Australian
ENUM
Discussion
Group

WG1/DOC 01

CONTEXT DOCUMENT FOR THE AUSTRALIAN ENUM TRIAL

Distribution is Unlimited

Disclaimer

This document discusses various aspects of the arrangements and operation of the Australian ENUM trial. It does not in any way imply that there will be a future commercial ENUM service in Australia

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Contents

I. READING THIS DOCUMENT

In order to facilitate the different priorities of different readers, this document has been divided into "zones of detail" with enough referencing and hyper linking to allow informed skimming of its various sections.

When reading this document, it is always important to keep in mind the distinction between an ENUM Trial System and a commercial ENUM system. Some issues that would be critical for a commercial ENUM system and which would need to be solved or considered carefully before such a system was commissioned can, and in some cases, should be treated differently when applied to an ENUM Trial System.

This document and its contents applies only to an ENUM Trial System.

Executive Summary

This provides a good overview of what this document is about. When discussing key concepts or proposals it also provides references (and hyperlinks) into the appropriate sections of the document. It should be considered both a summary and a road map.

If you wish to skim the document quickly, this is the place to start.

Introduction to the Overview Elements

For those (immediately) requiring more detail on the overall aspects of the trial then read the following sections:

Section 1.4 "What is ENUM"

This section attempts to give a brief overview of ENUM. ENUM is a technique that allows a network device to determine what services are associated with an E.164 number. E.164 numbers can be used to identify ordinary phones, fax machines, pagers, data modems, email clients, and text terminals. The services associated with an E.164 number may be reached using the traditional public switched telephone network or via the Internet, which has its own electronic addressing system based on IP addresses and domain names. ENUM may assist in the convergence between the two addressing systems. It is the applications that might be developed using ENUM and the policy and legal implications of using the existing E.164 numbering system in Australia to refer to services beyond the traditional public switched telephone network that need to be considered.

Section 1.5 "Trialling ENUM"

This section identifies a non-exhaustive list of trial objectives and also details the proposal for the trial structure and the rationale behind that structure.

Section 4 "Lifecycle Model"

This section proposes a framework for a trial that identifies:

- The phases of the trial (i.e. how it is going to happen);
- Who is responsible for each phase; and
- The outcomes for each phase.

In addition you might then want to look at the Reference Architecture (section 5.1) and the section dealing with the use of the numbers allocated to the ENUM trial (section 5.5).

Section 5 "Reference Architecture and Top Level Requirements"

The Reference Architecture and the Functional requirements of each of the subsystems and the various interfaces can be found here. Where Tier 1 requirements are discussed, these constitute the requirements for the Base Service.

Appendix 1 and 2 "Security and Privacy Guidelines"

All activities relating to data transfer and manipulation both within the Tier 1 Registry Operator and at the Tier 1 Registry Operator interfaces shall be performed in a way to ensure that they can only be accessed and deciphered by authorised parties.

The detail related to specific privacy and security guidelines for the Australian ENUM trial have been developed by separate Working Groups. These guidelines are included as Appendix 1 and Appendix 2.

II. EXECUTIVE SUMMARY

This summary is broken into three sections.

1. The first provides a general outline on what the document does and the expectations placed on the ENUM infrastructure providers.
2. The second is to provide a context by identifying the major trial participants and discussing the possible activities that they may undertake in an Australian ENUM Trial.
3. The third part summarises the major elements of the proposed structure of the Australian ENUM trial.

Note that if a commercial implementation of an Australian ENUM system were to eventuate in the future, the choice of the Tier 1 Registry Operator(s) for that system will be completely independent of the choice of Tier 1 Registry Operator made for the Australian ENUM Trial (see section 1.7, "Choosing Tier 1 Registry Operator(s)").

Section 1 - General Outline

This document proposes a three part approach to the Australian ENUM trial and a basic architecture for Part 1 of the trial.

Within the context of a Reference Architecture, (see figure 5.1) the document specifies a minimum Base Service that must always be available from the Tier 1 Registry Operator in order to ensure that trial participants have a stable experimental platform. Note that, while maintaining the Base Service to the trial participants, it is expected that the Tier 1 Registry Operator will also work on and test issues arising from the examination of some or all of the objectives identified in the section "Trial Objectives" (see section 1.5.4). Note that the Tier 1 Registry Operator and all trial participants will be encouraged to extend and modify the "Trial Objectives" in the light of experience.

All participants using the facilities of the ENUM Trial System will be required to share results. The mechanism(s) for facilitating this are beyond the scope of this document, but some suggestions are made in section 1.6, "Sharing Results".

Section 2 - Participants and Activities

The purpose of the Australian ENUM trial is to provide an environment where various entities (individuals or organisations) can perform one or more functions in an ENUM service model, and test different configuration options, different business models, and identify and recommend solutions to various administrative and regulatory issues that arise between the different functions.

The following is a list of some functions, and the issues that a trial could investigate. An entity could perform one or more of these functions.

Tier 1 Registry Operator (see the Reference Architecture of Figure 5.1)

The Tier 1 Registry Operator will be responsible for:

a) Maintaining a database that stores information about a fully qualified ENUM record associated with an E.164 number in the *Telecommunications Numbering Plan 1997* (e.g. 8.7.6.5.4.3.2.1.3.1.6.e164.arpa). The contents of this database shall be kept private in accordance with the *Privacy Addendum to the Context Document for the Australian ENUM Trial* (see Appendix 2).
b) Using the information in the database to create a zonefile for the 1.6.e164.arpa domain and operating a set of Tier 1 nameservers to supply the DNS information using established DNS query mechanisms. The Tier 1 Registry Operator shall maintain a primary nameserver and at least one secondary nameserver.
c) Providing a directory service, like the WHOIS service used for domain names, that provides publicly readable information about a particular ENUM record. Appendix 2 contains further information on the privacy considerations regarding the WHOIS service.
d) Implementing the RT1 interface to allow Registrars to remotely connect to and interact with the Tier 1 Registry.
e) Authenticating Registrars and interfacing with them via the RTI interface in order to perform registration related operations (establishing a pointer to a nameserver holding a customer NAPTR record, transfer of ENUM domain between Registrars, deleting cancelled ENUM domains)

f) Managing the set of E.164 numbers allocated by the ACA for the Australian ENUM trial. The Tier 1 Registry Operator, or an associated Carriage Service Provider, will issue these numbers to Registrars.

In addition, the Tier 1 Registry will be required to respond to ACA management instructions and to ensure that the Tier 1 Registry supports the use of E.164 numbers described in section 5.5 "Use of Numbers".

The specific data fields to be held in the Registry will be solicited during the call for expression of interest for the Tier 1 Registry Operator. As a guideline, it is expected that the following information about an ENUM number would be stored:

- Registrant (ENUM subscriber) contact information, including name and address;
- Technical contact information;
- Identity of the Registrar; and
- The domain name and IP address of a Tier 2 Nameserver that holds the subscriber's NAPTR record.

The trial might test different combinations of the information above for different ENUM records in the database to test privacy and performance issues.

For the purposes of the trial, the Tier 1 Registry Operator is not precluded from also being a Registrar (Tier 2 Registrar) and a Tier 2 Nameserver Operator. This will allow for trial participants to participate in the trial without operating any ENUM infrastructure. However, the Registrar function provided by the Tier 1 Registry Operator would be separated from the Registry. This Registrar would have to interface with the Registry via the same interface as all the other Registrars in the trial. This decision is in line with the approach adopted in the U.S. (see Ref[3], "…US Implementation of ENUM") and allows for:

- Development and testing of separate Registrar technologies and Registry technologies
- Possible future interoperability testing of Registrar and Registry sub systems both internationally and locally
- Positioning in a market place that both allows for and requires separate Registrar and Registry sub-systems

The arrangement allowing the Tier 1 Registry Operator to also function as a Registrar is for trial purposes only and represents a conflict of interest that is unlikely to be allowed in a commercial situation, due to the anti-competitive monopoly arrangement.

The Tier 1 Registry Operator would want to test the interfaces between the Tier 2 Registrars and the Registry Operator. The Extensible Provisioning Protocol (EPP protocol) would be an appropriate basis for communication. These interfaces may include different business models (e.g. per record fees, or some sort of fixed service fee for unlimited transactions). Note domain name registries typically operate via transaction fees for registration and renewal of records.

Tier 2 Registrars (Registrars in the Reference Architecture of section 5)

The Tier 2 Registrar (referred to as the Registrar from here on) is the entity that interacts with the customer. The ENUM trial system places no limit on the number of Registrars for the ENUM Trial System. The Registrar is responsible for:

- Registering new ENUM subscribers
- Authenticating the identity of an ENUM subscriber and validating their authority to make changes to an existing ENUM domain or register an existing telephone number as an ENUM number (existing numbers will not be used in the initial trial phase)
- Interfacing with the Tier 1 Registry Operator to establish a pointer in the Registry to the Tier 2 Nameserver holding the subscriber's NAPTR record
- Interfacing with a Tier 2 Nameserver Operator to provision a subscriber's NAPTR record (if the Registrar is not also a Tier 2 Nameserver Operator)
- Issuing ENUM numbers to new ENUM subscribers (initial trial phase does not allow for existing telephone numbers to be used as ENUM numbers)

Registrars will have to interface directly with the Tier 1 Registry Operator and as such will have to be accredited prior to registering any subscriber's ENUM numbers. The data fields to be provided to the Tier 1 Registry Operator by the Registrar will be decided during the call for expressions of interest for a

Tier 1 Registry Operator. At a minimum it is expected that the following information about an ENUM number would be provided:

- Registrant (ENUM subscriber) contact information, including name and address
- Technical contact information
- Identity of the Registrar
- The domain name and IP address of a Tier 2 Nameserver that holds the subscriber's NAPTR record

Registrars will typically, but not necessarily, also be Tier 2 Nameserver Operators (either directly or through outsourcing arrangements).

Tier 2 Nameserver Operators (see the Reference Architecture of section 5)

A Tier 2 Nameserver Operator is responsible for operating a nameserver (and probably a database with information about each entry in the zonefile on the nameserver) that contains NAPTR records associated with ENUM records in the Tier 1 Registry.

A Tier 2 Nameserver Operator would typically also be a service provider (e.g. a web hosting company), or a Registrar.

The provisioning system used by a Tier 2 Nameserver Operator is not specified as this will vary depending on the particular application and business model used by the Tier 2 Nameserver Operator. It is possible that a Tier 2 Nameserver Operator could maintain information associated with a particular NAPTR record that is in turn maintained by separate service providers. Different Tier 2 Nameserver Operators may have very different business models.

Service Provider

A service provider uses ENUM to provide a service to an end user. The service provider might want to trial different service offerings in a market trial with end users. These service offerings which would typically use ENUM as an "enabling" technology and may include a Voice Over IP service (VOIP), or a contact management service.

The service provider may wish to test interfaces to a Registrar. The service provider may wish to have access to a directory service to assist with administration (i.e. a WHOIS like service).

Application developer

An application developer may wish to trial different end-user software (e.g. that runs on an Internet connected PC) that makes use of ENUM. Possible applications that could use ENUM include email client and web browsers. The application developer may wish to market test different ideas with actual end users. The application developer may want to assist end users to register ENUM records via a Registrar.

End user

An end user may wish to learn about how new services can be useful for their activities (it is unlikely that the end user will be aware of ENUM, just as most end users are not aware of the DNS). The end user may work with an application developer or service provider. The end user will be interested in both how useful the new services are, and also want to know whether using the service will expose the user to undesirable consequences (e.g. SPAM in the case of using an email service). Consumer groups may be able to assist end users to understand the risks as well as advantages of services, and assist in setting policies.

Regulator

A regulator might want to examine how the introduction of ENUM may impact established policies surrounding the telecommunications industry and existing uses of E.164 numbers, and policies surrounding the use of the DNS in Australia. The regulator will need to understand whether ENUM provides the means for anti-competitive conduct, or avoidance of existing policy regulation (e.g. law enforcement issues associated with tracing calls).

Section 3 - Proposal for the Operation of an Australian ENUM Trial

It is proposed that the Australian ENUM trial have three parts, (see section 1.5.3 "Trial Staging") some of which will run concurrently.

ENUM Trial – Part 1

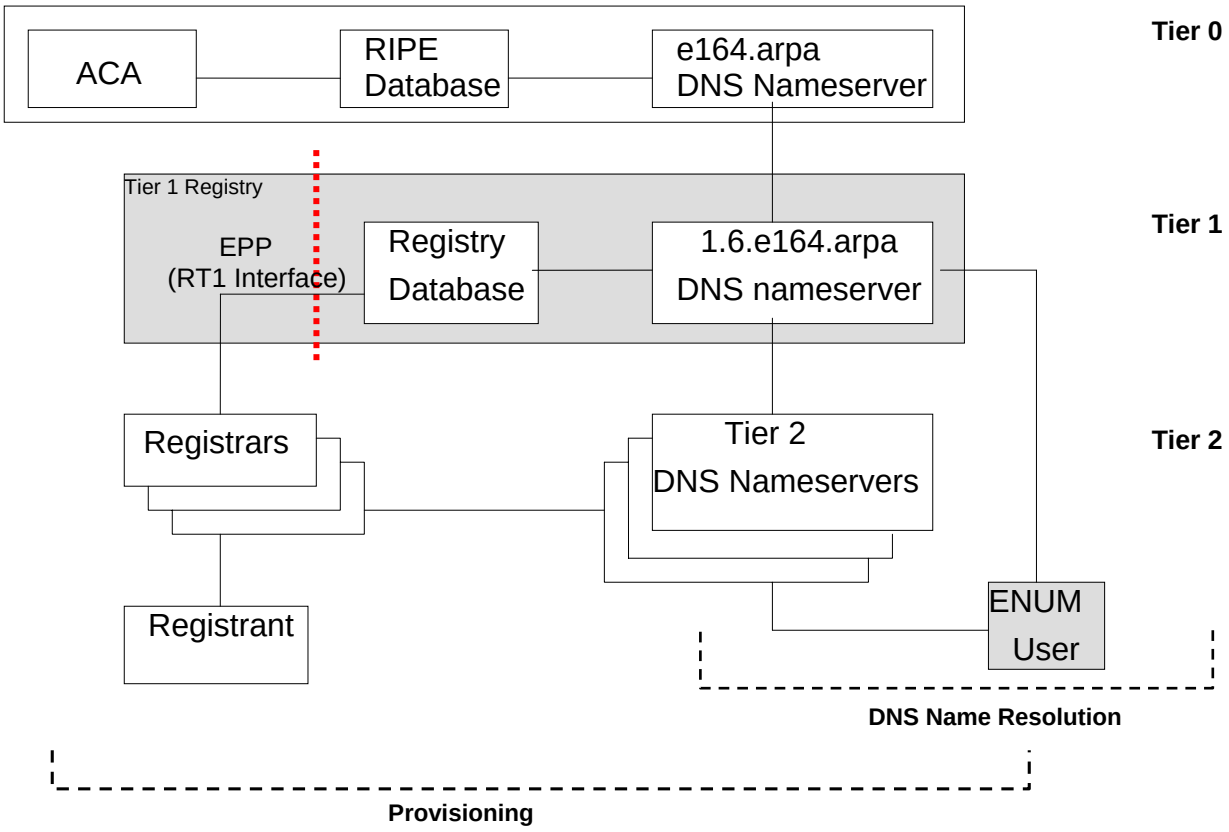
The Part 1 Trial will use E.164 numbers which are part of the *Telecommunications Numbering Plan 1997* but which have not been allocated to any Carriage Service Provider. These numbers will be allocated by ACA to the Tier 1 Registry Operator or an associated Carriage Service Provider, which in turn will issue numbers to Registrars (see section 5.5, "Use of E.164 Numbers"). The ACA could also allocate numbers directly to registrars that are carriage service providers. Part 1 of the trial will operate in accordance with the lifecycle model identified in this document (see section 4, "Lifecycle Model").

The trial places no limit on the applications that can be trialled, but it should be noted that in Part 1, it would not be possible to provide any to any connectivity where any PSTN user could use one of these numbers to complete a telephone call.

The Part 1 ENUM Trial System will have a single Tier 1 Registry Operator and will allow for multiple Registrars, and Tier 2 Nameserver Operators where required for particular application by trial participants (see section 5, "Reference Architecture" or the figure below).

To be part of the trial, Registrars will need pass a technical interface test with the Tier 1 Registry Operator. The Tier 1 Registry Operator will provide as a minimum, a continuing Base Service which includes; a Tier 1 nameserver with support for nameserver records (to refer to Tier 2 nameservers). The Tier 1 Registry Operator will also have the option of providing support for NAPTR records, which effectively allows the Tier 1 Registry Operator to also perform the function of a Tier 2 Nameserver Operator (to allow trial participants to participate without operating any ENUM infrastructure).

The Base Service is defined in section 5 of this document. Note that other types of service are not precluded by this condition. In fact, their development and testing is encouraged.



ENUM Trial – Part 1 – Top Level Reference Architecture (see Figures 5.1 and 5.2), showing the logical separation of the Tiers (See the section "Definition of Terms" for terminology)

ENUM Trial – Part 2

The purpose of this part of the trial is to study issues associated with using already allocated non-geographic numbers from the *Telecommunications Numbering Plan 1997*. It is likely that this part of the trial will commence once there is a significant commitment from trial participants and industry to implement a commercial ENUM infrastructure in Australia based on experiences gained in part 1 of the trial, and also the rate of ENUM acceptance in other countries (and hence likelihood of support in commonly available hardware and software). Some of the analysis of the regulatory and implementation issues can be carried out during part 1 of the trial.

ENUM Trial –Part 3

This part will tackle the issues associated with using geographic numbers from the *Telecommunications Numbering Plan 1997*, and consider how to provide any to any connectivity based on such technology. This part will only occur if it is considered at the time that it is appropriate to use geographic numbers for ENUM. Consideration of this issue will involve examination of the consumer, regulatory and business issues that may arise from using geographic number range for ENUM.

1. INTRODUCTION

1.1. What is the Purpose of this Document

This document identifies the working arrangements that must be established between industry and the Australian Communications Authority in order to allow an Australian ENUM trial to proceed. It is based on the assumption that the ACA has the country code "61" delegation.

It also identifies and describes the top level requirements for the Australian ENUM Trial System (ETS).

The working arrangements should allow individual organisations to explore various aspects of an ENUM service. The following is a list of some of the aspects that may be explored within the context of the Australian ENUM trial. Note that the list below is for illustrative purposes and is not meant to be exhaustive.

- Legislative and Regulatory aspects
- Possible commercial applications
- Business models that may be appropriate to ENUM
- Security aspects of an ENUM service
- Privacy aspects of an ENUM service
- Performance aspects of an ENUM service
- Compliance Testing Facilities

1.2. Who is the Intended Audience for this Document

This document is being prepared for the Australian ENUM Discussion Group (AEDG)

1.3. The Australian ENUM Discussion Group (AEDG)

1.3.1. Mission

The Australian ENUM Discussion Group is a consultative and advisory body designed to assist stakeholders in responding to the policy, regulatory, technical and commercial implications associated with the introduction of ENUM, particularly for E.164 numbers allocated within the "61" country code.

It is hoped that the Discussion Group meetings and any trial outcomes will put Australia on the front foot in creating a platform for innovation that will benefit Australian citizens and businesses.

1.3.2. Scope

The main tasks of the Australian ENUM Discussion Group are:

- providing a national forum for the discussion of ENUM and related issues;
- maximising Australia's role in relation to ENUM internationally;
- identification and development of regulatory, technical and commercial issues in relation to ENUM;
- identification of consumer and privacy issues and the development of regulatory arrangements to address these issues;
- monitoring international ENUM developments, including overseas trials, and considering their implications for Australia;
- assisting the ACA in developing the prerequisites and objectives for ENUM trials and the oversight of those trials;
- advising on results and experiences gained during ENUM trials,
- providing (as appropriate) upstream input to ITU-T and IETF, and
- determining the different potential uses of ENUM.

1.3.3. Membership

The membership of the Australian ENUM Discussion Group should:

- comprise representatives from the telecommunication and Internet industries and community, consumer groups, privacy organisations and regulatory authorities; and
- be of a manageable size to ensure progress of issues.

The Discussion Group is not a formal decision making body with member voting rights, but rather a consultative and advisory body designed to move ENUM issues forward.

1.3.4. Working Groups

The Australian ENUM Discussion Group may create working groups as required for the consideration of issues that have a defined objective or specialised focus. Members of the Discussion Group may nominate to participate in working groups.

The working groups will be responsible for reporting to the Discussion Group on its progress, and the Discussion Group will be responsible for delivering and approving working groups' objectives, timeframes and outputs.

The Tier 1 trial working group (WG1) was established to develop this context document and any detailed requirements that may be necessary to establish and run the ENUM trial.

1.4. What is ENUM

ENUM is a new proposed standard by the IETF (see "E.164 number and DNS" Ref[1]) and the ITU (see the E.164 Supplement Ref[2]) whereby the Domain Name System (DNS) can be used for identifying available services associated with one E.164 number [3].

Using ENUM, a network user, a piece of software in a machine, or a "network" can look up what services are associated with a specific E.164 number and its holder in a decentralised way with distributed management of the different levels in the lookup process.

Thus, by looking up a particular E.164 number in the ENUM database, you may obtain such information as: email addresses, web pages and Session Initiation Protocol addresses that are "bound" to that E.164 number.

How does that information become "bound" to a particular E.164 number? The entity responsible for the number enters that information into the ENUM system and is able to edit and remove it at any time. An entity (which may be an individual, corporation or service provider) that does this is referred to as a Registrant (also ENUM registrant).

In its own right, ENUM is a simple lookup service with the lookup index being the E.164 number. However, once in existence it may become a "keystone" building block in a number of other Applications and Services.

To communicate with an ENUM registrant, a person need only know their "telephone number" (i.e. E.164 number). A national/international ENUM system could provide all other contact information back to the entity making the enquiry, that is, if allowed by the ENUM registrant.

As an aid to this description of ENUM consider the following very possible ENUM scenario where a customer (call this one customer A) wishes to send an email to another customer called customer B. We'll assume that customer A has customer B's E.164 number and that customer B has registered this number with the ENUM system:

Customer A (the caller) enters customer B's phone number (i.e. E.164 number) into his equipment (e.g. voice enabled computer, or an "intelligent" phone) and also enters that the required mode of communication is email. Customer A's equipment will query the ENUM system with customer B's E.164 number. The ENUM system will use this number to retrieve customer B's services profile and contact data. The calling customer's terminal will then use the appropriate part of the profile to establish the email communication.

In the next instance, customer A wishes to place a mobile call to customer B. The same number that was used to find the email name is still used to find the mobile number.

In summary, the basic ENUM service can be thought of as being much like a "Telephone Book" which is implemented electronically on the globally distributed database system called the DNS. Instead of being indexed by name it is indexed by phone number. Such an international "Directory Service" may give rise to a variety of ENUM enabled Applications and Services.

1.5. Trialling ENUM

1.5.1. The Need for a Trial

ENUM technology may provide new areas of opportunity where Australian industry can directly participate in the development of national and international applications, services and infrastructure. In addition, the introduction of a national ENUM service may affect the efficiency of national industry in ways that are as yet not understood.

In order to understand and develop both areas, it is necessary to gain practical "hands on" experience in the implementation, provisioning, operation, development of ENUM services, and understand the different business models of applications that make use of the ENUM service.

1.5.2. A Complete Strategy (PSTN and Internet)

Any complete strategy for an Australian ENUM trial must include PSTN/Internet working. However, at this time, the technical and regulatory issues have yet to be resolved.

For example, any "interconnection" of the PSTN call control system (via the call control databases) may open the PSTN to hacking via the DNS. Whether security attacks can develop in this way is unknown, but given that the consequences of such attacks can be major disruption to all telecommunication services (PSTN and Internet) it is prudent to err on the side of caution. Note that direct access to the PSTN/ISDN signalling system is not being advocated by this document.

It is likely that trial participants will initially trial private network applications such as the interconnection of corporate PABXs that are connected to the Internet via gateways.

The essential difference between the DNS and PSTN service control points (service control points are the "call control databases" that provide routing data to a circuit switch based on the input of a phone number) is that the DNS is a highly distributed database globally accessible to any device or network connected to the Internet. Service control points are a highly specialized and restricted databases available only to uniquely authenticated and authorized PSTN switches.

Appropriate domain name holders can modify DNS entries while only authorised carriers can modify data in PSTN service control points. Most importantly, information in the DNS is available to all Internet users, unlike information in the PSTN/ISDN which is often restricted to the operating carriage service provider. This is a fundamental point of difference.

1.5.3. Trial Staging

The proposed staging of the ENUM trial is based upon the types of E.164 numbers used. Part 1 will use E.164 numbers which are part of the *Telecommunications Numbering Plan 1997* but which have not been allocated to carriage service providers. This type of number is often referred to as being "not live". In all stages it is proposed that "real" (i.e. numbers that form part of the Numbering Plan) numbers be used.

In order to cater for and allow for a considered study of the differences between the PSTN and Internet worlds, it is proposed that the trial proceed in a number of parts:

ENUM Trial Part 1 - limited (separate part of the 61 Numbering Plan)

An ENUM Trial System is set up containing a single Tier 1 Registry Operator and multiple Registrars, with the option to allow trial participants to operate Tier 2 nameservers as part of various application scenarios. The Tier 1 Registry Operator must develop agreements with Registrars (to cover issues such as competence in DNS management, and opt-in to privacy legislation where necessary), and also test the interface between itself and the Registrars, for example using the EPP protocol. Trial participants do not need to operate any ENUM infrastructure nor do they need to be accredited as either the Tier 1 Registry Operator or a Registrar, and may purely take advantage of the ENUM trial infrastructure to test various applications.

The Part 1 Trial will use E.164 numbers which are part of the *Telecommunications Numbering Plan 1997* but which have not been allocated for use by any Carriage Service Provider. These numbers will be allocated by the ACA to the Tier 1 Registry Operator (or an associated Carriage Service Provider) which in turn may issue numbers to Registrars, which in turn may issue the number to ENUM registrants (who may be individuals, corporations, or service providers). The ACA could also allocate numbers directly to registrars that are carriage service providers.

This approach allows groups in the trial to co-operate and work with one another and to co-operate and work with international groups. It will not support any to any connectivity that would allow any PSTN user to use the number to make a call to a user on the Internet, as this would require significant changes in the PSTN routing infrastructure of the various carriers. It will however support limited private network routing of calls via PABXs connected to Internet gateways (i.e. Voice Over IP applications).

Note that testing of applications involving the crossover of internet telephony calls to and from a PSTN are possible in this part of the trial if a trial participant is working with an international group with access to a Carriage Service Provider that allows such crossover.

Part 1 of the ENUM trial is expected to enable participants to:

a. Identify the possible applications/services that would require full service from the PSTN to the Internet using ENUM;
b. Identify generic application/services that may be possible in the future;
c. Determine which of these applications may have sound business cases;
d. Determine which of these applications are likely to be of strategic value to each of the participants;
e. Identify the regulatory issues (i.e. are the applications allowed under the current regulatory framework and if not, what changes can be made) and obligations associated with these applications;
f. Identify and describe any specific privacy issues related to these applications that are not covered by the current Australian Privacy legislation;
g. Identify specific privacy principles and approaches that may solve the privacy issues identified above;
h. Identify the security threats and likely security attacks associated with the implementation of these applications/services;
i. Identify the consequences and costs if a security attack is successful;
j. Identify the security controls that must be in place to reduce the probability and cost of a successful attack to an "acceptable" level (implicit in this is also the determination of what "acceptable" means); and
k. Test interfaces between Registrars and the Registry.

ENUM Trial – Part 2 (Authorisation, Authentication and Regulation)

The purpose of this part of the trial is to study issues associated with using already allocated non-geographic numbers from the *Telecommunications Numbering Plan 1997*. It is likely that this part of the trial will commence once there is a significant commitment from trial participants and industry to implement a commercial ENUM infrastructure in Australia based on experiences gained in part 1 of the trial, and also the rate of ENUM acceptance in other countries (and hence likelihood of support in commonly available hardware and software). Some of the analysis of the regulatory and implementation issues can be carried out during part 1 of the trial.

This section of the trial is broken into two parts, namely:

Part 2a – Inclusion of some existing non-geographic numbers (possibly mobile telephone numbers)
The focus will be on issues of authorisation, authentication and regulation.

Part 2b – Examination of regulatory issues regarding geographic telephone numbers
This part of the trial will examine regulatory and application issues such as issues associated with charging, number portability and further PSTN/interworking.

ENUM Trial –Part 3 (Geographic numbers)

This part will tackle the issues associated with using geographic numbers from the Australian E.164 number plan, and consider how to provide universal services based on such technology. This part will only occur if it is considered at the time that it is appropriate to use geographic numbers for ENUM. Consideration of this issue will involve examination of the consumer, regulatory and business issues that may arise from using geographic number range for ENUM.

1.5.4. Trial Objectives

The trial of ENUM may allow a range of Business, Regulatory and Technical objectives to be tested. They may include, but are not limited to the following:

Business Objectives

a) Identification of new applications that can be developed using the base ENUM service.
b) Identification of the financial models for possible commercial services.
c) Development of initial “Top Level” business cases for some or all these applications.
d) Identification of any specific strategic (national and/or industry sector specific) issues related to some or all of these applications.
e) Determination of the likely behaviour of customers for each of the applications identified above. For example, this may include how often will they change their data or how much data they will store on the National ENUM system.
f) For each application determine likely customer expectations with respect to availability and response time.
g) Identification of potential value added services to be incorporated in the ENUM databases.
h) Determination of the administrative and operational procedures necessary to run any future ENUM services.

Regulatory Objectives

In developing any future basic Australian ENUM service (on which other services and applications will be developed), some or all of the following must be considered:

a) Service Availability Aspects

- It may be necessary to regulate the structure of any ENUM service to guarantee continuity of service and to guarantee that the maximum ENUM response time is less than or equal to a certain value.
- If applications using the basic ENUM service are, or are likely to become critical to the Australian economy or security, then the service must be guaranteed, or mechanisms put into place to ensure that the critical applications operate at some reduced, but acceptable level.

- If existing services such as PSTN based telephony become dependent upon an ENUM system then a guaranteed level of PSTN service availability must exist in the event of partial or complete denial of the ENUM system service.
- Whether a mandated degree of redundancy is required in any basic ENUM service to guarantee continuity of service, and if so, what form should it take and to what level.

b) Basic Australian ENUM Service Structure and ENUM Response Time

- Whether any future basic ENUM service will have one or many Tier 1 Registry Operators and what are the relative advantages and disadvantages of the one or many Tier 1 model.
- Determination of whether Tier 1 Registry Operators are equivalent to Carriage Service Providers (CSPs) as defined in the Telecommunications Act 1997.
- If Tier 1 Registry Operators are deemed not to be equivalent to Carriage Service Providers, what are their rights and responsibilities and what legislation covers their operation.
- Determination of the selection criteria for the Tier 1 Registry Operator for a future commercial ENUM arrangement, if applicable.
- Determination of the accreditation criteria for Registrars for a future commercial ENUM arrangement, if applicable.
- To satisfy security requirements of different industry segments consider the issue of controlled access to parts of the ENUM domain name tree. That is, will the Australian model have a single ENUM service, where some or all of the following are true:
  - all tiers are open to any DNS query from the internet; or
  - some operators in each tier allow queries only from specially authorised entities (e.g. network gateways, networks or computers).
- If the Australian model is to have controlled access to various security zones in the ENUM DNS tree, then how will the zones be determined, what level of security will be required and how shall it be administered?
- Whether the Australian model will mandate a separation of the Registrar and Registry functions:
  - at all tiers;
  - only at Tier 1; or
  - or not at all.
- Whether a mandated maximum ENUM response time is required, and if so, what that time should be. It is noted that in any common resource system (such as the DNS) specifications related to response times can only be formulated in terms of probability.
- Whether a mandated minimum availability figure is required:
  - at all tiers;
  - only at Tier 1; or
  - not at all.

- If a mandated minimum availability figure is required, what should it be.

c) PSTN Aspects

- Where crossover services such as PSTN/Internet telephony exist, determine if call location determination is required and if so, how shall it be done.
- Determine, whether as a principle that the PSTN service must be maintained at a particular level regardless of the state of any interconnected ENUM systems.
- Determine the possible PSTN service degradation scenarios for progressive implementation of ENUM enabled services and/or for those cases where particular network functions are moved onto ENUM DNS systems.
- Determine what legislation (if any) is required to mitigate any possible basic PSTN service degradation under the conditions identified above.
- Security of the PSTN. Any “interconnection” with ENUM potentially opens the control systems of the PSTN to security attacks from the internet. Determine the likely Threat/Impact/Counter measure

scenarios.

d) Numbering Aspects

- Ensuring present obligations surrounding specific parts of the E.164 number range in Australia can continue to be met in an environment using the ENUM service.
- Methodology for determining the right to register an E.164 number with an ENUM database (i.e. who "owns" a E.164 number and how is their ownership proved).
- Methodology for resolving disputes of "ownership" of E.164 numbers.
- Methodology for number allocation for any future ENUM services.

The trial should further examine the issue of authentication (how, what authority, how much identification is needed, who has the right to make an entry for a number).

e) Privacy Aspects

- What requirements exist to ensure that ENUM end users know that any information that they associate with "their" telephone number is available to anyone or anything issuing a query to the ENUM system.
- Review of the provisions of the Australian privacy legislation to determine what, if any parts need to be modified to cover the introduction of an ENUM service.
- Review of the provisions of the Australian privacy legislation to determine what, if any parts need to be modified to cover the introduction of any new applications that may arise by using the basic ENUM service.
- Determine whether mechanisms are required to ensure that customers' phone numbers cannot be used to identify specific customers by name. If so, then what should they be?
- Determine whether mechanisms are required to ensure that customer data on ENUM databases cannot be read by unauthorised parties and if so what should they be and should they be mandated.
- Determine whether mechanisms are required to ensure security of this data when it is transferred from computer to computer and if so, what form should they take and whether they should be mandated.

f) Illegal Business Operations

- Determine whether as a principle it is necessary to prevent access to any ENUM based services by business operations that are headquartered outside of Australia, but which offer services in Australia via the internet that are illegal in Australia.
- Determine whether in practice such denial will actually stop these illegal services from operating in Australia.
- If it is practical to stop a service by denying access to the Australian sub-tree of any future ENUM service and it is determined as being appropriate. What mechanisms must be put into place?

Technical Objectives

In developing any future basic Australian ENUM service (on which other services and applications will be developed), some or all of the following must be considered:

a) General Technical Objectives

- To provide a facility that will allow service providers to trial different service and application offerings in a market trial with end users (e.g. Voice Over IP or a contact management service).
- To provide a facility that will allow application developers to trial different end-user software (e.g. that runs on an Internet connected PC) that makes use of the base ENUM service. Possible applications that could use the base ENUM service include email client and web browsers. The application developer may

wish to market test different ideas with actual end users. The application developer may want to assist E.164 number holders to register ENUM records via a Registrar.

- An end user may wish to learn about how new services can be useful for their activities (it is unlikely that the end user will be aware of ENUM, just as most end users are not aware of the DNS). The end user may work with an application developer or service provider. The end user will be interested in both how useful the new services are, and also want to know whether using the service will expose the user to undesirable consequences (e.g. SPAM in the case of using an email service). Consumer groups may be able to assist end users to understand the risks as well as advantage of the services, and assist in setting policies.
- For a given application or service response time, identify database and "circuit" capacity requirements.
- Identification of the characteristics of any ENUM service security zones.
- Design criteria for gateway filtering functions that may be required to protect different ENUM service security zones.
- End user to end user interoperability of the base ENUM service.
- Development of software and hardware for new applications and services that use the ENUM Base Service.
- End to end performance testing of the new applications and services.
- Development and testing of security mechanisms to safeguard the ENUM system and user data.

b) **Objectives Concerning the Tier 1 Registry Operator**

Note that whilst testing various objectives, the Tier 1 Registry Operator will be required to maintain, at all times, a base service that the trial participants can rely on. This base service is defined in the subsection 5.3.4.2 entitled "Tier 1 Registry Operator". Some of the technical issues that may need to be examined are described in the following:

- The Tier 1 Registry Operator will maintain a database that stores information about a fully qualified ENUM record associated with an E.164 number in the Australian numbering plan. E.g. 8.7.6.5.4.3.2.1.3.1.6.e164.arpa.

  The trial might test different combinations of that information for different ENUM records in the database to test privacy and performance issues

  The information could include:

  - full contact and eligibility details for the holder of the E.164 number
  - the identity of the Registrar responsible for maintaining the record in the registry
  - the domain name and IP address of a nameserver that holds further information associated with each ENUM record (e.g. NAPTR records)
  - the information necessary to create the NAPTR records

- The Tier 1 Registry Operator will use the information in the database to create a zonefile for the 1.6.e164.arpa zone, and operate a set of nameservers (Tier 1 nameservers) to supply the DNS information using established DNS query mechanisms. This zonefile may contain only nameserver records for the Tier 2 nameservers that provide further information (via NAPTR records), or it could also contain NAPTR records (which would contain information about the services associated with an ENUM number) for particular ENUM records. Allowing the Tier 1 Registry to also hold NAPTR records, effectively gives the Tier 1 Registry Operator the option to also provide the Tier 2 Nameserver Operator function in the reference architecture.

- The Tier 1 Registry Operator must also provide a directory service (e.g. like WHOIS used for domain names) that provides "publicly" readable information about a particular ENUM record.

  The directory service could publish a subset of the information contained in the Tier 1 database, in accordance with the Privacy Guidelines included as Appendix 2.

- The Tier 1 Registry Operator is required to test the interfaces between the Registrars and the Tier 1 Registry Operator. An appropriate protocol must be used, for example the EPP protocol.

- These interfaces may include different business models (e.g. per record fees, or some sort of fixed service fee for unlimited transactions). Note domain name registries typically operate via transaction fees for registration and renewal of records.

c) Objectives Concerning the Registrars (see Registrar in section 5)

- A Registrar would be responsible for placing, maintaining and deleting records in the Tier 1 registry which point to Tier 2 nameservers holding registrants' NAPTR records. See the section "RT1 (Registrar to Registry at Tier 1)"

  The specific information to be provided to the Tier 1 Registry Operator by the Registrar will be decided during the call for expressions of interest for a Tier 1 Registry Operator. At a bare minimum it is expected that the following information would be provided:
  - full contact and eligibility details for the holder of the E.164 number;
  - technical contact information
  - the identity of the Registrar responsible for maintaining the record in the registry;
  - the domain name and IP address of a nameserver that holds further information associated with each ENUM record (e.g. NAPTR records)

- The Registrar must test administrative procedures for verifying the identity of an E.164 number holder, and determining when to update or delete an ENUM record in the Tier 1 Registry. The Registrar may wish to deal directly with holders of ENUM numbers, or deal only through service providers.

- The Tier 1 Registry Operator will develop tools and procedures to test the interfaces between the Registrars and the Tier 1 Registry Operator.

d) Objectives Concerning other Trial Participants

Trial participants will be seeking to determine whether the ENUM service is useful in various applications. A trial participant need not be a Tier 1 Registry Operator, or a Registrar, and does not need to operate any ENUM infrastructure. Some trial participants will choose to operate a Tier 2 Nameserver. The provisioning systems associated with a Tier 2 Nameserver Operator will depend on the specific application and business model, and this document does not attempt to document possible models. A Tier 2 Nameserver Operator may choose to implement a similar model to tier 1 of the ENUM infrastructure.

1.6. Sharing Results

As a general guideline, organisations using the facilities of the ENUM Trial System will be required to share results and insights gained from the trial. The exact mechanisms that will be used to facilitate this have yet to be developed by the AEDG but they may include the following:

- An ENUM Trial website providing the facility to post results;
- An ENUM Trial website providing links to the web sites of participating organisations. It is expected that those organisations will keep their sites updated with results, views and insights; or
- Physical discussion forums and Working Groups to promote "face to face" contact and discussion.

1.7. Choosing Tier 1 Registry Operator(s) for a Possible Commercial System

Note that if a commercial implementation of an Australian ENUM System were to eventuate in the future, the choice of the Tier 1 Registry Operator(s) for that system will be completely independent of the choice of Tier 1 Registry Operator made for the Australian ENUM Trial.

The ACA and AEDG reserves the right to develop completely new selection criteria and processes for the selection of any future Tier 1 Registry Operators in any possible future commercial version of an Australian ENUM system.

2. ACKNOWLEDGEMENTS & REFERENCES

2.1. Acknowledgements

Significant use has been made of material in the "ENUM Forum Specifications for US Implementation of ENUM", Ref[3].

2.2. References

[1] "E.164 number and DNS",
RFC2916, Internet Engineering Task Force

[2] "Numbering Plan of the International Telephone Service - Supplement: Operational and administrative issues associated with National Implementations of ENUM",
ITU-T, E.164 Supplement (05/2002), International Telecommunications Union

[3] "ENUM Forum Specifications for US Implementation of ENUM",
Document # 6000_1_0

[4] "ENUM: Mapping Telephone Numbers Onto the Internet – Potential Benefits with Policy Risks", Center for Democracy & Techncology,
(see http://www.cdt.org/standards/enum/030428analysis.pdf)

[5] "Secret Key Transaction Authentication for DNS (TSIG)",
RFC 2845, Internet Engineering Task Force

[6] "Domain Name Security Extensions",
RFC2535, Internet Engineering Task Force

[7] "The TLS Protocol",
RFC 2246, Internet Engineering Task Force

3. DEFINITION OF TERMS

ACA	Australian Communications Authority
ACIF	Australian Communications Industry Forum
AEDG	Australian ENUM Discussion Group
Authenticated Communications	A phrase used to describe the requirement that all entities in a communication be required to prove that they are who they represent themselves to be
Authoritative	Generally referred to the nameservers responsible for maintaining a particular subdomain of the Domain Namespace. These nameservers are said to be authoritative for that namespace
Base Service	This is the minimum service that the Tier 1 Registry Operator is required to offer. It is necessary to define a Base Service in order to ensure that the trial system offers a stable base for all participants. The base service is described in section 5.3.4.2 of this document.
E.164	The numbering Plan for the International Telecommunications Service
Entity	Represents any of the following elements in the Australian ENUM Trial; people, organisations, software, hardware, networks, computer systems.
ENUM Registrant	Interfaces to a Registrar for the purposes of entering and making changes to records in the tier 1 registry.
ENUM Response Time	The time interval between the first E.164 ENUM query (of an iterative set) crossing the DN1 interface and the arrival of the NAPTR records associated with the E.164 number at the DN1 interface of the querying terminal
EPP	Extensible Provisioning Protocol. This protocol standard allows for the separation of Registrar and Registry function. This supports a competitive business model where competing Registrars use a Shared Registry
ETS	Australian ENUM Trial System. This refers to all of the entities involved and the interactions between them. Note that these interactions include technical flows (DNS queries) and business flows (reports). The scope of the ETS is illustrated in the Reference Architecture of Figure 5.1
IETF	Internet Engineering Task Force
ISDN	Integrated Services Digital Network
ITU	International Telecommunications Union
Nameserver	An particular computer system in the DNS that is responsible (see Authoritative) for a subdomain of the Domain Name Space and which will perform name to address translations services and address to name translations services to the internet community
Namespace	The set of all possible names
NAPTR	Naming Authority Pointer A pointer in a DNS that identifies the systems responsible for a particular subdomain in the Domain Name Space
NAPTR Records	Naming Authority Pointer Records This refers to the information stored by the systems responsible for a particular subdomain in the Domain Name Space
Privacy Guidelines	The set of rules and conventions to ensure an appropriate level of Privacy for the Australian ENUM Trial, included as Appendix 2.
Provisioning	The process of gathering information for the DNS and then publishing it so that some (or all of it) can be accessed by the general internet community by querying an authoritative nameserver
PSTN	Public Switched Telephone Network

Registrars	Tier 2 Registrars. The organisations responsible for taking registration requests from customers, placing records in the Tier 1 Registry and interacting with Tier 2 Nameserver Operators to provision customer's NAPTR records.
Tier 1 Registry Operator (ROP)	Australian Tier 1 Operator. The organisation that implements the Tier 1 Requirements (T1R) using the Tier 1 System (T1Sys) and required business structures and processes.
RIPE	European IP Research Institute
Secure Communications	A phrase used to describe the requirement that the content of a communication remain secret to all entities except those that are specifically authorised to view the content
Service Provider	A service provider would be a user of ENUM that uses it to provide a service to an end user
SIP	Session Initiation Protocol. SIP is an Internet proposed standard documented in RFC 2543 for setting up, controlling and tearing down sessions in the Internet. Sessions include, but are not limited to, Internet telephone calls and multimedia conferences
SSH	Secure Shell Protocol This is a protocol suite that provides a set of network "connectivity" tools used for secure "logins" to systems, typically for administrative activities
T1ADMIN	Administrative Functions and Systems for Tier 1 *(Note that it is not clear whether this separation of Administrative functions from the Tier 1 Domain Name System (T1DNS) is necessary)*
T1DNS	Tier 1 Domain Name Servers This represents the cluster of nameservers that are authoritative for the namespace under the control of ROP. In practice these nameservers will contain pointers to the AT2OP nameservers in the various T2DNS clusters that contain the actual NAPTR records for the numbers currently under their control
T1R	Tier 1 Requirements The Functional, Technical and Business Requirements that must be implemented by the organisation (see ROP) selected to operate the Tier 1 component of the ETS
T1REG	Tier 1 Registry This comprises a section that deals with the DNS operation necessary to serve ENUM DNS requests. In the Australian ENUM trial, the T1REG will hold information that "points" to the T2REG that holds the NAPTR records for specific registered E.164 numbers
T1Sys	Tier 1 System This refers to the Hardware and Software that implements part of the Tier 1 Requirements (T1R)
T2DNS	Tier 2 Domain Name Servers This represents the cluster of nameservers that are authoritative for the namespace under the control of a particular Tier 2 Nameserver operator
Tier 2 Nameserver Operator	Australian Tier 2 Nameserver Operator. A trial participant may optionally choose to operate a Tier 2 Nameserver.
WG1	Working Group 1, also referred to as the Tier 1 Trial Working Group. This is the name for the Working Group established to develop this Context document and an subsequent detailed Requirements.
ZN1	Zone File Transfer Interface for Tier 1 This refers to the interface used by the Primary nameserver in the Tier 1 Registry Operator to update the zone files in the secondary nameservers. It is identified in this document because it is a security risk if the primary and secondary nameservers of a tier are geographically separated

4. LIFE CYCLE MODEL FOR THE ENUM TRIAL

4.1. Introduction

The model of figure 4.1 describes how the Australian ENUM Trial System (ETS) project shall unfold. It indicates that work shall proceed on a phase by phase basis, with work in any particular phase being managed by the AEDG. Note that this diagram does not preclude parallel activities in many phases at once. The actual approach to work taken is a project management decision made by the AEDG. The AEDG reserves the right to terminate the development of the ETS at any time.

The ETS Lifecycle Model identifies the phases in the development and conclusion of the ETS. It also identifies the general outcomes for each phase and the Groups or individuals responsible for each phase of the trial's lifecycle.

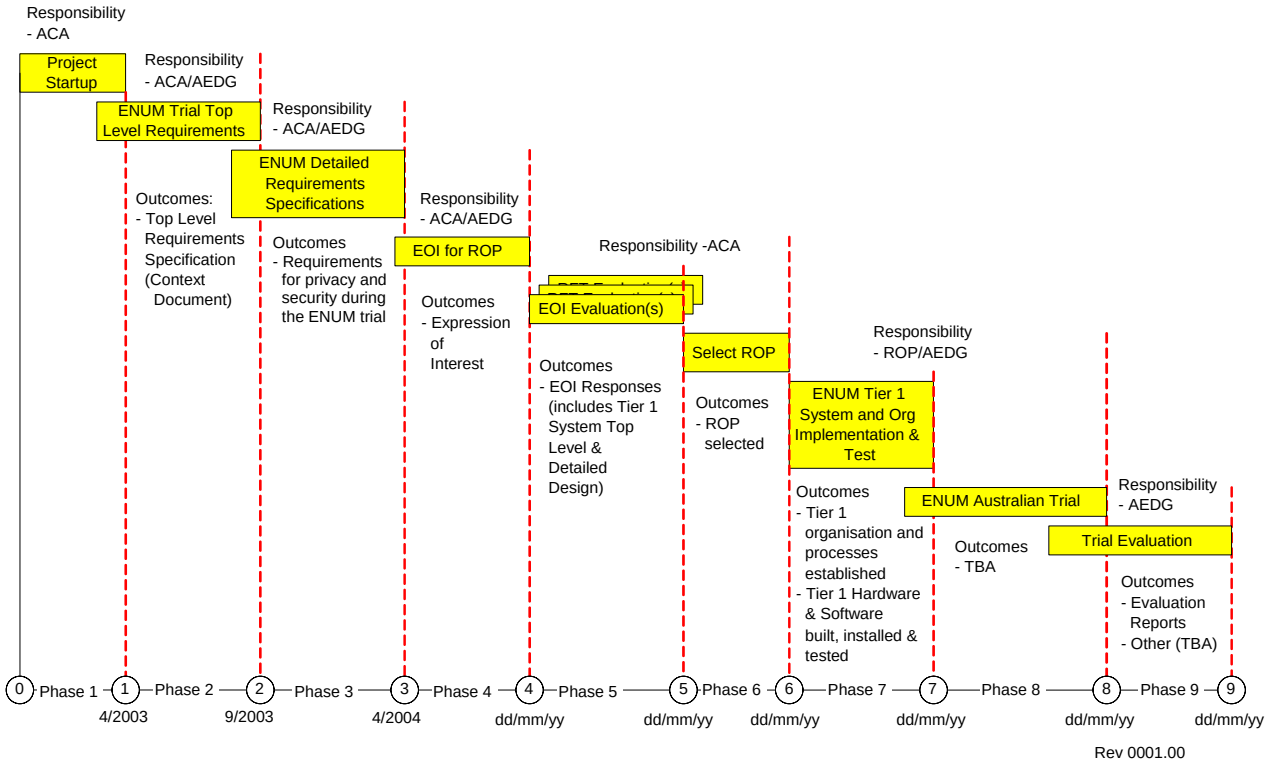


Figure 4.1
Australian ENUM Trial Lifecycle Model (Showing phases, expected outcomes and responsibilities)

4.2. The Model

The following is a description of each of the phases.

4.2.1. Phase 1 - Project Start-up

During phase 1, the Australian ENUM Discussion Group is established to consider the advantages that an ENUM trial may have.

4.2.2. Phase 2 - ENUM Trial Top Level Requirements

This phase of the project will develop a broad description of the requirements of the ENUM Trial System in the form of this context document. It will do so within the context of an implementation independent Functional Model of the ETS (see section 5). It will also establish a Lifecycle Model and identify the phases of the ENUM Trial System project, general outcomes and responsibilities for each phase.

4.2.3. Phase 3 - ENUM Detailed Requirements Specifications

This phase develops detailed Requirements for the ENUM trial. These detailed requirements cover the privacy and security aspects of the ENUM trial. These requirements are included in Appendix 1 and 2 to this Context Document.

4.2.4. Phase 4 – Expression of Interest for Tier 1 Registry Operator

The ACA shall call for Expressions of Interest (EOI) from organisations interested in taking on the role of Tier 1 Registry Operator.

The EOI will require that applicants provide both top level (architectural) and detailed design solution(s) that they believe will best meet the requirements identified in the documents of phase 3. The EOI will identify a range of criteria that will used to select the Tier 1 Registry Operator. The criteria used to select a "best" design will include, but is not limited to:

- The extent to which the design can support the privacy and security requirements identified in Phase 3. Note that it is incumbent upon the respondent to clearly show this in their EOI response;
- The time it will take to implement and test the design (see phase 7); and
- The cost of implementing, operating and maintaining the design during phases 7 and 8 of the project.

The detailed criteria for selection of an applicant to become the Tier 1 Registry Operator shall be included in the documents associated with the Expression of Interest.

4.2.5. Phase 5 – Expression of Interest Evaluations

The tender responses shall be evaluated against the criteria identified in the Expression of Interest documents (see phase 4).

4.2.6. Phase 6 - Tier 1 Registry Operator Selected

An organisation is selected to implement the Tier 1 requirements (T1R). This organisation is referred to as the Tier 1 Registry Operator.

4.2.7. Phase 7 - ETS Organisation and T1Sys Implementation & Test

The Tier 1 Registry Operator shall establish a structure and business processes that it can show will meet the business requirements and the privacy and security requirements. The Tier 1 Registry Operator shall establish technical processes necessary to implement, operate and maintain the ENUM trial system.

4.2.8. Phase 8 - Australian ENUM Trial

In this phase of the project, Registrars shall enter and leave the Australian ENUM trial by requesting accreditation to the T1Sys (the hardware, software and other components used to implement the functions of the Tier 1 Registry Operator) and at some later stage by requesting that their accreditation be revoked.

With respect to numbers, the Tier 1 Registry Operator shall support the behaviour described in section 5.5, "Use of Numbers".

4.2.9. Phase 9 - Trial Evaluation

The trial shall be evaluated by the AEDG. The evaluation shall include consideration of:

- Extent to which requirements were met;
- Likelihood that a commercial ENUM system will be developed; and
- Regulatory requirements.

5. REFERENCE ARCHITECTURE & TOP LEVEL REQUIREMENTS

5.1. Introduction and the Top Level Model

The purpose of the Reference Architecture is to provide a model that allows for the identification and subsequent specification of the Requirements of the ETS. This is done in two stages. The first uses a Top Level Model which is an overview of the ETS and the second uses a Detailed Model which fills in the gaps of the Top Level Model.

The major functions of the ETS are briefly described below, they are spread across a number of the Functional Modules identified in the Top Level and Detailed Models:

a) Provisioning
The modules associated with provisioning allow customers (registrants) to register at Tier 2and to have their information appear in the DNS system

b) Name Resolution
The modules associated with "Name Resolution" allow a User to issue DNS queries to the ENUM Trial System for a specific E.164 number and to receive the records associated with that number.

c) Operations
The modules associated with "Operations" represent the functions necessary to perform the day to day operations of the ETS. They include but are not limited to; Registrant account tracking, gathering of performance statistics, reporting to AEDG and ACA, management of the Tier 2 interface

d) Security
The modules associated with "Security" are spread throughout the architecture of the ETS. They are involved in:

- the identification and authentication of any entity requesting registration at Tier 1
- the validation of the right of an entity to perform the action that they request
- ensuring that all communications within and between modules are secure and authenticated

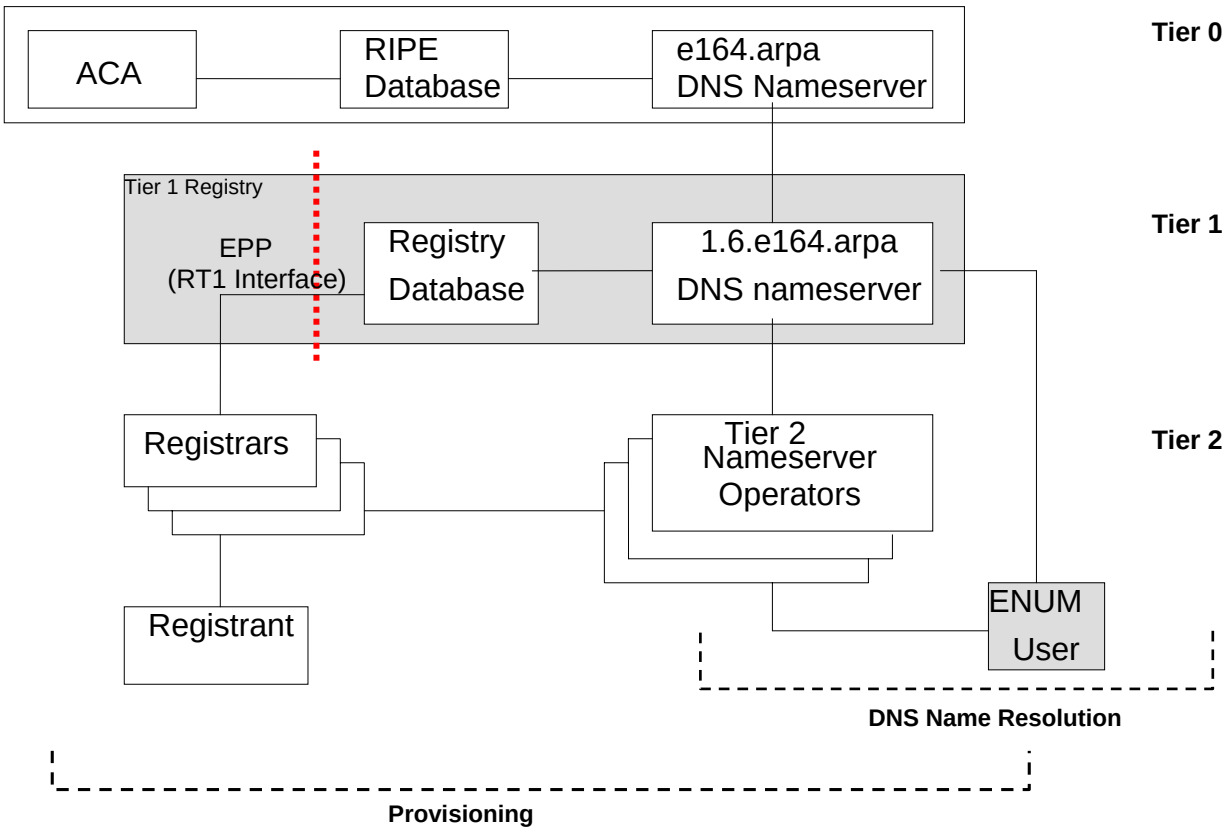


Figure 5.1 – Top Level Reference Architecture of the ETS

5.2. Detailed Model

The following is a more detailed model of the ETS. It covers a little more detail, by showing the logical separation of the Tiers and various aspects of the possible Business/Administrative and security flows

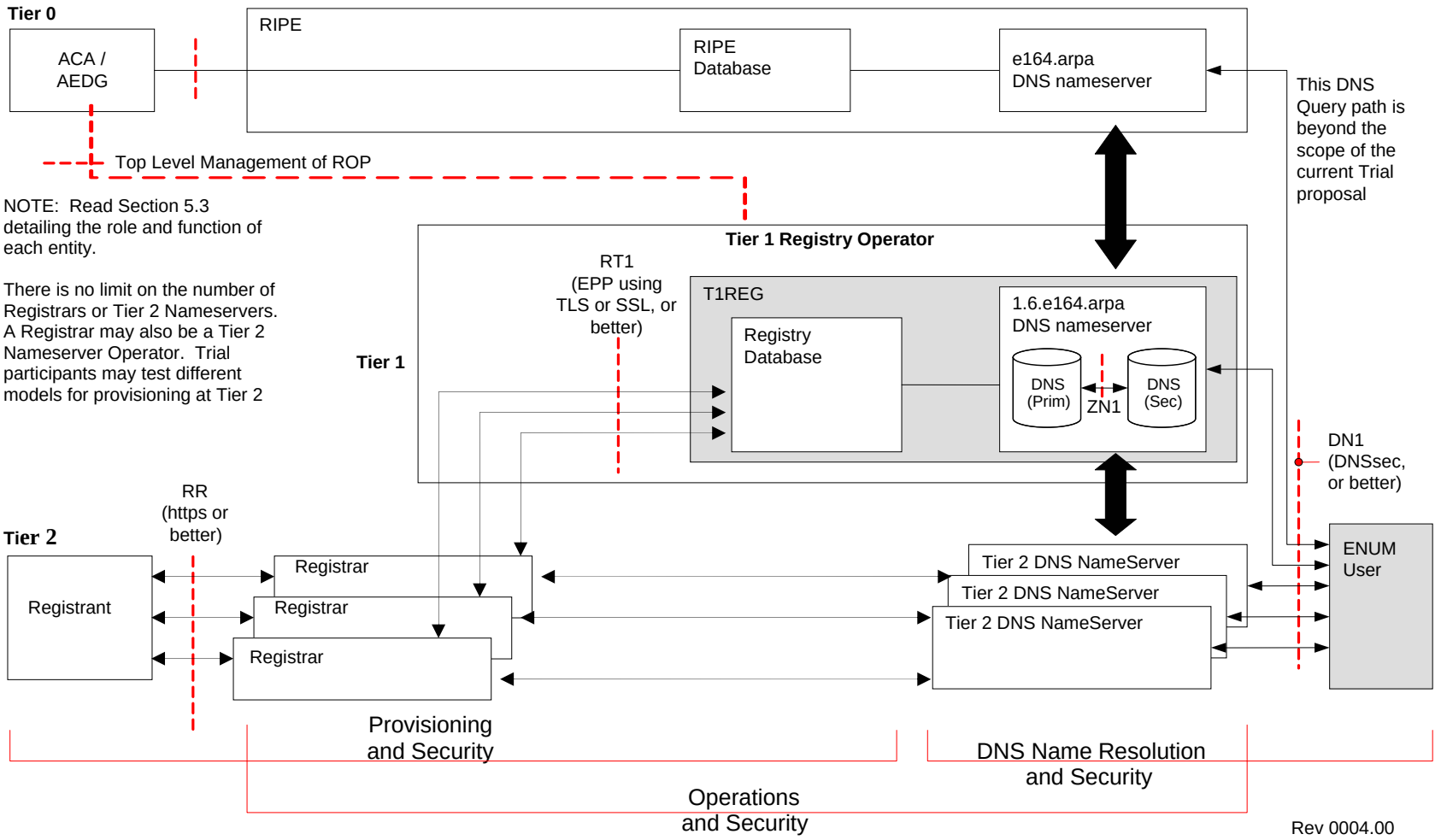


Figure 5.2
Detailed Functional Model of the ETS showing logical separation of the Tiers and various aspects of the possible Business and Security Flows

5.3. Top Level Functional Modules

5.3.1. RIPE

The European IP Research Group (RIPE) is responsible for the e164.arpa domain. It controls delegation of numbers and it controls the domain root servers. Any group wishing to run national ENUM trials must gain delegation of the appropriate number from RIPE.

5.3.2. ACA

The Australian Communications Authority (ACA) is the only group in Australia authorised to apply for and receive delegation authority for the subdomain **1.6.e164.arpa** (i.e. the range of numbers that apply to Australia).

If an ENUM trial is to take place in Australia, the ACA will be responsible for establishing the minimum requirements to enable a trial to take place. It will do this in the following way:

a) The AEDG (in conjunction with the ACA) will develop this document ("the ENUM Context document") which is a "High Level" document containing a "framework" set of requirements and processes for the trial

b) The AEDG, in conjunction with the ACA, will establish privacy and security requirements for the ENUM trial.

c) ACA will call for Expressions of Interest from organisations interested being the Tier 1 Registry Operator. This will request that applicants provide information to demonstrate its abilities to perform the operations of a Tier 1 Registry Operator;

d) The details required for the response to the Expression of Interest shall be given in the Expression of Interest documents. However, it will be a requirement that as part of the response, organisations will include an "Implementation Architecture" which shows how they propose to build and operate the Tier 1 Registry. In their response, applicants must clearly show how their implementation architecture will satisfy all of the Top Level requirements of this context document.

e) Evaluate the responses to the "Expression of Interest" and select an organisation to implement the Tier 1 Registry Operator functions. This organisation shall hereafter be referred to as Tier 1 Registry Operator.

f) Under ACA top level monitoring, the selected organisation will be expected to run the Tier 1 trial database on behalf of the ACA. The selected organisation will:

   i) establish premises suitable to house the equipment and personnel necessary to run the Australian ENUM trial;

   ii) establish the management infrastructure and management processes necessary to implement and operate the Tier 1 Registry Operator functions;

   iii) establish the equipment, software and personnel necessary to run the Australian ENUM trial.

g) ACA will request delegation of the 1.6.e164.arpa subdomain from RIPE and make this available to the Tier 1 Registry Operator to manage for the duration of the trial.

h) ACA will nominate the E.164 number range to be used in the Australian ENUM trial.

i) ACA shall nominate the start and end dates of Phase 8 of the trial.

5.3.3. ENUM Discussion Group

See section 1.3

5.3.4. Tier 1 Registry

The Tier 1 Registry (T1REG) is envisaged as a shared registration system whereby competing Registrars may register ENUM domain names.

There shall be a sufficient number of nameservers with geographic diversity to provide a high availability domain name service, comparable to industry best practice. The Tier 1 Registry shall support logging and backup capabilities for all zone file updates.

5.3.4.1. Data Fields to be held in the Tier 1 Registry

The specific data fields to be held in the Registry will be solicited during the call for expression of interest for the Tier 1 Registry Operator. As a guideline, it is expected that the following information about an ENUM number would be stored:

- Registrant (ENUM subscriber) contact information, including name and address;
- Technical contact information;
- Identity of the Registrar; and
- The domain name and IP address of a Tier 2 nameserver that holds the subscriber's NAPTR record.

The trial might test different combinations of the information above for different ENUM records in the database to test privacy and performance issues.

5.3.4.2. Tier 1 Registry Operator

The Tier 1 Registry Operator will be responsible for the following functions, which constitute the ENUM trial base service:

a) Maintaining a database that stores information about a fully qualified ENUM record associated with an E.164 number in the *Telecommunications Numbering Plan 1997* (e.g. 8.7.6.5.4.3.2.1.3.1.6.e164.arpa). The contents of this database shall be kept private in accordance with the *Privacy Addendum to the Context Document for the Australian ENUM Trial* (see Appendix 2).
b) Using the information in the database to create a zonefile for the 1.6.e164.arpa domain and operating a set of Tier 1 nameservers to supply the DNS information using established DNS query mechanisms. The Tier 1 Registry Operator shall maintain a primary nameserver and at least one secondary nameserver.
c) Providing a directory service, like the WHOIS service used for domain names, that provides publicly readable information about a particular ENUM record. The Privacy Guidelines at Appendix 2 contains further information on what can be included in the WHOIS service.
d) Implementing the RT1 interface to allow Registrars to remotely connect to and interact with the Tier 1 Registry.
e) Authenticating Registrars and interfacing with them via the RTI interface in order to perform registration related operations (establishing a pointer to a nameserver holding a customer NAPTR record, transfer of ENUM domain between Registrars, deleting cancelled ENUM domains)
f) Managing the set of E.164 numbers allocated by the ACA for the Australian ENUM trial. The Tier 1 Registry Operator, or an associated Carriage Service Provider, will issue these numbers to Registrars once they have been accredited. In addition, the Tier 1 Registry will be required to respond to ACA management instructions and to ensure that the Tier 1 Registry supports the use of E.164 numbers described in section 5.5 "Use of Numbers".

5.3.4.3. Optional Functions of Tier 1 Registry Operator (Registrar, Tier 2 Nameserver Operator)

For the purposes of the trial, the Registry Operator is not precluded from also being a Registrar (Tier 2 Registrar) and a Tier 2 Nameserver Operator. This will allow for trial participants to participate in the trial without operating any ENUM infrastructure. However, the Registrar function provided by the Tier 1 Registry Operator would be separated from the Registry function. This Registrar would have to interface with the Registry via the same interface as all the other Registrars in the trial. This decision is in line with the approach adopted in the U.S. (see Ref[3], "…US Implementation of ENUM") and allows for:

- Development and testing of separate Registrar technologies and Registry technologies
- Possible future interoperability testing of Registrar and Registry sub systems both internationally and locally
- Positioning in a market place that both allows for and requires separate Registrar and Registry sub-systems

The arrangement allowing the Tier 1 Registry Operator to also function as a Registrar is for trial purposes only and represents a conflict of interest that is unlikely to be allowed in a commercial situation, due to the anti-competitive monopoly arrangement.

The Tier 1 Registry Operator would want to test the interfaces between the Registrars and the Registry Operator. The Extensible Provisioning Protocol (EPP protocol) would be an appropriate basis for communication. These interfaces may include different business models (e.g. per record fees, or some sort of fixed service fee for unlimited transactions). Note domain name registries typically operate via transaction fees for registration and renewal of records.

5.3.5. Registrars

Registrars (otherwise called Tier 2 Registrars) are the entities that interact with the ENUM registrant. The ENUM trial system places no limit on the number of Registrars for the ENUM Trial System. The Registrar is responsible for:

- Registering new ENUM subscribers
- Authenticating the identity of an ENUM subscriber and validating their authority to make changes to an existing ENUM domain or register an existing telephone number as an ENUM number (existing numbers will not be used in the initial trial phase)
- Interfacing with the Tier 1 Registry Operator to establish a pointer in the Registry to the Tier 2 Nameserver holding the subscriber's NAPTR record
- Interfacing with a Tier 2 Nameserver Operator to provision a subscriber's NAPTR record (if the Registrar is not also a Tier 2 Nameserver Operator)
- Issuing ENUM numbers to new ENUM subscribers (initial trial phase does not allow for existing telephone numbers to be used as ENUM numbers)

Registrars will have to interface directly with the Tier 1 Registry Operator via the RT1 interface and as such will have to be accredited prior to registering any subscriber's ENUM numbers. The data fields to be provided to the Tier 1 Registry Operator by the Registrar will be decided during the call for expressions of interest for a Tier 1 Registry Operator. At a minimum it is expected that the following information about an ENUM number would be provided:

- Registrant (ENUM subscriber) contact information, including name and address
- Technical contact information
- Identity of the Registrar
- The domain name and IP address of a Tier 2 nameserver that holds the subscriber's NAPTR record

Registrars will typically, but not necessarily, also be Tier 2 Nameserver Operators (either directly or through outsourcing arrangements).

5.3.6. Tier 2 Nameserver Operator

A Tier 2 Nameserver Operator is responsible for operating a nameserver (and probably a database with information about each entry in the zonefile on the nameserver) that contains NAPTR records associated with ENUM records in the Tier 1 Registry.

A Tier 2 Nameserver Operator would typically also be a service provider (e.g. a web hosting company), or a Registrar.

The provisioning system used by a Tier 2 Nameserver Operator is not specified as this will vary depending on the particular application and business model used by the Tier 2 Nameserver Operator. It is possible that a Tier 2 Nameserver Operator could maintain information associated with a particular NAPTR record that is in turn maintained by separate service providers. Different Tier 2 Nameserver Operators may have very different business models.

The provisioning system used by a Tier 2 Nameserver operator is not specified as this will vary depending on the application and business model of trial participants.

5.3.7. ENUM Registrant

The ENUM Registrant is any individual, corporation, or service provider that is a participant in the trial, and wishes to create or update an ENUM entry in the Tier 1 for the purposes of their trial application.

5.3.8. ENUM User

An ENUM User is a generic term used to refer to any entity that is capable of issuing an ENUM DNS query to the ETS. In general an ENUM User could be a Service Provider, Application Developer, End User, query software in a terminal or query software in a network gateway.

An ENUM User needs to obtain the URI information associated with a particular E.164 number. One example is SIP based internet telephony service where a SIP Proxy server that needs to query the ENUM DNS servers for SIP information to establish a call from the telephone network to an internet "phone" user.

5.3.9. Identification, Authentication & Authority Verification

Registrars must also implement and test the following functions and approaches:

- The Identification and Authentication of Registrants presenting at the RR interface;
- Verification of the authority of the Registrant to make specific requests at the RR interface.

5.4. Interfaces

5.4.1. RT1 (Registrar to Registry at Tier 1)

The RT1 interface is used for interaction between a Registrar and the T1REG. As a general security principle all data transfers between a Registrar and T1REG shall be secure and authenticated

RT1 will support data entry and provisioning for trial participants. It may be used by the Registrar to manage accounts with the T1REG (e.g., creation, closure, modification and billing); to provision the nameserver, contact information, Tier 2 Nameserver information and other information to the Tier 1 Registry for ENUM domain name registrations; and to accept or reject the transfer request for an ENUM domain name (i.e. when dealing with numbers being ported between Registrars) and to inform (if appropriate) other Registrars of any such changes

The RT1 interface will use an industry accepted protocol, such as EPP (note that the Extensible Provisioning Protocol is currently a proposed internet standard) on a secure Transport Layer (e.g. "Transport Layer Security Protocol", see Ref[7]) and provide for complete automated entry and modification of data.

Each EPP session will be authenticated and encrypted using for example TLS (see Ref[7]), or a Transport Layer protocol with authentication and encryption capabilities as good as or better that TLS. The T1REG shall authenticate every EPP client connection using both an X.509 server certificate issued by a trusted Certification Authority, and its Registrar password.
The Registrar can do the following:

- Connect to, and use the facilities of T1REG
- Request the creation of an account
- Request the registration of new ENUM domain names (i.e.E.164 numbers)
- Receive notification of a successful or otherwise registration request
- Enter and later update information about registered ENUM domain names, contacts or host names that the ENUM Registrant is authorised to enter or modify
- Delete registered ENUM domain names, contacts or host names
- Renew registered ENUM domain names, contacts or host names
- Request that one or more registered E.164 numbers be deregistered
- Transfer ENUM domain name registration between Registrars
- Request that the account be removed

5.4.2. ZN1 Interface

This is the interface used for communication between the primary and secondary nameservers. The major use of this interface is for Zone File transfer, but it is not limited to that use.

- Zone files shall be periodically generated and transferred to all T1DNS nameservers in a manner that is consistent with the "Security and Privacy Guidelines" (see section 5.3.9) adopted for the ENUM Trial
- Zone file distribution should conform to appropriate IETF standards

5.5. Use of E.164 Numbers

Part 1 of the trial shall use E.164 numbers allocated under the *Telecommunications Numbering Plan 1997* that have not been allocated. Numbers shall be allocated under the Plan to the Tier 1 Registry Operator (or an associated carriage service provider) for use in the ENUM trial. The ENUM trial numbers may also be allocated by the ACA to other carriage service providers, but may only be used for the purpose of the ENUM trial. The numbers may be issued to registrars and registrants.

The Tier 1 Registry Operator shall implement the ENUM Trial System (ETS) such that E.164 numbers are portable between Registrars.

6. CONCLUSION

This document presents the Top Level requirements for the Australian ENUM trial system (ETS). It does so within the context of implementation independent models of the ETS (see Figure 5.1 and 5.2).

This document specifies a minimum Base Service that must always be available from the Tier 1 Registry Operator in order to ensure that users of the Australian ENUM Trial System have a stable experimental platform. Note that, while maintaining the Base Service the Tier 1 Registry Operator will work on and test issues arising from the examination of some or all of the objectives identified in the section "Trial Objectives".

The level of detail in this document is sufficient enough to allow the ACA and AEDG to ask for "expressions of interest" from organisations that may wish to take on the role of the Australian Tier 1 Registry Operator for the trial.

7. REVISION HISTORY

Date	Rev #	Contact / Author(s)	Description
15-Jun-2003	0001.00	Peter Mikelaitis	First draft
16-Jun-2003	0001.01	WG1	Amendments to the first Draft
4-July-2003	0001.01d	WG1	Preliminary version (includes all comments up to 30/6/2003)
7-July-2003	0002.00	WG1	Draft version for Discussion purposes
18-July-2003	0002.01	WG1	Major revision of section 1.5
20-July-2003	0003.00	WG1	Release to ENUM Discussion Group (AEDG) for Review
15-Sept-2003	0004.00	AEDG	Major revision accommodating feedback from the AEDG, (Editor: Peter Mikelaitis)

APPENDICES

1. SECURITY REQUIREMENTS

Australian
ENUM
Discussion
Group

WG1/DOC 04
Version 1.0

AUTHENTICATION AND AUTHORISATION IN THE AUSTRALIAN ENUM TRIAL

Disclaimer

This document discusses various aspects of the arrangements and operation of the Australian ENUM trial. It does not in any way imply that there will be a future commercial ENUM service in Australia

Document Details

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Contents

1. INTRODUCTION

In 2003, the Australian ENUM Discussion Group's work on Privacy and Security posed a series of questions in relation to authentication and authorisation:

- who holds 'rights of use' (ROU) to a number?
- how does the ROU holder retain control re creation of ENUM record?
- how does the ROU holder retain control over NAPTR entries?
- how to verify identity of ROU holder (for creation of record, maintenance of NAPTR entries, for transfers between registrars)?
- how do authorised service providers add/modify/delete NAPTR entries?

The challenge is to ensure consistency between the ENUM e164.arpa domain and E.164 numbers without an imposing excessive administrative burden upon the parties involved.

This paper outlines a phased approach to exploring these questions, consistent with the phasing proposed in the Context Document for the Australian ENUM trial [1].

A flexible method for authentication in proposed for Part One, suitable for use with a number range that is exclusive to the ENUM trial and not in service in the PSTN. The low-cost and pragmatic approach to authentication appropriate for this part of the trial renders the Part One arrangements inappropriate for Part Two, which will use authentication arrangements with a higher level of robustness.

Parts Two and Three explore solutions to the core objective of consistency between the ENUM registrants and E.164 rights-holders. This paper provides a high-level outline of the competing approaches, and proposes that work proceed in parallel with Part One to develop a framework setting out the roles and interactions between the various stakeholders. This framework will be explored and tested in Parts Two and Three.

2. A PHASED APPROACH

2.1 Australian ENUM trial parts

The Context Document for the Australian ENUM trial [1] envisions a phased approach, with differing number ranges and trial objectives at each part.

Trial Part	E.164 Number Range	Objectives
One	Uses a number range that has not been issued to any Carriage Service Provider.	Industry to explore: • ENUM-enabled products and services • commercial and business-case issues ACA to explore regulatory issues: • privacy and security • issues arising from proposed registry/registrar/ESP framework
Two	Use of non-geographic numbers that have been allocated to customers	• Explore regulatory issues including authentication and authorization • Explore charging, number portability and PSTN/interworking issues
Three	Use of geographic and non geographic numbers	• Consider how to provide universal personal telephone services • Resolve issues identified in earlier parts

The next sections propose a phased approach to exploring the authentication and authorisation arrangements, consistent with the phasing outlined in the context document.

2.2Part One - Authentication and Authorisation arrangements

In Part One of the trial the proposed number range is for the exclusive use of ENUM and numbers in this range will not be used in the PSTN.

Because the numbers used in Part One are issued in conjunction with ENUM registration, they present relatively low-value targets to “hackers” in comparison with numbers in use in the PSTN. This reduces the risks associated with a flexible and low-cost approach to authentication and authorisation.

The Trial Expression of Interest will call for Vendors to propose suitable arrangements, subject to criteria outlined below.

The Registry Operator will be required to verify the technical capability of all Registrars and the selected approach for authenticating ENUM customers will be referenced in the business agreement between the Registry Operator and the Registrar.

The criteria for selecting the authentication and authorisation procedures are that they are suitable for managing numbers that have not been allocated or issued other than for the ENUM trial.

At a minimum, the approach must verify that:

- a Registrant is contactable by email or telephone (ie challenge-response) and
- an ENUM Registrant requesting a modification/cancellation of an ENUM record is the number assignee (e.g. via a password, pin number etc).

The ENUM Registrant’s terms and conditions must require that the application details provided by the registrant are truthful.

This permits a broad scope, with a view to adopting the most expedient and cost-effective approach for Part

One of the trial.

The authentication and authorisation arrangements used in Part One will be discarded as being insufficiently robust for use in Part Two:

- the criteria for selecting authentication and authorisation procedures in these parts are different - Part Two aims to explore commercial-grade authentication and authorisation arrangements
- In Part Two, the rights-holder and ENUM registrant databases must be synchronised. This issue does not arise in Part One because the numbers are issued as a consequence of the ENUM registration process.

- The use of already-allocated numbers in Part Two presents a more valuable target for miscreants than the numbers in use in Part One. This increases both the likelihood and the cost of attacks on the authentication arrangements.

2.3 Parts Two and Three

2.3.1 Authentication and Authorisation – the need for a framework

Parts Two and Three explore the challenge raised in the introduction to this paper – how to ensure consistency between the ENUM e164.arpa domain and E.164 numbers without an imposing excessive administrative burden upon the parties involved.

The first step in this exploration is selecting from amongst the different solution approaches.

The chosen approach(es) to a solution are best expressed in a framework that identifies the various actors (including number issuers, Telecommunications Service Providers (TSPs), ENUM Service Providers (ESPs) and customers), roles and their interactions. Following agreement upon this framework, the Trial Manager will arrange for the agreed framework to be tested during Parts Two and Three of the trial.

The next section outlines in broad terms the differing approaches to a solution, providing a high-level sense of the work that is to happen in parallel with Part One.

2.3.2 Competing solution approaches

The central issue is ensuring consistency between the ENUM e164.arpa domain and E.164 numbers across all phases of the life cycle of a number. Synchronisation between these two domains must be maintained across the "add", "move", and "delete" transactions that apply to numbers in both domains. Any changes to the rights of use in a number must be reflected in both domains.

There are two general approaches to solving this problem:

1. A secret (or token) held by the customer

In this approach, the number-issuer supplies the rights-holder with:

- a physical token (such as a bill) or
- an electronic token such as a PIN or a signed public key certificate.

The rights-holder can present this token to an ESP in order to establish their right-to-use. The ESP confirms the validity of the token with either the token issuer/signer or with a central authority.

2. Identity matching

   In this approach, the ESP establishes a customer identity. The ESP then validates this identity as being that of the rights-holder with reference to either the number-issuer or a central authority.

In both approaches the ESP must validate something – either the token or customer identity. The ESP's validation can be done with reference to either:

- the number issuer, or
- a neutral third-party, which is fed and kept up-to-date by number issuers.

3. FUTURE WORK

3.1 Developing a framework for Authentication and Authorisation

The differing approaches outlined in section 0 each have strengths and weaknesses, and raise a number of questions:

- What role should number issuers have? What role are number issuers willing to have? All the approaches listed above involve effort on the part of issuers.
- Approaches (1) and (2) differ in terms of the effort and disclosure required of the Customer – what do the cost/benefit relationships look like?
- Is there to be a central authority for customers or tokens? What are the risks/costs/benefits?
- Approach (2) above requires industry-wide standards for expressing and matching customer identity.
- What technologies are best suited to implementing the various models?

Standards for proof-of-identity associated with an ENUM registration are yet to be developed (eg. 100-point check?). Consideration must be given both to numbers that have been issued in relation to an existing telecommunications service and numbers that are issued in connection with an ENUM registration.

Clearly there are choices to be made here. This points to a body of work involving analysis and selection from amongst the differing solution approaches.

An in-principle commitment from the industry (ie. number issuers and other stakeholders) to exploring a specific set of roles and interactions for at least some portion of the customer base appears to be a necessary pre-requisite to moving to Parts Two and Three of the trial.

Following agreement upon the framework, the Trial Manager can arrange for specific technologies that implement the desired form of interaction to be tested in Part Two.

The work can happen in parallel with Part One of the trial.

It is also anticipated that there will be ongoing work on the regulatory issues happening in parallel with Part One of the trial, as outlined in section 3.1.

3.2 Rights of Use

Various participants in the working and discussion groups have pointed to the need to clarify the issues around rights-of-use to E.164 numbers in Australia. It is expected that this ongoing work will occur in parallel with Part 1 of the trial.

Workable assumptions in this area together with the work outlined in section 0 appears to be a prerequisite to fully testing the authentication and authorisation issues in Parts Two and Three of the trial.

4. TRANSITION FROM PART ONE TO PART TWO

4.1 No commitment to use Part One numbers in Part Two

Participants in Part One of the trial must be made aware of the following constraints associated with the Part One number range:

- No decision has been made on whether numbers used in Part One will be migrated into Part Two.
- There is no commitment on the part of the ACA to change the numbering plan to allow the Part One number range to be used in a non-ENUM context (ie. PSTN).
- Part One numbers will have been conditionally issued using authentication arrangements that are less robust than those contemplated for use in Part Two. Any use of Part One numbers in Part Two would require issued numbers to be re-authenticated.
- There is no commitment on the part of TSPs to condition their networks in such a way as to render this number range operable for telephony service

4.2 Criteria/trigger for the transition

A necessary precursor before moving from Part One to Part Two is that there is sufficient agreement upon the work mooted under section 3 above.

5. TRIAL OVERSIGHT AND MANAGEMENT

The Trial Manager - being the ACA or some self-regulatory organisation responsible for ENUM - must approve the authentication and authorisation arrangements proposed by the vendor(s) in all parts of the trial.

This approach assumes a relatively active role on the part of the Trial Manager. The Trial Manager will have to work with the Tier One registry and the validation agency to provide high-level guidance and final approval for the proposed approaches to authentication and authorisation.

6. SUMMARY

The phased approach:

- allows the trial to commence in a near-term timeframe
- creates a space to further explore the issues around rights of use to E.164 numbers in Australia.

This approach also allows the Australian trial to evolve in the direction of developing international standards in the area.

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2. PRIVACY REQUIREMENTS

Australian
ENUM
Discussion
Group

WG1/DOC 03
Version 1.0

PRIVACY ADDENDUM
TO
THE CONTEXT DOCUMENT
FOR
THE AUSTRALIAN ENUM TRIAL

Distribution is Unlimited

Disclaimer

This document discusses various aspects of the arrangements and operation of the Australian ENUM trial. It does not in any way imply that there will be a future commercial ENUM service in Australia

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Contents

1. INTRODUCTION

This document is to be read as an addendum to the "Context Document For the Australian ENUM Trial" and is the product of work by the Privacy and Security Working Group as amended by the Australian ENUM Discussion Group.

This report addresses issues that have been the subject of discussion by the Working and Discussion Groups:

- Data in the central registry and its exposure to the public and other interested parties
- Privacy
- Calling-party and called-party control of contact information
- Provisioning (authentication and authorisation)

The report makes a series of recommendations which categorises these issues as follows:

- Issues that manifest as requirements for the ENUM trial
- Issues to be the subject of trial
- Issues for further discussion

2. AUSTRALIAN ENUM TRIAL REQUIREMENTS

2.1 Data stored in the central registry

This section discusses the data stored in the central registry and its exposure to the public and other interested parties.

A separation of roles – registry and registrars

The Working Group notes two distinct models for describing the roles of registries and registrars in the registration of an ENUM number. In the terminology of the Domain Name System (DNS), these models are known as "thick" and "thin".

Section 2.1 of [12] offers the following description:

Domain registries usually follow one of two models for conducting registrations of domains. The "thick" model is the more traditional model. In a "thick" domain registry, the registry contains both the operational data for the domain and the contact data for the domain. In this model, the registry is typically the interface to the domain registrant but may also interface with the domain registrant through domain registrars. The "thin" model domain registry contains only operational data for domains. In the "thin" model, contact data for the domain are maintained by a domain registrar.

This document makes no assumptions regarding the specific selection of a model in an Australian context, but merely notes that while both models can implement the privacy framework outlined by this document, the selection of a model may alter the specific means by which the privacy framework is implemented.

Specific data fields held in the registry

Recommendation 1

The Working Group recommends that the specific data fields to be held in the registry be solicited during the call for expressions of interest for the Tier 1 Registry operator. As a guideline, it is expected that the following data elements will be stored so as to be linked to an ENUM number:

- Registrant contact information, including name and address
- Technical contact information
- Identity of the Registrar

Public exposure of registrant-contact details

The Working Group discussed whether information in the central registry should be exposed to the public using a protocol such as whois.

Whois in the DNS serves the following purposes:
1. Registrars use whois to assist in authenticating domain transfers
2. Consumers can use whois to verify that a domain name belongs to a specific registrant
3. Law Enforcement and "Intellectual Property" communities use whois for various purposes
4. ISPs (and consumers) may use whois for the purpose of Technical Support – whois identifies the operator of the nameservers for a domain.

Each of these purposes was discussed in the context of ENUM with the following conclusions drawn:
1. The issue of registrars authenticating ENUM transfers is discussed in Section 4 of this report, and in any case does not require registrant contact details to be exposed to the public,
2. Consumer trust in the context of ENUM relates to the issue of registrar-registrant authentication, and is discussed in Section 4.
3. Issues relating to "special" stakeholders including Law Enforcement and the "Intellectual Property" community are discussed in Section 2.2 below and in any case do not require registrant contact details to be exposed to the public,
4. The issue of technical support is discussed in Section 2.1.4 below.

The Working Group is unable to identify any purpose requiring registrant contact information to be exposed to the public.

Recommendation 2

The Working Group recommends that no registrant contact information be exposed to the public. A whois service will not be operative in respect of registrant information.

Vacant and Silent Numbers

In the same way that an E.164 number can be dialled in order to learn whether it is in use (a ring-tone indicating that a number is in use), an ENUM number that is in use will return an NAPTR record in response to a DNS query. Thus, both E.164 and ENUM numbers can be "probed" with the intention of learning whether it is in use, even through the number may be listed as "silent".

However, it should be noted that a mass query of large number ranges of E.164 numbers requires expensive auto-dialler equipment, while ENUM's use of the DNS means that tools for performing mass queries are likely to be readily accessible in software.

A status of "Non Existent Domain" in response to a DNS query of a vacant ENUM number indicates that an ENUM number is not in use.

Whois has no bearing on vacant or silent numbers since it is not operable in respect of registrant information.

A public directory service for the purposes of technical support

Section 2.1.3 noted that whois for Internet Domain Names serves as an authoritative directory service identifying the name server operator for a specific domain. Some Working Group members are of the view that this directory service is of assistance to service providers (and technical end-users) in troubleshooting technical issues associated with domain name service associated with a specific domain.

With Internet Domain Names, the Technical Contact (the name server operator) is often a service provider, such as an ISP or web hosting company. Sometimes it is the Registrar. A noteworthy special case is when the

technical contact and the registrant are the same party. An example is a small business where the owner is also the manager of the IT infrastructure.

Some Working Group members felt that technical support may be a purpose that justifies the exposure to the public of technical contact information.

Recommendation 3

The Working Group recommends that a whois service operate in order to provide contact information for the party responsible for the name servers associated with a specific ENUM number. The whois service would link name servers to name server operators.

The Working Group recommends the following steps to minimise the privacy risks associated with ENUM whois:

- Nameserver operators may opt-out (ie choose not to be listed)
- Technical Contacts can be a role rather than a personal identifier
- In order to establish an identifier, Technical Contacts need provide only one form of contact, chosen from amongst: telephone number, fax number, postal box, postal address, email, or url.
- Only specific fields should be exposed to the public

2.2 Access to data in the central registry

Certain interest groups may seek access to the information held in the central registry.

Parties identified by the Telecommunications Act 1997

Parties identified by the Telecommunications Act 1997, such as emergency services and law enforcement may seek access to the data in the central registry. The parties that may seek access to such data, and the circumstances under which they may do so are set out in Division 3 of Part 13 of the Act.

The Working Group discussed whether a registry operator and/or a registrar would be a carrier or carriage service provider under the *Telecommunications Act 1997* and therefore subject to the information access provisions (for law enforcement, and related agencies) set out in Division 3 of Part 13 of that Act. It was generally agreed that the registry operation and registrar function does not fit the definitions of a carrier or carriage service provider. However, some organisations involved in the ENUM trial may already, through their other functions, be carriers or carriage service providers, and therefore be subject to the information access provisions in the Act.

If registry/registrar operators are not subject to the information access provisions in the Act, the question arises what access to the registry should be provided to Law Enforcement and related agencies. Working Group members took the view that it would be consistent with the spirit of the trial to provide no more access than that required by law. In the case of Law Enforcement, this requires a warrant.

The question was raised as to whether it would be necessary or appropriate for the managers of the trial to monitor warrant activity. It was noted that warrant requests must be made publicly available. The Working Group therefore accepted that it would not be necessary to take any additional steps to monitor the execution of warrants.

It is important to note that the NAPTR records that are configured against an ENUM number are internet addresses that are subject to lookup by Law Enforcement and related agencies via conventional means. DNS queries reveal this addressing information, which in turn can be related to specific service providers and thence to the party involved with the endpoint.

Other interest groups

The “intellectual property” community has historically had a strong interest in being able to identify a registrant of an internet domain name. Because ENUM numbers also appear in the DNS, in the absence of a public whois service for ENUM numbers, these groups may seek access to information in the central registry.

Some commentators have suggested that the arguments for the whois service in respect of Internet Domain Names do not apply to ENUM numbers. The Center for Technology and Democracy in [9] writes:

> *Most of the reasons given to justify the whois database (as it relates to normal web domain names) simply do not apply to ENUM records. For example, there is no chance that anyone will have a trademark or other intellectual property interest in an ENUM number (which is simply a string of numbers). Because ENUM numbers are not used to "host" content (as with the World Wide Web), copyright owners would not need to be able to identify the owner of a web site that might be infringing on a copyright. Finally, because the allocation of ENUM numbers is controlled, ultimately, by a central national authority, there is no need (as with domain names) to be able to quickly determine the domain name provider (or registrar) that created the domain.*

The Working Group is generally of the view that it is not necessary to make registrant information publicly available for intellectual property (IP) purposes.

Some discussion concerned the specific case where an ENUM record refers to a web site that is serving content of interest to an IP stakeholder. The question arises as to whether the IP stakeholder can deal with the issues without the registrant contact details being publicly available. This scenario is seen outside the context of ENUM whereby some web sites are addressable by an internet IP address. It was agreed that this scenario is infrequent, and that mechanisms do exist for IP stakeholders to contact the relevant parties.

Recommendation 4

> The Working Group recommends that no access to registrant information be provided to “special” interest groups other than that required under existing law.

The Working Group notes that the trial offers an opportunity to assess whether any issues arise in this area in relation to ENUM.

2.3 Registry and Registrar privacy requirements

Requirement upon Registry and Registrar to opt-in to privacy requirements

Recommendation 5

> The Working Group recommends that both Registry and Registrar providers be required to:
> - be treated as an “organisation” under the Privacy Act 1988
> - comply with the National Privacy Principles [8]
> - comply with the following constraints (below) on the handling of data

Clause 16 of [7] may serve as boilerplate text for the Registry Request for Proposal.

Additional Data Handling Constraints

This section sets out recommendations for constraints upon information handling that are supplemental to those outlined in section 2.3.1.

A key theme of the Working Group’s discussions on this point was that the personal information of a trial registrant, including information collected in relation to their behaviour as a consumer of ENUM services, should not be used for ‘secondary’ purposes (i.e. purposes not directly related to the provision of the ENUM service) during or after the trial, except in cases where the participant has provided his or her express consent for this to occur.

The notion of ‘informed’ consent was also emphasized. Registrants should be explicitly informed of the consequences of their consent in terms of what will and will not be done with their personal information as part of being asked for consent.

The Working Group understood that the ENUM Discussion Group (or a project management body) would be available to oversee any contentious privacy issues that arose during the trial.

The following recommendation relates to the handling of personal information, as defined in the Privacy Act.

Recommendation 6

The Working Group recommends the following constraints upon the handling of personal information:

- A Registrant's personal information collected during the trial is not to be used for secondary purposes without the registrant's express consent
- A registrant's personal information collected during the trial is not to be used after the trial has completed without that registrant's express consent.

There should be no "bundled consent"– participation in the ENUM trial should not be conditional upon consent being provided for some non-ENUM-trial related use of personal information.

Recommendation 7

The Working Group recommends the development (either by the Discussion Group or by the Tier 1 Registry operator) of an ENUM Trial Statement setting out the purpose and scope of the trial. The Statement would also set out a statement relating to the handling of registrant personal information.

These recommendations do not preclude the use of information collected during the trial from being used in an aggregate (non-personally identifiable) manner after the trial has completed for the purposes of analysis and evaluation of the trial. All personal information collected during the trial is to be de-identified or deleted.

2.4 Post-trial evaluation of privacy and security issues

Recommendation 8

The Working Group recommends that Discussion Group establish arrangements for a post-trial review of privacy and security issues.

For example, if the trial identifies that existing privacy and legislative principles need to be supplemented with additional constraints, this may point to the development of a privacy code to which Registry and Registrar operators would be bound for the commercial operation of ENUM.

The formulation of an industry privacy code leads to the question of the regulatory arrangements for ENUM in the post-trial and commercial-launch phases. This issue is yet to be addressed.

3. THINGS TO BE TRIALLED

This section describes issues that the Working Group recommends be subjects of the ENUM trial in Australia.

3.1 Calling-party and called-party control

Introduction

In describing "calling-party" control and "called-party" control, John Morris in Section I, E of [9] writes:

1. Calling Party Control Model – Using ENUM Alone

In the Calling Party Control model, the amount of data entered into an ENUM record is maximized – all available forms of contact (such as voice, mobile, fax, e-mail, etc.) are placed in the Domain Name System (DNS) record. This allows the person initiating the contact (the "calling" party) to choose which of the forms of contact to use.

The critical aspect of the "calling party control" approach is that the person initiating the call always receives all possible contact methods, and can choose which to use.15 In addition, the calling party may retain all of the information and use it for other purposes.

2. Called Party Control Model – Using ENUM with a Proxy Server

In contrast to the "Calling Party Control" model, the "Called Party Control"

approach imposes constraints on the calling party's access to data about the called party.

Only a single method of contact is placed in the DNS record, and that contact method points only to a "proxy server," which can perform screening or other functions set by the person being called (the "called" party). A common implementation of this approach would use the "Session Initiation Protocol" (or "SIP") to run the proxy server, and thus the server would be termed a "SIP server."

In this approach, the calling party first submits a query to the DNS system, and receives back a pointer to the called party's proxy or SIP server. The calling party would then contact the proxy/SIP server, and that server – based on rules set by the called party – would decide what contact method (if any) should be provided to the calling party.

This approach allows the person being contacted (the "called" party) to choose which of the forms of contact to use, if any.

The critical aspect of the "called party control" approach is that the called party chooses whether and how the contact can be made.

This Called Party Control model can be implemented by having the called party contract with a third party service provider to operate a proxy/SIP server on behalf of the called party. Alternatively, the called party can operate proxy/SIP server equipment on its premises. This approach might be common in the case of a large corporation. As such servers become more common, they may also be built into individuals' computers or in "small office/home office" servers.

Within a proxy or SIP server would be rules or scripts that define how a call is to be processed, and who is permitted to receive details on specific contact methods (such as voice, fax, e-mail, etc.). For example, hypothetical rules could state that:
1. Anyone can receive my office VoIP address at anytime
2. Colleagues from my company can receive my cellular phone number during business hours on weekdays
3. My family can receive all contact methods at any time

The ultimate ENUM end user would likely be able to define these and other rules (such as call forwarding, etc.) through a World Wide Web site. To be clear, SIP-based services are today only in the early stages of their evolution and refinement, and so the details of what rules might be possible and how those rules might be implemented are not certain. In particular, it is not yet clear how individuals in a particular group (e.g., "my family") will be able to "authenticate" themselves are part of an exchange with a SIP proxy. A range of possible authentication technologies is under development.

Analogous use of terminology is found in Section 6.1 of [13].

With calling-party control:

- The ENUM registrant (the recipient or “called-party”) offers all her contacts via the DNS
- The ENUM User (originator or “caller”) selects from amongst the contacts
- The contacts in the DNS are vulnerable to harvesting

With called-party control:

- The ENUM registrant offers only one contact (a “service resolution service”)
- Service selection is negotiated between the caller’s agent and the called-party’s proxy
- The contact in the DNS, while vulnerable to harvesting, may obscure personal identifying information.

Business users who seek to maximise their reachability may be more likely to select calling-party control, while personal users who seek maximum control and minimal exposure via the DNS may be more likely to select called-party control.

Both models of control are service options to be provided by Registrars or ENUM Service Providers.

Recommendation 9

The Working Group recommends that the trial seek to test both calling-party and called-party models of control over contact information.

3.2 Provisioning (authentication and authorisation)

Provisioning issues encompass:

- Setup
- Transfers
- Change of number/disconnection
- Rights of use

Many of the issues encompassed under this section can be the subject of trial. Further discussion on these issues may appear in a separate addendum to the Context document.

4. FOR FURTHER DISCUSSION - PROVISIONING (AUTHENTICATION AND AUTHORISATION)

This section merely notes that issues relating to authentication and authorisation are to be addressed elsewhere.

Questions to be addressed in relation to authentication and authorisation include::

- who holds 'rights of use' (ROU) to a number?
- how does the ROU holder retain control re creation of ENUM record?
- how does the ROU holder retain control over NAPTR entries?
- how to verify identity of ROU holder (for creation of record, maintenance of NAPTR entries, for transfers between registrars)?
- how do authorised service providers add/modify/delete NAPTR entries?

5. REFERENCES

[7] AuDA Registrar Agreement
http://www.auda.org.au/docs/auda-registrar-agmt05-07.pdf

[8] National Privacy Principles
http://www.privacy.gov.au/publications/npps01.html
An extract from the *Privacy Amendment (Private Sector) Act 2000*

[9] ENUM: MAPPING TELEPHONE NUMBERS ONTO THE INTERNET
Potential Benefits with Public Policy Risks
Center for Technology and Democracy
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[10] ACIF Customer Transfer Code (ACIF C546:2001)
http://www.aca.gov.au/telcomm/industry_codes/codes/c546b.pdf

[11] DR ACIF C566:2003 Rights of Use of Numbers
http://www.acif.org.au/OCRP_WC14/files/DR_C566_2003.pdf
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[12] Cross Registry Internet Service Protocol (CRISP) Requirements
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http://www.ietf.org/internet-drafts/draft-ietf-enum-privacy-security-01.txt