

Country Code 1 ENUM LLC

Provider ENUM Tier 0/1 Registry Request for Proposal

Version 1.0

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1 INTRODUCTION

1.1 General

The CC1 ENUM LLC (the “LLC”) is seeking to build a commercial implementation of Provider ENUM that is consistent with the relevant open standards of the Internet Engineering Task Force (IETF) and the International Telecommunication Union (ITU), upon which ENUM is based. The LLC will help to implement a Provider ENUM system for those service providers within the United States that choose to participate. It is intended that the LLC implementation of Provider ENUM will adhere to national and industry privacy requirements. For the purposes of responding to this RFP, the LLC would consider entering into a contract with the chosen vendor for an initial period of Four (4) years with the mutually agreed upon option of two (2) extensions of the contract for a period of two (2) years each based on the vendor meeting the defined performance requirements. The vendor must furnish the necessary personnel, material, equipment, services, and facilities (except as otherwise specified) to perform the requirements stated in this Request for Proposal (RFP). The exact duration of the contract will be negotiated with the chosen vendor.

All capitalized terms used herein shall have the meaning ascribed to them as set forth in Section 3.0 of Annex 1 (Definitions) attached hereto.

1.1.1 Purpose of Request for Proposal

The purpose of this RFP is to invite interested parties (hereinafter referred to as the "bidder") to provide a proposal to perform the Country Code 1 (CC1) ENUM LLC Provider ENUM Tier 0/1 Registry function for participating service providers. The bidder's response should be based upon the specifications provided in this RFP. **SUBMISSION OF A RESPONSE TO THIS RFP INDICATES BIDDER'S CONSENT TO ABIDE BY ALL REQUIREMENTS AND PROCEDURES ESTABLISHED HEREIN.**

1.1.2 Confidentiality and Use of RFP Information by Bidder

Respondents shall use this RFP and any other information furnished to them in conjunction with this RFP solely for the purposes of responding to this RFP. Reproduction of any part of this RFP is authorized only for the preparation of a proposal.

No publicity or news releases pertaining to this RFP, responses to this RFP or discussions of any kind regarding the Requirements or the selection of a bidder may be released without the prior written approval of the LLC.

All bidders shall develop responses based on this RFP and any other information furnished/referenced by the LLC during the bidding process; any enhancements to the basic requirements shall be clearly identified.

1.1.3 Bidder's Information

During the bidding and selection process, the bidder's proposal will be considered confidential. The LLC's expectation is that the response to the RFP would NOT be proprietary in nature. If the bidder believes that it must provide proprietary information in order to satisfy the provisions of the RFP, that bidder must discuss that situation with the LLC and receive explicit permission from the LLC before responding to the RFP. Any information submitted by the bidder without the LLC's express written consent shall be deemed to be non-proprietary in nature regardless of any markings set forth thereon. Any information the bidder wishes to be considered proprietary must be clearly labeled as such. Any information not clearly labeled as such will be considered non-proprietary. If any information is clearly labeled as proprietary, the bidder may be asked at a later date to provide another copy of bidder's proposal with proprietary information redacted. If the LLC has given permission for the bidder to include proprietary material, then, at the bidder's request, the LLC and its consultant(s), if any, will consider executing a non-disclosure statement substantially in the form contained in Annex 2 to protect clearly labeled proprietary material.

At the end of the selection process, the LLC will retain the master copy of each bidder's proposal.

1.1.4 Selection Process

The LLC will evaluate each proposal from an overall administration, business (e.g., financial stability), price and operations perspective to ensure efficient and effective Tier 0/1 administration.

The LLC may make use of an independent consultant to assist in the evaluation of the proposals and to make recommendations to the LLC for its consideration in the selection process. Further details regarding the evaluation criteria can be found in Section 4.1. A detailed list of the events associated with this RFP can be found in "CC1 ENUM LLC Provider ENUM RFP Schedule of Events" to be posted on the LLC's web site.

1.1.5 Inquiries

All inquiries related to this RFP or its requirements should be submitted by electronic mail to the LLC Chair at the following address:

Chairman, CC1 ENUM LLC
chair@enumllc.com

It is the intention of the LLC to share both the questions and subsequent responses with all bidders under consideration at the time the question is raised. This will be handled by emailing responses. The identity of the requesting company shall be withheld. Telephone inquires will not be accommodated.

The LLC reserves the right to request additional information or clarification from any or all bidders on the proposals received. Bidders must submit written responses to such requests within one week upon receipt of request from the LLC.

1.1.6 Indemnification

The bidder agrees to indemnify and hold harmless the LLC and its officers, employees, agents, contractors, consultants, counsel, as well as its Members and their Affiliates (as defined in Par. 1.3) together with the officers, employees, agents, contractors, consultants and counsel of such Members and Affiliates for any and all liabilities, demands, damages, expenses and losses arising from this RFP and any subsequent contract award. The bidder shall be solely responsible for any claims, costs or damages it incurs in connection with its participation in this RFP.

1.2 Impact of Regulation and Legislation on this Procurement

The LLC is issuing this RFP. Bidders should be aware that the US government, through legislation or other mandates, might establish policies that may affect the decisions made by the LLC or the execution of the final contract to be managed by the LLC. Each bidder will be solely responsible for ensuring that the bidder's proposal complies with all applicable US laws, statutes, ordinances, and/or regulations, including without limitation those enacted or enforced by national, state, and municipal authorities.

1.3 Eligibility to Submit Proposals

1.3.1 Neutral Third Party

The Provider ENUM Tier 0/1 registry business shall be awarded to a "neutral third party." A neutral third party is an entity that:

a) is not a Member of the LLC, as that term is defined in Article 1 of the Country Code 1 Enum LLC Limited Liability Company Operating Agreement (the "Operating Agreement"), as amended; and

b) is not an Affiliate of a Member. An Affiliate of a Member is an individual or entity that directly or indirectly, through one or more intermediaries, controls, is controlled by, or is under common control with, a Member or an entity that is seeking admission as a Member. The term "control" in the preceding sentence means either the right to exercise, directly or indirectly, more than ten percent (10%) of the voting rights attributable to the controlled entity, or the ownership, directly or indirectly, of more than ten percent (10%) of the total interest in the profits or losses of the controlled entity. For purposes of determining whether an entity or Member is an Affiliate of another entity or Member, transactions which result in the requisite control being achieved, as set forth in the Operating Agreement, through merger, consolidation or by other means by which one or more Members no longer exist as a separate legal entity, shall be included. In addition, for purposes of determining whether and at what point in time such control is achieved, rights to exercise voting rights attributable to the controlled entity shall only be considered in determining whether the requisite rights and ownership exceed ten percent

(10%) when such rights and ownership have been legally transferred, assigned and conveyed, thereby entitling such transferee to the exclusive exercise of such rights and the exclusive benefit of such ownership. By way of example only and without limitation, such "control" of a Member shall be considered to have been achieved upon the actual transfer, assignment and conveyance of that number of shares of stock of a Member to a transferee which gives such transferee ownership of stock in the Member which exceeds the ten percent (10%) of the Member's voting rights or interests in profits and losses.

1.3.2 Subcontractors

Proposals must fully disclose and document any Provider ENUM Tier 0/1 contract activities that bidders intend to have performed by a subcontractor. In addition, any changes in the use of subcontractors must be updated to the LLC after award of the contract. The LLC reserves the sole right to approve or reject the use of one or more subcontractors for any reason.

1.3.3 Location

A proposal will only be considered if it is submitted by an entity that is authorized to conduct business within the United States of America. The bidder must have a physical presence that is in the US and must be able to guarantee that all primary locations of the registry will remain within the US. All proposals that do not meet this criterion will be rejected.

The legal jurisdiction under which the contract will be executed and maintained will be solely determined by the LLC.

1.3.4 General Background and Experience of Bidder(s)

Proposals shall contain a concise description of the principal business of the bidder and any subcontractors, including such items as company background, characteristics of business strength, performance support for what could potentially be a multi-year, multi-state business award, accomplishments and capabilities which demonstrate a strong foundation for managing and administering Domain Name System ("DNS") services, policies and procedures that will ensure evenhanded treatment of all Service Providers of Record, and certification that the bidder and any subcontractor(s) shall comply with the applicable provisions of this RFP.

Proposals shall also include a concise description of the DNS experience of the bidder and any subcontractors, including such items as products and services offered, customers served, successful performance of the functional skills required by this RFP on activities performed for other customers, and customer benefits that resulted from such successful performance.

1.3.5 Financial Details

Proposals shall include a concise description of the financial condition of the bidder and any subcontractors. Responses should include the most recent annual report or audited

financial statement of the bidder and any subcontractors. Proposals shall include all characteristics of bidder(s) financial strength to support what could potentially be a multi-year, multi-jurisdiction business award.

1.3.6 Contractual Continuity

The bidder must certify that it can and will financially and operationally support the ENUM LLC Provider ENUM Tier 0/1 Registry function for the duration of the award.

2 BIDDER/VENDOR REQUIREMENTS

The proposal must describe how the bidder will implement the necessary infrastructure, systems and policies to meet the technical and operational requirements described herein. The reference document for these requirements, “Technical and Operational Requirements for a Provider ENUM Tier 0/1 Registry for the United States” is contained in Annex 1.

Proposals must fully address all requirements contained in this document and any of its annexes, even if not specifically referenced in this Bidder/Vendor Requirements section.

2.1 Tier 1B Registry Operation

The proposal provided by the bidder must address the following points:

- The proposal must describe how the bidder would meet the Registry Database requirements (R1-R5) contained in section 5.1 of Annex 1.
- The proposal must describe how the bidder would meet the Shared Registration System requirements (R6-R13) contained in section 5.2 of Annex 1.
- The proposal must describe how the bidder would meet the Zone Data requirements (R14-R22) contained in section 5.3 of Annex 1.
- The proposal must describe how the bidder would meet the ContactInfo requirements (R23-R37) contained in section 5.4 of Annex 1.
- The proposal must describe how the bidder would meet the Caching requirements (R76) contained in section 5.6 of Annex 1.
- The proposal must describe how the bidder would meet the System Turn-Up and Testing requirements (R77-R79) contained in section 5.7 of Annex 1.
- The proposal must describe how the bidder would meet the Operations and Maintenance requirements (R80-R89) contained in section 5.8 of Annex 1.
- The proposal must describe how the bidder would meet the Systems Recovery requirements (R90-R94) contained in section 5.9 of Annex 1.
- The proposal must describe how the bidder would meet the Database Escrow and Backup requirements (R95-R104) contained in section 5.10 of Annex 1.
- The proposal must describe how the bidder would meet the Technical and Other Support requirements (R105-R107) contained in section 5.11 of Annex 1.

- The proposal must describe how the bidder would meet the Transition requirements (R108-R110) contained in section 5.12 of Annex 1.
- The proposal must describe how the bidder would meet the Accommodation of Future Internet Architectural Enhancement requirements (R111-R112) contained in section 5.13 of Annex 1.

2.2 Domain Name System

The Provider ENUM Tier 0/1 Registry must comply with all relevant IETF RFCs and all relevant industry best practices. The bidder must identify those RFCs with which its proposal would comply. The bidder must identify those relevant industry best practices with which it complies and either submit an online link to that best practice or attach a copy of the best practice if it is not available online.

2.3 Security

The proposal provided by the bidder must address the following points:

- The proposal must describe how the bidder would meet the general Security requirements (R38-R46) contained in sections 5.5 and 5.5.1 of Annex 1.
- The proposal must describe how the bidder would meet the Physical Security requirements (R47-R55) contained in section 5.5.2 of Annex 1.
- The proposal must describe how the bidder would meet the Network Security requirements (R56-R67) contained in section 5.5.3 of Annex 1.
- The proposal must describe how the bidder would meet the Backup Security requirements (R68-R70) contained in section 5.5.4 of Annex 1.
- The proposal must describe how the bidder would meet the Security Audit and Reporting requirements (R71-R74) contained in section 5.5.5 of Annex 1.
- The proposal must describe how the bidder would meet the Resolution Access Control requirements (R75) contained in section 5.5.6 of Annex 1.

2.4 Service Levels

The proposal provided by the bidder must address the following points:

- The proposal must describe how the bidder would meet the Service Availability requirements (R113-R125) contained in section 6.1 of Annex 1.
- The proposal must describe how the bidder would meet the Processing Time requirements (R126-R129) contained in section 6.2 of Annex 1.
- The proposal must describe how the bidder would meet the Update Frequency requirements (R130-R134) contained in section 6.3 of Annex 1.

- The proposal must describe how the bidder would meet the Cross-Network Name Server Performance requirements (R135) contained in section 6.4 of Annex 1.
- The proposal must describe how the bidder would meet the Internet Connectivity requirements (R136) contained in section 6.5 of Annex 1.
- The proposal must describe the levels bidder proposes for Shared Registration System Service Level requirements (R137-R141) contained in section 6.6 of Annex 1.
- The proposal must describe how the bidder would meet the Reports and Files requirements (R142-R151 and R168-R173) contained in sections 6.7 and 10 of Annex 1.

2.5 Interface Requirements

The proposal must describe how the bidder would meet the Interface requirements (R152-R164) contained in section 7 of Annex 1.

2.5.1 Registry Agreements

The Registry operator must work with the LLC to develop a Registry/SPR agreement. This agreement will require the SPR to comply with the procedures detailed in Section 8. In addition to the provisioning procedures, the Registry/SPR agreement will detail data privacy requirements.

The Registry must work with the LLC to develop a User agreement that would allow approved service providers access to the data in the Registry.

2.6 Provisioning Requirements

The proposal must describe how the bidder would meet the Provisioning requirements (R165-R167) contained in section 8 of Annex 1.

2.7 Miscellaneous Requirements

The proposal must describe how the bidder would meet the requirements contained in the subsections below.

2.7.1 Audits

The bidder should note that audits (e.g., financial, operational, contract compliance, neutrality) will be an integral part of the contract and the bidder must describe how it would participate in and comply with such audits. The LLC will choose an auditor, but the selected vendor will be expected to pay all fees, costs, and expenses of the audits to be conducted. Such audits may be conducted by the designated auditor after six months of registry operation and thereafter on an annual basis or other reasonable interval selected at the sole direction of the LLC.

2.7.2 Hours of Operation, Communications and Staffing Requirements

Registry capabilities shall be available twenty-four hours per day, seven days a week (24/7). Bidder must describe staffing plans to ensure that qualified personnel will be available or on call at all times in case of operational problems. The proposal must describe the planned availability of other Registry functions such as SPR billing and account inquiries.

The Registry operator must also provide mechanisms (e.g., voicemail, e-mail, facsimile, etc.) to be accessible on a 7-day, 24-hour basis to fully meet the needs of SPRs in the case of non-critical inquiries or questions. It is expected that the Provider ENUM Tier 0/1 Registry operator will respond within one business day to inquiries or questions submitted outside of normal business hours. Normal business hours are defined as from 8:00 AM Eastern Time until 5:00 PM Pacific Time, Monday through Friday.

Each member of the Registry's team must be reachable by a separately assigned, individual telephone number. The phone system must provide the capability to allow the caller to leave a message easily. This can be accomplished by an electronic messaging system that allows the caller to leave a message for the person called along with a date and time stamp for each message. In addition, communication capability for each member of the Registry's team via email is required.

Staffing must be at an appropriate level to ensure that the Registry can efficiently perform the functions identified in this RFP, and provide timely responses. If situations warrant, the staff must also be available at other times deemed necessary to meet the needs of the providers.

Proposed staffing profiles and levels, as well as the physical location of the Staff, must be part of the bidder's response. Proposals shall include detailed job descriptions and a resume for each individual that has been currently identified to perform any of the Registry's key functions.

2.7.3 Testing

During the selection process, bidders may be requested to demonstrate prototype or representative system functionality for evaluation and/or to make arrangements on their own premises to facilitate joint testing at no cost to the LLC.

The selected vendor will be required to furnish system functionality for evaluation and testing and/or to make arrangements on their own premises for facilitating joint testing during, at a minimum, a beta test period, at no cost to the LLC.

2.7.4 Global Infrastructure ENUM

If and when consensus is reached on a global tree for carrier/infrastructure ENUM, the contract award recipient must make accommodations to migrate all registrations to the global tree as soon as practicable and at the direction of the LLC.

2.7.5 Intellectual Property

The bidder must identify any of its own intellectual property that will be used in the operations of the Provider ENUM Tier 0/1 Registry. Any IPR licensing requirements are the responsibility of the bidder. The LLC shall own or be entitled to either an exclusive or a nonexclusive license to use all intellectual property produced by the vendor incident to the establishment or operation of the Provider ENUM Tier 0/1 registry, whether produced at the instance of the LLC or by the vendor on the vendor's own initiative, including the ownership or license rights to any software, data (excluding data proprietary to a member of the LLC or other Person purchasing goods or services from the vendor not essential to the operation of the Provider ENUM Tier 0/1 registry function), and any matter which is or may be subject to any patent, copyright, or mark registration. The LLC shall own all right, title, and interest, including all copyright, patent and other intellectual property rights pertaining thereto, in and to the Provider ENUM Tier 0/1 registry compiled in connection with the establishment or operation; provided, however, that it is expressly understood and agreed that ownership of the Provider ENUM Tier 0/1 registry shall not, nor shall it be deemed to, bestow upon the LLC, any of its members or any vendor any right, title or interest in and to any user data or to grant any license or other right, whether revocable or irrevocable, or whether exclusive or non-exclusive, with respect to such user data, it being expressly understood and agreed by the LLC and that all such rights with respect to the user data shall be governed by and set forth in any user agreements. The LLC shall grant to the vendor a non-exclusive license to use the Provider ENUM Tier 0/1 registry for the purpose of the vendor fulfilling its contract obligations to the LLC during the term of such contract between the vendor and the LLC.

The contract shall provide that upon the termination, cancellation, or expiration of the contract between the vendor and the LLC, or at any time upon the request of the LLC or one of its members, the vendor shall deliver a complete copy of the Provider ENUM Tier 0/1 registry, including but not limited to Registry Data (zone files, ContactInfo data, etc.), to the LLC and all of the rights and licenses granted by the LLC to the vendor shall terminate. The contract shall provide that the vendor shall provide to the LLC all technical information and know-how and such software necessary to enable the LLC, its members, or their respective designees, upon the termination, cancellation, or expiration of the contract between the vendor and the LLC, to operate the Provider ENUM Tier 0/1 registry either through the Provider ENUM Tier 0/1 registry or through a registry provided to the LLC through a successor vendor, and a license to use all such necessary technical information and know-how and such software and hardware as is necessary to manipulate, use, and operate the Provider ENUM Tier 0/1 registry for such time as may be reasonably necessary to convert the ENUM Tier 0/1 registry to and manipulate, operate and use in a format useable under a different configuration of software and hardware, but this requirement shall not permit the LLC to operate the Provider ENUM Tier 0/1 registry either itself or through a registry services provided to the LLC through a successor vendor except upon the termination, cancellation, or expiration of the contract between the vendor and the LLC and thereafter.

3 Instructions for Submitting Proposals

3.1 Content Structure

The bidder is responsible for any and all costs incurred in the preparation of the response to this RFP. The bidder's proposal shall consist of the following separate Tabs:

Tab 1 Proposal Summary

Tab 2 Functional and Technical Requirements

Tab 3 Price

Tab 4 Bidder Background and Vision

RESTRICT PRICE FIGURES TO TAB 3 OF THE RESPONSE. Proposals must specifically state how the bidder intends to meet each individual requirement of the RFP. Responses such as “in compliance,” or “fully complies,” etc., are **not** generally acceptable; detailed responses are expected to be contained within the proposal. All proposals meeting the stated requirements and specifications, except for minor exceptions and/or deviations, shall be considered. Failure to meet requirements may disqualify a proposal from the selection process. All bidders shall develop responses based on this RFP and any other information furnished/referenced by the LLC during the bidding process; any enhancements to the basic requirements shall be clearly identified.

Proposals having exceptions and deviations shall be considered only if the following conditions are satisfied:

- a) All exceptions and deviations, including enhancements, from the specifications are explicitly stated in the Proposal Summary; and
- b) All exceptions and deviations, including enhancements, are appropriately justified on the basis of performance, schedule and/or relative price.

3.2 Proposal Content

In addition to other proposal content specified elsewhere in this RFP, each proposal must include the following information, organized into tabs as specified below:

3.2.1 Proposal Summary (TAB 1)

This tab should summarize all key features of bidder’s proposal. All deviations and exceptions from the RFP should be stated, and a brief justification given. A more detailed justification may be included in the tab that covers the subject.

3.2.2 Functional and Technical Requirements (TAB 2)

This section should provide detailed information regarding the proposal, using the requirements contained in Section 2 as an outline.

In addition, this section should describe separately any services or functions, if any, the bidder proposes to perform as part of CC1 ENUM management in addition to those listed in the RFP.

3.2.3 Pricing (TAB 3)

This tab shall include a description of the proposed pricing of the registry's services. All pricing information shall be limited solely to this tab.

Bidder should describe, in detail, how bidder will cover costs of developing, implementing, and operating the Provider ENUM Tier 0/1 infrastructure as described in this RFP. This tab should address how bidder would cover the costs of all requirements set forth in this RFP. Proposals should project/estimate and explain annual vendor costs for the development and operation of this system in such a way to permit the LLC to match those costs to specific vendor requirements. If the bidder is proposing any additional functionality beyond that described in this RFP, the associated vendor costs for this additional functionality must be stated separately. No cost or portion of the cost of developing, implementing, and/or operating the Provider ENUM Tier 0/1 infrastructure will be borne by the LLC.

It is anticipated, but not warranted or guaranteed, that bidder will be able to recover such costs by proper allocation of charges to ENUM Registrants that fall under e164enum.us. Flexibility is granted in the structure bidders choose for pricing of the registry's services. Proposals must include detailed financial plans, including, if appropriate, the manner in which fees levied for services rendered would be derived and collected. Bidders are encouraged to propose any structure that makes sense in this environment. Bidders must confirm that pricing structures will remain firm for the duration of the contract (provided scope of work remains consistent as contemplated in the contract). All cost projections and estimates, as well as projected pricing for the registry's services must be stated in U.S. dollars.

3.2.4 Bidder Background (TAB 4)

This tab should provide an insight into the stability and background of the bidder and provide a vision of how the bidder would manage the Registry. The bidder must demonstrate sufficient resources, financial stability and capability of the bidder to provide reasonable certainty that it will be able to fulfill its obligations over the life of the registry agreement. This is an absolute criterion. The bidder must provide:

1. Three years of financial statements audited by an independent accounting firm and prepared in accordance with generally accepted accounting principles, or other equivalent information. The LLC or a designated third party evaluator of its choosing will determine whether such information is sufficiently equivalent.
2. Include resume(s) of key personnel (including education and experience credentials) that would perform and/or manage the requirements of this system. Identify any subcontractors that would be used in this effort, describe the

relationship with the bidder, and provide the necessary resume(s) for such key personnel.

3. Include a proposed draft of any contract(s) that the bidder proposes to use between itself, as vendor, and ENUM Registrants considered necessary to ensure the stable operation of its portion of the CC1 ENUM infrastructure and implement any necessary policies to ensure its stability. Note: The content of all such contract(s) must be approved in writing by the LLC. All ENUM Registrants are expected to be treated equitably.

4. Include no more than five performance references for other efforts similar in scope to this project that were either (a) completed by the bidder (either as a prime vendor or as a first-tier subcontractor) in the past five years or (b) are currently in process. For each performance reference, include the following information:

1. Contract Number/Purchase Order Number;
2. Duration of the Contract/Purchase Order;
3. Dollar Value of Contract/Purchase Order (Broken Down on a Per-Year Basis, if Applicable);
4. Contract type of Contract/Purchase Order (*e.g.*, firm-fixed-price, cost-plus-fixed-fee, cost-plus-award-fee, fixed-price with economic price adjustment);
5. Name and Mailing Address of Customer Organization;
6. Technical Point of Contact at Customer Organization for the Contract/Purchase Order, including Phone Number, Fax Number and Email Address;
7. Detailed Description of the Effort Performed by the contractor/subcontractor under the contract/purchase order.

The LLC may also request one or more site visit(s) to the bidder's facility(ies). LLC representatives would conduct such site visit(s). The purpose of this visit would be to gather information relevant to the bidder's submitted proposal. The LLC would arrange such a visit at least seven days in advance with the bidder.

3.3 Response Composition

The proposal shall be typed double spaced on 8-1/2" x 11" 3-hole punched paper with each section beginning on a new page and separately tabbed. The same article, section or paragraph number and title used in the RFP shall be used for your comments.

The bidder is requested not to make its proposal elaborate with respect to binding or presentation. The proposal evaluation procedure places a higher premium on thoroughness of presentation, i.e., responsiveness, than on quantity of material included.

3.4 Submission of Proposals

The bidder must submit the ORIGINAL PRINTED VERSION (to be designated the Master copy) and four (4) paper copies of the Proposal along with the non-refundable application fee of \$10,000.00 (check made payable to “CC1 ENUM LLC”) to the following address:

CC1 ENUM LLC
c/o McKenna Long & Aldridge
ATTN Paul J. Dechary
1900 K Street, NW
Washington, DC 20006

The bidder must also submit, to the same address, one ELECTRONIC COPY of the Proposal *in text searchable .pdf format*, on CD-ROM to accompany the Master copy.

If there is any discrepancy in the information between the Master copy and any other copy submitted, the Master printed copy will be considered authoritative.

The bidder's cover letter should include the name(s), phone number(s), e-mail address(s), and fax number(s) of the individual(s) within the bidder's company who should be contacted in case any questions should arise during evaluation of the proposal.

Responses to the RFP must be received at the address provided above by the noted closing date or the proposal will be disqualified.

The package containing the proposal shall be marked "Sealed Proposal" with this RFP title and the bidder's company's name.

3.5 Closing Date

All proposals in response to this RFP shall be received by the closing date as specified in “CC1 ENUM LLC Provider ENUM RFP Schedule of Events” to be posted on the LLC’s web site.

3.6 Acceptance Period

The proposal shall indicate that it is valid for a period of at least 180 days from the Closing Date.

3.7 Award

The LLC reserves the right:

- a) To reject any and all responses;
- b) To conduct negotiations with more than one bidder simultaneously;
- c) To add, delete and/or change the terms of this RFP and to issue corrections and amendments to the RFP;
- d) To accept or reject, in whole or in part, any and all responses without giving any reason for the decision;
- e) To have any documents submitted by a bidder reviewed and evaluated by any individuals, including, independent consultants (also required to sign non-disclosure agreement); and
- f) To cancel this RFP process without penalty at any time before a contract is signed and, in the LLC's sole discretion, to initiate another RFP process which may or may not include some or all of the requirements of this RFP.

The LLC and its individual members neither assume nor accept any contractual obligation(s) by issuing the RFP, receiving, accepting, and evaluating the bidder's response, making a preliminary bidder selection, and/or negotiating prospective contract terms with any bidder(s).

The LLC reserves the right to cancel any contract or agreement if the services or facilities do not pass mutually agreeable system acceptance tests. This will be done at no cost or obligation to the LLC. Proposals should include bidder's suggestions for a set of system acceptance tests for the LLC's consideration. The LLC reserves the right to negotiate all terms and conditions in order to enter into a formal agreement with the successful bidder. This document, the bidder's response, and full system documentation will form part of the agreement.

The bidder, by stating compliance to a requirement in this RFP, agrees that the bidder has read and understood the requirement and that compliance is complete and deliverable at no additional cost unless otherwise noted.

This RFP may include unintended errors, omissions, and/or deficiencies. Therefore, the accuracy and completeness of this document and related documents are not guaranteed. In the event of errors, omissions, and/or deficiencies are discovered by the bidder, the bidder shall notify the LLC in writing.

The bidder is expected to examine the specifications and instructions carefully. Calculation errors shall be the bidder's risk. In the event of a bidder's error in price, time or calculations, quoted items shall prevail.

3.8 Additional Contract Terms and Conditions

This section identifies Contract terms and conditions that the LLC intends to incorporate into the Contract. The following list is in addition to the terms and conditions specified in the RFP, and in no event should be considered all encompassing.

3.8.1 Conformity with Law

All work performed, and materials supplied or used in conjunction with such work, must comply with all applicable laws, statutes, ordinances, and/or regulations, including without limitation those enacted or enforced by national, state, and municipal authorities.

3.8.2 Trademarks and Publicity

Vendor shall have no rights or interest in names or trademarks associated with offering the Provider ENUM Tier 0/1 service or capabilities.

3.8.3 Termination

The contract shall establish the right of termination without liability to the LLC if the vendor substantially defaults in performing obligations.

3.8.4 Procedural Matters and Limitation of Liability

The bidder's response should include bidder's proposed revenue model for recovering costs and expenses and allocation of reasonable profits to bidder in connection with providing Provider ENUM Tier 0/1 Registry services under the contract. The bidder's proposed revenue model shall not be binding on the LLC. Upon selection of the bidder, the LLC and bidder shall negotiate the definitive terms of the revenue model which shall be included in the contract. Under the terms of the contract, the vendor will be solely responsible for all billing and collections for services performed and rendered thereunder. Upon execution of a contract with bidder, neither the LLC nor the Registrants will be required to reimburse the bidder/vendor for any material costs and or expenses for services necessary or required for the Provider ENUM Tier 0/1 Registry incurred during the term of the contract that were not included or identified in the contract.

Subject to the foregoing, it is anticipated that material modifications to the Provider ENUM Tier 0/1 Registry may be necessary or required and the LLC and bidder will negotiate in good faith to mutually agree on revisions to the vendor's revenue model as reasonably appropriate to reflect any modifications for additional services provided by the vendor.

In no event will the LLC have any liability under the contract or otherwise for (i) the vendor's costs or expenses, or any compensation to the vendor, in connection with the establishment or operation of the Provider ENUM Tier 0/1 Registry, or (ii) services provided by the vendor incidental to the provision of Provider ENUM Tier 0/1 Registry services to any person or entity authorized to purchase such services.

Changes in the competitive and regulatory environment may impact the level of participation by the Members. Accordingly, the vendor shall not be guaranteed any specific level of participation by the Members. The LLC's rights under the contract with the vendor shall not be impaired or subject to any defense or offset on account of the breach by any Member of the LLC or any other person or entity of any obligation owing to the vendor arising out of the purchase of any services.

3.8.5 Taxes

The vendor shall file all tax returns required by law to be filed by the vendor. The vendor shall provide access to relevant documents for tax audits.

3.8.6 Insurance

Vendor shall maintain usual and customary insurance coverage, including but not limited to worker's compensation insurance, employer's liability insurance, comprehensive general liability insurance, and motor vehicle insurance.

3.8.7 Authority

The Bidder shall represent and warrant that it has all required approval and authority to enter into, execute and perform the obligations under the Contract.

3.8.8 Mechanic's Lien

Vendor shall perform services free of mechanic's lien or other liens.

3.8.9 Performance Guarantees/Liquidated Damages

Any award of business and subsequent contractual arrangement will include specific performance guarantees from the vendor. Such performance will be guaranteed through the use of liquidated damages.

3.8.10 Non-Assignment

The vendor shall not assign, transfer, or sublet the contract or any interest therein or any part thereof without prior written consent of the LLC. All subcontractors must be identified by the vendor and approved by the LLC prior to disclosure of any information. If subcontracting is involved, the vendor shall be responsible for the workmanship, costs, etc. incurred by the sub-contractor in the performance of their duties.

3.8.11 No Discrimination

Goods and services provided by the vendor shall be provided to any person or entity authorized to purchase such goods and services on substantially the same uniform terms and conditions on which such goods or services are provided to any other person or entity, without discrimination.

3.8.12 No Modifications without Company Approval.

The vendor shall not undertake to make any modifications to the Provider ENUM Tier 0/1 Registry at the instance of any Member of the LLC or of any other person or entity, or on its own initiative without the prior written approval of the LLC.

3.8.13 Benefit of Modifications

The benefits of any modifications to the Provider ENUM Tier 0/1 Registry shall be made available to each LLC Member or other person or entity authorized to purchase goods and services from the vendor on substantially the same, uniform terms and conditions.

3.8.14 Limitation on Contracts with LLC Members and Affiliates in Connection with the Provider ENUM Tier 0/1 Registry.

The vendor shall not enter into a contract with any LLC Member, or an Affiliate of a Member (as defined in Par. 1.3.1), for the purchase by the vendor of goods or services to be provided by the Member, or an Affiliate of a Member, incident to the establishment or operation Provider ENUM Tier 0/1 Registry. Notwithstanding the foregoing, the vendor may enter into such an agreement with a Member, or an Affiliate of a Member, if the agreement does not represent or constitute control over, or operation of, any of the name servers or any portion of the shared registration system, the determination of which shall be made solely by LLC.

3.8.15 No Gratuities

The vendor shall not accept gratuities from any Member or other purchaser of Provider ENUM Tier 0/1 Registry goods and services except that this prohibition shall not apply to payment by a Member or other purchaser of the cost of meals of vendor's staff incident to business meetings between vendor's staff and such Member or other purchaser, holiday gifts, and similar de minimis items if: (i) the vendor establishes internal procedures to account for such expenditures for the vendor which procedures shall be approved by the LLC and in good faith complies with such procedures; (ii) the aggregate of such expenditures by any single Member or other purchaser in a calendar year reported to the vendor in accordance with the procedures established by the vendor does not exceed \$1,000.00; and (iii) upon request by the LLC, the vendor makes a report of such expenditures to the LLC.

4 Evaluation of Proposals

The LLC will evaluate proposals submitted in response to this RFP using the criteria outlined below. Technical excellence and comprehensiveness of the overall service for US Provider ENUM operation is as important as the proposed price(s) to ENUM Registrants.

4.1 Criteria for Evaluation

Some criteria to be used for the proposal evaluation include:

- a) Threshold Issues
 - Completeness of proposal
 - Meets neutrality requirements
- b) Costs
 - Price
 - Preparation of estimates
- c) Technical Specifications
 - Adequacy of proposed server architecture
 - Quantity
 - Geographic diversity
 - Redundancy
 - Capacity
 - Reliability
 - RFC 2870 compliance
 - Other significant features or capabilities
 - Response time
 - Update latency interval
 - Propagation delay
 - Zone refresh interval

- Hours of operations
 - Security
 - Operational system
 - Physical
 - Network
 - Backup
 - Audit & reporting
 - Communication requirements
 - Subcontractors
- d) Qualifications
- Industry experience
 - Financial stability
 - Technical expertise

The bidder shall furnish all information requested herein or further requested in accordance with the procedures herein specified. Any deviations or exceptions to the RFP should be noted. Any bidder who does not completely reply to the proposal as requested may be eliminated at the discretion of the LLC.

The LLC will consider any additional information relevant to this proposal provided by the bidder that the LLC, in its sole discretion, deems appropriate.

The same article, section or paragraph number and title used in the RFP shall be used for comments.

Annex 1

June 7, 2007

CC1 ENUM LLC

CC1 ENUM Provider Tier 0/1 Registry Technical and Operational Requirements for a Specific Country within Country Code 1

Abstract

This document contains technical and operational requirements for operating a Provider ENUM Tier 0/1 for interested service providers within the United States. This includes interfaces to other entities providing services for ENUM as well as the requirements for deploying and operating the ENUM Tier 0/1 infrastructure.

Section 1.0 Scope, Purpose, and Application

1.1 Scope

This document describes the Provider ENUM Tier 0/1 technical and operational requirements for the members of the CC1 ENUM LLC. In particular these technical requirements are to be used to select the Provider ENUM Tier 0/1 Registry operator for telephone numbers (TNs) of interested service providers under the ITU-T E.164 international numbering standard.

Provider ENUM is defined as the use of the technology in RFC3761 by the Service Provider of Record (SPR) for a specific E.164 number to map a telephone number into a URI (Universal Resource Identifier) that identifies a specific point of interconnection to that service provider's network that could enable the originating party to establish communication with the associated terminating party. It is separate from any URIs that the end-user, who registers their E.164 number, may wish to associate with that E.164 number. Provider ENUM is sometimes referred to as “Carrier ENUM” or “Infrastructure ENUM”.

The Provider ENUM Tier 0/1 Registry operator is the single entity responsible for providing Provider ENUM Registry services initially under e164enum.us and eventually under a global ENUM root (to be determined by the ITU-T¹) for US TNs, including management of pointers to Tier 2 Provider name servers. The Tier 0/1 Registry does not contain Naming Authority Pointer (NAPTR) records but points at Tier 2 name servers where NAPTR records associated with E.164 numbers are stored. The ENUM Tier 0/1 Registry operator must establish an open standard interface that is available for all SPRs to use.

These requirements do not presume integration of User and Provider ENUM, for example, by sharing of common infrastructure components but also are not intended to preclude such sharing.

1.2 Purpose

This document is intended to provide the specifications necessary to implement the Provider ENUM Tier 0/1 Registry for Numbering Plan Area (NPA) resources within the U.S. It is intended to provide sufficient information to allow the LLC to issue an RFP for an ENUM Tier 0/1 Registry implementation. As such, it describes, among other things,

¹ Originally the IETF planned to use ie164.arpa for this purpose. That domain is used in this document as a placeholder until such time as a global apex for Provider ENUM is chosen.

the reference architecture for the Provider ENUM Tier 0/1 Registry. It also provides the critical security and privacy requirements for implementing this system.

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 Provider ENUM Tier 0/1 Registry for NPA resources within the U.S.

Section 2.0 References

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. Koster, & 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] Vixie, P., Gudmundsson, O., Eastlake 3rd, D, Wellington, B., "Secret Key Transaction Authentication for DNS (TSIG)", 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
- [33] Hollenbeck, S. "E.164 Number Mapping for the Extensible Provisioning Protocol (EPP)," RFC 4114, June 2005.
- [34] Crawford, M., "Non-Terminal DNS Name Redirection," RFC 2672, August 1999.
- [35] Newton, A. & M. Sanz, "IRIS: The Internet Registry Information Service (IRIS) Core Protocol," RFC 3981, January 2005.
- [36] Y. Rekhter, et al., "Address Allocation for Private Internets," RFC 1918, February 1996.

Section 3.0 Definitions, Acronyms, & Abbreviations

3.1 Definitions

Address of Record	A URI that can be used to determine a point of interconnection with Service Provider of Record of the telephone number
Authentication	The process of verifying that a party, e.g., the Service Provider of Record, 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, Name server, 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 0/1 name servers and observing the responses from the Tier 0/1 name servers. (These strings of requests and responses are referred to as a "CNNP Test".)
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 Tier 1A Registry	Organization that registers ENUM domains corresponding to NPAs and hosts the set of their authoritative name server (NS) records.
Provider ENUM	Use of the technology in RFC3761 by the service-provider-of-record for a specific E.164 number to map a telephone number into a URI that identifies a specific point of interconnection to

that service provider's network that could enable the originating party to establish communication with the associated terminating party

Provider ENUM Tier 0/1 Registry	The repository of ENUM domain name registrations for Provider ENUM
Provider ENUM Tier 0/1 Registry Operator	Organization that registers ENUM domains corresponding to 10 digit E.164 numbers for their Service Providers of Record 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 SPRs
Service Provider of Record (SPR)	The service provider, recognized by the appropriate regulatory authority, which has been allocated numbering resources, as reflected in the LERG™ and NPAC. The SPR is also known as the Registrant.
Tier 2 Provider	Person/organization that maintains the ENUM zone including the NAPTR resource records for a number and is pointed to by the Tier 0/1

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
DNAME	DNS RR for non-terminal redirection
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
LERG™	Telcordia Local Exchange Routing Guide
NANP	North American Numbering Plan
NAPTR	Naming Authority Pointer (DNS Resource Record)
NIC	Network Information Center
NPA	Numbering Plan Area

NPAC	Number Portability Administration Center
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
SPR	Service Provider of Record
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

This section specifies the reference architecture of a single common ENUM DNS domain, nominally e164enum.us, within the United States, and potentially other Country Code 1 nations that choose to participate. The plan of the CC1 ENUM LLC is to implement Provider ENUM in a separate domain from User ENUM, specific to the US or Country Code 1. When a global apex is established for Provider ENUM, it is the intent of the LLC to merge the US/CC1 implementation into the global tree.²

Accordingly, a tiered architecture parallel to the User ENUM implementation in 1.e164.arpa is presented as the target but initial implementation will consist of a collapsed Tier 0/1 with e164enum.us as the apex.

4.1 Interim Implementation

The initial Provider ENUM implementation is based on a collapsed tiered architecture as shown in Figure 1. The combined CC1 ENUM Tier 0/1 Registry would host the e164enum.us and 1.e164enum.us domains, with entries in the 1.e164enum.us zone corresponding to US NPAs as well as containing the NS records for individual numbers within those NPAs. The remainder of this document will discuss requirements in terms of the initial architecture but except where noted, requirements apply to all phases of implementation.

² ie164.arpa has been proposed in the IETF as a potential global root for Provider ENUM.

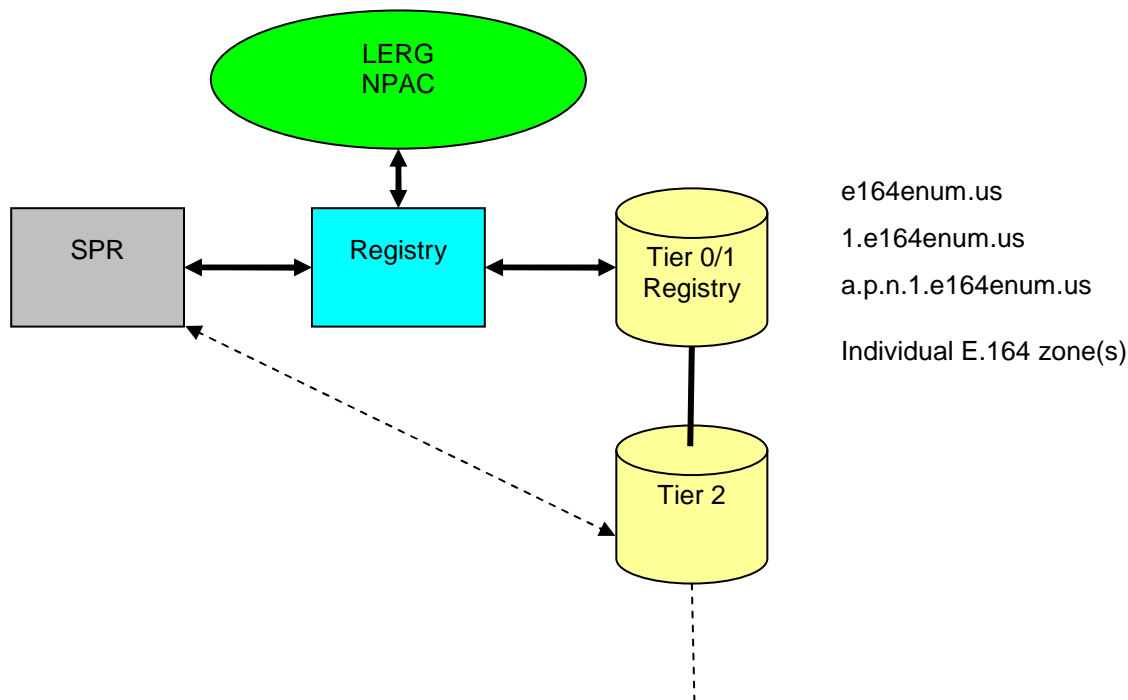


FIGURE 1 – Interim Provider ENUM Functional Architecture

Service Providers of Record, the entities that register numbers into the Provider ENUM Tier 0/1 Registry, will, in turn, be required to establish a business relationship with the CC1 ENUM Tier 0/1 Provider ENUM Registry Operator prior to registering any telephone number in e164enum.us. The Tier 0/1 Registry Operator is responsible for verifying that the numbers an SPR seeks to register are served by the SPR based on the LERG and NPAC.³

The nature of the business relationship between the Tier 0/1 and the SPR will be defined by the LLC, embodied in a Registry agreement, and will be the same for all SPRs. Entries in the Tier 0/1 name servers point to the name servers of the Tier 2 provider for a given

³ An SPR may only register numbers shown as allocated to it in the LERG or pooled or ported to it in the NPAC. Pooled or ported numbers may only be registered by the SPR shown in the NPAC.

E.164 number. The Tier 2 Provider for an E.164 number maintains the actual NAPTR records that contain URIs for specific communication services, and these records are used to support interconnection between service providers.

If SPRs from other NANP nations elect to join with the LLC in implementing Provider ENUM under e164enum.us, their NPAs and numbers could be added to the Tier 0/1, or, if they prefer to maintain a separate registry, their NPAs could be delegated to that registry from the LLC Tier 0/1.

In any case, the LLC seeks integration with other national Provider ENUM trees as they are deployed rather than waiting until the development of a global tree subject to agreements with the corresponding registry operators. This will be achieved through the population of DNAME records for the corresponding country codes under e164enum.us. These records would point to the apex domain of the other national tree. Likewise DNAME records for country code 1 (or country code 1 NPAs if NANP consensus is not achieved) would be populated in the other national trees pointing to e164enum.us.

It is anticipated that SPRs will generally be Tier 2 providers for their numbers though they may elect to outsource this function to other entities. SPRs are responsible for the reliability and performance of the Tier 2 name servers to which their numbers are delegated. It is also anticipated that SPRs will want to provide different interconnection points to different interconnection partners. A variety of techniques exist to accomplish this, resulting in either a differential response from Tier 2 or differential resolution by different interconnection partners of a common Tier 2 response. These considerations are not expected affect the Tier 0/1 functionality that is the focus of this document. It is noted that the points and terms of interconnection between SPRs are a matter for negotiation between SPRs and the Registry plays no role in this process as it provisions only NS records delegating ENUM domains to the serving SPR.

4.2 Target Implementation

Target Provider ENUM implementation is based on a tiered architecture as shown in Figure 2. At Tier 0 is the ie164.arpa zone.⁴ Entries in Tier 0 name servers correspond to country codes and point to the name servers of the Tier 1 Registry that is the authoritative name server for that country code. Entries in Tier 1 Registries normally correspond to

⁴ For user ENUM RIPE NCC provides the Tier 0 function. The instructions regarding operations of the domain e164.arpa can be found at the URL: <http://www.ripe.net/rs/enum/instructions.html>. It is presumed that instantiation of a global Provider ENUM will result in a parallel process for the chosen domain with a to be determined operator. For illustrative purposes this document uses the domain ie164.arpa.

The ITU-T TSB evaluates e164.arpa 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/>.

individual telephone numbers and point to the Tier 2 name servers 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 ie164.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. The Tier 1B Registry Operator is responsible for verifying that the numbers an SPR seeks to register are served by the SPR based on the LERG and NPAC.

Service Providers of Record, the entities that register numbers into the Provider ENUM Tier 1B Registry Operator, will, in turn, be required to establish a business relationship with the CC1 ENUM Tier1B Provider Registry Operator prior to registering any telephone number in ie164.arpa.

The nature of the business relationship between the Tier 1B and the SPR will be defined by the LLC, embodied in a Registry agreement, and will be the same for all SPRs for a given NPA entered into Tier 1A. Entries in the Tier 1B name servers point to the name servers 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 for specific communication services, and these records are used to support interconnection between service providers.

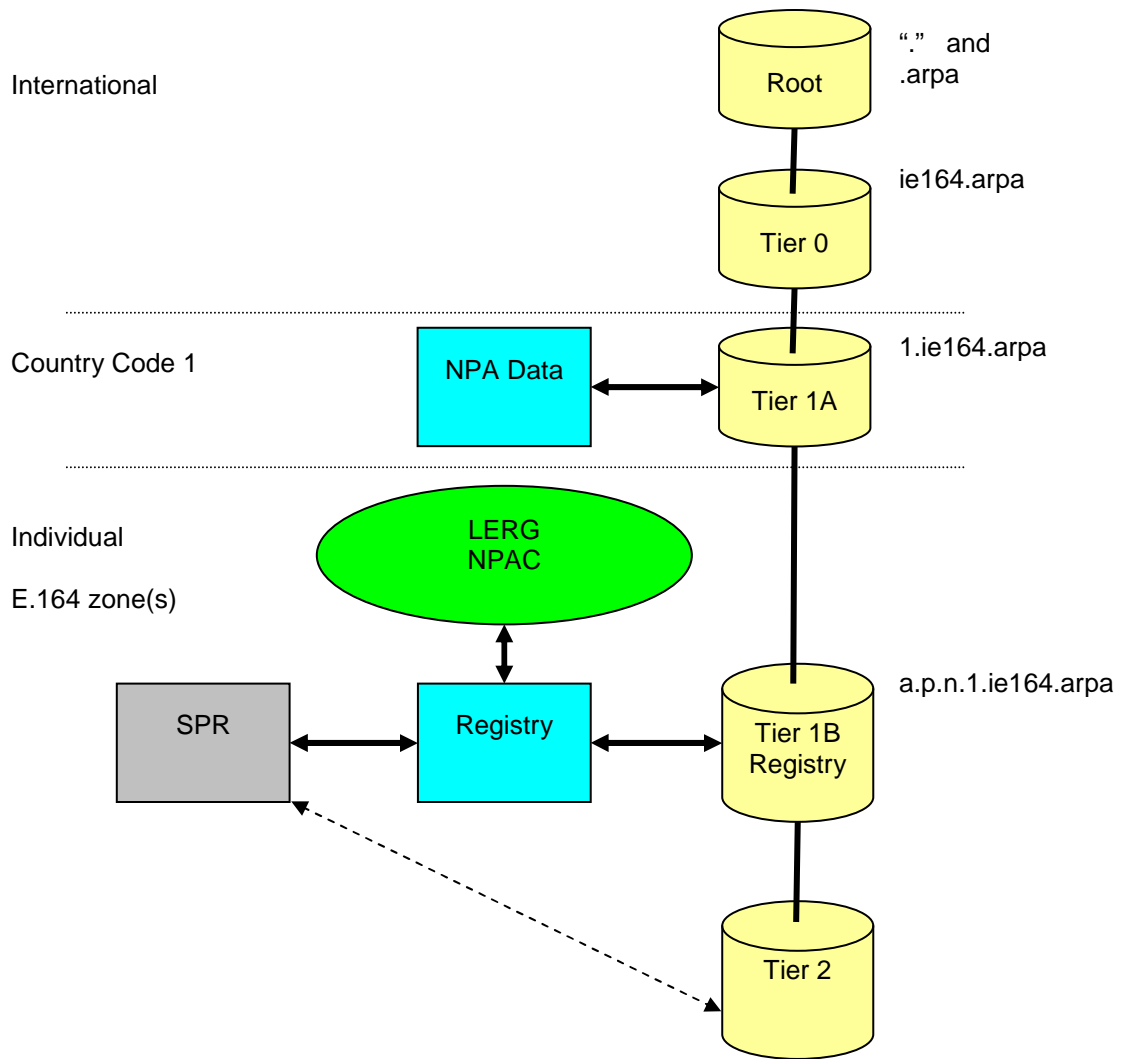


FIGURE 2 –Provider ENUM Functional Architecture

Section 5.0 Operational & Infrastructure Requirements

This section provides requirements for the operation and infrastructure of the ENUM Tier 0/1 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 0/1 Registry. The three primary objects associated with an ENUM Tier 0/1 registration are: domain, host, and contact. It is critical that a Registry database operate in a responsive and robust manner.

An ENUM Tier 0/1 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)

A Registry database:

- [R1] Shall be sized to accommodate the expected demand at initial launch, and to support growth without interruption as Provider ENUM matures.
- [R2] Shall be able to perform transactions at a rate that meets the needs of the ENUM users.
- [R3] Shall maintain its performance based on agreed to service-level measurements, even as the number of users, workload volume, or database size increases.
- [R4] Shall maintain a high level of availability as required by the Service Level Requirements (SLRs) contained herein. If an ENUM Tier 0/1 Registry bidder believes that a level of availability other than that specified in section 6.1, then it 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.
- [R5] 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 0/1 Registry Operator shall provide a Shared Registration System (SRS) that allows multiple Service Providers of Record to enter ENUM registrations into the registry. An ENUM Tier 0/1 Registry will maintain the addresses of the name servers of the Tier 2 providers in the US ENUM name space and will have authority to communicate with the ENUM Tier 1A Registry when and if the target architecture is implemented.

An ENUM Tier 0/1 Registry is required to:

- [R6] Allow concurrent operations from multiple SPRs to a SRS to enter ENUM registrations into the registry
- [R7] Verify that a number which an SPR seeks to register is allocated/porting to that SPR using data from the LERG and NPAC⁵
- [R8] Using data from the NPAC remove registrations for numbers that have been ported away or otherwise reassigned from an SPR and, optionally, by agreement with the recipient SPR, establish a new registration for the number.
- [R9] Provide procedures for SPRs to establish default registration for all numbers for which they are the SPR based on the LERG and NPAC. Thus, if an SPR acquires a new number block, the numbers in the block, with the exception of any ported out, would be registered according to a predefined template without the need for specific SPR action. This capability should allow for multiple templates per SPR based on characteristics such as NPA, state, LATA, SPID, OCN, or AOCN.
- [R10] Provide non-discriminatory services to each authorized SPR to perform registration related operations
- [R11] Provide and conduct non-discriminatory SPR certification procedures.⁶
- [R12] Support open standard interfaces between the ENUM Tier 0/1 Registry and authorized SPRs
- [R13] Perform Zone data creation and maintenance necessary to update the zone data and information in the local data stores (see Section 5.3)

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.

⁵ Note that because SPR information is updated from the authoritative source whenever it changes there is not need for periodic revalidation of registrations as in user ENUM.

⁶ The intent of these procedures is to 1) verify that the party in question is in fact a service provider or record under criteria defined by the LLC and has signed the user agreement to be developed in consultation with the LLC and 2) verify the operation of the SPR instance of the Registry-SPR interface, including proper implementation of authentication procedures.

An ENUM Tier 0/1 Registry bidder must describe how it would meet the following requirements for zone data operations:

- [R14] The SRS/Registry Database shall provide means to generate the zone data from the Registry database to reflect changes made through the ENUM Registry-Service Provider of Record interface as defined in the Service Level Requirements (SLRs in Section 6.)
- [R15] The zone data, once generated by SRS/Registry Database, shall be reliably and securely propagated to all ENUM Tier 0/1 name servers with minimum delay.
- [R16] The frequency of zone data generation and the delay of zone data propagation shall meet the SLR requirements
- [R17] Zone data generation and propagation procedures shall be carefully engineered so that they will not adversely affect the normal ENUM Tier 0/1 Registry and name server operations.
- [R18] Zone data distribution procedure should conform to appropriate IETF standards (see Section 2)
- [R19] The SPR to ENUM Tier 0/1 Registry SRS shall be the only automatic means by which a SPR can make changes to its ENUM domain names without the need for Registry personnel intervention.
- [R20] The name servers for an ENUM Tier 0/1 Registry shall be placed in geographically dispersed data centers with topically diverse connections to the Internet to allow for maximum redundancy against disaster and failures.
- [R21] The registry database shall support logging and backup capabilities for all zone data updates.
- [R22] Zone transfers, including incremental zone transfers, shall be available to certified SPRs so as to allow them to maintain a local copy of the Tier 0/1.⁷

5.4 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 SPR for trouble resolution. It will also allow for appropriate disclosure of SPR information for authorized law enforcement inquiries. An ENUM Tier 0/1 Registry bidder is required to describe how they would provide this service to meet the needs of the communications industry while safeguarding the non-public information of SPRs from a technical perspective. The Tier 0/1 operator will respond to all lawful ContactInfo requests from appropriate authorities.

⁷ The Zone transfer capability is intended to allow SPRs to be able to maintain a local copy of the Tier 0/1 zone data and query it rather than the Tier 0/1 name servers maintained by the Registry.

ContactInfo may also be used to support other industry functions, e.g., associating a service type with a number (i.e., VoIP) per OBF request.

5.4.1 Introduction

This section describes specific requirements for the Tier 0/1 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.

5.4.2 Need for ContactInfo Databases

1. [R23] The Tier 0/1 Operator shall maintain ContactInfo databases associated with ENUM registrations.
2. [R24] The appropriate technology for maintaining public access to such ContactInfo should be the IRIS protocol developed by the CRISP Working Group.
3. [R25] The information from that database that could be made accessible to which parties is a matter of policy for the CC1 ENUM LLC to determine, to ensure compliance with privacy regulations and best practices. The Registry shall enforce these LLC policies.

5.4.3 General ContactInfo Requirements

The general requirements for the ContactInfo database are:

1. [R26] Mining Prevention: providing some technical means to discourage data mining of the information base should Tier 1/0 and/or ContactInfo be publicly accessible.
2. [R27] Standard and Extensible Schemas
3. [R28] Level of access: not all data need be equally accessible by all users of the service
4. [R29] Client processing: facilitating the creation of client software that can automatically extract relevant details from the services responses
5. [R30] Searches: The protocol should provide for flexible access by authorized entities while limiting other queries to searches by full telephone number only.
6. [R31] Result Set Limits: the protocol must include provisions for allowing a server operator to express a client search limit

[R32] 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.

[R33] Contact-Info Databases should use modern authentication and authorization methods to control access by Registry personnel, SPRs, and querying parties.

5.4.4 Data Collection Requirements and ContactInfo Data Access

Because ContactInfo data are expected to be the same for large groups (and, in some cases, perhaps all) of an SPR's ENUM registrations, the Registry will maintain for each registration a pointer to the corresponding ContactInfo dataset populated by the SPR.

[R34] the Registry shall allow SPRs to define, modify, and delete, ContactInfo datasets.

In registering a number an ENUM SPR will indicate which ContactInfo dataset should be associated with the number being registered.

[R35] The Tier 0/1 operator will then populate an IRIS database with that information for access by SPRs. The data that is to be publicly accessible is a matter to be governed by appropriate regulatory requirements and the Tier 0/1 contract.

. [R36] The IRIS database shall also include other per-registration information in addition to the per SPR information. The Registry shall support population of this information which may include a service type field and such other fields as may be specified by the LLC.

[R37] Below are the recommended data elements that should be included in the SPR 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 SPR 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. Registrants shall be able to define and populate additional optional contact roles (e.g. escalation) with name, phone, and email.

5.4.4.1 SPR Contact Data Elements

Table 1 SPR Contact Data Elements

Data Element	Private	Public	Example
Service Provider of Record Name		X	
SPR Admin. Contact Name		X	
SPR Admin Contact Phone Number		X	
SPR Admin Contact Email		X	
SPR Technical Contact Name		X	
SPR Technical Contact Phone Number		X	
SPR Technical Contact EMail		X	

5.5 *Security*

[R38] The Tier 0/1 Registry Operator must secure both Registry operations and data. The Registry Operator 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 Operator shall define and implement multi-tiered procedures that provide security protections to all parts of the Registry system.

[R39] The Registry Operator is required to protect Registry system access from all forms of abuse, fraud, or security breaches. In addition, a Tier 0/1 must follow any and all commercial practices used to protect credit card information (Gramm-Leach-Bliley Act).

5.5.1 *Operational System Security*

Security requirements are detailed below:

- [R40] Protection/Prevention of compromise of the systems hosting or managing Tier 0/1
- [R41] Protection from Denial of Service attacks (internal & external)
- [R42] Requirements for maintaining security updates for all software
- [R43] Security (integrity, authenticity) of communications between the components of the Tier 0/1 service (name servers, registry, etc)
- [R44] Encryption requirements
- [R45] Authentication & Authorization requirements
- [R46] Requirements on ISPs providing connectivity for Tier 0/1

5.5.2 *Physical Security*

- [R47] The Tier 0/1 Registry Operator shall employ a variety of physical security systems to ensure that unauthorized personnel have no access to sensitive equipment and/or data.
- [R48] All servers containing any sensitive data shall be physically secured so that only a controlled list of people can obtain access.
- [R49] 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.
- [R50] 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 that open into or out of a restricted area.
- [R51] 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.

- [R52] 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.)
- [R53] 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.
- [R54] 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.
- [R55] 24-hour access to the data center by authorized personnel shall not be hindered by aforesaid security measures.

5.5.3 Network Security

- [R56] The Tier 0/1 shall use techniques such as User identification, passwords, and/or IP range checking for all restricted services (which includes services other than DNS resolution.).
- [R57] Secure File Transfer Protocols shall be used for all "file transfers" between the ENUM Tier 0/1s and the Tier 1A Registry [RFC 2228, RFC 2577, or similar equivalent] when and if the target architecture is implemented.
- [R58] 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.
- [R59] 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.
- [R60] DNS servers shall run a minimum set of applications and system services, in addition to the DNS server software.
- [R61] The Tier 0/1 Operator shall check all its DNS servers to ensure that data integrity is maintained.
- [R62] Services which are IP-restricted shall have each IP address specified individually. Private use network block addresses (as defined in RFC 1918) are not to be used, since this adds the risk that a host could masquerade as a spare IP address on an internal network.

- [R63] 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.
- [R64] 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 0/1 Registry.
- [R65] Bidders are requested to describe the measures they would employ to protect against/mitigate the effect of Distributed Denial of Service attacks, particularly if the Provider ENUM apex domain is publicly accessible.
- [R66] 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 an 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.

[R67] The Tier 0/1 Registry Operator 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.

5.5.4 Backup Security

- [R68] Backup shall be performed in a secure manner on the main Tier 0/1 Registry site.
- [R69] The Tier 0/1 Registry Operator shall use an encryption scheme for the backup of sensitive data as a part of the implementation process.
- [R70] Backup information shall be stored in a secure off-site location.

5.5.5 Security Audit and Reporting

[R71] The Tier 0/1 Registry Operator shall run a security audit on a regular basis but no less often than once per quarter.

- [R72] The Tier 0/1 Registry Operator 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.
- [R73] 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 0/1 Registry data. Bidders should detail the hierarchy of breach severity and escalation procedures.
 - [R74] The Tier 0/1 Registry Operator shall provide a monthly security status report to the CC1 ENUM LLC, including a list of security incidents categorized by severity.

5.5.6 Resolution Access Control

Although it is the intent of the LLC to make the initial NS record for an ENUM registration publicly accessible, regulatory constraints may ultimately result in the need to restrict access to name resolution services to SPRs and other qualified parties pursuant to a user agreement. [R75] Bidders should offer proposals on how best to implement such controls⁸. Section 11 identifies the privacy considerations that apply, particularly in a partially open architecture.

5.6 Caching Requirements

This section refers to the minimum requirements for caching. [R76] Bidders should propose what they believe are appropriate values for name server caching requirements for time to live (TTL), particularly in light of the potential for number portability-driven changes in the SPR associated with a number.

5.7 System Turn-Up and Testing

[R77] Bidders need to provide a detailed start-up project implementation and system test plan, including proposed test cases, to support the Tier 0/1 registry system turn-up.

A Beta test period is recommended as a critical final step prior to successful commercial deployment. [R78] The Bidder should propose an appropriate plan and set of parameters for Beta testing.

[R79] Bidders are required to provide high level start-up project implementation timelines and plans as part of their bid proposal.

5.8 Operations and Maintenance

ENUM is envisioned as a wholly robust and high-availability service. [R80] An ENUM Tier 0/1 Registry bidder should describe how it would operate and maintain the various

⁸ Such controls would complicate the ability to provide international interoperability.

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 0/1 Registry bidder should also provide a comprehensive description of how they will manage their network operations center to address the following:

- [R81] Trouble reporting and ticket tracking:
 - How Tier 2 Providers and SPRs can submit trouble tickets and receive status reports.
 - Tracking of internal performance metrics.
- [R82] 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.
- [R83] Monitoring of servers and network connections
- [R84] Intrusion detection for both physical and network security
- [R85] Provide technical liaison with the Tier 1A entity for issues related to delegation authority over NPAs within 1.1e164.arpa if and when the target architecture is implemented.
- [R86] Provide a description on how escalations will be handled and communicated to the Tier 2 and SPRs.
- [R87] 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.
- [R88] 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.
- [R89] 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.

5.9 *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 0/1 Registry bidder should:

- [R90] 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
- [R91] Specify how redundancy and highly available Registry architecture will help expedite recovery from these failures.
- [R92] Specify how backup and escrow data will be used for recovery from these failures.

In addition the bidder should describe how it would:

- [R93] Provide a time estimate for recovering from each type of failure.
- [R94] Log each system outage and document system problems that could result in outages.

5.10 *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.

[R95] 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 0/1 Registry bidder shall specify:

1. [R96] The frequency and procedures for data backup
2. [R97] The frequency and procedures for data escrow
3. [R98] The hardware and software systems used for data backup
4. [R99] The procedures for retrieval of data and rebuild of the database
5. [R100] Who should have access to the escrowed data and in what circumstances it would be accessed by an entity other than itself
6. [R101] Testing process and schedule to verify the escrow and database backup procedure

7. [R102] The data escrow arrangements, including any contractual arrangements with Third parties

In addition, the following safeguards are required of ENUM Tier 0/1 Registry bidders:

- [R103] The data backup and escrow procedures shall not impede the overall performance of normal Registry operations
- [R104] The data backup and recovery procedures shall minimize the data loss and service interruption of the Registry

5.11 Technical and Other Support

[R105] The Tier 0/1 Registry Operator must provide technical and other support to SPRs and Tier 2 providers from an appropriate customer help desk with a well-defined escalation policy.

[R106] The Registry Operator must work with other national Provider ENUM Registries to implement and support linking of the corresponding Provider ENUM trees as directed by the LLC.

[R107] In the initial interim implementation the Registry Operator may also need to support Tier 1Bs of other NANP nations that choose to delegate their NPAs from the Tier 0/1 Registry under agreement with the LLC. Bidders should propose how they would support delegation of non-US NPAs from the Tier 0/1.

5.12 Transitions

5.12.1 Industry Developments

[R108] The Tier 0/1 Registry Operator must provide a plan for transition from the interim to target architecture should a global domain (e.g., ie164.arpa) be agreed to. In this transition the Tier 0/1 becomes the US Tier 1B. The plan must ensure no disruption of Provider ENUM DNS service.

[R109] If and when the target architecture is implemented, the Tier 1B Registry Operator 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.ie164.arpa.

5.12.2 Succession

[R110] The Tier 0/1 Registry Operator 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 0/1 function in providing ENUM DNS service.

5.13 Accommodation of Future Internet Architectural Enhancements

[R111] Bidders must respond with plan to accommodate IPv6 per RFC 2874.

[R112] Bidders must respond with plan to accommodate DNSSEC per RFC 2535.

Section 6.0 Service Level Requirements (SLR)

The Tier 0/1 Registry Operator 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

[R113] 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 SPR Community via e-mail and to CC1 ENUM LLC.

[R114] 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 an SPR 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 SPR. 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.

[R115] 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 SPRs 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.

[R116] The committed Service Availability for SRS is 99.95% and the Service Level Measurement Period is monthly.

- [R117] SRS Planned Outage Duration = 45 minutes per Monthly Timeframe
- [R118] SRS Planned Outage Timeframe = 0600-1400 UTC Sunday
- [R119] SRS General Maintenance Planned Outage notification Timeframe = 30 days
- [R120] 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. [R121] The committed Service Availability for ContactInfo is 99.95% and the Service Level Measurement Period is monthly.

- [R122] ContactInfo Planned Outage Duration = 45 minutes per Monthly Timeframe
- [R123] ContactInfo Outage Timeframe = 0600-1400 UTC Sunday
- [R124] ContactInfo Maintenance Planned Outage Notification Timeframe = 30 days
- [R125] 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

[R126] 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. [R127] 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 RFC 4114. It measures the processing time for add, modify, and delete transactions associated with domain names, name servers, contacts, and SPR 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.
- [R128] 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.
- [R129] 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 SPRs; Name server and ContactInfo. SPRs generate these updates through the SRS. The SRS then updates the Name server and the ContactInfo.

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

- [R130] Update Frequency--Name Server = 10 minutes for 95%.
- [R131] Update Frequency-- ContactInfo = 10 minutes for 95%.

i. Zone Transfers

[R132] Incremental zone transfers to SPRs should also meet the update frequency requirement of 10 minutes for 95% of transactions.

ii. LERG-Driven Updates

[R133] Changes in registrations (additions, deletions, modifications) resulting from changes in the LERG record for a number shall be made by 0015 hours (i.e., 12:15 am) on the LERG effective date.

iii. NPAC-Driven Updates

[R134] Changes in registrations (additions, deletions, modifications) resulting from changes in the NPAC record for a number shall be made within 15 minutes of NPAC broadcast.

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.

[R135] 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 (or a testing entity selected by it) 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 0/1's DNS Name Servers and observing the responses from the Tier 0/1'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 0/1 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 0/1 name server must not exceed the required values.
- b) The packet loss to each of the Tier 0/1 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

[R136] Bidders must describe the physical connectivity arrangements planned to support each of their name servers and how these arrangements will enhance service reliability and security.

6.6 Shared Registration System (SRS)

An ENUM Tier 0/1 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:

- [R137] Registry database throughput – number of transactions per second
- [R138] Registry database availability (in line with 6.1.2)

- [R139] Number of ENUM Service Provider of Record accounts
- [R140] Number of concurrent ENUM SPR -ENUM Registry connections
- [R141] Frequency of zone data generation: rates per day, hour, minute

6.7 *Reports and Files*

[R142] An ENUM Tier 0/1 Registry Operator shall provide reporting service to Service Providers of Record and the LLC. In addition, it may make zone data available to Service Providers of Record 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 SPRs and the LLC.

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

[R143] Except in the case of Name Server performance requirements, the Tier 0/1 Registry Operator will perform internal monitoring as a means to verify that the availability and performance measurements of this document are being met.

[R144] Beginning no later than 120 days after the commencement-of-service date, the ENUM Tier 0/1 Registry Operator will provide preliminary monthly system performance and availability reports to the LLC.

[R145] The ENUM Tier 0/1 Registry Operator will provide service availability percentages during each Performance Measurement Period as listed in this document.

[R146] An ENUM Tier 0/1 Registry Operator may provide custom reporting service that would allow ENUM SPR and the LLC to specify report criteria and have the report available for download upon completion.

[R147] These reports should be posted to a secure site (e.g., Secure File Transfer Protocol (SFTP)) that can be accessed by the SPRs by entering username and pass code.

[R148] The format for reports should be easily machine-readable by SPRs (i.e., XML, CSV).

[R149] Naming convention of reports should identify the SPRs, the date the report was created, and the subject of the report.

[R150] An ENUM Tier 0/1 Registry Operator should archive copies of all reports created.

[R151] An ENUM Tier 0/1 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

7.1 Interfaces between Registry and Service Provider of Record

The Tier 0/1 Registry-SPR interface will be a shared registration system (SRS) whereby accredited SPRs or their authorized agent (e.g., a service bureau) may register ENUM domain names for their numbers in the CC1 ENUM name space.

[R152] The Tier 0/1 Registry Operator will be required to develop a Registry- Service Provider of Record Agreement. The Registry and Service Provider of Record Agreement will include the details regarding the interface protocols that can be used.

A Tier 0/1 Shared Registration System (SRS) is required to:

- [R153] Allow an unlimited number of SPRs to register ENUM domain names in the LLC's Provider ENUM name space
- [R154] Provide equivalent access to the system for all SPRs 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,
 - Update information about registered ENUM domain names and associated information,
- [R155] Support the open standard interface between the Registry and SPR, as defined in the IETF extensible provisioning protocol (EPP) standard suite (RFC3730 through RFC3735 and RFC 4114). The Tier 0/1 Registry Operator will work with the industry to identify and develop further extensions to EPP for the purposes of supporting the LLC's Provider ENUM, if needed.
- [R156] The common Tier 0/1 registry protocol for SPR shall be EPP but this should not preclude other protocols from being used between the registry and SPRs. In particular, proposals with respect to the use of SOAP are sought.
- [R157] Reject illegal commands/requests (e.g., missing mandatory data element) from ENUM SPR.

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

- [R158] Security of the SRS applications shall be provided in part via the mandatory use of the TLS [RFC 2246] protocol for transport layer security.
- [R159] 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 0/1 Registry, and its SPR password.
- [R160] Security of the SRS application shall be provided via an authenticated and encrypted connection. At a minimum, IPSEC will be used to secure the connection.

- [R161] Each EPP session shall be authenticated and encrypted using IPSEC. The Tier 0/1 Registry shall authenticate every EPP client connection using a valid PKI.

[R162] The Tier 0/1 must support batch file processing so that the ENUM SPR can put many commands into one file and deposit it in a “command” directory on a Tier 0/1 Registry server. The Tier 0/1 Registry Operator 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 SPR can periodically check and retrieve files in the “response” directory. Once the file is read, the ENUM Tier 0/1 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 0/1 Registry

If and when the target architecture is implemented, the Tier 1A registry will likely contain less than a thousand records and additions and changes are expected to be infrequent. Thus, a formal mechanized interface or system (Shared Registration System) between Tier 0/1s and the Tier 1A may not be required.

7.3 Other Interfaces

- The interface between the ENUM SPR and the Tier 2 Provider, if the SPR chooses to outsource that function is a matter between the parties.
- [R163] The Tier 0/1 Registry Operator must become an NPAC user and establish the appropriate interfaces to obtain NPAC data for registration validation and porting notification
- [R164] The Tier 0/1 Registry Operator must subscribe to the LERG to obtain data for registration validation

Section 8.0 Provisioning

This section defines provisioning requirements and procedures for ENUM administration. This involves the following ENUM functional entities: Service Provider of Record, ENUM Tier 0/1 Registry Operator, and, potentially a Tier 2 provider if the SPR elects to outsource these functions. 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 0/1 Registry and the SPR.

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:

- SPRs will be bound by a Registry agreement developed by the Tier 0/1 Registry Operator together with the LLC. This agreement will require the SPR to comply with the procedures detailed below. In addition to the provisioning procedures, the Registry agreement will detail data privacy requirements. SPRs have an established trust relationship with the Tier 0/1 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 SPR 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 0/1 Registry and an SPR is not included in the provisioning procedures.
- An SPR can either provide its own Tier 2 Provider service or outsource the name server operation.
- An SPR may authorize its Tier 2 Provider to review/update certain data (e.g., host and technical contact information) at the Registry

8.2 Provisioning Requirements

This section lists, or cross-references, the high level requirements for the entities involved in provisioning the ENUM.

8.2.1 Tier 0/1 Registry

[R165] The Tier 0/1 Registry is responsible for properly identifying and authenticating a SPR before accepting any transactions.

[R166] The Tier 0/1 Registry is responsible for ensuring that SPRs comply with the requirements and procedures set out in the Registry agreement and monitoring SPR compliance.

8.2.2 *Service Provider of Record*

The Service Provider of Record must only register numbers for which they are identified in the LERG/NPAC as the network service provider.

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

The SPR must follow the policies specified for Provider ENUM provisioning.

8.3 *Provisioning Procedures*

This section describes representative scenarios for Provider ENUM Provisioning Activities.

[R167] The Tier 0/1 Registry Operator shall develop a comprehensive set of procedures, subject to LLC approval. The Registry Operator shall implement the procedures agreed upon and incorporate them into the Registry agreement.

8.3.1 *Initial ENUM Registration*

8.3.1.1 Assumptions

8.3.1.2 Provisioning Procedures

1. The SPR establishes secure communication with the Tier 0/1 Registry and
2. The SPR provides registration information:
 - TN or TN range
 - A list of name server host names associated with the ENUM domain name(s)
 - SPR's information and technical and administrative contact information
3. The Registry authenticates the SPR and verifies the SPR's authority to register the TN based on the LERG and NPAC.
4. If the validation fails, the registration is rejected. If the validation is successful, the process continues with step 5.
5. Tier 0/1 Registry acknowledges to the SPR that the ENUM domain name registration is accepted. The Tier 1 Registry then performs the zone file updates to add the NS RRs of this ENUM domain name to its name servers. 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 name server information indicating where NAPTR RRs are hosted.

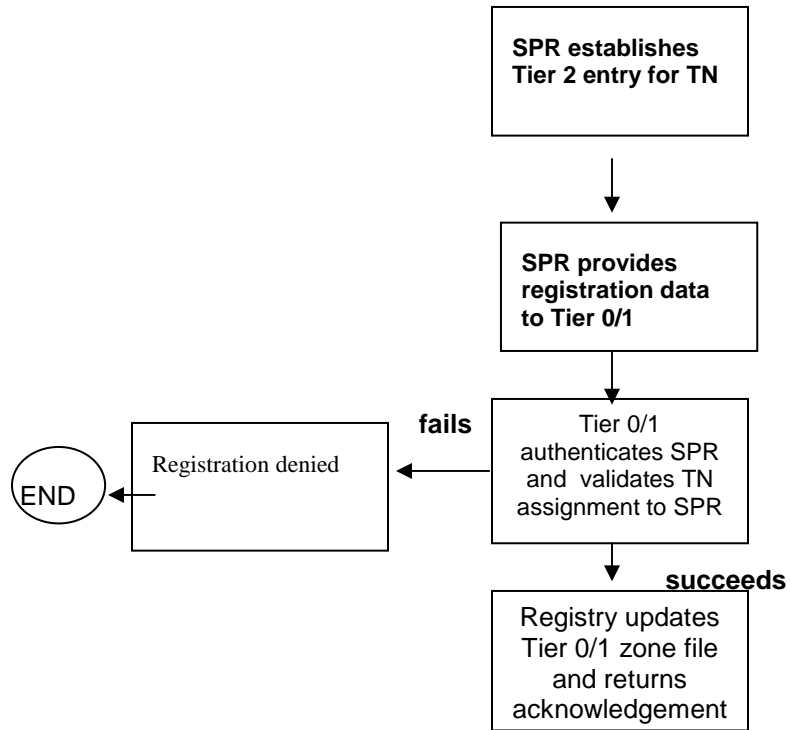


Figure 4. SPR registers TN or TN range

8.3.2 SPR Checks/Changes Information at Tier 0/1 Registry

The SPR checks or changes information stored at the Tier 0/1 Registry.

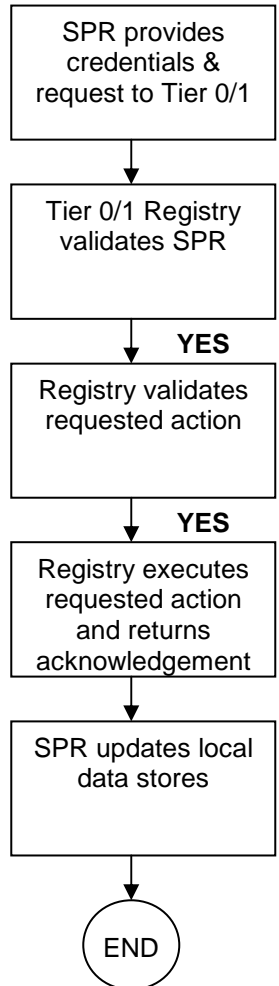
8.3.2.1 Assumptions

8.3.2.2 Provisioning Procedures

1. The SPR provides the AAA-related information and indicates the type of request with the associated information to the Tier 0/1 Registry. The type of request and associated information may include:

- Check
 - All or certain current information associated with an ENUM registration such as:
 - 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 SPRs data such as:
 - Contact information
 - Organizational information
 - IP address(es)
 - Security pass phrase (for authenticating an SPR when contacting the Tier 0/1 Registry's customer support by telephone)
 - User id and password information
 - Digital certificate information
- Add
 - Additional SPR Contact information
 - Additional SPR Organizational information
 - Additional IP address(es)
 - Additional user id and password
- Delete
 - Contact information
 - IP address(es)
 - SPR user id and password, when there are multiple accounts

- Modify/Change
 - SPR's contact information, user id, password, security pass phrase, digital certificate information, web site address
2. The Tier 0/1 Registry validates the SPR and, if the request is with respect to TN information, the SPR's authority over the TN based on the LERG and NPAC.
 - a. If the validation fails, the Tier 0/1 Registry rejects the request indicating authentication/authorization failure (e.g., invalid password).
 - b. If the validation is successful, the Tier 0/1 Registry proceeds with Step 3.
 3. The Tier 0/1 Registry checks whether the requested action is valid.
 - a. If the request is not valid (e.g., syntax error), the Tier 0/1 Registry rejects the request indicating the reason for rejection.
 - b. If the request is valid, the Tier 0/1 Registry performs the required actions and returns a positive acknowledgement.
 4. When a response is received, the SPR 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 8.3.2.2:
SPR Checks/Changes Information at Tier 0/1 Registry**

8.3.3 SPR Terminates ENUM Registration

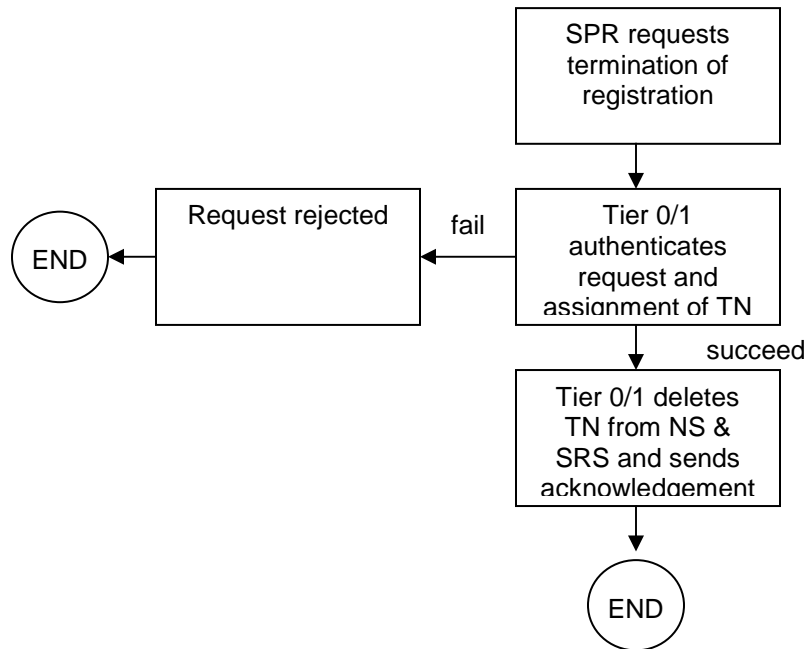
The SPR terminates an ENUM registration.

8.3.3.1 Assumptions

The ENUM registration is to be terminated.

8.3.3.2 Provisioning Procedures

1. The SPR establishes secure communication with Tier 0/1 and requests removal of a TN registration providing the TN and necessary authentication information.
2. The Registry authenticates the SPR and the TN assignment.
If YES, the Proceed to step 3.
If NO, the request is rejected and the reason indicated
3. The Tier 0/1 Registry removes the ENUM registration for that ENUM domain name from its local data store and name servers.
4. The Tier 0/1 acknowledges the successful execution of the request to the SPR.



**FIGURE 6 - Flow Chart for 8.3.3.2:
SPR Terminates ENUM Registration**

8.3.4 Number Port to new SPR

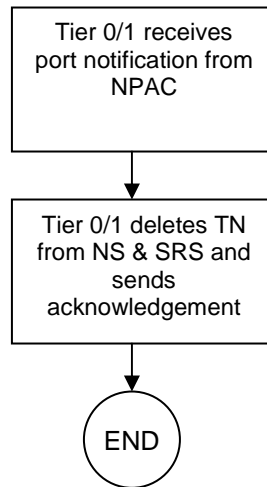
The number ports away from the current SPR.

8.3.4.1 Assumptions

- The Tier 0/1 determines that the number has ported to a new SPR
- In the absence of an automatic capability to create registration for the new SPR the registration is deleted.

8.3.4.2 Provisioning Procedures

1. The Tier 0/1 Registry determines from NPAC port notification that a number registered in Provider ENUM has ported.
2. The Tier 0/1 Registry deletes the existing ENUM registration for ported away number.
3. The Registry sends notification of the delete to the old SPR.



**FIGURE 8 - Flow Chart for 8.3.4.2:
Number Ports Away from Current SPR**

8.4 Area Code Split

An area code is split.

8.4.1 Assumptions

- The Tier 0/1 Registry, the SPRs 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 period⁹.
- 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.e164enum.us," and the new ENUM domain name would be "4.3.2.1.4.3.4.1.7.5.1.e164enum.us." 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."
- 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.e164enum.us, 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 particular circumstances where individual 10 digit telephone numbers are changed. The Registry Operator must develop practices to ensure that the SPRs update the registry database with the correct information when this occurs.
- The Tier 0/1 Registry Operator 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

⁹ 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.

(<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 0/1 Registry with a Permissive Dialing Period

At no time before the T1 shall the Tier 0/1 Registry accept any request on any new ENUM domain name from the SPR. This is because the new TN under the new area code is not yet effective before T1.

Starting at T1, the Tier 0/1 Registry shall be capable of accepting and responding to any request made on the new ENUM domain name from the SPR, and shall perform data updates on the local data stores and zone files, if applicable.

The Tier 0/1 Registry shall not accept any request on any old ENUM domain name from the SPR during the permissive dialing period.

At T1, the Tier 0/1 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 name server information copied from those associated with the corresponding old ENUM domain names at T1.¹⁰ The Tier 0/1 Registry shall not remove the Name server (NS) Resource Records (RRs) associated with the old ENUM domain names from the existing zone file(s).

The Tier 0/1 Registry Operator 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.

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 0/1 Registry policy (e.g., frequency of zone file updates).

Within twenty-four hours after T1, the Tier 0/1 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 0/1 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.

¹⁰ 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 Tier 0/1 Registry shall keep the name server 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 SPR 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 inquires about the ContactInfo information on the old ENUM domain names.

During the permissive dialing period, if the Tier 0/1 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 0/1 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 0/1 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 0/1 Registry should send an e-mail message to each technical contact 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 0/1 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 0/1 Registry Operator send an e-mail message to each associated SPR 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 0/1 Registry accept any request on any new ENUM domain name from the SPR. This is because the new TN under the new area code is not yet effective before T1.

The Tier 0/1 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 0/1 Registry shall perform zone file updates to change all the old ENUM domain names to the new ENUM domain names while keeping the name server 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 0/1 Registry shall be capable of accepting and responding to any request made on the new ENUM domain name from the SPR and shall perform data updates on the local data stores and zone files, if applicable.

Within twenty-four (24) hours after T1, the Tier 0/1 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 0/1 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 SPR with a Permissive Dialing Period

The SPR 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 0/1 Registry Operator will notify SPRs of impending area code splits.

One week before the SPR shall 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.

Within twenty-four hours after T1, the SPR should 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.

During the permissive dialing period, if the SPR should submit a create request only on the new ENUM domain name and shall have the NAPTR RRs that are associated with both the new and old ENUM domain names in the Tier 2 name servers.

Within twenty-four hours after T2, the SPR update the Tier 2 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 SPR without a Permissive Dialing Period

The SPR should be aware of any area code split and the associated T1 that impacts the ENUM domain names registered through it. The Tier 0/1 Registry Operator will notify SPRs of impending area code splits.

One week before T1, the SPR shall update the Tier 2 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.

Within five minutes after T1, the SPR 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.

Section 9.0 Dispute Resolution

Because determination of Service Provider of Record is based on the LERG and NPAC a dispute resolution process like that planned for User ENUM is not required for Provider ENUM. Disputes concerning registrations rights to a TN must be resolved through PSTN processes leading to LERG/NPAC updates which will then be faithfully reflected by the Tier 0/1 Registry.

Section 10.0 Tier 0/1 Registry Reporting

The Registry Operator should make available regular reports for the SPRs on the daily, weekly, and monthly activity. [R168] The monthly level report should provide the necessary details for end of month billing. [R169] 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 0/1 Registry Reporting for SPRs

[R170] The Registry Operator should provide daily, weekly, and monthly reports that are available to SPRs via a secured file transfer protocol (e.g., SFTP) server. [R171] To assist SPRs in their ability to monitor their registration activity throughout the month, the Tier 0/1 registry should generate separate daily and weekly reports for each of its SPRs, as listed in Table 3 below.

SPRs 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 SPRs with a means to reconcile their monthly invoices to their transaction activities, listed below:

- * Registrations
- * Syncs
- * Deletions
- *Port outs
- *Port ins

The reports reflect the actual activity for the period that affected the SPR account. The SPRs 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 SPRs, as well as the Tier 0/1 personnel, to easily trace activity during the audit process.

Table 1 SPR Reports provided by Tier 0/1

Report Name	Report Features
Daily Transactional SPR Report	Lists all SPR-Registry transactions that occurred on previous day
Daily SYNC Report	Lists all domains that were synced previous day
Daily Delete Report	Lists all domain names deleted
Weekly Domain Name Report	Cumulative report of all domain names managed by SPR; Lists domain name, create date,
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 SPR to capture detailed billable transaction events

10.2 Tier 0/1 Registry Operator Reporting to LLC

[R173] On a monthly basis the Tier 0/1 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 2 Monthly LLC report provided by Tier 0/1

SPR Status.
Service Level Agreement Performance
TLD Zone File Access Activity
Completed EPP interface software releases
Domain Names Under Sponsorship – Per SPR
Name Servers Registered – Per SPR
Domain Names Registered by Registry Operator
Contact Info Service Activity
Total Monthly Contact Info Queries
Total Monthly Domain Name Transaction Trend by Category
Total Monthly Name Server Transactions by Category (Additions, Modifications, Deletions) by SPR by NPA
Average Daily Transaction Range
E.164 Geographical Registrations Distribution
Deleted Names - Per SPR
Other Information <ul style="list-style-type: none"> a) Total Monthly Transactions by Category b) Total Transactions by Month c) Registrations Distribution for reporting month

Section 11.0 Privacy Considerations

Provider ENUM data are intended primarily for use by service providers for the purpose of effecting interconnection. While this is simplified by having at least an initial AoR available in the public DNS, care in implementation is required to protect customer privacy. In particular, the following should be observed by SPRs in registering numbers into Provider ENUM.

- AoRs should not include information that would associate a person with a telephone number
- AoRs should identify carrier network elements rather than user customer premises equipment
- To prevent data miners from identifying active non-published numbers by identifying numbers registered in Provider ENUM that are not present in directory listings, SPRs should register all allocated TNs in blocks that contain TNs that they wish to register, whether or not those TNs are currently assigned and whether or not the SPR supports interconnection via ENUM for those TNs (in the latter case a tel URI can be provided in the registration.)

Annex 2

FORM OF CONFIDENTIALITY AGREEMENT

Whereas, the Country Code 1 ENUM LLC (the “LLC”) has issued the Provider ENUM Tier 0/1 Registry Request for Proposal dated _____ (the “RFP”); and

Whereas, _____ (the “Bidder”) wishes to submit a proposal in response to the RFP; and

Whereas, Bidder contemplates that in order to submit a complete response, it will be necessary for Bidder to furnish to the LLC certain information which consists of the business, financial, trade secrets, or other technical information, owned by Bidder (the “Bidder Confidential Information”); and

Whereas, the LLC wishes to review such Bidder Confidential Information in conjunction with its consideration of the Bidder’s proposal,

Now, therefore, in consideration of the Bidder’s submission of a proposal, and for other good and valuable consideration, the receipt and sufficiency of which is hereby agreed, the LLC agrees, as set forth below, to treat confidentially the Bidder Confidential Information, whether furnished before or after the date of this Agreement.

1. Bidder has clearly marked each page of its proposal that contains the Bidder’s Confidential Information. Bidder and the LLC agree that "Bidder Confidential Information" does not include information that (1) is or becomes generally available to the public (other than as a result of a disclosure prohibited by this Agreement), (2) was available to the LLC, its Member(s) or their Affiliate(s) on a non-confidential basis prior to its disclosure by the bidder, or (3) is or becomes available to the LLC, its Member(s) or their Affiliate(s) on a non-confidential basis from a source other than the bidder, provided that such source is not bound by a confidentiality agreement with the bidder.
2. The LLC and the Members shall have the right to use such Bidder Confidential Information and to disclose such Bidder Confidential Information to the Members and to the LLC’s and the Members’ and their Affiliates’ (as that term is defined by Paragraph 1.3 of the Request for Proposal) officers, employees, agents, contractors, consultants and counsel to the extent necessary to permit the LLC to carry out the LLC’s and its Members’ rights and responsibilities in conjunction with the RFP, as such rights and responsibilities are to be solely determined by the LLC.
3. The LLC shall not use such Bidder Confidential Information for any other purpose.

4. No Member or Affiliate of a Member who obtains access to such Bidder Confidential Information may use such information for any other purpose, including use in any competitive activities of such Member or Affiliate.
5. The LLC, its Members (and their Affiliates) shall use no less than a reasonable degree of care to protect the Bidder's Confidential Information. The LLC and its Member agree to establish and to maintain appropriate internal mechanisms to ensure that their officers, employees, agents, contractors, consultants and counsel, as well as the officers, employees, agents, contractors, consultants and counsel of their Affiliates, shall not disclose Bidder Confidential Information except for purposes authorized herein, provided, however, that in the event the LLC, its Members, their Affiliates, or their officers, employees, agents, contractors, consultants and counsel are requested or required in respect of any judicial or governmental administrative proceeding (by oral questions, interrogatories, requests for information or documents, subpoena(e), or similar process) to disclose any of the Bidder's Confidential Information, bidder understands and agrees that they will comply with such request or requirement.
6. The bidder agrees to indemnify and hold harmless the LLC and its Members officers, employees, agents, contractors, consultants, counsel, as well as its Members and their Affiliates (as defined in Par. 1.3) together with the officers, employees, agents, contractors, consultants and counsel of such Members and Affiliates for any and all liabilities, demands, damages, expenses and losses arising from this Confidentiality Agreement and/or the RFP and any subsequent contract award.
7. In the event that Bidder and the LLC enter into a contract for the provision of US ENUM Tier 1B Registry Services, this Agreement shall become null and void, and treatment of confidential information shall be governed solely by the terms of said contract.

BIDDER

By:

Title:

COUNTRY CODE 1 ENUM LLC

By:

Title: