

**CC1 ENUM Tier 1B Registry**  
**Technical and Operational Requirements**  
**for a Specific Country within Country Code 1**

**CC1 ENUM LLC TAC**

**Abstract**

This document contains technical and operational requirements for operating an ENUM Tier 1B for Country Code 1. This includes interfaces to other entities providing services for ENUM as well as the requirements for deploying and operating the ENUM Tier 1B infrastructure.

**FOREWORD**

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At the time it approved this document, the CC1 ENUM LLC TAC had the following members:

Jim Baskin	TAC Chairman, Verizon
Tim Ruiz	GoDaddy.com
Steven D. Lind	AT&T
Bernie Ku	AT&T (SBC Labs)
Mark McFadden	BT Americas
Jay Carpenter	1-800 AFTA
Phyllis Anderson	AT&T (SBC Labs)
Richard Shockey	NeuStar
Karen Mulberry	Verizon (MCI)
Robert Schafer	Verizon (MCI)
Ken Buchanan	BellSouth
Penn Pfautz	AT&T
Beth O'Donnell	COX
Judith Oppenheimer	ICB
Kaj Tiesink	Telcordia
Tim Denton	CIRA
Jim Danda	Sprint
Kevin McCandless	Verisign
Bob Malone	Evolving Systems
Andrew Gallant	AG Design, LLC
Eric Zelman	800 Response Marketing LLC

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# CC1 ENUM Tier 1B Registry

## Technical and Operational Requirements

### for a Specific Country within Country Code 1

#### SECTION 1.0 SCOPE, PURPOSE, AND APPLICATION

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##### *1.1 Scope*

This document describes the ENUM Tier 1B technical and operational requirements for a specific country within the North American Numbering Plan (NANP) Country Code 1 serving area. In particular these technical requirements are to be used to select the ENUM Tier 1B Registry for US telephone numbers (TNs) under the ITU-T E.164 international numbering standard, and may be accepted or modified by other NANP member nations when determining their approach.

The Tier 1B Registry operator is the single entity responsible for providing ENUM Registry services under 1.e164.arpa for US TNs, including management of pointers to Tier 2 Provider nameservers. The Tier 1B Registry does not handle Naming Authority Pointer (NAPTR) records but points at Tier 2 Providers where NAPTR records associated with E.164 numbers are stored. The ENUM Tier 1B Registry must establish an open standard interface that is available for all ENUM Registrars to use. The Tier 1B Registry will be prohibited from functioning as a Registrar.

##### *1.2 Purpose*

This document is intended to provide the specifications necessary to implement the ENUM Tier 1B Registry components for Numbering Plan Area (NPA) resources within the U.S. It is intended to provide sufficient information to allow a contracting entity to issue an RFP for an ENUM Tier 1B Registry implementation. As such, it describes, among other things, the reference architecture for the ENUM Tier 1B Registry. It also provides the critical security and privacy requirements for implementing this system for the US numbering space.

This document will be distributed to all stakeholders with a view of seeking consensus amongst an audience that is as large as possible and ensuring that the implementation of a country's ENUM Tier 1B Registry proceed as swiftly and as smoothly as possible.

##### *1.3 Application*

This document is intended to be used as the basis for an RFP that will identify and provide the technical specifications necessary to select a vendor that will implement the ENUM Tier 1B Registry components for NPA resources within the U.S. This may also be used by other countries within the NANP for their ENUM Tier 1B registry vendor selection requirement.

## SECTION 2.0 REFERENCES

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The following references contain provisions that, through reference in this text, constitute provisions of these technical requirements. At the time of publication, the editions indicated were valid. All documents are subject to revision, and parties to agreements based on this specification are encouraged to investigate the possibility of applying the most recent editions of the references indicated below.

- [1] Crocker, D., "Standard for the format of ARPA Internet text messages", STD 11, RFC 822, August 1982.
- [2] Harrenstien, K., Stahl, M. and E. Feinler, "NICNAME/WHOIS", RFC 954, October 1985.
- [3] Mockapetris, P., "Domain names - concepts and facilities", STD 13, RFC 1034, November 1987.
- [4] Mockapetris, P., "Domain names - implementation and specification", STD 13, RFC 1035, November 1987.
- [5] Mockapetris, P., "DNS encoding of network names and other types", RFC 1101, April 1989.
- [6] Rivest, R., "The MD5 Message-Digest Algorithm", RFC 1321, April 1992.
- [7] Ohta, M., "Incremental Zone Transfer in DNS (IXFR)." RFC 1995, August 1996
- [8] Vixie, A P., "Mechanism for Prompt Notification of Zone Changes (DNS NOTIFY)." RFC 1996, August 1996
- [9] Bradner, S., "The Internet Standards Process -- Revision 3", BCP 9, RFC 2026, October 1996.
- [10] Vixie, A P., Ed., S. Thomson, Y. Rekhter, and J. Bound "Dynamic Updates in the Domain Name System (DNS UPDATE)" RFC 2136, April 1997
- [11] Elz, R. and R. Bush, "Clarifications to the DNS Specification", RFC 2181, July 1997.
- [12] Elz, R., Bush, R., Bradner, S. and M. Patton, "Selection and Operation of Secondary DNS Servers", BCP 16, RFC 2182, July 1997.
- [13] M. Horowitz & S. Lunt, "FTP Security Extensions" RFC 2228, October 1997.
- [14] Eidnes, H., de Groot, G. and P. Vixie, "Classless IN-ADDR.ARPA delegation", BCP 20, RFC 2317, March 1998.
- [15] Eastlake, D., "Domain Name System Security Extensions", RFC 2535, March 1999.
- [16] M. Allman & S. Ostermann, "FTP Security Considerations," RFC 2577, May 1999.
- [17] Vixie, P., "Extension Mechanisms for DNS (EDNS0)." RFC 2671, August 1999
- [18] R. Bush, D. Karrenberg, M. Kosters, & R. Plzak, "Root Name Server Operational Requirements," RFC2870, June 2000.
- [19] Crawford, M. and C. Huitema, "DNS Extensions to Support IPv6 Address Aggregation and Renumbering." RFC 2874, July 2000
- [20] Eastlake, D., "DNS Request and Transaction Signatures (TSIG(0)s)." RFC 2931, September 2000
- [21] Mealling, M., "Dynamic Delegation Discovery System (DDDS) Part Five: URI.ARPA Assignment Procedures", RFC 3405, October, 2002
- [22] Crispin, M., "Internet Message Access Protocol, Version 4rev1", RFC 3501, March 2003.
- [23] ENUM Forum Final Specifications Document "ENUM Forum Specifications for US Implementation of ENUM Document" 6000\_1\_0, March 14, 2003
- [24] Hollenbeck, S., "Extensible Provisioning Protocol", RFC 3730, March 2004 .
- [25] Hollenbeck, S., "Extensible Provisioning Protocol Domain Name Mapping", RFC 3731, March 2004.
- [26] Hollenbeck, S., "Extensible Provisioning Protocol Host Mapping", RFC 3732, March 2004.
- [27] Hollenbeck, S., "Extensible Provisioning Protocol Contact Mapping", RFC 3733, March 2004.
- [28] Hollenbeck, S., "Extensible Provisioning Protocol Transport Over TCP", RFC 3734, March 2004.
- [29] Falstrom, P., Mealling, M., "The E.164 to Uniform Resource Identifiers (URI) Dynamic Delegation Discovery System (DDDS) Application (ENUM)", RFC 3761, April 2004.
- [30] RFC 2845
- [31] ICANN, "Uniform Domain Name Dispute Resolution Policy", Policy Adopted: August 26, 1999
- [32] ICANN, "Rules for Uniform Domain Name Dispute Resolution Policy", Policy Adopted: August 26, 1999

## SECTION 3.0 DEFINITIONS, ACRONYMS, & ABBREVIATIONS

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### 3.1 Definitions

Application Service Provider	Person/organization providing applications to ENUM end users.
Authentication	The process of verifying that a party, e.g., the ENUM Applicant, is who they claim to be. (See Verification)
Authorization	The process of verifying that an (authenticated) party is entitled to perform some action.
Core Registry Services	The three core services provided by the Registry - SRS, Nameserver, and ContactInfo Services
Core Internet Service Failure	Is an extraordinary and identifiable event beyond the control of Registry Operator affecting the Internet services to be measured pursuant to SLRs. Such events include but are not limited to congestion, collapse, partitioning, power grid failures, and routing failures
Cross Network Name Server Performance (CNNP) Test	Measurements conducted by sending strings of DNS request packets from each of four measuring locations to each of the Tier 1B nameservers and observing the responses from the Tier 1B nameservers. (These strings of requests and responses are referred to as a "CNNP Test".)
Disputing Party	An entity other than the current Registrant, claiming to be the assignee of the telephone number represented by the ENUM domain name, that initiates a challenge to remove or change the registration in the Tier 1B.
Dynamic Delegation Discovery System (DDDS)	Used to implement lazy binding of strings to data, in order to support dynamically configured delegation systems such as ENUM is based on. The DDDS functions by mapping some unique string to data stored within a DDDS Database by iteratively applying string transformation rules until a terminal condition is reached. (RFC 3401 to 3405)
ENUM	Refers to a protocol developed in the Internet Engineering Task Force (IETF) (RFC 3761) whereby the DNS can be used for identifying available services associated with one E.164 number
ENUM Applicant	Person/organization that is seeking to register an E.164 number into the CC1 ENUM Tier 1B Registry
ENUM Registrant	Person/organization that has been authorized and registered their E.164 number into the CC1 ENUM Tier 1B Registry

ENUM Registrar	Entity that will provide ENUM registration services to an ENUM Applicant(s)
ENUM Tier 1A Registry	Organization that registers ENUM domains corresponding to NPAs and hosts the set of their authoritative name server (NS) records.
ENUM Tier 1B Registry	Organization that registers ENUM domains corresponding to 10 digit E.164 numbers and hosts the set of pointers to their Tier 2 name servers
Registry Data	Registration Data maintained by the registry including Zone-File Data, and all other data submitted by ENUM Registrars
Telephone Number Assignee (Assignee)	The person/organization that is assigned an e.164 number.  (Note that telephone number assignment practices are out of scope of this document.)
Thick Registry	Is one in which all of the information associated with registered entities, including both technical information (information needed to produce zone files) and social information (information needed to implement operational, business, or legal practices), is stored within a central registry repository
Tier 2 Provider	Person/organization that maintains ENUM zone including the NAPTR resource records for that number and is pointed to by the Tier 1B
Verification	Verifying the identity of the ENUM Applicant, and that the ENUM Applicant is authorized to register the telephone number (i.e., verifying that the ENUM Applicant is the telephone number assignee), must be accomplished during the provisioning process. The initial and ongoing verification of telephone number assignment is the responsibility of the ENUM Registrar.

### 3.2 *Acronyms & Abbreviations*

AAA	Authentication, Authorization and Accounting
ASCII	American Standard Code for Information Interchange
ASP	Application Service Provider
CC1	Country Code 1
CC1 ENUM LLC	Country Code 1 ENUM Limited Liability Corporation
CNAME	Canonical Name
CNNP	Cross Network Name Server Performance
CRISP	IETF Cross Registry Information Service Protocol Working Group
CSR	Customer Service Representatives'
DDDS	Dynamic Delegation Discovery System
DNS	Domain Name System
DNSSEC	DNS Security Extension
ENUM	<u>T</u> elephone <u>N</u> umber <u>M</u> apping
EPP	Extensible Provisioning Protocol
FCC	Federal Communications Commission
FQDN	Fully Qualified Domain Name
FTP	File Transfer Protocol
HVAC	Heating, Ventilating, and Air Conditioning
HTTP	Hypertext Transfer Protocol
IAB	Internet Architecture Board
ICANN	Internet Corporation for Assigned Names and Numbers
IETF	Internet Engineering Task Force
IRIS	Internet Registry Information Service
ITU	International Telecommunications Union
ITU-T	International Telecommunications Union – Telecommunications Sector
LDAP	Lightweight Directory Access Protocol
NANP	North American Numbering Plan
NAPTR	Naming Authority Pointer (DNS Resource Record)
NIC	Network Information Center
NPA	Numbering Plan Area
NS	Name Server
OAM&P	Operations Administration Maintenance and Provisioning
PoP	Point of Presence
RFC	Request for Comments
RIPE NCC	Réseaux IP Européens Network Coordination Centre

RRs	Resource Record
RTT	Round-Trip Time
SP	Service Provider
SRS	Shared Registration System
SSL	Secure Socket Layer
TCP	Transmission Control Protocol
TLS	Transport Layer Security
TTL	Time to Live
TN	Telephone Number
TSIG	Transaction Signatures
TSP	Telephony Service Provider
UDP	User Datagram Protocol
URI	Uniform Resource Identifier
URL	Uniform Resource Locator
UTF-8	Unicode Transformation Format -8 encoding
US	United States of America
WWW	World Wide Web

## SECTION 4.0 INTRODUCTION

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This section specifies the reference architecture of a single common ENUM DNS domain, 1.e164.arpa, within Country Code 1.

ENUM implementation is based on a tiered architecture as shown in Figure 1. At Tier 0 is the RIPE NCC which maintains the e164.arpa zone.<sup>1</sup> Entries in the RIPE NCC nameservers correspond to country codes and point to the name servers of the Tier 1 Registry that is the authoritative nameserver for that country code. Entries in Tier 1 Registries normally correspond to individual telephone numbers and point to the Tier 2 nameservers that hold the NAPTR records used to provide actual communication services.

Because Country Code 1 corresponds to an integrated numbering plan in which the country code is shared among several countries, the plan of the LLC is to split Tier 1 functionality into a Tier 1A, which would receive the CC1 delegation from the Tier 0, and potentially multiple Tier 1Bs serving different CC1 (NANP) member countries. Entries in Tier 1 A will correspond to NPAs and will point to the Tier 1B that holds per –number delegations for the numbers within the given NPA.

Tier 1 B Registries are required to deal directly with the CC1 ENUM Tier 1A Registry to arrange for the provisioning of NS records for the NPAs they serve into the CC1 ENUM Tier 1A Registry.

CC1 ENUM Tier1B Registry(ies) will be required to establish a business relationship with the CC1 ENUM Tier 1A Registry prior to registering any NPA in e164.arpa. The nature of the business relationship will be defined by the CC1 ENUM LLC embodied in a Registry agreement, and will be the same for all CC1 ENUM Tier1B Registry(ies). This is necessary to ensure that each CC1 ENUM Tier1B Registry's records are properly maintained and that only the assignee of the NPA which has been designated to participate in ENUM by the national administration in charge of the NPA in question can register it into Tier 1A.

ENUM Registrars, the entities that accept registration requests from number assignees, will, in turn, be required to establish a business relationship with the CC1 ENUM Tier1B Registry(ies) prior to registering any telephone number, in e164.arpa.

The nature of the business relationship between the Tier 1B and the ENUM Registrars will be defined by the contracting entity, embodied in a Registry-Registrar agreement, and will be the same for all ENUM Registrars for a given NPA entered into Tier 1A. This is necessary to ensure competitive equity between registrars in Tier1B and to ensure that ENUM Registrant's records are properly maintained and that the assignee of the E.164 telephone number has decided to participate in ENUM. Entries in the Tier 1B nameservers point to the nameservers of the Tier 2 provider for a given E.164 number. The Tier 2 Provider for an E.164 number maintains the actual NAPTR records that contain URIs (Uniform Resource Identifiers) for specific communication services, and the Application Service Provider (ASP) uses these records to provide those services to the number assignee (Registrant)

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<sup>1</sup> The instructions regarding operations of the domain e164.arpa can be found at the URL: <http://www.ripe.net/rs/enum/instructions.html> .

The ITU-T TSB evaluates delegation requests. Information on how TSB will handle ENUM requests can be found under the bullet "Interim Procedures" at the ITU-T Web site at: <http://www.itu.int/ITU-T/inr/enum/>.

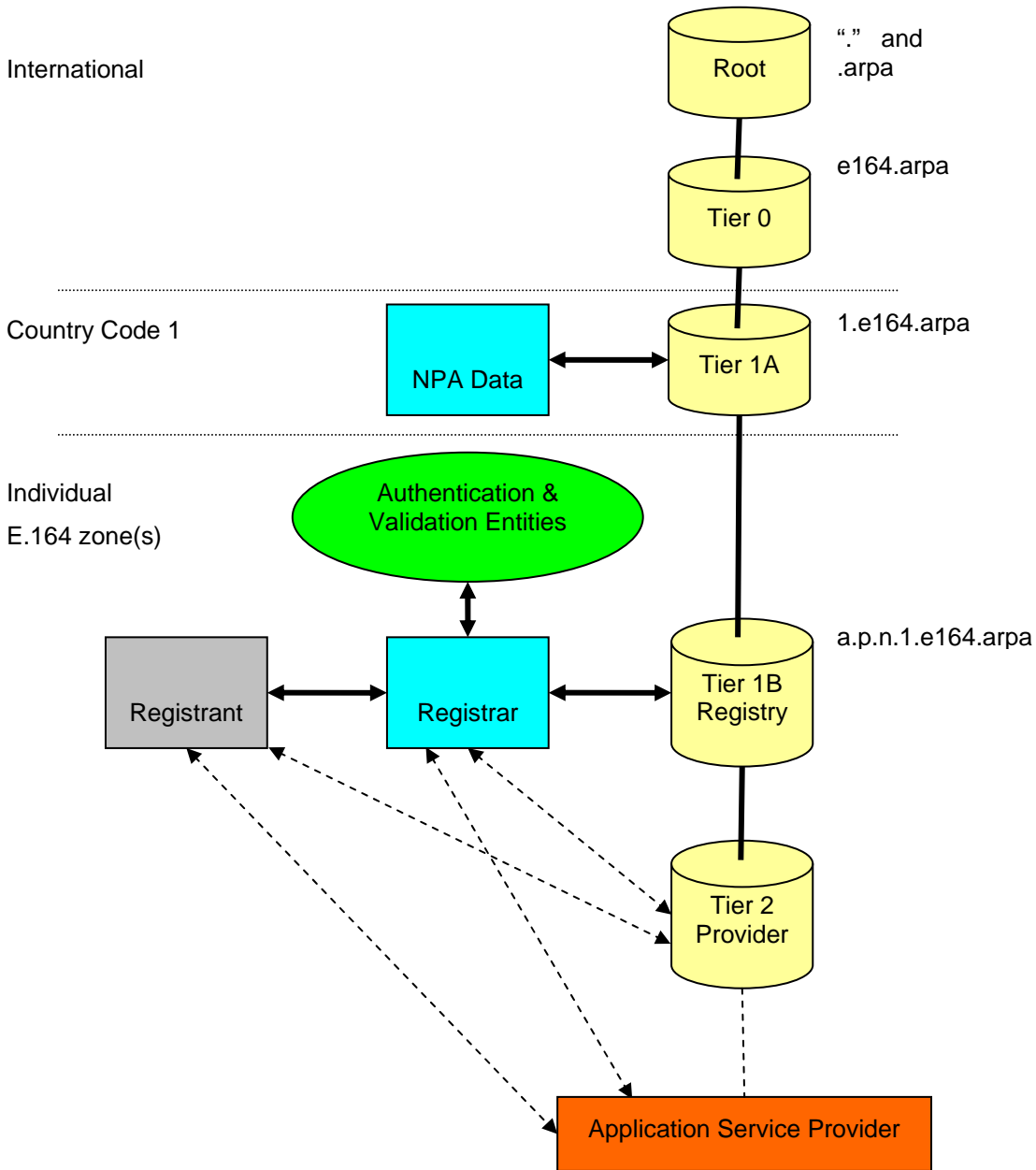


FIGURE 1 – ENUM Functional Architecture

## SECTION 5.0 OPERATIONAL & INFRASTRUCTURE REQUIREMENTS

---

This section provides requirements for the operation and infrastructure of the ENUM Tier 1B registry. Service Level Requirements are contained in Section 6.0.

### 5.1 Registry Database

The Registry database is the central repository for all objects concerning ENUM domain name registrations in an ENUM Tier 1B Registry. The three primary objects associated with an ENUM Tier 1B registration are: domain, host, and contact. It is critical that a Registry database operate in a responsive and robust manner.

An ENUM Tier 1B Registry bidder should describe how it would meet the following requirements for an ENUM Registry database, and it should provide estimates of demand if necessary. (See Service Level Requirements (SLR) Section)

An ENUM Tier 1B Registry shall follow the “thick registry” model as detailed in Section 5.4 below. A Registry database:

- Shall be sized to accommodate the expected demand at initial launch, and to support growth without interruption as ENUM matures.
- Shall be able to perform transactions at a rate that meets the needs of the ENUM users.
- Shall maintain its performance based on agreed to service-level measurements, even as the number of users, workload volume, or database size increases.
- Shall maintain a high level of availability as required by SLRs contained herein. An ENUM Tier 1B Registry bidder should describe what level of availability it believes is necessary; what amount of scheduled maintenance is necessary; and how it would expect to meet the appropriate availability level.
- Shall be replicated and hosted in geographically dispersed data centers to achieve high availability and facilitate data backup and recovery.

### 5.2 Shared Registration System (SRS)

The Tier 1B registry shall provide a Shared Registration System (SRS) that allows multiple registrars to enter ENUM registrations into the registry. An ENUM Tier 1B Registry will maintain the addresses of the nameservers of the Tier 2 providers in the US ENUM name space and will have authority to communicate with the ENUM Tier 1A Registry.

An ENUM Tier 1B Registry is required to:

- Allow concurrent operations from multiple ENUM Registrars
- Provide non-discriminatory services to each authorized ENUM Registrar to perform registration related operations
- Provide and conduct non-discriminatory registrar certification procedures
- Support open standard interfaces between the ENUM Tier 1B Registry and authorized ENUM Registrars
- Perform Zone data creation and maintenance necessary to update the zone data and information in the local data stores
- Support open standard interface(s)

### 5.3 *Zone Data*

Zone data is typically a database file (or a collection of database files) consisting of the technical information that the DNS requires to function correctly. Zone data generation is the term traditionally used to describe the process of generating zone information from the Registry database, deploying it to the primary server, and then propagating it out to the secondary servers. The latter two steps are also called zone data propagation.

An ENUM Tier 1B Registry bidder must describe how it would meet the following requirements for zone data operations:

- The SRS/Registry Database shall provide means to generate the zone data from the Registry database to reflect changes made through the ENUM Registry-ENUM Registrar interface as defined in the Service Level Requirements (SLRs).
- The zone data, once generated by SRS/Registry Database, shall be reliably and securely propagated to all ENUM Tier 1B nameservers with minimum delay.
- The frequency of zone data generation and the delay of zone data propagation shall meet the SLR requirements
- Zone data generation and propagation procedures shall be carefully engineered so that they will not adversely affect the normal ENUM Tier 1B Registry and nameserver operations.
- Zone data distribution procedure should conform to appropriate IETF standards (see Section 2)
- The ENUM Registrar to ENUM Tier 1B Registry SRS shall be the only automatic means by which an ENUM Registrar can make changes to the ENUM domain names it sponsors without the need for Registry personnel intervention.
- The nameservers for an ENUM Tier 1B Registry shall be placed in geographically dispersed data centers topically diverse connections to the Internet to allow for maximum redundancy against disaster and failures.
- The registry database shall support logging and backup capabilities for all zone data updates.

### 5.4 *Thick Registry Model*

A thick registry is one in which all of the information associated with registered entities, including both technical information (information needed to produce zone files) and social information (information needed to implement operational, business, or legal practices), is stored within a central registry repository. The Thick Registry will provide for centralized escrow transfers and lawfully authorized access to the registry data. To protect the privacy of registrant information, public access to the thick registry will be limited. Details for public access to registration data are found in Section 5.5.

- Escrow – transfers. If a registrar goes out of business or experiences some other kind of disaster that corrupts or destroys its data store, the data kept at the thick Tier 1B registry can help transfer registrations to a different registrar, and help registrants keep their domain names. Besides that, keeping registrant information at the Tier 1B registry helps registry operators enforce the transfer policy, and may generally contribute to making the transfer process run more smoothly.
- Lawful Access. Because all needed information is held at the Tier 1B, response to lawful access inquiries is simplified.

- **ContactInfo.** Because all needed information is in the Tier 1B Registry, the Tier 1B rather than each Registrar responds to ContactInfo queries. This provides a single destination for queries and consistency in performance.

It is understood that technical information populated into the Tier 1B Registry DNS resource records is intended to be publicly available for responses to DNS queries.

## **5.5 ContactInfo**

Instead of a conventional WHOIS service, a new query service known as ContactInfo will be provided for ENUM. This service will provide a means of contacting the necessary entities for trouble resolution without compromising the privacy of the ENUM Registrant. It will also allow for appropriate disclosure of ENUM Registrant information in alleged cases of fraudulent or illegal activity on the part of a ENUM Registrant. An ENUM Tier 1B Registry bidder is required to describe how they would provide this service to meet the needs of the communications industry and the public while safeguarding the personal information of the ENUM Registrants.

The Tier 1B will respond to all lawful ContactInfo requests from appropriate authorities.

### **5.5.1 Introduction**

This section describes specific requirements for the Tier 1B operator to maintain a ‘ContactInfo’ database. Also included in this section are the following: how the database should be operated, and what information should be publicly accessible.

### **5.5.2 Need for ContactInfo Databases**

1. There is a need for the Tier 1B Operator to maintain ContactInfo databases associated with ENUM registrations.
2. The appropriate technology for maintaining public access to such ContactInfo should be the IRIS protocol developed by the CRISP Working Group.
3. There is a requirement on the TIER 1B operator to maintain such a database in a manner known as the “Thick Registry” where the TIER 1B Registry operator maintains the authoritative database of registration information obtained from all Registrars.
4. The information from that database that could be made publicly accessible is a matter of policy for the CC1 ENUM LLC to determine, to ensure compliance with privacy regulations and best practices.

### **5.5.3 General ContactInfo Requirements**

The general requirements for the ContactInfo database are:

1. Mining Prevention: providing some technical means to discourage data mining of the information base
2. Standard and Extensible Schemas
3. Level of access: not all data need be equally accessible by all users of the service
4. Client processing: facilitating the creation of client software that can automatically extract relevant details from the services responses
5. Searches: The protocol should provide for flexible access by authorized entities while limiting public queries to searches by full telephone number only.
6. Result Set Limits: the protocol must include provisions for allowing a server operator to express a client search limit

The implementation of ContactInfo Databases must be policy neutral and extensible to allow the LLC to administer associated ContactInfo policies, with regard to individual database elements as well as the database as a whole.

Contact-Info Databases should use modern authentication and authorization methods to control access by Registry personnel, Registrars, and querying parties.

#### **5.5.4 Data Collection Requirements and ContactInfo Data Access**

The Tier 1B operator will accredit various entities to perform the function of ENUM Registrars. Those Registrars will as part of the registration process collect a variety of data associated with ENUM registrations which may include the registrant, billing contacts, technical contacts, administrative contacts, legal contacts, zone contacts, abuse contacts, and security contacts. The data that can be collected will be governed by appropriate regulatory requirements and the Tier 1B contract.

ENUM accredited Registrars will transmit copies of specified data for each registration to the Tier 1B operator for maintenance under the concept of a “thick Registry”.

The Tier 1B operator will then take portions of the data, such as Registrar contact data, and populate an IRIS database with that information for public access. The data that is to be publicly accessible is a matter to be governed by appropriate regulatory requirements and the Tier 1B contract.

Below, are the recommended data elements that should be included in the Zone ContactInfo.

The data elements that are marked as public should be made available to all queries under the terms and conditions of the Tier 1B contract and in compliance with appropriate regulatory requirements. All data in the database must be true and accurate. The use of proxied data is not allowed.

##### **5.5.4.1 Zone Contact Data Elements**

**Table 1** Zone Contact Data Elements

<b>Data Element</b>	<b>Private</b>	<b>Public</b>	<b>Example</b>
Domain Name		X	4.5.6.7.5.5.5.3.2.1.1.e164.arpa
Domain ID		X	
Domain Status		X	REGISTRAR-LOCK
Domain Updated Date		X	
Domain Expiration Date		X	
Registrar Name		X	
Registrar URL		X	
Last Updated by Registrar		X	
Last Transferred		X	
Name Server ID		X	
Name Server Name		X	BAY-W2.ACME.FOO

Name Server URL		X	Iris:ereg1//t1b.us/host/bay-w2.acme.foo
Name Server Status		X	
Name Server Association Status		X	
Name Server IP Address		X	
Name Server Creation Date		X	
Name Server Last Transfer Date		X	
Tier 1B Name		X	
Tier 1B URL		X	
Tier 1B Name Server Name		X	

Below are the recommended data elements that should be included in the Registrar ContactInfo. The data elements that are marked as public must be made available to all queries. The data elements that are marked as private must be secured in the ContactInfo database and only available to queries that have the appropriate authorization. The registrant has the right to change the default data elements that are marked as private to public at their discretion. If a data element is marked optional, then there is no requirement for populating those fields. These fields should be populated with role-based information (e.g., email address abuse@xyz.com)

**5.5.4.2 Registrar Contact Data Elements**

**Table 2 Registrar Contact Data Elements**

Data Element	Private	Public	Example
Registrar Name		X	
Registrar Address		X	
Registrar Phone Number		X	
Registrar URL		X	
Registrar Admin. Contact Name		X	
Registrar Admin Contact Phone Number		X	
Registrar Admin Contact Email		X	
Admin Contact Name	X		
Admin Contact Phone Number	X		
Admin Contact Email	X		

Billing Contact Name	X		
Billing Contact Phone Number	X		
Billing Contact Email	X		
Technical Contact Name	X		
Technical Contact Phone Number	X		
Technical Contact Email	X		
Registrant Name	X		
Registrant Company Name	X		
Registrant Address	X		
Registrant Contact Phone Number	X		
Registrant Contact Email	X		
Legal Contact Name (Optional)	X		
Legal Contact Phone Number (Optional)	X		
Legal Contact Email (Optional)	X		
Abuse Contact Name (Optional)	X		
Abuse Contact Phone Number (Optional)	X		
Abuse Contact Email (Optional)	X		
Security Contact Name (Optional)	X		
Security Contact Phone Number (Optional)	X		
Security Contact Email (Optional)	X		

**5.5.5 Privacy Considerations**

ENUM Registry maintains a full and complete copy of all relevant data associated with ENUM registrations in accordance with the requirement for a “thick Registry”. It is anticipated that Registrars will handle normal and routine inquiries about registrants. Those making inquiries about existing registrations should be referred to the ContactInfo data query mechanism. ENUM Registrars and registries will comply with applicable regulations on the collection of personally identifying information and must disclose the reasons for the collection and publication of such data to their applicants.

It is anticipated that personally identifying registrant information associated with ENUM would not be made publicly available through the ContactInfo data query mechanism; however, such data could be made available to authorized entities (such as Law Enforcement agencies) under appropriate legal and regulatory procedures. Operators of the Tier 1B registry should anticipate inquiries from law enforcement agencies from time to time.

Registrants may choose to have specific ContactInfo data fields that would otherwise be marked as private, made available through the ContactInfo data query mechanism. The Registry-Registrar interface SHOULD be able to flag appropriate fields for the Registry to publish in a separate registrant info field.

Should a Registrant indicate that it chooses to manage its own Tier 2 DNS infrastructure, the registrant would also be the zone contact. Under these circumstances, the requirement for publishing zone contact data may override personal privacy considerations. In those cases, the registrant will be notified via an appropriate disclosure of the circumstances and necessity to publish such data.

Bidders need to address how they will comply with privacy and other regulations (ContactInfo) where they either store the data or if required where the data is originated. Example – CA privacy regulations differ from other states.

#### **5.5.6 Escrow Requirement**

The Tier 1B contract shall contain an escrow requirement for all appropriate data required to maintain business continuity in the event of a force majeure incident. The escrow agreement is essential to ensure business continuity and stability of 1.e164.arpa.

## **5.6 Security**

A Tier 1B must secure both Registry operations and data. A Registry shall conduct comprehensive threat analyses on all parts of the Registry system to identify the vulnerable points and the types of security attacks. Based on the analyses, the Registry shall define and implement multi-tiered procedures that provide security protections to all parts of the Registry system.

A Tier 1B is required to protect Registry system access from all forms of abuse, fraud, or security breaches. In addition, a Tier 1B must follow any and all commercial practices used to protect credit card information (Gramm-Leach-Bliley Act).

### **5.6.1 Operational System Security**

Security requirements are detailed below:

- Protection/Prevention of compromise of the systems hosting or managing Tier 1B
- Protection from Denial of Service attacks (internal & external)
- Requirements for maintaining security updates for all software
- Security (integrity, authenticity) of communications between the components of the Tier 1A and 1B service (name servers, registry, etc)
- Encryption requirements
- Authentication & Authorization requirements
- Requirements on ISPs providing connectivity for Tier 1B

### 5.6.2 *Physical Security*

- The Tier 1B Registry shall employ a variety of physical security systems to ensure that unauthorized personnel have no access to sensitive equipment and/or data.
- All servers containing any sensitive data shall be physically secured so that only a controlled list of people can obtain access.
- The hosting centers shall be secured so that no access to the internal networks is possible for unauthorized persons. All internal networks shall be isolated from public access, and external Internet links shall be firewall-protected to prevent intruders from gaining access.
- Physical precautions inside the server rooms shall include movement detectors (using infra-red or similar means) to alert security personnel should an intruder gain access to a secured location. Alarms will be fitted to all doors and windows, which open into or out of a restricted area.
- The doors and windows shall be secure enough to withstand a reasonable amount of force, and damage to doors or windows shall also trigger the alarms.
- Security staff shall be present at all times, and should have sufficient training to enable them to correct most problems. Appropriate personnel shall also be contacted when necessary to help contain the situation. (Bidder should provide its proposed escalation procedures.)
- Access to the server room shall be controlled by a two-factor authentication system. An authorized individual shall require both an authorized access token and a valid PIN or passcode to gain physical access to the servers. Any use of an access token shall be logged and such logs shall be archived for at least 1 year.
- Should an access card be lost or stolen, it is the responsibility of each employee to report this in a timely manner so that the lost card may be deactivated and a new card issued. Closed circuit TV shall be in place at all sites for identification purposes should an unauthorized person attempt to use a stolen access card. Personnel authorized temporary access to the servers, but not permanently issued access tokens, shall be escorted by permanent staff while within the restricted space.
- 24-hour access to the data center by authorized personnel shall not be hindered by aforesaid security measures.

### 5.6.3 *Network Security*

- The Tier 1B shall use techniques such as User identification, passwords, and/or IP range checking for all restricted services (which includes services other than DNS resolution.).
- Secure File Transfer Protocols shall be used for all "file transfers" between the ENUM Tier 1Bs and the Tier 1A Registry [RFC 2228, RFC 2577, or similar equivalent].
- System maintenance shall be performed via SSL or similarly secured connections. Telnet servers shall not be operational on any system on the DNS network due to their security risk.
- Each system shall operate a very restricted set of basic services in the relevant sections for DNS, ContactInfo, FTP, SCP, and WWW services. Systems shall be firewall-protected in hardware, and IP filtering rule sets shall be in place to reject packets that are not appropriate for a particular host.
- DNS servers shall run a minimum set of applications and system services, in addition to the DNS server software.

- The Tier 1B Operator shall check all its DNS servers to ensure that data integrity is maintained.
- Services which are IP-restricted shall have each IP address specified individually. Network addresses are not to be used, since this adds the risk that a host could masquerade as a spare IP address on an internal network.
- Packet "sniffers", designed to check all traffic passing through a network interface, shall be in place to catch suspicious traffic. These will actively scan for incorrect or illegal packets, and alert the security team. Packet sniffers may also give some indication of the source of an attack, which would be of use in preventing that attack in the future.
- Network security shall be verified by a security audit process, which involves scanning from an internet-connected host all TCP and UDP ports on servers operated by the Tier 1B Registry.
- Security tests shall be performed on the DNS Servers and a corresponding report audited on a regular basis. Each test will attempt to take advantage of a security flaw using a specific attack method, and the result shall be reported. Here is a non-exhaustive list of known attacks:
  - Buffer overflow exploit
  - Missing format string exploit
  - Packet fragmentation attack
  - Data flooding (SMURF ping, etc.)
  - DNS spoofing
  - FTP spoofing
  - Dictionary passwords
  - Replay attack
  - Denial of service (DoS)

Some of these attacks may not be applicable to all services.

The Tier 1B Registry shall update the tests used when new vulnerabilities, security flaws, or techniques are discovered. The updates shall be based on information from security-related mailing lists, websites, newsgroups, and industry best practices.

#### **5.6.4 Backup Security**

- Backup shall be performed in a secure manner on the main Tier 1B Registry site.
- The Tier 1B Registry shall use an encryption scheme for the backup of sensitive data as a part of the implementation process.
- Backup information shall be stored in a secure off-site location.

#### **5.6.5 Security Audit and Reporting**

The Tier 1B Registry shall run a security audit on a regular basis but no less often than once per quarter.

- The Tier 1B Registry shall run a security audit to test all systems for configuration issues and security vulnerabilities. Results of this audit should then form the basis of a quarterly security audit report, which will also detail any recommendations for system alterations and a timeline for remediation.
- All security breaches are to be reported to the Registry management responsible for security and to the CC1 ENUM LLC. Should a serious breach be detected, some services may be suspended temporarily if this is necessary to ensure the reliability of the Tier 1B Registry data. Bidders should detail the hierarchy of breach severity and escalation procedures.

- The Tier 1B Registry shall provide a monthly security status report to the CC1 ENUM LLC, including a list of security incidents categorized by severity.

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### **5.7 Caching Requirements**

This section refers to the minimum requirements for caching. Bidders should propose what they believe are appropriate values for name server caching requirements for time to live (TTL).

### **5.8 System Turn-Up and Testing**

Bidders need to provide a detailed start-up project implementation and system test plan, including proposed test cases, to support the Tier 1B registry system turn-up.

A Beta test period is recommended as a critical final step prior to successful commercial deployment. The Bidder should propose an appropriate plan and set of parameters for Beta testing.

Bidders are required to provide high level start-up project implementation timelines and plans as part of their bid proposal.

### **5.9 Operations and Maintenance**

ENUM is envisioned as a wholly robust and high-availability service. An ENUM Tier 1B Registry bidder should describe how it would operate and maintain the various aspects of the Registry at a high service level. Bidders should include descriptions of how they intend to ensure system reliability, system recovery procedures, and technical support, including arrangements for power, HVAC (Heating, Ventilating, and Air Conditioning), and fire systems.

An ENUM Tier 1B Registry bidder should also provide a comprehensive description of how they will manage their network operations center to address the following:

- Trouble reporting and ticket tracking:
  - How Tier 2 and registrars can submit trouble tickets and receive status reports.
  - Tracking of internal performance metrics.
- Technician support 24x7x365:
  - Internal hand off between different technician levels (1, 2, etc).
  - Internal hand off between different support groups.
  - Trouble referral and tracking to third party entities.
- Monitoring of servers and network connections
- Intrusion detection for both physical and network security
- Provide technical liaison with the Tier 1A entity for issues related to delegation authority over NPAs within 1.e164.arpa
- Provide a description on how escalations will be handled and communicated to the Tier 2 and registrars.

- Describe disaster recovery plans to restore critical components of the system within 48 hours in the case of a force majeure event. No single event should result in an outage of DNS resolution service itself.
- Describe how the network operations center will perform internal monitoring as a means to verify that the availability and performance measurements in this document are being met and provide reports on a monthly basis to the CC1 ENUM LLC or its designee.
- Describe information retention practice to ensure that the summary data is kept for the life of the contract and that valid ticket data is kept on a rolling thirteen-month basis in the trouble reporting system.

### 5.10 System Recovery Procedures

System recovery refers to the process of bringing the system back to normal operations after the system has gone down due to failures. The goal is to minimize downtime, data loss, and adverse impacts on other systems.

- In describing how it intends should meet operations and maintenance requirements the ENUM Tier 1B Registry bidder should: Specify how it will employ recovery procedures for failures that occur at different parts of the Registry system, such as:
  - Data center failures
  - Database failures
  - Server failures
  - Network failures
- Specify how redundancy and highly available Registry architecture will help expedite recovery from these failures.
- Specify how backup and escrow data will be used for recovery from these failures.

In addition the bidder should describe how it would:

- Provide a time estimate for recovering from each type of failure.
- Log each system outage and document system problems that could result in outages.

### 5.11 Database Escrow and Backup

The goal of any data backup/recovery procedure is full and timely recovery from failures without any loss of data. Data backup strategies handle system hardware failures (e.g., loss of a processor or one or more disk drives) by reinstalling the data from daily backups, supplemented by the information on the “before” and “after” backup files that the database creates. In order to guard against loss of the entire facility because of fire, flood, or other natural or man-made disaster, off-site escrow of the Registry data should be provided in a secured storage facility.

An ENUM Tier 1B Registry bidder shall specify:

- The frequency and procedures for data backup
- The frequency and procedures for data escrow
- The hardware and software systems used for data backup
- The procedures for retrieval of data and rebuild of the database
- Who should have access to the escrowed data and in what circumstances it would be accessed by an entity other than itself

- Testing process and schedule to verify the escrow and database backup procedure
- The data escrow arrangements, including any contractual arrangements with Third parties

In addition, the following safeguards are required of ENUM Tier 1B Registry bidders:

- The data backup and escrow procedures shall not impede the overall performance of normal Registry operations
- The data backup and recovery procedures shall minimize the data loss and service interruption of the Registry

### **5.12 Technical and Other Support**

The Tier 1B Registry must provide technical support to the Tier 1A for resolution of issues with respect to the delegation of authority over a country's NPAs within 1.e164.arpa. The Tier 1B Registry must provide technical and other support to Registrars and Tier 2 providers from an appropriate customer help desk with a well-defined escalation policy.

The RFP should require the Registry bidders to describe how they would fulfill these requirements

### **5.13 Transition**

The Tier 1B Registry must provide a plan for transitioning of the Registry to a new provider should that be required under the terms of the contract. The plan must ensure no disruption of Tier 1B function in providing ENUM DNS service.

### **5.14 Accommodation of Future Internet Architectural Enhancements**

Bidders must respond with plan to accommodate IPv6 per RFC 2874.

Bidders must respond with plan to accommodate DNSSEC per RFC 2535.

## SECTION 6.0 SERVICE LEVEL REQUIREMENTS (SLR)

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The Tier 1B Registry shall use commercially reasonable efforts to provide performance at the levels set forth herein.

### 6.1 Service Availability

Service Availability is measured as follows:

Service Availability % =  $\{[(MTM - POMU) - UOM] / (MTM - POMU)\} * 100$  where:

MTM = Monthly Timeframe Minutes calculated as the number days in that month times 24 hours times 60 minutes. For example, the MTM for January is 31 days \* 24 hours \* 60 minutes or MTM = 44,640 minutes.

POMU = Planned Outage Minutes Used is the number of minutes of a Planned Outage or Extended Planned Outage Used for that Monthly Timeframe for each individual System Service. No Monthly Timeframe shall have both a Planned and an Extended Planned Outage.

UOM = Unplanned Outage Minutes

#### 6.1.1 DNS Resolution Service

The Service Availability calculation shall be calculated by the Registry Operator and the results reported for each Monthly Timeframe for DNS Name Server availability. Results will be reported to the Tier 1B Community via e-mail and to CC1 ENUM LLC.

Service Availability--DNS Name Service = 100% per calendar month. Service Availability as it applies to the DNS Name Server refers to the ability of the DNS Name Server to resolve a DNS query from an Internet user. DNS Name Service unavailability will be logged with the Registry Operator as Unplanned Outage Minutes. Registry Operator will log DNS Name Service unavailability when such unavailability is detected by monitoring tools, or once Tier 1B reports an occurrence to Registry Operator's customer service help desk in the manner required by the Registry Operator (i.e., e-mail, fax, and telephone) and Registry Operator confirms that the occurrence is not unique to the reporting Tier 1B. DNS Name Service unavailability shall mean when greater than 25% of sites on the Registry Operator's constellation are returning answers to queries with more than 1% packet loss averaged over a Monthly Timeframe or 5% packet loss for any five minute period. The committed Service Availability for DNS Name Server is 100% per calendar year.

Planned Outage – For DNS resolution service no Planned Outages are allowed

#### 6.1.2 SRS

Service Availability as it applies to the SRS refers to the ability of the SRS to respond to Registrars that access and use the SRS through the EPP or designated protocol. SRS Unavailability will be logged with the Registry Operator as Unplanned Outage Minutes. The committed Service Availability for SRS is 99.95% and the Service Level Measurement Period is monthly.

- **SRS Planned Outage Duration = 45 minutes per Monthly Timeframe**
- **SRS Planned Outage Timeframe = 0600-1400 UTC Sunday**
- **SRS General Maintenance Planned Outage notification Timeframe = 30 days**
- **SRS Updates/Upgrades notification timeframe = 90 days**  
(as defined in the Patch, Update and Upgrade Policy)

### 6.1.3 *ContactInfo*

Service Availability as it applies to ContactInfo refers to the ability of users to access and use the Registry's ContactInfo service. ContactInfo Unavailability will be logged with the Registry Operator as Unplanned Outage Minutes. The committed Service Availability for ContactInfo is 99.95% and the Service Level Measurement Period is monthly.

- **ContactInfo Planned Outage Duration = 45 minutes per Monthly Timeframe**
- **ContactInfo Outage Timeframe = 0600-1400 UTC Sunday**
- **ContactInfo Maintenance Planned Outage Notification Timeframe = 30 days**
- **ContactInfo Updates/Upgrades notification timeframe = 90 days**  
(as defined in the Patch, Update and Upgrade Policy)

## 6.2 Processing Time

Processing time is an important measurement of transaction-based services like the System Services. Service Availability, including Planned Outages and Extended Planned Outages, measures the amount of time that the service is available to its users. Processing time measures the quality of Service Availability.

Processing Time refers to the round-trip for the System Services ("Processing Time"). Since each of the System Services has a unique function, the Performance Specifications Processing Times are unique to each System Service. Processing Time Performance Specifications will be measured in a monthly timeframe and will be reported on a monthly basis to the CC1 ENUM LLC.

### 6.2.1 *DNS Resolution Service*

Processing Time--DNS Name Server Resolution  $\leq$  100 milliseconds for 95%. Bidders should provide sufficient detailed justification for any proposal that does not meet this requirement.

- a) Processing Time - DNS Name Server Resolution is applicable to the DNS Name Server. It measures the processing time for a DNS query.
- b) The Performance Specification is 100 milliseconds for 95% of the transactions. That is, 95% of the transactions during a Monthly Timeframe will take 100 milliseconds or less from the time name server receives the DNS query to the time it provides a response.

### 6.2.2 *SRS*

#### 1. Processing Time Add, Modify, Delete = 1000 milliseconds for 95%.

- Processing Time - Add, Modify, and Delete is applicable to the SRS as accessed through the EPP protocol defined in Appendix C. It measures the processing time for add, modify, and delete transactions associated with domain names, nameservers, contacts, and Registrar profile information.
- The Performance Specification is 1000 milliseconds for 95% of the transactions processed. That is, 95% of the transactions will take 1000 millisecond or less from the time the Registry Operator receives the request to the time it provides a response.

#### 2. Processing Time--Query Domain

- ContactInfo Processing Time - Query Domain is applicable to the SRS as accessed through the designated protocol. It measures the processing time for an availability query of a specific domain name.

- The performance specification is 500 milliseconds for 95% of the transactions. That is, 95% of the transactions will take 500 milliseconds or less from the time the Registry Operator receives the query to the time it provides a response as to the domain name's availability.

### 6.2.3 *ContactInfo*

- Processing Time - ContactInfo Query is only applicable to the ContactInfo. It measures the processing time for a ContactInfo Query.
- The Performance Specification is 1000 milliseconds for 95% of the transactions. That is, 95% of the transactions will take 1000 milliseconds or less from the time the ContactInfo receives a query to the time it responds.

## 6.3 Update Frequency

There are two important elements of the Registry that are updated frequently and are used by the general public; Nameserver and ContactInfo. Registrars generate these updates through the SRS. The SRS then updates the Nameserver and the ContactInfo. These will be done on a batch basis.

The committed Performance Specification with regard to Update Frequency for both the Nameserver and the ContactInfo is 10 minutes for 95% of the transactions. That is, 95% of the updates to the Nameserver and ContactInfo will be effectuated within 10 minutes. This is measured from the time that the registry confirms the update to the Registrar to the time the update appears in the Nameserver and ContactInfo. Update Frequency Performance Specifications have a monthly Service Level Measurement Period and will be reported on a monthly basis.

- Update Frequency--Nameserver = 10 minutes for 95%.
- Update Frequency-- ContactInfo = 10 minutes for 95%.

## 6.4 Cross-Network Name Server Performance (CNNP)

DNS Name Server Round-trip and packet loss from the Internet are important elements of the quality of service provided by the Registry Operator. These characteristics, however, are affected by Internet performance and, therefore, cannot be closely controlled by Registry Operator. The committed performance specification for cross-network name server performance is a measured Round-trip of fewer than 300 milliseconds and measured packet loss of under 1% averaged over the course of a Monthly Timeframe and no greater than 5% for any five (5) minute period over the course of a Monthly Timeframe. Cross-network name server performance measurements may be conducted by the CC1 ENUM LLC at times of its choosing, in the following manner:

- 1) The measurements will be conducted by sending strings of DNS request packets from each of four measuring locations to each of the Tier 1B's DNS Name Servers and observing the responses from the Tier 1B's DNS Name Servers. (These strings of requests and responses are referred to as a "CNNP Test".) The measuring locations should be at least four geographically diverse sites.
- 2) Each string of request packets will consist of 100 UDP packets at 10-second intervals requesting name server (NS) records for arbitrarily selected Tier 1B domains, pre-selected to ensure that the NPAs exist in the Registry and are resolvable. The packet loss (i.e. the percentage of response packets not received) and the average round-trip time for response packets received will be recorded.

- 3) To meet the packet loss and Round-trip requirements for a particular CNNP Test, all three of the following must be true:
  - a) The Round-trip and packet loss from each measurement location to at least one Tier 1B name server must not exceed the required values.
  - b) The packet loss to each of the Tier 1B name servers from at least one of the measurement locations must not exceed the required value.
  - c) The Round-trip time to each of 75% of the Name servers from at least one of the measurement locations must not exceed the required value.
- 4) Any failing CNNP Test result obtained during an identified Core Internet Service Failure shall not be considered. "Core Internet Service Failure" refers to an extraordinary and identifiable event beyond the control of Registry Operator affecting the Internet services to be measured. Such events include but are not limited to congestion collapse, partitioning, power grid failures, and routing failures.
- 5) To ensure a properly diverse testing sample, the testing entity will conduct the CNNP Tests at varying times (i.e. at different times of the day, as well as on different days of the week).
- 6) In the event of persistent failure of the CNNP Tests (three or more consecutive failed tests), CC1 ENUM LLC will give Registry Operator written notice of the failures (with backup data) and Registry Operator will have sixty days to cure the failure.
- 7) Sixty days prior to the commencement of testing under this provision, CC1 ENUM LLC will provide Registry Operator with the opportunity to evaluate the testing tools and procedures to be used by testing entity. In the event that Registry Operator does not approve of such tools and procedures, the testing entity will work directly with Registry Operator to make necessary modifications.

## 6.5 Internet Connectivity

Bidders must describe the physical connectivity arrangements planned to support each of their nameservers and how these arrangements will enhance service reliability and security.

## 6.6 Shared Registration System (SRS)

An ENUM Tier 1B Registry bidder shall propose service-level requirements it would expect to meet with regard to operations of the SRS. This shall include the following items:

- Registry database throughput – number of transactions per second
- Registry database availability (in line with 6.1.2)
- Number of ENUM Registrar accounts
- Number of concurrent ENUM Registrar-ENUM Registry connections
- Frequency of zone data generation: rates per day, hour, minute

## 6.7 ENUM Tier 1B Registry Management

This section provides requirements for the management and monitoring of events in the ENUM Tier 1B Registry system. This includes logging of events, auditing logs and notification of significant events to personnel for remedial action.

- Reject illegal commands/requests (e.g., missing mandatory data element) from ENUM Registrars
- Detect dual registration attempts for the same ENUM domain name, and inform the requesting ENUM Registrar so that it can initiate the dispute resolution process. If a Registrar initiates a dispute resolution process the Tier 1B will notify the original Registrar of the dispute. The ENUM Tier 1B Registry must take appropriate action to protect the integrity of the original registration during the dispute resolution process.

## 6.8 Reports and Files

An ENUM Tier 1B Registry shall provide reporting service to ENUM Registrars and the contracting entity. In addition, it may make zone data available to ENUM Registrars and other contracting entities under terms and conditions established by the LLC restricting the use of such data to network uses and not for marketing purposes. The bidder should propose the types and frequency of reports it will provide to both the Registrars and the Contracting Agency.

Details of information to be included in reports are provided in section 10.

Except in the case of nameserver performance requirements, the Tier 1B Registry will perform internal monitoring as a means to verify that the availability and performance measurements of this document are being met.

Beginning no later than 120 days after the commencement-of-service date, the ENUM Tier 1B Registry will provide preliminary monthly system performance and availability reports to the contracting entity.

The ENUM Tier 1B Registry will provide service availability percentages during each Performance Measurement Period as listed in this document.

- An ENUM Tier 1B Registry may provide custom reporting service that would allow ENUM Registrars and the Contracting Agency to specify report criteria and have the report available for download upon completion.

These reports should be posted to a secure site (i.e., FTP (File Transfer Protocol)) that can be accessed by the ENUM Registrars by entering username and pass code.

The format for reports should be easily machine-readable by ENUM Registrars (i.e., XML, CSV).

Naming convention of reports should identify the ENUM Registrars, the date the report was created, and the subject of the report.

An ENUM Tier 1B Registry should archive copies of all reports created.

An ENUM Tier 1B Registry bidder is required to address what mechanisms it would use to enable the contracting entity to:

- Monitor the initial progress of implementation
- Monitor the ongoing participation in the offering
- Monitor and provide feedback regarding the ongoing performance of the Tier 1
- Monitor ongoing system updates and changes
- Monitor ongoing policy updates and changes
- Drive system updates and changes
- Drive policy updates and changes

## SECTION 7.0 INTERFACE REQUIREMENTS

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### 7.1 *Interfaces between Registry and Registrar*

The Tier 1B Registry-Registrar interface will be a shared registration system (SRS) whereby accredited competing Registrars may register ENUM domain names for their customers in the CC1 ENUM name space. The Tier 1B Registry will be required to develop a Registrar Accreditation process and Registry-Registrar Agreement. The Registry and Registrar Agreement will include the details regarding the interface protocols that can be used.

A Tier 1B Shared Registration System (SRS) is required to:

- Allow an unlimited number of accredited Registrars to register ENUM domain names in the CC1 ENUM name space
- Provide equal access to the system for all accredited Registrars to perform registration related operations such as:
  - Register new ENUM domain names and associated information
  - Check status of registered ENUM domain names and associated information,
  - Delete registered ENUM domain names and associated information,
  - Renew registered ENUM domain names and associated information,
  - Update information about registered ENUM domain names and associated information,
  - Transfer ENUM domain name registration among competing accredited Registrars
- Support the open standard interface between the Registry and accredited Registrars, as defined in the IETF extensible provisioning protocol (EPP) standard suite (RFC3730 through RFC3735). The Tier 1B Registry will work with the CC1 ENUM industry to identify and develop further extensions to EPP for the purposes of supporting CC1 ENUM if needed.
- The common Tier 1B registry protocol for registrars shall be EPP but this should not preclude other protocols from being used between the registry and registrars.
- Reject illegal commands/requests (e.g., missing mandatory data element) from ENUM Registrars.

The bidder should propose a set of security applications for the SRS, such as what is being proposed in the following:

- Security of the SRS applications shall be provided in part via the mandatory use of the TLS [RFC 2246] protocol for transport layer security.
- Each EPP session shall be authenticated and encrypted using TLS. The ENUM Registry shall authenticate every EPP client connection using both an X.509 server certificate, issued by a commercial Certification Authority identified by the Tier 1 Registry, and its ENUM Registrar password.
- Security of the SRS application shall be provided via a mandatory authenticated and encrypted connection. At a minimum, IPSEC will be used to secure the connection.
- Each EPP session shall be authenticated and encrypted using IPSEC. The ENUM Registry shall authenticate every EPP client connection using a valid PKI.

The Tier 1B must support batch file processing so that the ENUM Registrar can put many commands into one file and deposit it in a “command” directory on a Tier 1 B Registry server. The Tier 1 B Registry should move the file to an archive directory, process the commands based on the order as they appear in the file, and put all the responses to the commands in the same order in a file that is deposited in a “response” directory on the same server. ENUM Registrars can periodically check and retrieve files in the

“response” directory. Once the file is read, the ENUM Tier 1B Registry can move the file to an archive directory where it can be preserved as backup.

### **7.2 *Interfaces between Tier 1A Registry and Tier 1B Registry***

Because the Tier 1A registry will likely contain less than a thousand records and additions and changes are expected to be infrequent, a formal mechanized interface or system (Shared Registration System) between Tier 1Bs and the Tier 1A may not be required.

### **7.3 *Other Interfaces***

- The interface between the ENUM Registrar and the Tier 2 Provider will be identified and agreed to between the parties, and may be defined in an industry Best Practices document
- The interface between the ENUM Registrar and the ENUM Registrant is likely to be defined by each ENUM Registrar.
- The interface between the ENUM Registrant and the Tier 2 Provider is likely to be defined by each Tier 2 Provider.
- The interface between the Tier 1B Registry and the Tier 2 Provider can be as simple as a telephone call or e-mail message about a DNS operation problem.

## SECTION 8.0 PROVISIONING

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This section defines provisioning requirements and procedures for ENUM administration. This involves the following ENUM functional entities: ENUM Registrar, ENUM Tier 1B Registry, Tier 2 Provider, Application Service Provider (ASP), and ENUM Registrant. This section will address the tasks and responsibilities required to provision and maintain ENUM registrations by the above functional entities with the focus on the interface between the Tier 1B Registry and the ENUM Registrar.

This section does not include procedures for interaction with the Tier 1A Registry.

### 8.1 Assumptions

The following assumptions are made when describing the provisioning scenarios:

- ENUM Registrars will be bound by a Registry-Registrar agreement developed by the Tier 1B Registry together with the LLC. This agreement will require the Registrar to comply with the procedures detailed below. In addition to the provisioning procedures, the Registry-Registrar agreement will detail privacy requirements based on those in Section 9 of ENUM Forum document 6000\_1\_0 and registration dispute resolution procedures based on Section 14 of the ENUM Forum document.
- ENUM Registrars have an established trust relationship with the Tier 1B Registry. This relationship includes the method for secure communication, user authentication (e.g., the assignment of a user identification (ID) and password for session management), a Registrar ID for ENUM Registration identification, and exchange of contact and other information before ENUM registrations begin. How to open a secure communication link and establish a session between a Tier 1B Registry and an ENUM Registrar is not included in the provisioning procedures.
- An ENUM Registrar can offer Tier 2 Provider service. It can either operate the nameservers itself, or outsource the nameserver operation.
- The entity that serves as the Tier 1B Registry for a number cannot also serve as an ENUM Registrar. This stricture is intended to prevent conflicts of interest on the part of the Registry.
- An ENUM Registrant may authorize its Tier 2 Provider to review/update certain data (e.g., host and technical contact information) at its ENUM Registrar and/or its ASPs to review/update some application-related data for his/her ENUM domain name. The necessary data elements and procedures related to the interactions between the Tier 2 Provider and the ENUM Registrar, or between ASPs and Tier 2 Providers are not addressed in this document.

### 8.2 Provisioning Requirements

This section lists, or cross-references, the high level requirements for the entities involved in provisioning the ENUM. In terms of provisioning for ENUM, more stringent and specific requirements will be placed on the Tier 1B Registry and the ENUM Registrars. The Tier 2 Provider, although still subject to certain requirements, will have more freedom to interact with ENUM Registrants, and optionally, with the ASPs and the ENUM Registrar in terms of the protocols and/or methods for interactions.

### **8.2.1 Tier 1B Registry**

The Tier 1B Registry is responsible for properly identifying and authenticating a Registrar before accepting any transactions. The Tier 1B Registry is responsible for ensuring that Registrars comply with the requirements and procedures set out in the Registry-Registrar agreement and monitoring Registrar compliance.

### **8.2.2 ENUM Registrar**

The ENUM Registrar must authenticate ENUM Applicants and verify their authorization to register an ENUM domain. In particular,

- When dealing with a corporate ENUM Registrant, only those specific persons who are the designated contact persons of the corporate account with the telephony service provider (TSP) can request ENUM registration for any TN used by that corporation.
- When a broker/agent is involved in applying for ENUM, the broker/agent must demonstrate authorization by the TN assignee/ENUM Registrant to register for ENUM.

The Registry-Registrar agreement will contain minimum requirements for Authentication and Authorization building on those discussed in Section 12 of ENUM Forum Document 6000\_1\_0.

The ENUM Registrar must support the protocols specified between the Tier 1 Registry and the ENUM Registrars. The protocols include those for application handling, secure communications, and lower-layer transport and routing.

The ENUM Registrar must follow the policies specified for ENUM provisioning (e.g., various grace periods, if any, transfer and renewal).

The ENUM Registrar should notify the technical contact associated with each ENUM domain name impacted by an area code split following the recommended procedures in Section 8.4.

If the ENUM Registrar also offers the Tier 2 Provider function to the ENUM Registrant, it must support all the requirements a Tier 2 Provider must support. If it outsources those functions with a Tier 2 Provider, it must collect the NAPTR resource record (RR) information or sufficient information that allows that Tier 2 Provider to provision the NAPTR RRs from the ENUM Registrant.

### **8.2.3 Tier 2 Provider**

The Tier 2 Providers that offer commercial service to other parties (as opposed to a Registrant providing a Tier 2 solely for their own TNs) are expected to adhere to LLC Best Practices and participate in a certification process administered by the Tier 1B Registry. Commercial Tier 2 Providers must agree to host NAPTRs for multiple ASPs and are prohibited from disclosing any information not published in nameservers that they collect in the process of providing service. Non-commercial Tier 2 Providers must self certify themselves as such.

### **8.2.4 ENUM Registrant**

The ENUM Registrant shall register only the TN or TNs assigned to them.

The ENUM Registrant should inform the ENUM Registrar when he/she disconnects the telephony service (e.g., is no longer the TN assignee).

If an ENUM Registrant operates the Tier 2 Provider function, it should also comply with the recommendations of the Tier 2 Provider Best Current Practices document.

### **8.2.5 Application Service Provider (ASP)**

The ASPs must give the correct application addresses/URLs to the ENUM Registrant. They may interact with the Tier 2 Provider in provisioning certain data related to their application service when authorized by the ENUM Registrant. ASPs must ensure that the correct information is provisioned in the NAPTR RRs stored at Tier 2 Providers.

## **8.3 Provisioning Procedures**

This section describes representative scenarios for ENUM Provisioning Activities. Additional scenarios are detailed in US ENUM Forum 6000\_1\_0. The Tier 1B Registry shall develop a comprehensive set of procedures, subject to LLC approval. The Registry shall implement the procedures agreed upon and incorporate them into the Registry-Registrar agreement.

### **8.3.1 Initial ENUM Registration**

#### **8.3.1.1 Assumptions**

An ENUM Applicant may either select a Tier 2 Provider prior to contacting an ENUM Registrar or contract with a Registrar that also provides Tier 2 services. In the later case, the Registrar will already have some of the information required for provisioning.

#### **8.3.1.2 Provisioning Procedures**

1. The ENUM Applicant selects an ENUM Registrar and provides the following information to that ENUM Registrar to register for ENUM for his/her TN:
  - TN
  - A list of nameserver host names associated with the ENUM domain name
  - ENUM registration period (e.g., two years)
  - ENUM Registrant's information and technical, administrative and billing contact information
  - Any AAA-related information required by the ENUM Registrar
2. The ENUM Registrar may interact with the ENUM Applicant for more information if needed. The ENUM Registrar then validates the ENUM Applicant's identity and authority to register the TN. If the Applicant is not the assignee of the TN, the Registrar must verify that the Applicant is the duly authorized agent of the TN assignee. In this case the Registrar will collect contact information for both the agent and the TN assignee.
3. If the validation fails, the application for ENUM is rejected. If the validation is successful, the process continues with step 4.
4. The ENUM Registrar registers the ENUM domain name with the Tier 1B Registry by providing the following information:
  - Request for new ENUM domain name registration
  - ENUM domain name (e.g., 4.3.2.1.3.3.5.2.0.2.1.e164.arpa)
  - A list of nameserver host names

- ENUM Registration period (e.g., two years)
  - The ContactInfo data elements defined in Section 5.5.4
5. After successful authentication and authorization checks of the ENUM Registrar, the Tier 1B Registry determines whether there is an existing ENUM registration for the same ENUM domain name.
- If YES, it initiates the dispute resolution process in the Registry-Registrar agreement and this process stops.
  - If NOT, the Tier 1B Registry acknowledges to the ENUM Registrar that the ENUM domain name registration is accepted with a registration expiration date. The Tier 1 Registry then performs the zone file updates to add the NS RRs of this ENUM domain name to its nameservers. After the zone file updates have been performed at the Tier 1 Registry, real-time DNS queries for this particular ENUM domain name will be able to retrieve the nameserver information indicating where NAPTR RRs are hosted.
  - After receiving the positive acknowledgement from the Tier 1 Registry, the ENUM Registrar records this successful ENUM registration and may inform the ENUM Registrant about the successful registration of his/her ENUM domain name.

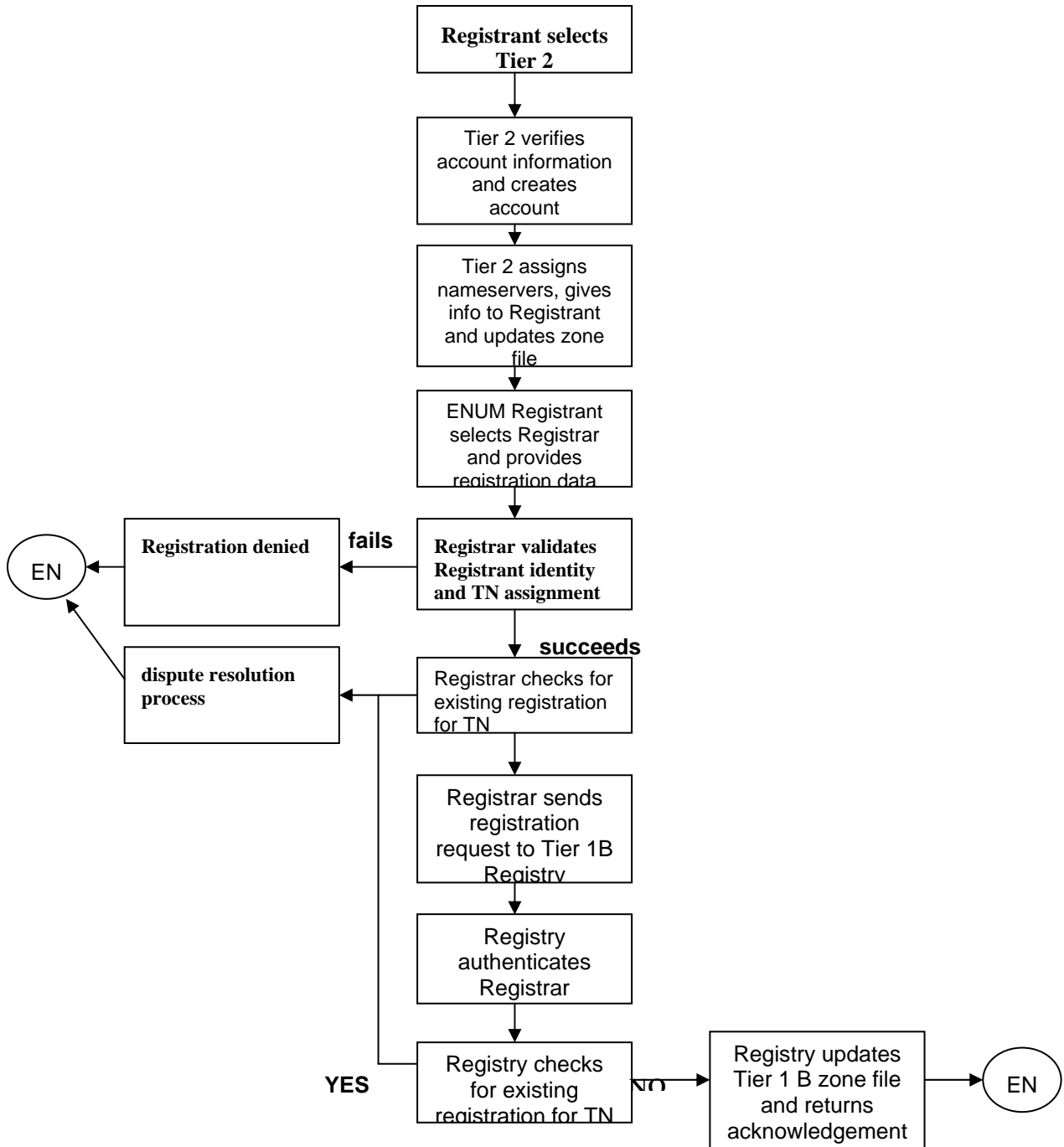


FIGURE 2 – Flow Chart for 8.3.1.2:  
Initial ENUM Registration

### 8.3.2 *ENUM Registration Transfer*

ENUM Registrant transfers his/her ENUM registration to another ENUM Registrar.

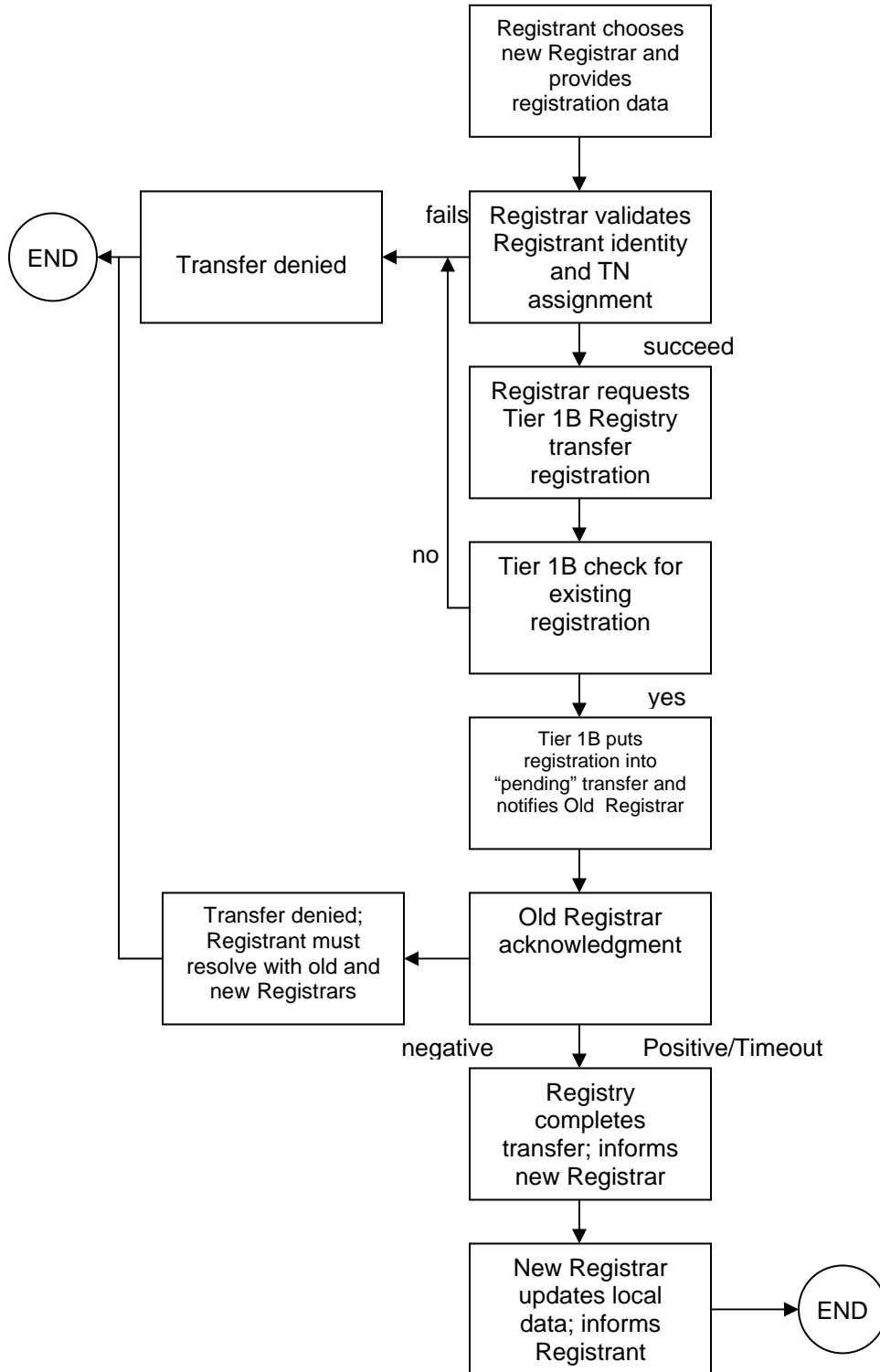
#### 8.3.2.1 Assumptions

- ENUM Registrant uses the same Tier 2 Provider and the nameservers are the same.
- ENUM Registrant can initiate the transfer of the ENUM registration at any point during the term of the registration
- Registrations must be periodically revalidated, no less often than once a year

#### 8.3.2.2 Provisioning Procedures

1. The ENUM Registrant decides to use another ENUM Registrar for his/her ENUM registration and provides the following information to that ENUM Registrar:
  - TN
  - The ENUM Registrant's information and technical, administrative and billing contact information
  - Any AAA-related information required by the ENUM Registrar
2. The ENUM Registrar may interact with the ENUM Registrant for more information if needed. The ENUM Registrar then validates the ENUM Registrant's identity and TN assignment.
  - a. If the validation fails, the request for transferring the ENUM registration is rejected and the transfer process stops.
  - b. If the validation is successful, go to Step 3.
3. ENUM Registrar requests that the Tier 1B Registry transfer the service registration for this particular ENUM domain name by providing the following information:
  - Request for transferring an existing ENUM domain name
  - ENUM domain name (e.g., 4.3.2.1.3.3.5.2.0.2.1.e164.arpa)
  - ENUM Registration expiration date
  - Any AAA-related information
4. After successful authentication and authorization checks of the ENUM Registrar, the Tier 1B Registry determines whether there is an existing service registration for the ENUM domain name that can be transferred.
  - a. If YES, it puts the ENUM domain name in the “pending transfer” state and informs the old ENUM Registrar about the transfer.
    - If the Tier 1B Registry receives an acknowledgement from the old ENUM Registrar or times out for receiving an acknowledgement, it completes the transfer (e.g., the new ENUM Registrar is now the sponsoring Registrar) and changes the state of the ENUM domain name back to the “active” state. The Tier 1B Registry also notifies the new ENUM Registrar about the successful completion of the transfer request. The notification may be put in a queue for ENUM Registrars to retrieve.

- If the Tier 1B Registry receives a negative acknowledgement from the old ENUM Registrar, it will deny the transfer and the old and new ENUM Registrars and the ENUM Registrant will need to resolve this among themselves.
  - b. If NOT, the Tier 1B Registry rejects the transfer by indicating that the ENUM domain name does not exist.
5. After receiving the response from the Tier 1B Registry, the new ENUM Registrar performs the following:
- a. If the transfer is complete, it puts the information associated with the transferred ENUM domain name in the local data stores. It informs the ENUM Registrant about the successful transfer and completes the necessary actions (e.g., collects the registration fee from the ENUM Registrant for the renewal period and pays the Tier 1B Registry).
  - b. If the old ENUM Registrar rejects the transfer, then the new ENUM Registrar informs the ENUM Registrant about the result and urges the ENUM Registrant to settle the matter with the old ENUM Registrar.
  - c. If the transfer is rejected due to the non-existence of the ENUM domain name, it informs the ENUM Registrant about the result.



**FIGURE 3 – Flow Chart for 8.3.2.2:  
ENUM Registrant Transfers ENUM Registration to another Registrar**

### 8.3.3 *ENUM Registrant Checks/Changes Information at the ENUM Registrar*

ENUM Registrant checks or changes information stored at the ENUM Registrar.

#### 8.3.3.1 *Assumptions*

- The ENUM Registrant has already set up an account with the ENUM Registrar. This account includes a login/password that allows the Registrar to authenticate the Registrant before providing access to registration information.
- The ENUM Registrant can check and make changes to all the information except the Telephone Number (TN) kept by the ENUM Registrar.
- The ENUM Registrant may initiate the changes himself/herself, or his/her action may be triggered by requests from the Tier 2 Provider if the ENUM Registrant is the only one that can deal with the ENUM Registrar.
- Some data changes/additions/deletions made by the ENUM Registrant at the ENUM Registrar need to be reflected at the Tier 1B Registry. It is assumed that if the ENUM Registrar approves and acts upon such a request the Tier 1B Registry will not deny that request.

#### 8.3.3.2 *Provisioning Procedures*

1. The ENUM Registrant provides the authentication/authorization information (login/password) and indicates the type of request with the associated information to the ENUM Registrar. The type of request and associated information may include:

- Check
  1. Status of ENUM domain name registration
  2. All or certain current values associated with the registered ENUM domain name account such as:
    - Technical, administrative and billing contact information
    - Contact information for the account with the ENUM Registrar
    - Nameservers
    - Registration expiration date
- Add
  - New nameserver
  - Additional technical, administrative or billing contact information
  - Additional Contact information for the account with the ENUM Registrar
  - Authorization for the Tier 2 Provider to access its data stored at the ENUM Registrar, if not previously authorized
- Delete
  - Nameserver
  - Technical, administrative or billing contact information

- Contact information for the account with the ENUM Registrar
  - Authorization of the Tier 2 Provider to access its data stored at the ENUM Registrar, if previously authorized
  - Modify/Change
    - User id, if permitted
    - Password
    - Technical, administrative or billing contact information
    - Registrant's contact information
    - Tier 2 Provider contact information
    - TSP account information such as the TSP name if ENUM Registrant ports his/her TN to a new TSP or billing address
2. The ENUM Registrar validates the ENUM Registrant.
  3. If the validation fails, the ENUM Registrar rejects the request indicating authentication/authorization failure (e.g., invalid password).

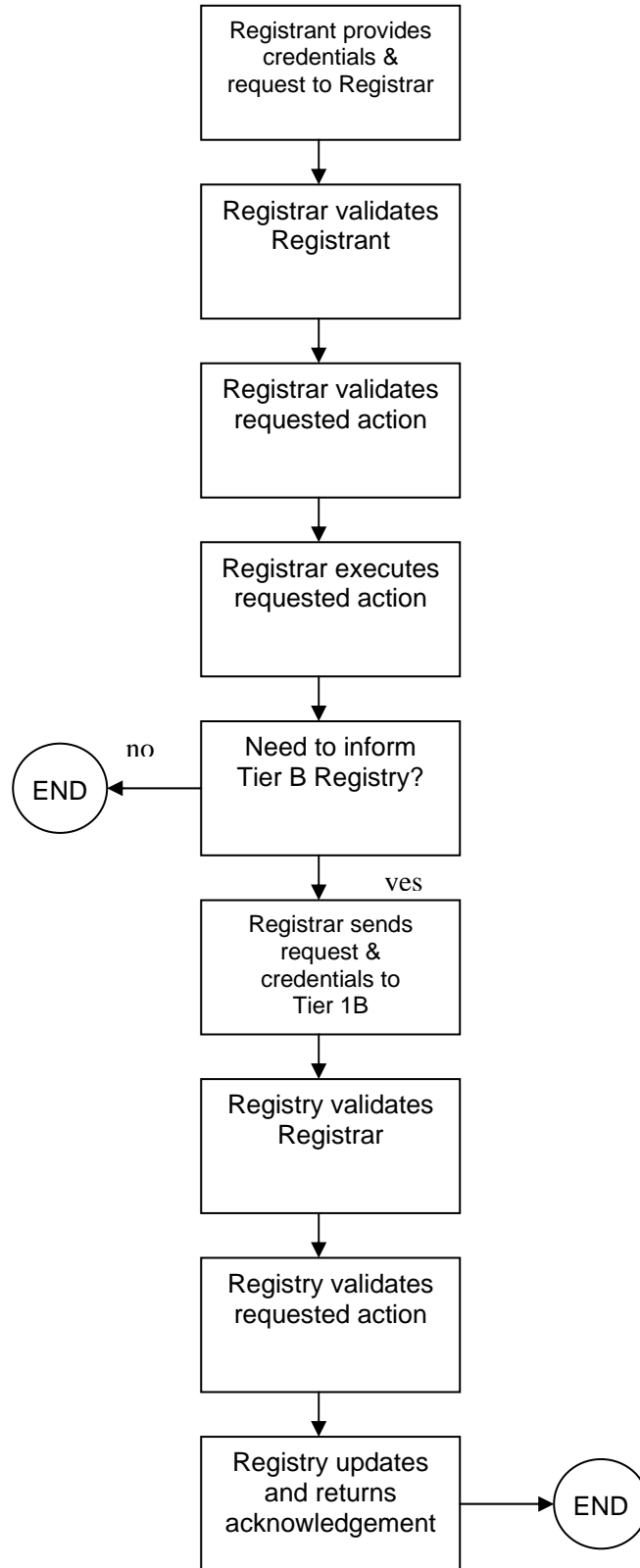
If the validation is successful, the ENUM Registrar proceeds with Step 4.

4. The ENUM Registrar checks whether the requested action is valid.
  - a) If the request is not valid, the ENUM Registrar rejects the request indicating the reason of rejection. Illegal requests include but are not limited to:
    - Change/modify data that the ENUM Registrant is not allowed to change/modify or does not exist
    - Delete data that does not exist or will result in missing mandatory data
    - Add data that the ENUM Registrant is not allowed to add or will exceed the maximum value or field length allowed for that data
  - b) If the request is valid, the ENUM Registrar performs required actions that include but are not limited to:
    - Returns the requested information, if available, or an indication that the requested information is not available
    - Replaces with data from the request and returns a positive acknowledgement
    - Deletes data and returns a positive acknowledgement
    - Adds data and returns a positive acknowledgement

If the action of change/deletion/addition cannot be performed due to internal problems, the Registrar indicates "request pending" to the ENUM Registrant. After successful completion of the request, the Registrar sends a positive acknowledgement to the ENUM Registrant.

The Registrar may inform the Tier 2 Provider if it is authorized by the ENUM Registrant to access/change certain data, and the ENUM Registrant has made changes to the data that the Tier 2 Provider is authorized to change.

5. The ENUM Registrar checks whether it needs to inform the Tier 1B Registry about the data change, deletion or addition, or to access the Tier 1B Registry for data status.  
If the ENUM Registrar need not inform the Tier 1B Registry about the data change, deletion, addition or to access the Tier 1B Registry for data status, the process stops.  
If the ENUM Registrar needs to inform the Tier 1B Registry about the data change, deletion or addition, it provides the authentication/authorization information and indicates the type of request with the associated information to the Tier 1B Registry.
6. The Tier 1B Registry validates the ENUM Registrar.  
If the validation fails, the Tier B1 Registry rejects the request indicating authentication/authorization failure (e.g., invalid password). The ENUM Registrar, if valid, needs to resolve the problem (e.g., re-assign a password) with the Tier 1B Registry and resubmit the request.  
If the validation is successful, the Tier B1 Registry proceeds with Step 7.
7. The Tier 1B Registry checks whether the requested action is valid.  
If the request is not valid (e.g., syntax error), the Tier 1B Registry rejects the request indicating the reason for rejection.  
If the request is valid, the Tier 1B Registry performs the required actions and returns a positive acknowledgement.
8. ENUM Registrar returns the requested information if not yet done in step 4.



**FIGURE 4 – Flow Chart for 8.3.3.2:  
ENUM Registrant Checks/Changes Information at ENUM Registrar**

### 8.3.4 *ENUM Registrar Checks/Changes Information at Tier 1B Registry*

The ENUM Registrar checks or changes information stored at the Tier 1B Registry.

#### 8.3.4.1 **Assumptions**

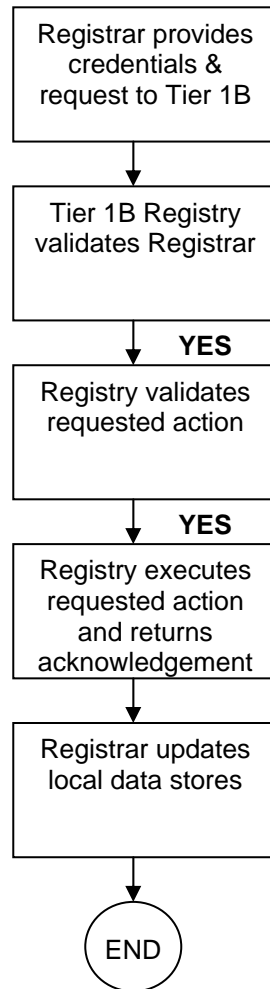
- Only the checks/changes initiated by the ENUM Registrar are discussed. Checks/changes initiated by the ENUM Registrant and the Tier 2 Providers may be accomplished through the Registrar.
- The ENUM Registrar does not initiate a transfer request without the ENUM Registrant's request

#### 8.3.4.2 **Provisioning Procedures**

1. The ENUM Registrar provides the AAA-related information and indicates the type of request with the associated information to the Tier 1B Registry. Any information that is provided by this ENUM Registrar can be checked and changed by this ENUM Registrar. An ENUM Registrar may check some information (e.g., whether an ENUM domain name is registered) even if the information is provided by other ENUM Registrars. The type of request and associated information may include:

- Check
  - All or certain current information associated with the ENUM Registrant's ENUM registration such as:
    - Contact information
    - service registration expiration date
    - The last date when an object is created, modified or transferred
    - State of an object (e.g., active, server hold)
  - All or certain current information associated with the ENUM Registrar's data such as:
    - Contact information
    - Organizational information
    - IP address(es)
    - [Web site address]
    - [ContactInfo server name]
    - Security pass phrase (for authenticating an ENUM Registrar when contacting the Tier 1B Registry's customer support by telephone)
    - User id and password information
  - Digital certificate information
- Add
  - Additional ENUM Registrar Contact information
  - Additional ENUM Registrar Organizational information
  - Additional IP address(es)
  - Additional user id and password
- Delete

- Contact information
  - IP address(es)
  - ENUM Registrar user id and password, when there are multiple accounts
  - Modify/Change
    - ENUM Registrar's contact information, user id, password, security pass phrase, digital certificate information, web site address
2. The Tier 1B Registry validates the ENUM Registrar.
    - a. If the validation fails, the Tier 1B Registry rejects the request indicating authentication/authorization failure (e.g., invalid password).
    - b. If the validation is successful, the Tier 1B Registry proceeds with Step 3.
  3. The Tier 1B Registry checks whether the requested action is valid.
    - a. If the request is not valid (e.g., syntax error), the Tier 1B Registry rejects the request indicating the reason for rejection.
    - b. If the request is valid, the Tier 1B Registry performs the required actions and returns a positive acknowledgement.
  4. When a response is received, the ENUM Registrar performs the following:
    - a. If the request is rejected, it tries to determine the cause of the failure and re-submit the request, if needed, after the problem is cleared.
    - b. If the request is accepted, it makes the necessary changes/additions/ deletions in the local data stores.



**FIGURE 5 – Flow Chart for 8.3.4.2:  
ENUM Registrar Checks/Changes Information at Tier 1B Registry**

### 8.3.5 *ENUM Registrant Renews ENUM Registration*

The ENUM Registrant renews his/her ENUM registration when the previous ENUM registration is to expire or when he/she decides to extend the service registration period at any time before the existing service registration expires.

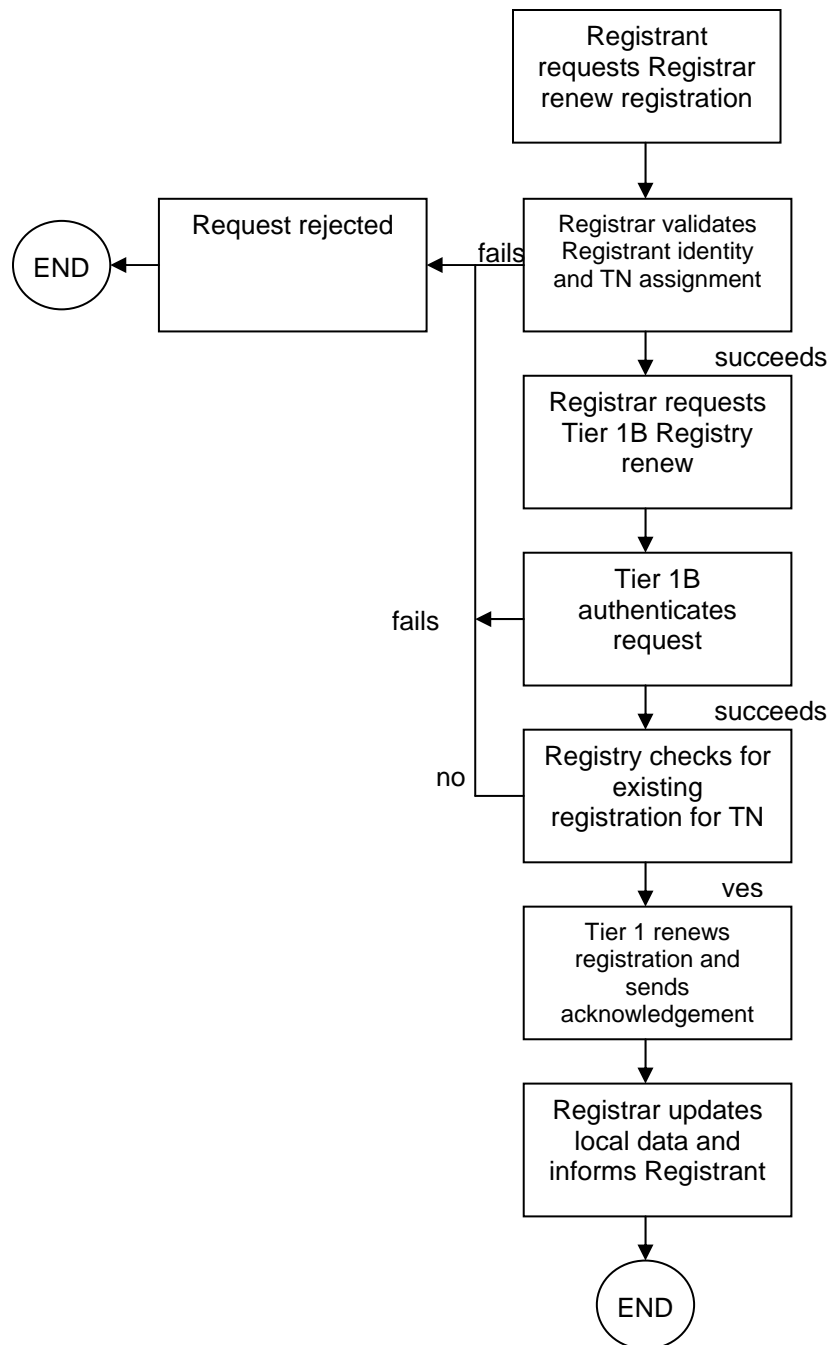
#### 8.3.5.1 **Assumptions**

- The ENUM Registrant does not change the ENUM Registrar for the renewed registration period.
- Host information associated with the ENUM domain name does not change.
- The ENUM Registrant will renew the service contract, if necessary, with the Tier 2 Provider. This process is not discussed.

#### 8.3.5.2 **Provisioning Procedures**

1. The ENUM Registrant requests that the ENUM Registrar renew or extend the existing ENUM registration by providing the following information:
  - ENUM TN
  - Renewal period
  - Any AAA-related information required by the ENUM Registrar for renewal.
2. The ENUM Registrar then validates the ENUM Registrant's identity and the TN assignment as discussed in Section 8.2.2.
  - a. If the validation fails, the application for renewing the ENUM registration is rejected. The process stops.
  - b. If the validation is successful, the ENUM Registrar proceeds with Step 3.
3. The ENUM Registrar requests that the Tier 1B Registry renew the ENUM domain name by providing the following information:
  - Request to renew ENUM registration.
  - ENUM domain name (e.g., 4.3.2.1.3.3.5.2.0.2.1.e164.arpa).
  - New ENUM Registration expiration date.
  - Any AAA-related information required by the Tier 1B Registry.
4. After successful authentication and authorization checks of the ENUM Registrar, the Tier 1B Registry determines whether there is an existing ENUM registration for the requested ENUM domain name.
  - a. If YES and the ENUM Registrar is the one who registered the ENUM domain name, the Tier 1B Registry acknowledges to the ENUM Registrar that the ENUM domain name registration is renewed with a new registration expiration date. The Tier 1B Registry then updates the data (e.g., new registration expiration date and date when renewal is done) in the local data stores.
  - b. Otherwise, the Tier 1B Registry rejects the request.
5. After receiving the response from the Tier 1B Registry, the ENUM Registrar performs the following:

- a. If the renewal is accepted, it updates information such as the service registration expiration date and the date the renewal is done in the local data stores. It informs the ENUM Registrant about the successful renewal and completes the necessary actions (e.g., collects the registration fee from the ENUM Registrant for the renewal period and pays the Tier 1B Registry).
- b. If the renewal is rejected due to the non-existence of the ENUM domain name, it informs the ENUM Registrant about the result.



**FIGURE 6 – Flow Chart for 8.3.5.2:  
ENUM Registrant Renews ENUM Registration**

### 8.3.6 *ENUM Registrant Terminates ENUM Registration*

The ENUM Registrant terminates his/her ENUM registration before it expires.

#### 8.3.6.1 Assumptions

The ENUM registration is to be terminated before the registration expiration date.

#### 8.3.6.2 Provisioning Procedures

1. The ENUM Registrant contacts the ENUM Registrar and indicates his/her desire to terminate registration for his/her ENUM domain name. The ENUM Registrant provides the following information:
  - ENUM TN
  - Request for terminating ENUM registration
  - Any AAA-related information required by the ENUM Registrar
2. The ENUM Registrar checks if the request comes from the authorized ENUM Registrant.

If YES, the ENUM Registrar reminds the ENUM Registrant that terminating his/her ENUM registration may cause associated addresses and services to no longer function as before. Proceed to step 3.

If NO, the ENUM Registrar ends the termination process by indicating to the requester that he/she is not authorized to terminate the service registration for the subject ENUM domain name.
3. The ENUM Registrar notifies the Tier 1B Registry about service termination by providing the following information:
  - ENUM domain name
  - Request for terminating ENUM
  - Any AAA-related information required by the Tier 1B Registry
4. The Tier 1B authenticates the Registrar before acting on the request.
5. The Tier 1B Registry notifies the ENUM Registrar that the registration for the subject ENUM domain name has been terminated. It then removes the ENUM registration for that ENUM domain name from its local data store and nameservers.
6. The ENUM Registrar acknowledges the successful execution of the request to the ENUM Registrant.
7. The responsible party arranges for removal of NAPTR records at the Tier 2 Provider:

If the ENUM Registrar also provides the Tier 2 Provider function it removes the NAPTR records from its nameservers.

If the ENUM Registrar uses a Tier 2 Provider, it notifies the Tier 2 Provider to terminate the service by removing the NAPTR records from its nameservers.

If the ENUM Registrant had contracted for the Tier 2 Provider function directly, the ENUM Registrant notifies the Tier 2 Provider to terminate the service by removing the NAPTR records from its nameservers.

If the ENUM Registrant provided the Tier 2 Provider function him/her/itself, the Registrant removes the NAPTR records from his/her/its nameservers.

8. Notification of Application Service Providers (ASPs). The Registrant should notify the Registrant's ASPs that the ENUM registration has been terminated if they are authorized to access/change the data at the Tier 2 Provider.

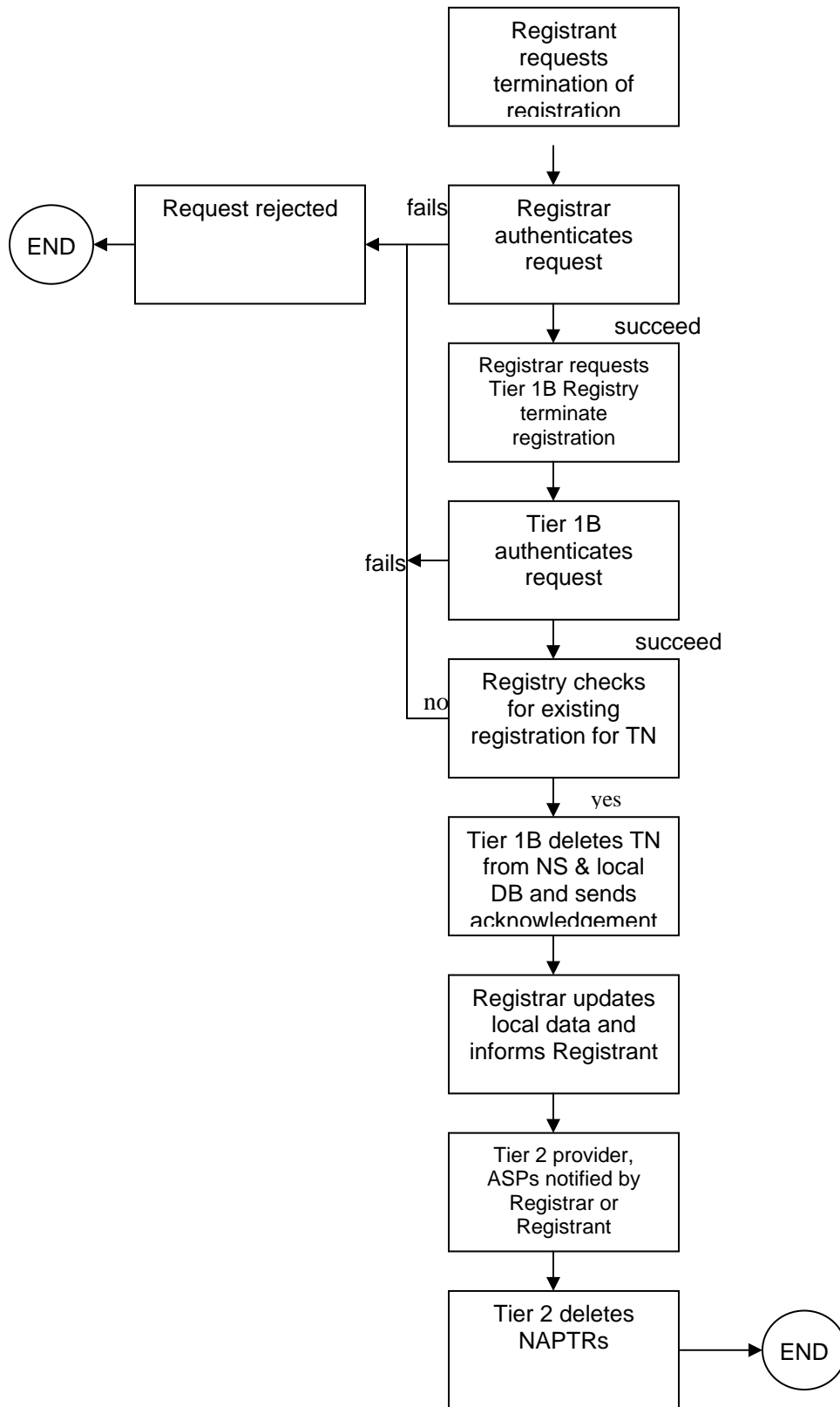


FIGURE 7 – Flow Chart for 8.3.6.2:  
ENUM Registrant Terminates ENUM Registration

### 8.3.7 *ENUM Registrant No Longer the TN Assignee*

The ENUM Registrant terminates his/her telephone service before the previous ENUM registration expires, which may result in a dangling registration.

#### 8.3.7.1 Assumptions

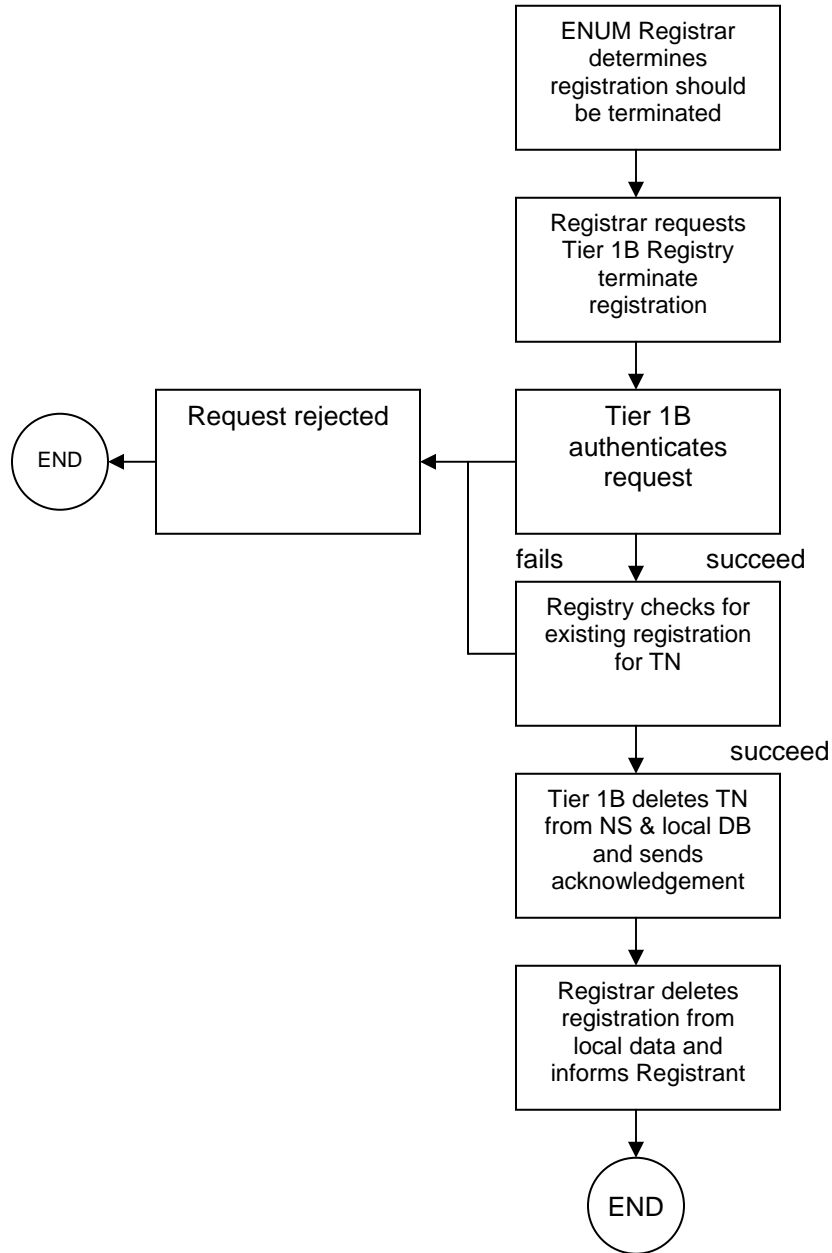
- The ENUM Registrant does not inform the ENUM Registrar that he/she is no longer the TN assignee.
- The ENUM Registrar detects that the ENUM Registrant is no longer the TN assignee through the periodic re-validations or notification from the ENUM Registrant's serving Telephony Service Provider (TSP).<sup>2</sup>

#### 8.3.7.2 Provisioning Procedures

1. The ENUM Registrar determines that the registration of an ENUM domain name should be terminated; it requests the Tier 1B Registry to delete the ENUM domain name by providing the following information:
  - Request to delete the ENUM registration.
  - ENUM domain name (e.g., 4.3.2.1.3.3.5.2.0.2.1.e164.arpa)
  - Any AAA-related information required by the Tier 1B Registry.
2. After successful authentication and authorization checks of the ENUM Registrar, the Tier 1B Registry determines whether there is an existing ENUM registration for the requested ENUM domain name.
  - a. If YES, the Tier B1 Registry acknowledges to the ENUM Registrar that the ENUM domain name registration is deleted. The Tier 1B Registry then removes information associated with the ENUM domain name in the local data stores and updates the zone file.
  - b. If NOT, the Tier 1B Registry rejects the request.
3. After receiving the response from the Tier 1B Registry, the ENUM Registrar may inform the ENUM Registrant and the technical contacts associated with the ENUM domain name about the termination of the ENUM registration.

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<sup>2</sup> The ENUM Registrar may need to make contractual arrangements with the TSP to receive the notification.



**FIGURE 8 – Flow Chart for 8.3.7.2:  
ENUM Registrant No Longer the TN Assignee**

### **8.3.8 *ENUM Registrar Terminates the ENUM Registration***

The ENUM Registrar terminates the ENUM Registrant's service registration before the previous ENUM registration expires due to contractual business reasons. This can happen when the ENUM Registrant does not pay the ENUM Registrar the registration fee before the grace period, if any, of the ENUM registration expires. It may also happen if the ENUM Registrar determines that an ENUM registration is no longer valid (e.g., as the result of the dispute resolution process).

The provisioning procedures are exactly the same as those described in Section 8.3.7.

### **8.3.9 *Tier 1B Registry Terminates the ENUM Registration***

#### **8.3.9.1 Assumptions**

The circumstances for termination of a registration are policy issues outside the scope of the TAC that need to be resolved by the LLC.

#### **8.3.9.2 Provisioning Procedures**

1. The Tier 1B Registry removes information associated with the ENUM domain name in the local data stores, updates the zone file, and notifies the associated Registrar.
2. The Tier 1B Registry may inform the technical contacts via e-mails associated with the ENUM domain name to remove the NAPTR RRs from the nameservers.

### **8.4 Area Code Split**

An area code is split; the new area code is assigned to the same Tier 1B Registry that handles the old area code.

#### **8.4.1 Assumptions**

- The Tier 1B Registry, the ENUM Registrars and the Tier 2 Providers that are involved with the telephone numbers (TNs) impacted by the area code split will take the necessary steps to support the area code split and the permissive dialing period<sup>3</sup> whether the ENUM Registrant informs them about the area code split/TN change or not.
- The ENUM domain name that is associated with the TN under the old area code is referred to as the "old ENUM domain name." The ENUM domain name that is associated with the TN under the new area code is referred to as the "new ENUM domain name." For example, if the TN 703-434-1234 has registered for ENUM and is to be changed to 571-434-1234, the old ENUM domain name would be "4.3.2.1.4.3.4.3.0.7.1.e164.arpa," and the new ENUM domain name would be "4.3.2.1.4.3.4.1.7.5.1.e164.arpa." The TN under the old area code (e.g., 703-434-1234) is referred to as the "old TN," and the TN under the new area code (e.g., 571-434-1234) is referred to as the "new TN."

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<sup>3</sup> The permissive dialing period is the interval during which the TN under either the old area code or the new area code can be dialed to reach the same termination. The length of the permissive dialing period is normally a few months and is set by the state Public Utility Commission for each involved area code.

- Only the ENUM domain names that are associated with the TNs impacted by the area code split (those that are to be changed to the new area code) are discussed. ENUM domain names that are not impacted by the area code split are handled by the usual procedures. For example, if 703-538-6789 is not subject to the area code change, its associated ENUM domain name, 9.8.7.6.8.3.5.3.0.7.1.e164.arpa, will remain the same.
- T1 is the time (e.g., 12:01am EST on 6/1/01) when the new area code (e.g., 434 split from the old area code 804) becomes effective and the permissive dialing period begins. T2 is the time (e.g., 12:01am EST on 1/15/02) when the permissive dialing period ends.
- In area code relief activities there occur particulate circumstances where individual 10 digit telephone numbers are changed. The registry must develop practices to ensure that the registrar and registrants update the registry database with the correct information when this occurs.
- The Tier 1B Registry shall monitor the North American Numbering Plan Administrator (NANPA) website (<http://www.nanpa.com>) for impending area code splits (see NPA Relief Planning Letter), and use other information sources (e.g., the "area code split exchange diskette" from Telcordia (<http://www.trainfo.com>) as needed to maintain an up-to-date list of the affected NPA-NXX codes for a particular area code.

#### **8.4.2 Provisioning Procedures**

##### **8.4.2.1 Procedures/Guidelines for a Tier 1B Registry with a Permissive Dialing Period**

One week before T1, the Tier 1B Registry shall send an e-mail message to each associated ENUM Registrar about the area code split and to remind it to take the appropriate actions required by the area code split.

At no time before the T1 shall the Tier 1B Registry accept any request on any new ENUM domain name from the ENUM Registrar. This is because the new TN under the new area code is not yet effective before T1.

Starting at T1, the Tier 1B Registry shall be capable of accepting and responding to any request made on the new ENUM domain name from the ENUM Registrar, and shall perform data updates on the local data stores and zone files, if applicable.

The Tier 1B Registry shall not accept any request on any old ENUM domain name from the ENUM Registrar during the permissive dialing period.

At T1, the Tier 1B Registry shall perform zone file updates to add all the new ENUM domain names. One, or more than one, new zone files may be created, or new data is added, to the existing zone file for those new ENUM domain names with exactly the same nameserver information copied from those associated with the corresponding old ENUM domain names at T1.<sup>4</sup> The Tier 1B Registry shall not remove the Nameserver (NS) Resource Records (RRs) associated with the old ENUM domain names from the existing zone file(s).

The Tier 1B Registry should progressively reduce the Time to Live (TTL) values for the resource records associated with the old ENUM domain name so that such records will not persist in resolver caches beyond T2.

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<sup>4</sup> The new and old ENUM domain names may or may not be in the same zone file depending on how the zones are cut/delegated.

The TTL in the NS RRs associated with the new ENUM domain name is set to a typical value (e.g., from a day to a week) depending on the Tier 1B Registry policy (e.g., frequency of zone file updates).

Within twenty-four hours after T1, the Tier 1B Registry shall update its stored information to reflect the area code change on all the TNs. It shall search the local data stores and change all the TNs that are subject to the area code change, not just those that are associated with the old ENUM domain names. This will change all the phone numbers and fax numbers in the contact information of all the records.

The Tier 1B Registry shall not accept any request (e.g., create, check, update, renew or transfer) on any old ENUM domain name during the permissive dialing period while it maintains records associated with the old ENUM domain name.

The Tier 1B Registry shall keep the nameserver information in the zone file, and information in the local data stores associated with each new ENUM domain name, synchronized with those associated with the corresponding old ENUM domain name during the permissive dialing period. Any update request on the new ENUM domain name that is received from the ENUM Registrar during the permissive dialing period shall cause the same update on the old ENUM domain name. This includes the data in the ContactInfo database in case there are inquiries about the ContactInfo information on the old ENUM domain names. Because of this need for data synchronization, it is highly recommended that the same Tier 1B Registry handle both the old and new area codes when there is an area code split.

During the permissive dialing period, if the Tier 1B Registry receives a create request for an ENUM domain name that is available (e.g., no record exists for this ENUM domain name) and the associated TN is a new TN due to an area code split, it shall create a record for the old ENUM domain name in addition to the record for the new ENUM domain name.

At T2, the Tier 1B Registry shall perform zone file updates to remove the NS RRs associated with the old ENUM domain names. It shall remove all the records associated with the old ENUM domain names from the local data stores.

After the permissive dialing period expires, the Tier 1B Registry shall expect new ENUM registrations on the old ENUM domain names in accordance with the requirements for the area code split. Within twenty-four hours after T2, the Tier 1B Registry should send an e-mail message to each technical contact and ENUM Registrant that is associated with each old ENUM domain name to remind them to update the zone file(s) by removing any RR in the zone file and the data in the local data stores that is associated with the old ENUM domain name.

#### **8.4.2.2 Procedures/Guidelines for a Tier 1B Registry without a Permissive Dialing Period**

Since there is no permissive dialing period, T1 and T2 are the same. T1 in this case is the time when the new TN must be dialed and the old TN must not be dialed.

One week before T1, it is recommended that the Tier 1B Registry send an e-mail message to each associated ENUM Registrar about the area code split and to remind them to take the appropriate actions required by the area code split.

At no time before T1 shall the Tier 1B Registry accept any request on any new ENUM domain name from the ENUM Registrar. This is because the new TN under the new area code is not yet effective before T1.

The Tier 1B Registry should progressively reduce the Time to Live (TTL) values for the resource records associated with the old ENUM domain name so that such records will not persist in resolver caches beyond T1.

At T1, the Tier 1B Registry shall perform zone file updates to change all the old ENUM domain names to the new ENUM domain names while keeping the nameserver information unchanged. This can also be done by adding the NS RRs for the new ENUM domain names and removing those associated with the old ENUM domain names when dynamic updates are done. The TTL in the NS RRs associated with the new ENUM domain names should be set to a typical value (e.g., from a day to a week) depending on the Tier 1 Registry policy (e.g., frequency of zone file updates).

Starting at T1, the Tier 1B Registry shall be capable of accepting and responding to any request made on the new ENUM domain name from the ENUM Registrar and shall perform data updates on the local data stores and zone files, if applicable.

Within twenty-four (24) hours after T1, the Tier 1B Registry shall update its stored information to reflect the area code change on all the TNs. It shall search the local data stores and change all the TNs that are subject to the area code change, not just those that are associated with the old ENUM domain names. This will change all the phone numbers and fax numbers in the contact information of all the records.

After T1, the Tier 1B Registry shall expect new ENUM registrations on the TNs under the old area code because the associated TNs can be reassigned to new telephony subscribers.

#### **8.4.2.3 Procedures/Guidelines for an ENUM Registrar with a Permissive Dialing Period**

The ENUM Registrar should be aware of any area code split and the associated T1 and T2 that impacts the ENUM domain names registered through it. The Tier 1B Registry will notify Registrars of impending area code splits.

One week before T1, it is recommended that the ENUM Registrar inform the ENUM Registrant, based on the Registrant contact information, about the changes of the ENUM domain name and the contacts' phone numbers and/or fax numbers for each old ENUM domain name. If it has the technical contact information or if it deals with the Tier 2 Provider, the ENUM Registrar should send an e-mail message to each technical contact or the contact person of the Tier 2 Provider to remind him/her to update the zone file(s) by adding the NS RRs and the Naming Authority Pointer (NAPTR) RRs for the new ENUM domain name before T1 and to leave the NS RRs and the NAPTR RRs associated with the old ENUM domain names in the existing zone file(s) until the permissive dialing period expires.

At no time before T1 may the ENUM Registrar accept any request on any new ENUM domain name from the ENUM Registrant, nor shall they submit any request on any new ENUM domain name to the Tier 1B Registry.<sup>5</sup>

Within twenty-four hours after T1, the ENUM Registrar shall update its stored information to reflect the area code change on all the TNs. It shall search the databases and change any TN that is subject to the area code change. This will change all the phone numbers and fax numbers in the contact information in all the records.

It is recommended that the ENUM Registrar verify with the ENUM Registrant, or the Tier 2 Provider if it is allowed to access/update data, whether a telephone number is correct when it receives a request during the permissive dialing period to add a phone or fax number or to change to a phone or fax number that is in a NPA-NXX subject to an area code change due to an area code split.

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<sup>5</sup> The ENUM Registrar could accept the requests and wait until T1 to submit the requests to the Tier 1B Registry, or it could submit the requests using the old ENUM domain names before T1.

Starting at T1, the ENUM Registrar shall be capable of accepting and responding to any request made on the new ENUM domain name from the ENUM Registrant, and shall perform data updates on the local data stores and the Tier 1B Registry, if applicable.

The ENUM Registrar shall stop accepting any request on any old ENUM domain name during the permissive dialing period. If the ENUM Registrar receives any request on the old ENUM domain name from the ENUM Registrant during the permissive dialing period, it should inform the ENUM Registrant about the change to the new ENUM domain name due to an area code split. It shall also inform the ENUM Registrant and/or the technical contact to have the NAPTR RRs that are associated with both the new and old ENUM domain names in the Tier 2 Provider's nameservers.

During the permissive dialing period, if the ENUM Registrar receives a new registration for an ENUM domain name that is available (e.g., no record exists for this ENUM domain name) and the associated TN is a new TN due to an area code split, it shall submit a create request on the new ENUM domain name and shall inform the ENUM Registrant and/or the technical contact to have the NAPTR RRs that are associated with both the new and old ENUM domain names in the Tier 2 Provider's nameservers.

The ENUM Registrant may inform the ENUM Registrar about the TN change whether it is related to the ENUM domain name or any phone or fax number. The ENUM Registrar can confirm/ignore the update request if the change has been made automatically and may double check whether the change has been made correctly.

After the permissive dialing period expires, the ENUM Registrar shall expect new ENUM registrations on the old ENUM domain names because the associated TNs can be reassigned to new telephony subscribers.

Within twenty-four hours after T2, the ENUM Registrar should send an e-mail to each technical contact and ENUM Registrant that are associated with each old ENUM domain name to remind them to update the zone file(s) by removing any RR in the zone file and the data in the local data stores that are associated with the old ENUM domain name.

#### **8.4.2.4 Procedures/Guidelines for an ENUM Registrar without a Permissive Dialing Period**

The ENUM Registrar should be aware of any area code split and the associated T1 that impacts the ENUM domain names registered through it. The Tier 1B Registry will notify Registrars of impending area code splits.

One week before T1, it is recommended that the ENUM Registrar inform the ENUM Registrant, based on the Registrant contact information, about the changes of the ENUM domain name and the contacts' phone numbers and/or fax numbers for each old ENUM domain name. If it has the technical contact information or if it deals with the Tier 2 Provider, the ENUM Registrar should send an e-mail message to each technical contact or the contact person of the Tier 2 Provider to remind him/her to update the zone file(s) by adding the NS RRs and the NAPTR RRs for the new ENUM domain name, and by removing those RRs associated with the old ENUM domain name at T1.

At no time before T1 may the ENUM Registrar accept any request on any new ENUM domain name from the ENUM Registrant; nor shall they submit any request on any new ENUM domain name to the Tier 1B Registry.

Within five minutes after T1, the ENUM Registrar shall update its stored information to reflect the area code change on all the TNs. It shall search the databases and change any TN that is subject to the area code change. This will change all the phone numbers and fax numbers in the contact information in all the records.

It is recommended that the ENUM Registrar verify with the ENUM Registrant, or a Tier 2 Provider if it is allowed to access/update data, whether a telephone number is correct when it receives a request within one month after T1 to add a phone or fax number or to make a change to a phone or fax number that is in a NPA+NXX subjecting to an area code change due to area code split.

Starting at T1, the ENUM Registrar shall be capable of accepting and responding to any request made on the new ENUM domain name from the ENUM Registrant, and shall perform data updates on the local data stores and the Tier 1B Registry, if applicable.

The ENUM Registrant may inform the ENUM Registrar about the TN change whether it is related to the ENUM domain name or any phone or fax number before or after T1. The ENUM Registrar can confirm/ignore the update request if the change has been made automatically and may double check whether the change has been made correctly.

After T1, the ENUM Registrar shall expect new ENUM registrations on the old ENUM domain names because the associated TNs can be reassigned to new telephony subscribers.

## SECTION 9.0 DISPUTE RESOLUTION

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This dispute resolution process applies to geographic ENUM registrations. All Registries, Registrars, Registrants, and disputing parties are required to use these procedures and abide by the outcome. The Tier 1B Registry accepts registrations from Registrars and administers the dispute resolution process.

### 9.1 Triggers

Triggers for disputes include the following:

- The Tier 1B Registry detects an attempt to register an ENUM domain name that is currently registered and informs the requesting ENUM Registrar so that the Registrar can initiate the dispute resolution process, if needed.
- A Registrar tells a prospective Registrant that the E.164 number is already registered or that the Registrar's attempt to register an E.164 number in the Tier 1 Registry has been refused by the Tier 1 Registry because the number is already registered.
- The assignee of an E.164 number discovers by other means that the number is registered in a Tier 1 Registry (e.g., by performing an ENUM DNS query).

### 9.2 Tier 1B Registry Registration Dispute

Disputes will arise when a Registrant, an Applicant, or other party disputing an ENUM registration claim authority over the same telephone number and ENUM domain name. A Tier 1B Registry may need to take action during the period of the dispute or upon resolution of the dispute (i.e., transfer the ENUM domain name, or cancel the ENUM domain name).

### 9.3 Procedures for Resolution of Registration Conflicts

This section describes procedures for resolution of conflicting ENUM registration claims based on the telephone number assignment status.

Disputes regarding registration of a given ENUM domain name in a Tier 1B Registry may occur. A primary ENUM principle is that only the current assignee of an E.164 telephone number may apply for, establish, change, or maintain the ENUM registration for that number. Dispute resolution will, therefore, consist of identifying which, if any, party to the dispute is the current number assignee or the valid assignee's legal representative or agent.

#### 9.3.1 General Principles

These procedures will be incorporated by reference into every ENUM registration agreement.

The Tier 1B Registry, in an unbiased manner, will perform the dispute resolution process.

Either party to the dispute may appeal the result to a court with competent jurisdiction, but only after completing the process described in this document.

The Tier 1B Registry shall not change or remove an existing registration prior to the final determination of the dispute.

## **9.4 Dispute Resolution Process**

### **9.4.1 Process Initiation**

When a Registrar has informed an Applicant that the telephone number in question has already been registered, the (the “Disputing Party”) may initiate the dispute resolution process by submitting a Dispute Initiation Form [by e-mail or postal mail] to the Tier 1B Registry responsible for that number.

If the current assignee of an telephone number discovers by another method that the number is registered in an ENUM Tier 1B Registry, that current number assignee (the “Disputing Party”) may initiate the dispute resolution process in the same manner, even if the current assignee does not intend to register the number and only wants the existing registration removed from the Registry.

### **9.4.2 Determination of Assignee**

The determination of which, if any, of the parties to the dispute is the current assignee of the telephone number:

The Tier 1B Registry will verify that the parties are disputing the registration of the same telephone number. The Tier 1B Registry will use the same types of methods used by Registrars during initial registrations and periodic verification reviews to identify the current assignee of the telephone number. The Tier 1B Registry will need detailed identity information as well as permission from the disputing parties in order to obtain assignment information.

If the Tier 1B Registry is unable to contact the current Registrant, or if either party does not cooperate in providing the information necessary to allow the Tier 1B Registry to verify the current number assignee, the Tier 1B Registry shall use definitive documentation to determine the party that has the right to register the number. In this situation, the parties cannot hold the Tier 1B Registry liable for a decision that is reversed upon appeal.

### **9.4.3 Time Frame**

Upon receipt of a Dispute Initiation Form, the Tier 1B Registry will within 3 business days send a notification to the Registrar, the current Registrant, and the disputing party.

The complete process, including resolution, should take no more than 30 calendar days from receipt of the Dispute Initiation Form by the Tier 1B Registry. (This time frame is designed to accommodate the availability factors of all parties, including reasonable vacation schedules or other factors while providing reasonably quick resolution.)

### **9.4.4 Remedies**

The remedies available to a disputing party pursuant to these Procedures shall be limited to requiring the cancellation of the registration, or the transfer of the registration, to the disputing party if so desired.

### **9.4.5 Transfers During a Dispute**

The current Registrant may not transfer the registration to another holder: (i) during a pending administrative proceeding; or (ii) during a pending court proceeding or arbitration commenced regarding the registration unless the party to whom the registration is being transferred agrees, in writing, to be bound by the decision of the court or arbitrator.

### **9.4.6 Changing Registrars**

The Registrant may not transfer the registration to another Registrar during a pending administrative proceeding. The Registrant may transfer administration of the registration to another Registrar during a pending court action or arbitration, provided that they shall continue to be subject to the proceedings.

**9.4.7 Procedure Modifications**

These Procedures may be modified at any time by the contracting authority. The revised Procedures will be published at least thirty (30) calendar days before they become effective. Unless this Procedure has already been invoked by the submission of a Dispute Initiation Form to a Tier 1B Registry, in which event the version of the procedure in effect at the time it was invoked will apply until the dispute is over, all such changes will be binding upon Registrants with respect to any registration dispute, whether the dispute arose before, on or after the effective date of the change. In the event that a Registrant objects to a change in this Procedure, the Registrant's sole remedy is to cancel the registration. The revised Procedure will apply to all parties until the registration is cancelled.

**9.4.8 Fees**

There shall be a reasonable fee to file a dispute. Should the dispute be deemed valid, the fee will be refunded to the complainant. Costs of handling a dispute that is deemed valid shall be paid by the Registrar which that improperly entered the registration. The TAC recommends that the LLC consider the merits of a "loser pays" model for assessing dispute resolution costs to disputing parties.

## SECTION 10.0 TIER 1B REGISTRY REPORTING

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The registry should make available regular reports for the registrars on the daily, weekly, and monthly activity. The monthly level report should provide the necessary details for end of month billing. Further more a monthly report on performance and major activities should be reported to the contracting authority and all designated government agencies.

### 10.1 Tier 1B Registry Reporting for Registrars

Registrars require easy-to-use tools and reports to assist them in managing their business. The registry should provide daily, weekly, and monthly reports that are available to registrars via a secured file transfer protocol (FTP) server. To assist registrars in their ability to monitor their registration activity throughout the month, the Tier 1B registry should generate separate daily and weekly reports for each of its registrars, as listed in Table 3 below.

Registrars are able to use these reports to monitor their registration activities and to reconcile their activity to the monthly billing reports. These reports are published on the first day of each month and provide registrars with a means to reconcile their monthly invoices to their transaction activities, listed below:

- \* Registrations (including deletions within the grace period)
- \* Transfers (including deletions within the grace period)
- \* Renewals (including deletions within the grace period)
- \* Restores
- \* Syncs
- \* Non-Refund Deletions

The monthly reports include the transactions for the previous month as well as the grace period deletes for the previous month. The grace period deletions are flagged with a deletion date. The domains that are deleted outside the grace period will continue to be listed on separate reports. These "non-refund" reports include all deletions from the previous month that occurred outside the grace period, whether or not they were added, renewed, or transferred during that month or during a prior month.

The reports reflect the actual activity for the period that affected the registrar deposit account. The registrars receive one monthly invoice reflecting the counts for all billable activity for the month and the details behind the summary counts on the invoice are provided in the detail reports identified above. The system associates a transaction ID with every transaction that occurs in the system. These transaction IDs provide an audit trail of all financial transactions allowing registrars, as well as the Tier 1B personnel, to easily trace activity during the audit process.

Table 3 Registrar Reports provided by Tier 1B

<b>Report Name</b>	<b>Report Features</b>
Daily Transactional Registrar Report	Lists all Registrar-Registry transactions that occurred on previous day
Daily Gaining and Losing Transfer Report	Lists domains transferred in, transferred out, or in pending transfer status
Daily Renewal Report	Lists all domain names auto-renewed previous day; provides domain name and expiration date
Daily Restore Report	Lists all domain names restored by registrar previous day. Domains on this report must have Restore Report submitted through registrar tool within 7 days.
Daily SYNC Report	Lists all domains that were synced previous day
Daily Pending Delete Report	Lists all domain names in Pending Delete status; Published to all registrars so they can see what names are up for deletion; Lists the domain name and the date it is due for deletion.
Weekly Domain Name Report	Cumulative report of all domain names managed by registrar; Lists domain name, create date, expiration date, and status.
Weekly Name Server Report	List all name servers managed by your business; Lists name server name and IP address.
Weekly Domains Hosted by Name Server Report	Lists all domains hosted by your name servers; Lists name server and domain names.
Monthly Billing Detailed Report	Developed for each Registrar to capture detailed billable transaction events
Weekly Registrar Report	List of all current Registrar's with their contact information

**10.2 Tier 1B Registry Reporting to LLC**

On a monthly basis the Tier 1B should provide a report to the LLC that provides performance details and major activities. In Table 4 is a list of recommended data to be reported.

**Table 4 Monthly LLC report provided by Tier 1B**

Accredited Registrar Status.
Service Level Agreement Performance
TLD Zone File Access Activity
Completed EPP interface software releases
Domain Names Under Sponsorship – Per Registrar
Name Servers Registered – Per Registrar
Domain Names Registered by Registry Operator
Contact Info Service Activity
Total Monthly Contract Info Queries
Total Monthly Domain Name Transaction Trend by Category
Total Monthly Name Server Transactions by Category (Additions, Modifications, Deletions by Registrar by NPA)
Total Monthly Name Server Write Transactions by Subcategory (What is this referring to – need explanation)
Average Daily Transaction Range
E.164 Geographical Registrations Distribution
Deleted Names - Per Registrar
Restored Names - Per Registrar
Violations of Registrar Restore Report - Per Registrar
Other Information <ul style="list-style-type: none"> <li>a) Total Monthly Transactions by Category</li> <li>b) Total Transactions by Month</li> <li>c) Registrations Distribution for reporting month</li> </ul>

**10.3 Tier 1B Registry Reporting to Government Agencies**

The Tier 1B Registry should be prepared to provide reports to Government agencies at the direction of the LLC.

**10.4 Registrar Reporting to the LLC**

On a monthly basis each Registrar should provide a report to the LLC that provides performance details and major activities and will be specified in the Registrar accreditation process. In Table 5 is a list of recommended data to be reported.

**Table 5 Monthly report provided by each Registrar to the LLC**

Disputes Initiated
Disputes Resolved