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ENUM Registry Interface Requirements
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Abstract

An ENUM registry interacts with various elements to maintain what is essentially a telephone number to uniform (or a more modern version) resource identifier. The interfaces needed are identified in this requirements document, as well as the requirements for the more generic interfaces.

1 Introduction

An ENUM registry supporting the DDDS [[RFC3761](#)] requires two specific interfaces and a third class of other interfaces. One specific interface is shared with a legacy telephone Operating Support System (OSS), through which telephone number (account) activity is reported. The other specific interface is to the resolution system, for the most part a DNS constellation. The third class of interfaces are those needed to obtain information about telephone number from other regulatory sources, such as a national telephone number plan

administrator. Interfaces of this latter sort will vary according to the environment, the structure of those interfaces will be determined by the appropriate regulatory organization.

The first of the specific interfaces is named the ENUM Provisioning interface. The kind of activity that is reported over this interface are telephone number activations and deactivations, service additions and deletions from telephone numbers and other activity usually driven by customer account activity. Ancillary traffic on this interface will exist for the purpose of setting up short cuts, or profiles, to be automatically applied when a information about a number or a range of numbers is changed.

The second of the specific interfaces is named the ENUM Resolution Database interface. This interface dispenses resolution information to the resolution system, roughly equivalent to a DNS IXFR [[RFC1995](#)] in content. For reasons of openness, this interface is not strictly assumed to be a DNS data flow.

The other interfaces are too varied and already specifically defined by the administration involved that they will not be discussed further in this requirement document.

2 Terminology

The key words "MUST," "SHOULD," and "MAY" in this document are to be interpreted as described in [RFC 2119](#) [[RFC2119](#)].

Terms used elsewhere in the document (including in the introduction):

ASCII - American Standard Code for Information Interchange [[RFC0020](#)]
DNS - Domain Name System [[RFC1034](#)]
RR - Resource Record [[RFC1034](#)]
SOA - Start of Authority [[RFC1034](#)] [[RFC1035](#)]
AXFR - Authoritative Zone Transfer [[RFC1034](#)] [[RFC1035](#)]
TXT - DNS Text record [[RFC1035](#)]
IXFR - Incremental Zone Transfer [[RFC1995](#)]
SIP - Session Initiation Protocol [[RFC3261](#)]
DDDS - Dynamic Delegation Discovery Service [[RFC3401](#)]
NAPTR - Naming Authority Pointer record [[RFC3403](#)]
EPP - Extensible Provisioning Protocol [[RFC3730](#)]
ENUM - E.164 to URI DDDS [[RFC3761](#)]
URI - Uniform Resource Identifiers [[RFC3986](#)]
IRI - Internationalized Resource Identifiers [[RFC3987](#)]
TLS - Transaction Layer Security [[RFC4366](#)]
[E.164](#) - International Public Telecommunications Numbers [ITUE164]
SOAP - Simple Object Access Protocol [SOAP1] [SOAP2] [SOAP3]
XML - Extensible Markup Language [XML]
WSDL - Web Services Description Language [WSDL1] [WSDL2] [WSDL3]
OSS - Operational Support Systems [OSS]

[3](#) ENUM Provisioning interface

The ENUM Provisioning interface has the following requirements. Most of these requirements also apply to the ENUM Resolution Database interface.

[3.1](#) Application Layer

These requirements match fit at the application layer of the network stack.

[3.1.1](#) MUST be able to convey all of the information required for a DNS NAPTR resource record.

- o The DDDS operates on the NAPTR record. Public standards are based on this record. It is not that the record is important, but that the information in it has been well thought out. Deviating from this may curtail future growth.

[3.1.2](#) MUST be able to convey all of the information required for a DNS TXT resource record or any other record type that can conceivably be used in DDDS.

- o As a temporary measure for data that is not present in any ENUM service definition [IANAENUM].

[3.1.3](#) MUST be able to associate an RR set with any E.164 number, whether the number refers to a specific telephone number or a range or block of telephone numbers.

- o E.164 is a string up to 15 digits, but operating on just 7 (a North American 1000 block) is permitted.

[3.1.4](#) MUST be able to express the maximum number of digits in an E.164 block.

- o Because the number of digits varies, when operating on a block, the number of digits of individual numbers must be known. Perhaps this will be available via another source, so this may be MUST to be able, MAY be used.

[3.1.5](#) MUST be able to express the publication rules for any registered data.

- o For data that differs upon the querier, such as the difference between contacts and address-of-records in SIP.

[3.1.6](#) MUST provide a means of tracking individual commands.

- o Each command has to be identifiable for later actions. The interface is not involved in tracking.

[3.1.7](#) SHOULD follow any applicable standards.

- o Public standards are hardier than internally developed solutions.

[3.1.8](#) SHOULD be easy to implement within legacy software development processes.

- o The participants in the environment have already established practices based on SOAP/XML, WSDL, and TLS.

[3.1.9](#) SHOULD provide a profile facility to allow a set of URI's for a set of services to be associated with telephone numbers.

- o One of the common "rewrite" rules for the URI will be of the form "\1@somehost.company.example." The "\1" refers to the telephone number being processed, hence this kind of shorthand should be available when activating a bulk of telephone numbers that will all be serviced the same way.

[3.2](#) Presentation Layer

These requirements refer to the rendering of the messages in transmission.

[3.2.1](#) MUST use an encoding method that is robust, easy to design and troubleshoot, and is capable of supporting IRI's.

- o Easy to design and troubleshoot lends itself to mechanisms that are text based as opposed to binary or hexadecimal. Internationalization is important, for now at least host names might be in non-ASCII and sooner or later other parts of a URI may also be.

[3.2.2](#) SHOULD use a widely recognized standard.

- o Avoiding specifically developed mechanisms.

[3.3](#) Session Layer

Relates to methods, functions.

[3.3.1](#) MUST provide methods for adding and deleting signal RR sets.

- o Specifically adding an RR set or an RR to an existing set has to be addressed, deleting a specific RR from a set or an entire RR set or even a telephone number.

[3.3.2](#) MUST provide methods for adding and deleting in bulk.

- o At times an individual telephone number will be changed, but often times many updates will be queued and sent at a fixed interval.

[3.3.3](#) MUST provide atomic add and delete or change methods.

o Either having a change command or having atomic action guarantees is sufficient.

[3.3.4](#) SHOULD be constructed in a way compatible with legacy environments.

o Legacy environments use SOAP/XML, WSDL, and TLS. That is not to say that this interface as to do the same, but if it does, it will be easier on the participants.

[3.4](#) Transport Layer

The transport layer is strictly point-to-point, with no caching or forwarding. The requirements herein are related to security. Security is to be implemented in the applications exchanging data, the requirements here are meant to say that relevant security data will be exchanged in the building of the transport.

[3.4.1](#) MUST provide data integrity.

[3.4.2](#) MUST provide authentication (data).

[3.4.3](#) MUST provide data secrecy.

o All three of these can be provided by using TLS, with the certificate handshake being used by the application to complete the security needs. Yes, this is an example of mentioning a solution in the requirements.

[4](#) ENUM Resolution Database interface

All of the requirements for the ENUM Provisioning interface apply plus the following, with the exception of requirement 3.1.5.

[4.1](#) MUST allow the client to control the rate of flow of updates.

o The client could do this by asking the server to send up to some number of records. This is merely to allow the client to keep up with the server.

[4.2](#) SHOULD be able to populate a DNS zone transfer message, once the SOA RR is included.

o A DNS AXFR or IXFR consist of a zone's SOA resource record, followed by a list of resource records, and followed by another copy of the SOA resource record. The SOA resource record has parameters best set by the resolution system, so that is left to the client-side of this interface. But all of the rest of the zone transfer data ought to be able to be pulled from the formats exchanged over this interface.

[4.3](#) SHOULD be able to be used to populate a non-DNS resolution system.

o If for any reason an environment wants to not use DNS but still get the benefit of an ENUM registry, they ought to be able to pull from the data feed the relevant information. How that would be done is not a subject for this document, but it is assumed that it would be possible based on the community review of DDDS and ENUM to date.

[5](#) EPP Protocol

Breaking from requirements, there has been some consideration to EPP extensions for ENUM [[RFC4114](#)], and why it has not been adopted and why a requirements document is now being produced to cover what would seemingly be addressed by that solution.

There are two reasons for EPP not being adopted. One is that it isn't compatible with legacy participants. The other reason is that it requires more implementation work.

Legacy participants have an existing base of software development built around SOAP/XML and WSDL, and are familiar with TLS. Approaches to ENUM registry interfaces that use these tools will blend more easily into the software products already in use to manage telephone numbers.

The use of SOAP permits automatic generation of software to handle the client side of the exchange. Domain name registries had to provide software tool kits to give to registrars to match this functionality. When a change is made to EPP, there will be a lot of software exchanged.

From experience with both EPP and SOAP based approaches to registry software, the SOAP based approach is much easier on the software engineering process. The difference between the approaches is not seen in a protocol analysis, but in an analysis of software engineering.

[6](#) Security Considerations

These interfaces are assumed to operate in a pre-arranged and secure environment. The interfaces are expected to uphold the security, other than that the interfaces have no security concerns.

[7](#) IANA Considerations

As this is a requirements document, there is nothing requested of IANA.

[8](#) Internationalization Considerations

The only data sensitive to internationalization are the URI's (IRI's) associated with ENUM services at a telephone number. Solutions to these requirements are called upon to provide a means to express URI's in any script.

[9](#) References

[9.1](#) Normative

(none)

[9.2](#) Informative

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