specific services with these specific numbers. If these numbers are mapped into an ENUM DNS zone, will the specific services assigned to them be maintained or will other internet applications be associated with these international non-geographic numbers? If the latter situation is permissible, what will be the impact on existing number assignees and their customers?

Since most countries have national non-geographic numbers, they may wish to consider applying the domestic policy of their national non-geographic numbers to be consistent with their treatment of these international non-geographic country code numbers with respect to the ENUM DNS.

The ITU-T has also set aside non-geographic country codes for Networks, Groups of countries and for Trial purposes. These applications also need to be addressed with respect to the ENUM concept and they appear in clauses 9, 10 and 11, below.

6 General implications of ENUM for non-geographic country codes

There are a variety of issues that Administrators of non-geographic numbering resources need to consider regarding implementation of an ENUM DNS for their portion of the E.164 numbering plan. This clause lays out those issues.

There are issues regarding inserting E.164 numbers into a DNS-based architecture for numbers that are within a non-geographic country code. These issues include how to determine the most appropriate arrangement for adding, updating, and deleting the ENUM records related to an E.164 number, and who administers the ENUM Tier 1 servers (from an operational perspective). For those resources that are currently administered by the ITU-TSB (i.e., 800 for UIFS, 878 for UPT, 979 for UIPRS, and 808 for UISCS), it will be necessary for the TSB to be involved in a Tier 1 management capacity. For CC + IC and other number ranges sub-delegated to specific entities (e.g., 878 10) the entity to whom the code is assigned, may wish to administer the ENUM Tier 1 Registry for their allocated range.

Administrators of non-geographic numbering resources may also choose the ENUM Registrar and ENUM Tier 2 Name Server Provider if they do not wish to take on these responsibilities themselves. In some cases, the level of competition may call for allowing a variety of entities to be ENUM Registrars for end users. In other cases, subscribers themselves may be permitted to function as the ENUM Tier 2 Name Server Provider for their own ENUM records.

It will be appropriate for the procedures established by Administrators of non-geographic numbering resources to ensure the integrity of their portion of the E.164 numbering plan. It would be appropriate for the validity of subscriber identity, data and service-specific ENUM records in the NAPTR resource records to be addressed. Important issues include the incorporation of any number plan changes within the DNS, the natural churn of numbers, and procedures for addressing ceased numbers and recovering those records within the DNS. Number and name hijacking and fraud need to be addressed within the defined procedures. It would be appropriate for Administrators of non-geographic numbering resources to study whether and how such procedures can be enforced with carriers and third parties. It is important to note that a breakdown in the management of, and therefore the integrity of, this information can lead to call-processing failures in the future.

Only assigned non-geographic CCs shall be potential candidates for ENUM delegation.

7 Administrative issues for country codes assigned to global services

The ITU-TSB is the administrator for the assignment of numbers that support the Global Services associated with international non-geographic country codes. Assignees pay for the processing of their numbering applications for the assignment of selected individual numbers subtending these different service-specific country codes. As a result of Study Group 2 service descriptions that describe the particular services supported by these numbers, subscribers identify these services with these specific numbering resources. As a minimum, the administrative issues associated with mapping these numbers into an ENUM DNS will involve the ITU-TSB. The TSB will be required to make the ENUM DNS registrar aware of any changes, disconnections, and verify existing numbering assignments. Today, information regarding the availability of a particular non-geographic number is provided by the ITU-T. However, the ITU-T does not provide the name of the specific assignee of a given number. New procedures will need to be developed to accommodate this administrative requirement. If these Non-Geographic Country Code numbers are to be available for ENUM mapping, the ITU-TSB costs and responsibilities will need to be understood, specified, and recovered.

8 Implications of ENUM for country codes assigned to global services

Under the terms defined in ITU-T Rec. E.164, and the related Recommendations defined below, the ITU has allocated special country code resources to support ITU-T-defined Global Services. The current allocation status is as follows:

- CC 800 Universal International Freephone Service (Ref: ITU-T Recs E.152 and E.169.1)
- CC 878 Universal Personal Telecommunication Service (Ref: ITU-T Recs F.850 and E.168)

- CC 808 Universal International Shared Cost Service (Ref: ITU-T Recs E.155 and E.169.2)
- CC 979 Universal International Premium Rate Service (Ref: ITU-T Recs E.154 and E.169.3)

In the cases of UIFS, UISCS and UIPRS, the number structure consists of the country code that is followed directly by a subscriber number. Subscriber numbers are eight or nine digits as defined in the respective Recommendations referenced above.

Operational and administrative procedures will have to be reviewed as global service applications evolve. As mentioned above, the ITU-T global service country codes have been specifically assigned to particular global services (e.g., UIFS, UPT, UISCS and UIPRS). In considering these numbers as candidates for ENUM, concern has been raised that the nature of these global services may be compromised and should be maintained. If this were to occur, the present demand, utility, and application of these numbers in the PSTN may also be impacted.

In terms of populating ENUM databases with ITU-T Rec. E.164 Global Service resources, the following conditions apply:

– The ITU TSB is the Administrator for all resources currently allocated to Global Services, including both the country code(s) and subscriber numbers.

– For all of the country codes listed above except CC 878, the ITU TSB will be responsible for providing the ENUM Tier 0 Registry with the assignment and Tier 1 details (i.e., ITU TSB is Tier 1). The ITU TSB is also the Administrator of the eight-digit subscriber line numbers. In this role as Administrator, the ITU-TSB will additionally be the entity that verifies the assignment of a E.164 Global Service number to a given End User/subscriber.

– In the case of CC 878 (UPT), it may be appropriate for the entity assigned part of that number range to provide the ENUM Tier 1 Registry function.

– Consideration should be given as to who may serve as a Tier 2 entity. The level of qualification will need to balance the desire to promote subscriber choice of a Tier 2 entity versus any needs for consumer protection and simplification of processes for the ITU-TSB.

Issues for further consideration include:

- Global Service subscriber numbers are assigned to subscribers with their service provider acting as an agent with the ITU-T. End users can change service providers without changing numbers. Number portability does not effect the content of the ENUM database , but should be accounted for in the ENUM database process (e.g., carrier of record, authentication, etc.).
- With UIPRS, a one digit "accounting indicator," which is allocated by the service provider/national regulatory authority, precedes the eight-digit subscriber number. As such, the ITU-TSB will be aware of the assignment of the eight-digit subscriber number, but not which particular accounting indicator is in use, thus complicating validation. The means of effectively dealing with this anomaly in ENUM should be determined.
- Dealing with day-to-day end user/service provider changes vis-à-vis ENUM by an international organization such as ITU-TSB requires careful consideration. Note that ENUM database information may directly impact customer service(s), therefore near real time response is required to requests for additions, deletions, authentication, etc. The ITU-TSB may therefore wish to consider whether it is appropriate to delegate/outsource this activity at an operational level.

9 Implications of ENUM for country codes assigned to networks

Under terms defined in ITU-T Recs E.164 and E.164.1, the ITU-T has allocated country code 882 (and similarly CC 881) to Networks. Further, qualifying applicants (i.e., network operators/service providers) are allocated a two-digit Identification Code (IC's) that uniquely identifies their Network for routing, accounting and end user identification purposes.

The numbering resources following the Network CC + IC fields (i.e., up to a maximum of 10 digits) are under the direct control of the Network operator. Specifically, the Network operator has the responsibility for the design (i.e., format), deployment, and administration of these resources.

In terms of populating ENUM databases with E.164 Network resources, the following conditions apply.

In terms of the resources following the CC + IC that are assigned to, and therefore the responsibility of, individual Networks, the following applies regarding participating in ENUM functionality. It will be left to the discretion of each Network operator (presumably in consultation with their impacted end users) to determine if, and how to participate in ENUM.

To reduce the need to set up a Tier 1 Registry for the 882 CC, assignees may choose to set in place a Tier 1 Registry for the CC + IC range assigned to them.

Overall guidance on "how to" opt for inclusion or exclusion in ENUM could be provided, but this process is generally viewed as being a Network matter.

10 Implications of ENUM for country codes assigned to groups of countries

Under terms defined in ITU-T Recs E.164 (draft revised) and E.164.3 the ITU-T has allocated country code 388 to serve Groups of Countries (GoC). Further, qualifying applicants are allocated a one digit Group Identification Code (GIC) which uniquely identifies the GoC for routing, accounting, and end user identification purposes.

The numbering resources following the GoC CC + GIC field (i.e., up to a maximum of eleven digits) are under the direct control of the GIC Administrator (GICA), who should be appointed by each unique GoC. The GIC Administrator/Registrar has full responsibility for the design (i.e., format) and administration of the GoC's resources.

In terms of populating ENUM databases with E.164 GoC resources, the following applies:

– With regard to the resources following the GoC CC + GIC, which are assigned to, and are therefore the responsibility of each GoC and its GIC Administrator, the following applies regarding the population of ENUM. It will be the responsibility of each GoC (presumably in consultation with participating end users) to determine if, and how, to participate in ENUM.

Overall guidance on the ramifications of opting for inclusion or exclusion in ENUM could be provided, but this process is generally viewed as being a GoC matter.

11 Implications of ENUM for country codes assigned to trials

ITU-T Rec. E.164.2 addresses CCs assigned to trials. Should a CC be requested for an ENUM trial, this trial usage should be clarified in the Trial Country Code application. Once such an application is approved, it will then be the applicant's responsibility to "opt into" ENUM and to administer the ENUM trial for the agreed-to time frame.

12 Summary and conclusion

The Operational and Administrative issues associated with the implementation of ENUM for Non-Geographic Country Codes present unique circumstances and considerations that need to be taken into account. These Country Codes are associated with specific global services and uses. For some of these Non-Geographic Country Codes, the individual numbers are assigned and administered by the ITU-TSB.

Accordingly, the administration of both the Non-Geographic E.164 numbering resources and their corresponding ENUM DNS mappings are quite different from the administration of E.164 and DNS mappings for geographic Country Codes. As a consequence, the successful implementation of ENUM may therefore require the ITU-TSB to accept a greater administrative and technical set of responsibilities e.g., being responsible for the Tier 1 ENUM Registry for certain sets of these non-geographic resources.

Some of the issues highlighted in this Supplement that must be addressed and resolved include the following:

– the applicability of using ENUM for the various types of Non-Geographic numbering resources;

– how the ITU-TSB will undertake additional administrative responsibilities;

– the roles and administrative responsibilities of entities to whom the various types of Non-Geographic CC numbers are assigned; and

– the impact that ENUM mapping may have on the particular services or uses for which various Non-Geographic Country Codes are assigned.

New Non-Geographic global service CCs may need to be evaluated on an individual basis to determine their applicability, administrative requirements, costs and impacts when being mapped by the ENUM concept in the future.

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