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An ENUM Registry Type for the Internet Registry Information Service (IRIS)

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Abstract

This document describes an Internet Registry Information Service (IRIS) registry schema for registered ENUM information. The schema extends the necessary query and result operations of IRIS to provide the functional information service needs for syntaxes and results used by ENUM registries.

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1. Introduction

This document describes an IRIS registry schema for registries of ENUM data using an XML Schema [4] derived from and using the IRIS [5] schema.

The schema given is this document is specified using the Extensible Markup Language (XML) 1.0 as described in XML [1], XML Schema notation as described in XML_SD [3] and XML_SS [4], and XML Namespaces as described in XML_NS [2].

2. Document Terminology

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119 [10].

This document uses the term "ENUM" as the fully qualified domain name following the conventions of ENUM [17].

3. Schema Description

IRIS requires the derivation of both query and result elements by a registry schema. These descriptions follow.

References to XML elements with no namespace qualifier are from the schema defined in Section 4. References to elements and attributes with the "iris" XML namespace qualifier are from the schema defined in IRIS [5].

The descriptions contained within this section refer to XML elements and attributes and their relation to the exchange of data within the protocol. These descriptions also contain specifications outside the scope of the formal XML syntax. Therefore, this section will use terms defined by RFC 2119 [10] to describe the specification outside the scope of the formal XML syntax. While reading this section, please reference Section 4 for needed details on the formal XML syntax.

3.1. Query Derivatives

3.1.1. <findEnumsByE164> Query

<findEnumsByE164> finds ENUM domains by searching on prefixes of E.164 numbers and returns <enum> (Section 3.2.3) results.

The E.164 prefix is specified using the <e164Prefix> child of <findEnumsByE164>. An optional child element of <findEnumsByE164>,

<specificity>, can narrow the search to ENUM domains associated with E.164 numbers that are either more specific or less specific. If the <specificity> element is present and has the content 'less', then the search is to be narrowed to E.164 numbers that are less specific (i.e., have fewer digits). If the <specificity> element is present and has the content 'more', then the search is to be narrowed to E.164 numbers that are more specific (i.e., have more digits).

3.1.2. <findEnumsByContact> Query

<findEnumsByContact> finds ENUM domains by searches on fields associated with an ENUM domain's contact.

The allowable search fields are handled with either the <contactHandle> element or one of the elements in the "contactSearchGroup" (see Section 3.1.5). The <contactHandle> element allows for the ENUM domains to be selected based on the contact having the specified contact handle.

The query MAY also be constrained further using the optional <role> element. The contents of this element signify the role the contact has with the ENUM domain.

This query also provides optional <language> elements containing language tags. Clients MAY use these elements to give a hint about the natural language(s) of the affected element. Servers MAY use this information in processing the query, such as tailoring normalization routines to aid in more effective searches.

3.1.3. <findContacts> Query

<findContacts> searches for contacts given search constraints.

The allowable search fields are handled by one of the elements in the "contactSearchGroup" (see Section 3.1.5).

This query also provides optional <language> elements containing language tags. Clients MAY use these elements to give a hint about the natural language(s) of the affected element. Servers MAY use this information in processing the query, such as tailoring normalization routines to aid in more effective searches.

3.1.4. <findEnumsByHost> Query

This query does a simple search for the ENUM domains being hosted by a name server. The search is constrained using either the host name [12], host handle, IPv4 address, or IPv6 address of the name server.

3.1.5. Contact Search Group

Some of the queries above have similar query constraints for searching on contacts. This section describes those common parameters.

<commonName> allows the query to be constrained based on the common name of the contact. The constraint can either constrain the query by an exact match using the <exactMatch> element, or it may constrain the query by a subset of the common name using the <beginsWith> and <endsWith> elements.

<organization> allows the query to be constrained based on the organization name of the contact. It has the same semantics as the <commonName> element.

<eMail> constrains the query based on the e-mail address of the contact. This may be done by an exact e-mail address using the <exactMatch> element or by any e-mail address in a domain using the <inDomain> element. The <inDomain> MUST only contain a valid domain name (i.e., no '@' symbol), and the matching SHOULD take place only on the domain given (i.e., no partial matches with respect to substrings or parent domains). If either the contents of the <inDomain> element or domain part of the contents of the <exactMatch> element contain a name with non-ASCII characters, they MUST be normalized according to the processes of RFC 3491 [15].

The <city>, <region>, and <postalCode> elements restrict the scope of the query based on the city, region, or postal code of the contact, respectively. Each one must only contain an <exactMatch> element containing the exact city, region, or postal code (i.e., no substring searches).

3.2. Result Derivatives

3.2.1. Privacy Labels

Several of the results in this registry type have values that cannot be given but must be specified as present or must be flagged so that clients do not divulge them. In order to achieve this, some of the results use the following element types:

- "dateTimePrivacyType" - contains the XML Schema [3] data type "dateTime". The contents of this element MUST be specified using the 'Z' indicator for Coordinated Universal Time (UTC).

- "stringPrivacyType" - contains the XML Schema [3] data type "string".

- "normalizedStringPrivacyType" - contains the XML Schema [3] data type "normalizedString".

- "tokenPrivacyType" - contains the XML Schema [3] data type "token".

- "enumStatusType" - describes a state for an ENUM domain. This element has the following optional attributes:

  * 'scope' - indicates the scope or origin of the status value.

  * 'disposition' - contains either the value "pending", meaning that initial processing for this status has begun and is not yet complete, or the value "prohibited", meaning this ENUM domain cannot achieve this status according to either the registry or registrar of this ENUM domain.

  * 'actor' - contains either the value "registry", meaning this status value has been associated with this ENUM domain by the registry, or the value "registrar", meaning this status value has been associated with this ENUM domain by the registrar.

  This element has the following optional child elements:

  * <appliedDate> - indicates the date and time the status was applied.

  * <description> - provides a textual description of the status. This element has a required 'language' attribute.

  * <subStatus> - indicates a jurisdictional-dependent reason for this status value. This element has a required 'authority' attribute to indicate the jurisdictional authority associated with this sub-status.

- "contactTypeType" - contains an optional <description> child elements. Each <description> child element requires a 'language' attribute.

As specified, they are nillable and therefore may be present with empty content or present with their specified content. The use of these elements is also optional.

If present without content, each of these element types MUST have one or more of the following boolean attributes:

- 'private' - if true, this specifies that the content is absent because it may never be published.

- 'denied' - if true, this specifies that the content is absent because policy does not allow it to be given under the current level of access.

If present with content, each of these element types MAY have one or more of the following boolean attributes:

- 'doNotRedistribute' - if true, this specifies that the content is not to be redistributed.

- 'specialAccess' - if true, this specifies that the content has been provided due to special access rights.

These boolean attributes SHOULD be used in accordance with the level of access being granted the recipient of the data. For example, marking data as 'private' or 'denied' is to be expected if the user is anonymous or has some other low level of access that does not warrant viewing of that particular data. Likewise, data marked with 'doNotRedistribute' or 'specialAccess' is to be expected if the user is authenticated and has a high level of access.

3.2.2. Contact Group

Many of the results share a set of references to contacts regarding an associated role. These are represented by the following elements:

- <billingContact>

- <technicalContact>

- <administrativeContact>

- <legalContact>

- <zoneContact>

- <abuseContact>

- <securityContact>

- <otherContact>

Each of these elements contains an entity reference. The referent of each MUST be a <contact> (Section 3.2.5).

3.2.3. <enum> Result

An example of a <enum> result:

```
<enum
  authority="3.0.7.1.e164.arpa" registryType="ereg1"
  entityClass="enum-handle" entityName="555-1234.001" >

  <e164Number>+1 703 555 1234</e164Number>

  <nameServer
      iris:referentType="ereg:host"
      authority="3.0.7.1.e164.arpa" registryType="ereg1"
      entityClass="host-handle" entityName="ns1.001" />
  <nameServer
      iris:referentType="ereg:host"
      authority="3.0.7.1.e164.arpa" registryType="ereg1"
      entityClass="host-handle" entityName="ns2.001" />

  <registrant
    iris:referentType="ereg:contact"
    authority="3.0.7.1.e164.arpa" registryType="ereg1"
    entityClass="contact-handle" entityName="beb140">
    <iris:displayName language="en">
      Bill Eckels
    </iris:displayName>
  </registrant>

  <technicalContact
    iris:referentType="ereg:contact"
    authority="3.0.7.1.e164.arpa" registryType="ereg1"
    entityClass="contact-handle" entityName="mak21">
    <iris:displayName language="en">
      Mark Kosters
    </iris:displayName>
  </technicalContact>

  <status>
    <create/>
    <active/>
    <delete
      actor="registrar"
      disposition="prohibited">
      <subStatus
        authority="regr.example">
        AUTO-LOCK
      </subStatus>
    </delete>
```

```
        <update
          actor="registrar"
          disposition="prohibited">
          <subStatus
            authority="regr.example">
            AUTO-LOCK
          </subStatus>
        </update>
        <transfer
          actor="registrar"
          disposition="prohibited">
          <subStatus
            authority="registrar.example">
            AUTO-LOCK
          </subStatus>
        </transfer>
        <redemptionPeriod
          actor="registry"
          disposition="pending">
          <subStatus
            authority="policy-body.example">
            STANDARD RGP
          </subStatus>
        </redemptionPeriod>
      </status>

    </enum>
```

The <enum> result represents an instance of an ENUM domain assignment. The children of the <enum> element are as follows:

- <e164Number> - the E.164 number for this ENUM domain as defined by [13]. It is RECOMMENDED that only space characters be used between the digits of these E.164 numbers, as of the international number format defined in [14].

- <enumHandle> - a registry-unique assigned identifier to an ENUM domain.

- <nameServer> - MUST contain an entity reference to a referent of type <host> (Section 3.2.4).

- <registrant> - elements containing an entity reference to the registrant of this ENUM domain. The referent MUST be a <contact> (Section 3.2.5) result.

- ENUM domain contacts - see Section 3.2.2.

- o <status> - may contain at least one of the following elements of type 'enumStatusType' (see Section 3.2.1).
  - * <reserved> - this ENUM domain falls outside the normal registration rules and/or processes for registration
  - * <create> - assigned to a registrant
  - * <active> - available via DNS (either via delegation or direct publication)
  - * <inactive> - unavailable via DNS
  - * <dispute> - registrant assignment is in dispute
  - * <delete> - registrant assignment removed
  - * <transfer> - change of authority
  - * <update> - modification of this ENUM domain
  - * <renew> - renewal of ENUM domain registration
  - * <addPeriod> - period at the creation or activation of this ENUM domain (see RFC 3915 [18])
  - * <renewPeriod> - period at the renewal of this ENUM domain (see RFC 3915 [18])
  - * <autoRenewPeriod> - period at the automatic renewal of this ENUM domain (see RFC 3915 [18])
  - * <transferPeriod> - period at the transfer of this ENUM domain (see RFC 3915 [18])
  - * <redemptionPeriod> - period at the redemption of this ENUM domain (see RFC 3915 [18])
  - * <restore> - change to previous status of this ENUM domain
  - * <other> - a status only defined by its <subStatus> child element

  As stated in Section 3.2.1, each status value may have flags to indicate the entity responsible for assigning the status (e.g., actor='registrar') and the nature of the status (e.g., disposition="prohibited"). Any one status value MUST NOT imply other status values. For instance, <reserved> is just an

indication that the ENUM domain is given special reserved status; the <create disposition="prohibited"/> status value must also be present to indicate that the ENUM domain cannot be registered.

- <registrationReference> - an element containing an entity reference, the referent of which MUST be an <enum> (Section 3.2.3). The intention of this element is to point to the downstream registration reference. Therefore, if this is a result given back by an ENUM domain registry, it should point to the ENUM domain in the ENUM domain registrar or registrant service.

- <registry> - contains an entity reference specifying the ENUM domain registry operator for this ENUM domain that MUST be a <registrationAuthority> (Section 3.2.6).

- <registrar> - contains an entity reference specifying the ENUM domain registrar operator for this ENUM domain that MUST be a <registrationAuthority> (Section 3.2.6).

- <validationEntity> - contains an entity reference specifying the validation entity for this ENUM domain that MUST be a <validationEntity> (Section 3.2.7).

- communication service providers - the following elements contain an entity reference with a relationship to the ENUM domain. The referent of each MUST be a <communicationServiceProvider> (Section 3.2.8).

  * <lineCSP>

  * <signalCSP>

  * <dataCSP>

  * <voiceCSP>

  * <otherCSP>

- <validationEvent> -- elements containing an entity reference to validation events related to this ENUM domain. The referent MUST be a <validationEvent> (Section 3.2.9).

- <initialDelegationDateTime> - an element containing the date and time of the initial delegation of this ENUM domain.

- <lastRenewalDateTime> - an element containing the date and time of last renewal of this ENUM domain.

- <expirationDateTime> - an element containing the date and time of the expiration of this ENUM domain.

- <lastContactModificationDateTime> - specifies the last time a contact for the ENUM domain was added or removed.

- <lastContactModificationBy> - an element containing an entity reference. The referent MUST be a <contact> (Section 3.2.5) responsible for the last addition or removal of a contact for this ENUM domain.

- <lastDelegationModificationDateTime> - an element containing the date and time of the last time one of the nameservers was added or removed for the delegation of this ENUM domain.

- <lastDelegationModificationBy> - an element containing an entity reference. The referent MUST be a <contact> (Section 3.2.5) result and be responsible for the last addition or removal of a nameserver for this ENUM domain.

- <lastVerificationDateTime> - an element containing the date and time of the last time the data for this domain was verified by the responsible registration authority.

- <iris:seeAlso> - an element containing an entity reference specifying a referent that is indirectly associated with this domain.

3.2.4. <host> Result

An example of a <host> result:

```
<host
  authority="iana.org" registryType="ereg1"
  entityClass="host-handle" entityName="nsol184" >
  <hostHandle>nsol184</hostHandle>
  <hostName>a.iana-servers.net</hostName>
  <ipV4Address>192.0.2.43</ipV4Address>
  <hostContact
    iris:referentType="ereg:contact"
    authority="iana.org" registryType="ereg1"
    entityClass="contact-handle" entityName="dbarton" />
</host>
```

The <host> element represents an instance of a host registration. The children of the <host> element are as follows:

- <hostHandle> - a registry-unique assigned identifier for the host.

- <hostName> - the fully qualified domain name of the host. The contents of this element are a host name and MUST conform to RFC 1123 [19].

- <ipV4Address> - the content of which MUST conform to a valid IP version 4 host address as specified by RFC 791 [8].

- <ipV6Address> - the content of which MUST conform to a valid IP version 6 host address as specified by RFC 3513 [7].

- <hostContact> - an element containing an entity reference specifying a contact associated with this host. The referent MUST be <contact> (Section 3.2.5) results.

- <createdDateTime> - an element containing the date and time this host was created.

- <lastModificationDateTime> - an element containing the date and time this host was last modified.

- <lastVerificationDateTime> - an element containing the date and time this data for this host was last verified to be correct by the appropriate registration authority.

- <iris:seeAlso> - an element containing an entity reference specifying a referent that is indirectly associated with this host.

3.2.5. <contact> Result

An example of a <contact> result:

```
<contact
  authority="example.org" registryType="ereg1"
  entityClass="contact-handle" entityName="example-admin" >
  <contactHandle>example-admin</contactHandle>
  <commonName>Example.Org Manager</commonName>
  <organization>Internet Assigned Numbers Authority</organization>
  <eMail>res-dom@example.org</eMail>
  <postalAddress>
    <address>123 Mocking Bird Lane</address>
    <city>Some City</city>
    <region>CA</region>
    <postalCode>00000</postalCode>
    <country>US</country>
  </postalAddress>
  <phone>+1234567890</phone>
</contact>
```

The <contact> element represents an instance of a contact registration. The children of the <contact> element are as follows:

- <contactHandle> - a registry-unique assigned identifier for this contact.
- <commonName> - the name of the contact.
- <language> - a specification of the language code to use to localize the data in this result.
- <type> - contains one of the following child elements: <person>, <organization>, <role>, or <other>. Each of these elements is a "contactTypeType" as defined in Section 3.2.1.
- <organization> - an element containing the organization name of the contact.
- The <legalId> child element contains a jurisdictional identifier of this contact (an example of such an identifier is a national taxation ID or a commercial registry number).
- <eMail> - elements containing an e-mail address for this contact.
- <sip> - elements containing a SIP URI for this contact.
- <postalAddress> - elements containing children representing a postal address. <postalAddress> has the following children:
  - <address> - an element containing the street address for this contact.
  - <city> - an element containing the city for this contact.
  - <region> - an element containing the national region for this contact.
  - <postalCode> - an element containing the postal code for this contact.
  - <country> - an element containing the country for this contact. This SHOULD be a 2-letter country code compliant with ISO 3166 [11].
- <phone> - elements containing a voice phone number for this contact. If it begins with a '+' (plus) character, it MUST be a number defined by E.164 [13]. The format number defined in E.164 [13] is RECOMMENDED.

- <fax> - elements containing a facsimile phone number for this contact. If it begins with a '+' (plus) character, it MUST be a number defined by E.164 [13]. The format number defined in E.164 [13] is RECOMMENDED.

- <createdDateTime> - an element containing the date and time this contact was created.

- <lastModificationDateTime> - an element containing the date and time this contact was last modified.

- <lastVerificationDateTime> - an element containing the date and time this data for this contact was last verified to be correct by the appropriate registration authority.

- <translatedContacts> - an element containing an entity reference specifying equivalents of this contact that have been translated into other languages. The referent MUST be <contact> (Section 3.2.5) results.

- <iris:seeAlso> - an element containing an entity reference specifying a referent that is indirectly associated with this contact.

3.2.6. <registrationAuthority> Result

An example of a <registrationAuthority> result:

```
<registrationAuthority
  authority="iana.org" registryType="ereg1"
  entityClass="registration-authority" entityName="iana" >
  <serviceInstance
    iris:referentType="iris:serviceIdentification"
    authority="iana.org" registryType="ereg1"
    entityClass="iris" entityName="id" />
  <organizationName>
    Internet Assigned Numbers Authority
  </organizationName>
  <registrar />
</registrationAuthority>
```

The <registrationAuthority> result represents an entity capable of registering domains.

The <serviceInstance> child element of <registrationAuthority> contains an entity reference pointing to the entity "id" in the entity class "iris".

The <organizationName> child element contains the name of the registration authority.

The <legalId> child element contains an identifier of this registration authority (an example of such an identifier is a national taxation ID or a commercial registry number).

The registration authority type child elements, <registry>, <registrar>, and <other>, determine the role in which this registration authority plays in the process of registering ENUM domains. The intent of this element is to explain the various roles a registration authority may have with regards to the authority areas pointed to by the <serviceInstance> element. A client MAY understand the relationship of a registration authority with respect to an ENUM domain by the placement of the reference in the domain (e.g., <registry> or <registrar>).

contacts - see Section 3.2.2.

<iris:seeAlso> - an element containing an entity reference specifying a referent that is indirectly associated with this registration authority.

3.2.7. <validationEntity> Result

An example of a <validationEntity> result:

```
<validationEntity
  authority="example.org" registryType="ereg1"
  entityClass="validation-entity" entityName="govt" >
  <serviceInstance
    iris:referentType="iris:serviceIdentification"
    authority="example.org" registryType="ereg1"
    entityClass="iris" entityName="id" />
  <organizationName>
    Some Government Authority
  </organizationName>
  <technicalContact
    iris:referentType="iris:contact"
    authority="example.org" registryType="ereg1"
    entityClass="contact-handle" entityName="1234" />
  <administrativeContact
    iris:referentType="iris:contact"
    authority="example.org" registryType="ereg1"
    entityClass="contact-handle" entityName="abc" />
</validationEntity>
```

The <validationEntity> result represents an entity responsible for validating ENUM domains against E.164 [13] registrations.

The <serviceInstance> child element of <validationEntity> contains an entity reference pointing to the entity "id" in the entity class "iris".

The <organizationName> child element contains the name of the validation authority.

The <legalId> child element contains an identifier of this validation authority (an example of such an identifier is a national taxation ID or a commercial registry number).

contacts - see Section 3.2.2.

<iris:seeAlso> - an element containing an entity reference specifying a referent that is indirectly associated with this validation authority.

3.2.8. <communicationServiceProvider> Result

An example of a <communicationServiceProvider> result:

```
<communicationServiceProvider
  authority="bell.example.com" registryType="ereg1"
  entityClass="csp" entityName="bellco" >
  <serviceInstance
    iris:referentType="iris:serviceIdentification"
    authority="bell.example.com" registryType="ereg1"
    entityClass="iris" entityName="id" />
  <organizationName>
    Big Phone Co.
  </organizationName>
  <line />
</communicationServiceProvider>
```

The <communicationServiceProvider> result represents an entity providing ENUM domain service.

The <serviceInstance> child element of <communicationServiceProvider> contains an entity reference pointing to the entity "id" in the entity class "iris".

The <organizationName> child element contains the name of the registration authority.

The <legalId> child element contains an identifier of this communication service provider (an example of such an identifier is a national taxation ID or a commercial registry number).

The <cspId> child element contains an identifier unique to this communication service provider and identifies this communication service provider with regard to its operating jurisdiction.

The child elements, <line>, <signal>, <data>, <voice>, and <other>, detail the capabilities of this communication service provider. The capabilities this communication service provider provides to a specific ENUM domain are a subset of these capabilities and are expressed in the <enum> result using the <lineCSP>, <signalCSP>, <dataCSP>, <voiceCSP>, and <otherCSP> entity references.

contacts - see Section 3.2.2.

<iris:seeAlso> - an element containing an entity reference specifying a referent that is indirectly associated with this communication service provider.

3.2.9. <validationEvent> Result

An example of a <validationEvent> result:

```
<validationEvent
  authority="example.com" registryType="ereg1"
  entityClass="validation-event" entityName="xyz-0123" >
  <serial>xyz-0123</serial>
  <validationEntity
    iris:referentType="ereg:validationEntity"
    authority="bell.example.com" registryType="ereg1"
    entityClass="iris" entityName="id" />
</validationEvent>
```

The <validationEvent> result represents a record of validation for an ENUM domain.

The <serial> child element contains an identifier identifying this validation event between a validation entity and a registrar.

The <methodId> child element contains an identifier describing the method used for validation.

<registrar> - contains an entity reference specifying the ENUM domain registrar operator for this validation event that MUST be a <registrationAuthority> (Section 3.2.6).

<validationEntity> - contains an entity reference specifying the validation entity for this validation event that MUST be a <validationEntity> (Section 3.2.7).

<executionDateTime> - an element containing the date and time of the creation of this validation event.

<expirationDateTime> - an element containing the date and time of the expiration of this validation event.

<iris:seeAlso> - an element containing an entity reference specifying a referent that is indirectly associated with this validation event.

3.3. Generic Code Derivatives

3.3.1. <searchTooWide>

Servers MAY use the <searchTooWide> error code when a query must be narrowed to yield a result set acceptable to the policies of the server operator.

3.3.2. <languageNotSupported>

The queries <findEnumsByContact> and <findContacts> support optional language tags that allow a client to suggest to a server the languages in which to scope the queries. If a client passes to the server a language that the server does not support, the server MAY use this error code to indicate that one of the languages is not supported.

This element contains child elements named <unsupportedLanguage>. Each of these child elements specifies a language not supported by the server. When a server returns this error, it MUST give the languages from the query that are not supported.

3.4. Support for <iris:lookupEntity>

The following types of entity classes are recognized by the <lookupEntity> query of IRIS for this registry:

- host-name - the fully qualified domain name of a nameserver. It yields a <host> (Section 3.2.4) in the response.

- host-handle - the registry-unique identifier given a nameserver. It yields a <host> (Section 3.2.4) in the response.

- e164 - an E.164 number as specified by [13]. It yields an <enum> (Section 3.2.3) in the response. Clients SHOULD remove all non-digit characters between the digits of an E.164 number, and servers MUST ignore any non-digit characters between the digits of an E.164 number (e.g., "+1 703 555 1234" is to be interpreted as "+17035551234").

- enum - the fully qualified name of an ENUM domain. This is a domain name as specified by RFC 3761 [17]. It yields an <enum> (Section 3.2.3) in the response.

- enum-handle - the registry-unique identifier given an ENUM domain. It yields an <enum> (Section 3.2.3) in the response.

- contact-handle - the registry-unique identifier given a contact. It yields a <contact> (Section 3.2.5) in the response.

- ipv4-address - the IPv4 address of a nameserver. It yields a <host> (Section 3.2.4) in the response.

- ipv6-address - the IPv6 address of a nameserver. It yields a <host> (Section 3.2.4) in the response.

- registration-authority - the name of a registration authority. It yields a <registrationAuthority> (Section 3.2.6) in the response.

- validation-entity - the name of a validation entity. It yields a <validationEntity> (Section 3.2.7)

- csp - the identifier of a communication service provider. Yields a <communicationServiceProvider> (Section 3.2.8).

- validation-event - the identifier for a validation event. It yields a <validationEvent> (Section 3.2.9).

- All names in these entity classes are case insensitive.

4. Formal XML Syntax

This registry schema is specified in the XML Schema notation. The formal syntax presented here is a complete schema representation suitable for automated validation of an XML instance when combined with the formal schema syntax of IRIS.

```
<?xml version="1.0"?>
<schema xmlns="http://www.w3.org/2001/XMLSchema"
  xmlns:ereg="urn:ietf:params:xml:ns:ereg1"
  xmlns:iris="urn:ietf:params:xml:ns:iris1"
  targetNamespace="urn:ietf:params:xml:ns:ereg1"
  elementFormDefault="qualified" >

  <import namespace="urn:ietf:params:xml:ns:iris1" />

  <annotation>
    <documentation>
      ENUM registry schema
      derived from IRIS schema
    </documentation>
  </annotation>

  <!-- ======================================== -->
  <!--                                          -->
  <!-- Query Types                              -->
  <!--                                          -->
  <!-- ======================================== -->

  <!--                                          -->
  <!-- Find ENUMs by E.164                      -->
  <!--                                          -->

  <complexType
    name="findEnumsByE164Type">
    <complexContent>
      <extension
        base="iris:queryType">
        <sequence>
          <element
            name="e164Prefix"
            type="token" />
          <element
            name="specificity"
            minOccurs="0" >
            <simpleType>
              <restriction
                base="string">
```

```
                <enumeration
                  value="less"/>
                <enumeration
                  value="more"/>
              </restriction>
            </simpleType>
          </element>
        </sequence>
      </extension>
    </complexContent>
  </complexType>

  <element
    name="findEnumsByE164"
    type="ereg:findEnumsByE164Type"
    substitutionGroup="iris:query" />

  <!--                                                -->
  <!-- Find ENUMs By Contact                          -->
  <!--                                                -->

  <complexType
    name="findEnumsByContactType">
    <complexContent>
      <extension
        base="iris:queryType">
        <sequence>
          <choice>
            <group
              ref="ereg:contactSearchGroup" />
            <element
              name="contactHandle"
              type="ereg:exactMatchParameter" />
          </choice>
          <element
            name="role"
            minOccurs="0"
            maxOccurs="1" >
            <simpleType>
              <restriction
                base="string" >
                <enumeration
                  value="registrant" />
                <enumeration
                  value="billingContact" />
                <enumeration
                  value="technicalContact" />
                <enumeration
```

```
                    value="administrativeContact" />
                  <enumeration
                    value="legalContact" />
                  <enumeration
                    value="zoneContact" />
                  <enumeration
                    value="abuseContact" />
                  <enumeration
                    value="securityContact" />
                  <enumeration
                    value="otherContact" />
                </restriction>
              </simpleType>
            </element>
            <element
              name="language"
              type="language"
              minOccurs="0"
              maxOccurs="unbounded"/>
          </sequence>
        </extension>
      </complexContent>
    </complexType>

    <element
      name="findEnumsByContact"
      type="ereg:findEnumsByContactType"
      substitutionGroup="iris:query" />

    <!--                                                -->
    <!-- Find Contacts                                  -->
    <!--                                                -->

    <complexType
      name="findContactsType">
      <complexContent>
        <extension
          base="iris:queryType">
          <sequence>
            <group
              ref="ereg:contactSearchGroup" />
            <element
              name="language"
              type="language"
              minOccurs="0"
              maxOccurs="unbounded"/>
           </sequence>
        </extension>
```

```
    </complexContent>
  </complexType>

  <element
    name="findContacts"
    type="ereg:findContactsType"
    substitutionGroup="iris:query" />

  <!--                                                -->
  <!-- Find ENUMs By Host                             -->
  <!--                                                -->

  <complexType
    name="findEnumsByHostType">
    <complexContent>
      <extension
        base="iris:queryType">
        <sequence>
          <choice>
            <element
              name="hostName"
              type="ereg:exactMatchParameter" />
            <element
              name="hostHandle"
              type="ereg:exactMatchParameter" />
            <element
              name="ipV4Address"
              type="ereg:exactMatchParameter" />
            <element
              name="ipV6Address"
              type="ereg:exactMatchParameter" />
          </choice>
        </sequence>
      </extension>
    </complexContent>
  </complexType>

  <element
    name="findEnumsByHost"
    type="ereg:findEnumsByHostType"
    substitutionGroup="iris:query" />

  <!--                                                -->
  <!-- Contact Search Group                           -->
  <!--                                                -->

  <group
    name="contactSearchGroup">
```

```
      <choice>
        <element
          name="commonName"
          type="ereg:exactOrPartialMatchParameter" />
        <element
          name="organization"
          type="ereg:exactOrPartialMatchParameter" />
        <element
          name="eMail"
          type="ereg:domainResourceParameter" />
        <element
          name="sip"
          type="ereg:domainResourceParameter" />
        <element
          name="city"
          type="ereg:exactMatchParameter" />
        <element
          name="region"
          type="ereg:exactMatchParameter" />
        <element
          name="postalCode"
          type="ereg:exactMatchParameter" />
      </choice>
    </group>

    <complexType
      name="exactOrPartialMatchParameter">
      <choice>
        <group
          ref="ereg:partialMatchGroup" />
        <group
          ref="ereg:exactMatchGroup" />
      </choice>
    </complexType>

    <complexType
      name="exactMatchParameter">
      <group
        ref="ereg:exactMatchGroup" />
    </complexType>

    <complexType
      name="partialMatchParameter">
      <sequence>
        <group
          ref="ereg:partialMatchGroup" />
      </sequence>
    </complexType>
```

```
<complexType
  name="domainResourceParameter" >
  <choice>
    <group
      ref="ereg:exactMatchGroup" />
    <element
      name="inDomain"
      type="token" />
  </choice>
</complexType>

<group
  name="partialMatchGroup">
  <choice>
    <sequence>
      <element
        name="beginsWith">
        <simpleType>
          <restriction
            base="token">
            <minLength
              value="1"/>
          </restriction>
        </simpleType>
      </element>
      <element
        minOccurs="0"
        name="endsWith"
        type="ereg:endsWithType" />
    </sequence>
    <element
      name="endsWith"
      type="ereg:endsWithType" />
  </choice>
</group>

<simpleType
  name="endsWithType">
  <restriction
    base="token">
    <minLength
      value="1" />
  </restriction>
</simpleType>

<group
  name="exactMatchGroup">
  <sequence>
```

```
      <element
        name="exactMatch"
        type="normalizedString" />
    </sequence>
  </group>

  <!-- ======================================== -->
  <!--                                          -->
  <!-- Result Types                             -->
  <!--                                          -->
  <!-- ======================================== -->

  <!--                                          -->
  <!-- ENUM                                     -->
  <!--                                          -->

  <complexType
    name="enumType">
    <complexContent>
      <extension
        base="iris:resultType">
        <sequence>
          <element
            name="e164Number"
            type="token" />
          <element
            name="enumHandle"
            type="ereg:normalizedStringPrivacyType"
            nillable="true"
            minOccurs="0"
            maxOccurs="1" />
          <element
            name="nameServer"
            type="iris:entityType"
            minOccurs="0"
            maxOccurs="unbounded" />
          <element
            name="registrant"
            type="iris:entityType"
            minOccurs="0"
            maxOccurs="unbounded" />
          <group ref="ereg:contactGroup" />
          <element
            name="lastContactModificationDateTime"
            type="ereg:dateTimePrivacyType"
            nillable="true"
            minOccurs="0"
            maxOccurs="1" />
```

```
            <element
              name="lastContactModificationBy"
              type="iris:entityType"
              minOccurs="0"
              maxOccurs="1" />
            <element
              name="status"
              minOccurs="0"
              maxOccurs="1">
              <complexType>
                <choice
                  minOccurs="1"
                  maxOccurs="unbounded">
                  <element
                    name="reserved"
                    type="ereg:enumStatusType" />
                  <element
                    name="create"
                    type="ereg:enumStatusType" />
                  <element
                    name="active"
                    type="ereg:enumStatusType" />
                  <element
                    name="inactive"
                    type="ereg:enumStatusType" />
                  <element
                    name="dispute"
                    type="ereg:enumStatusType" />
                  <element
                    name="delete"
                    type="ereg:enumStatusType" />
                  <element
                    name="transfer"
                    type="ereg:enumStatusType" />
                  <element
                    name="renew"
                    type="ereg:enumStatusType" />
                  <element
                    name="update"
                    type="ereg:enumStatusType" />
                  <element
                    name="addPeriod"
                    type="ereg:enumStatusType" />
                  <element
                    name="renewPeriod"
                    type="ereg:enumStatusType" />
                  <element
                    name="autoRenewPeriod"
```

```
                type="ereg:enumStatusType" />
              <element
                name="transferPeriod"
                type="ereg:enumStatusType" />
              <element
                name="redemptionPeriod"
                type="ereg:enumStatusType" />
              <element
                name="restore"
                type="ereg:enumStatusType" />
              <element
                name="other"
                type="ereg:enumStatusType" />
            </choice>
          </complexType>
        </element>
        <element
          name="registrationReference"
          type="iris:entityType"
          minOccurs="0"
          maxOccurs="1" />
        <element
          name="registry"
          type="iris:entityType"
          minOccurs="0"
          maxOccurs="1" />
        <element
          name="registrar"
          type="iris:entityType"
          minOccurs="0"
          maxOccurs="1" />
        <element
          name="validationEntity"
          type="iris:entityType"
          minOccurs="0"
          maxOccurs="unbounded" />
        <element
          name="signalCSP"
          type="iris:entityType"
          minOccurs="0"
          maxOccurs="unbounded" />
        <element
          name="dataCSP"
          type="iris:entityType"
          minOccurs="0"
          maxOccurs="unbounded" />
        <element
          name="lineCSP"
```

```
      type="iris:entityType"
      minOccurs="0"
      maxOccurs="unbounded"/>
    <element
      name="voiceCSP"
      type="iris:entityType"
      minOccurs="0"
      maxOccurs="unbounded" />
    <element
      name="otherCSP"
      type="iris:entityType"
      minOccurs="0"
      maxOccurs="unbounded" />
    <element
      name="validationEvent"
      type="iris:entityType"
      minOccurs="0"
      maxOccurs="unbounded"/>
    <element
      name="initialDelegationDateTime"
      type="ereg:dateTimePrivacyType"
      nillable="true"
      minOccurs="0"
      maxOccurs="1" />
    <element
      name="lastRenewalDateTime"
      type="ereg:dateTimePrivacyType"
      nillable="true"
      minOccurs="0"
      maxOccurs="1" />
    <element
      name="expirationDateTime"
      type="ereg:dateTimePrivacyType"
      nillable="true"
      minOccurs="0"
      maxOccurs="1" />
    <element
      name="lastDelegationModificationDateTime"
      type="ereg:dateTimePrivacyType"
      nillable="true"
      minOccurs="0"
      maxOccurs="1" />
    <element
      name="lastDelegationModificationBy"
      type="iris:entityType"
      minOccurs="0"
      maxOccurs="1" />
    <element
```

```
            name="lastVerificationDateTime"
            type="ereg:dateTimePrivacyType"
            nillable="true"
            minOccurs="0"
            maxOccurs="1" />
          <element
            ref="iris:seeAlso"
            minOccurs="0"
            maxOccurs="unbounded" />
        </sequence>
      </extension>
    </complexContent>
  </complexType>

  <element
    name="enum"
    type="ereg:enumType"
    substitutionGroup="iris:result" />

  <!--                                                -->
  <!-- Host                                           -->
  <!--                                                -->

  <complexType
    name="hostType">
    <complexContent>
      <extension
        base="iris:resultType">
        <sequence>
          <element
            name="hostHandle"
            type="ereg:normalizedStringPrivacyType"
            nillable="true"
            minOccurs="0"
            maxOccurs="1" />
          <element
            name="hostName"
            type="normalizedString" />
          <element
            name="ipV4Address"
            type="token"
            minOccurs="0"
            maxOccurs="unbounded" />
          <element
            name="ipV6Address"
            type="token"
            minOccurs="0"
            maxOccurs="unbounded" />
```

```
            <element
              name="hostContact"
              type="iris:entityType"
              minOccurs="0"
              maxOccurs="unbounded" />
            <element
              name="createdDateTime"
              type="ereg:dateTimePrivacyType"
              nillable="true"
              minOccurs="0"
              maxOccurs="1" />
            <element
              name="lastModificationDateTime"
              type="ereg:dateTimePrivacyType"
              nillable="true"
              minOccurs="0"
              maxOccurs="1" />
            <element
              name="lastVerificationDateTime"
              type="ereg:dateTimePrivacyType"
              nillable="true"
              minOccurs="0"
              maxOccurs="1" />
            <element
              ref="iris:seeAlso"
              minOccurs="0"
              maxOccurs="unbounded" />
          </sequence>
        </extension>
      </complexContent>
    </complexType>

    <element
      name="host"
      type="ereg:hostType"
      substitutionGroup="iris:result" />

    <!--                                                -->
    <!-- Contact                                        -->
    <!--                                                -->

    <complexType
      name="contactType">
      <complexContent>
        <extension
          base="iris:resultType">
          <sequence>
            <element
```

```
      name="contactHandle"
      type="ereg:normalizedStringPrivacyType"
      nillable="true"
      minOccurs="0"
      maxOccurs="1" />
    <element
      name="commonName"
      type="ereg:normalizedStringPrivacyType"
      nillable="true"
      minOccurs="0"
      maxOccurs="1"/>
    <element
      name="language"
      type="language"
      minOccurs="0"
      maxOccurs="1" />
    <element
      name="type"
      minOccurs="0"
      maxOccurs="1">
      <complexType>
        <choice>
          <element
            name="person"
            type="ereg:contactTypeType" />
          <element
            name="organization"
            type="ereg:contactTypeType" />
          <element
            name="role"
            type="ereg:contactTypeType" />
          <element
            name="other"
            type="ereg:contactTypeType" />
        </choice>
      </complexType>
    </element>
    <element
      name="organization"
      type="ereg:normalizedStringPrivacyType"
      nillable="true"
      minOccurs="0"
      maxOccurs="1" />
    <element
      name="legalId"
      type="ereg:tokenPrivacyType"
      nillable="true"
      minOccurs="0"
```

```
    maxOccurs="unbounded" />
  <element
    name="eMail"
    type="ereg:stringPrivacyType"
    nillable="true"
    minOccurs="0"
    maxOccurs="unbounded" />
  <element
    name="sip"
    type="ereg:stringPrivacyType"
    nillable="true"
    minOccurs="0"
    maxOccurs="unbounded" />
  <element
    name="postalAddress"
    minOccurs="0"
    maxOccurs="unbounded" >
    <complexType>
      <sequence>
        <element
          name="address"
          type="ereg:stringPrivacyType"
          nillable="true"
          minOccurs="0"
          maxOccurs="1" />
        <element
          name="city"
          type="ereg:stringPrivacyType"
          nillable="true"
          minOccurs="0"
          maxOccurs="1" />
        <element
          name="region"
          type="ereg:stringPrivacyType"
          nillable="true"
          minOccurs="0"
          maxOccurs="1" />
        <element
          name="postalCode"
          type="ereg:normalizedStringPrivacyType"
          nillable="true"
          minOccurs="0"
          maxOccurs="1" />
        <element
          name="country"
          type="ereg:tokenPrivacyType"
          nillable="true"
          minOccurs="0"
```

```
                maxOccurs="1" />
            </sequence>
          </complexType>
        </element>
        <element
          name="phone"
          type="ereg:normalizedStringPrivacyType"
          nillable="true"
          minOccurs="0"
          maxOccurs="unbounded" />
        <element
          name="fax"
          type="ereg:normalizedStringPrivacyType"
          nillable="true"
          minOccurs="0"
          maxOccurs="unbounded" />
        <element
          name="createdDateTime"
          type="ereg:dateTimePrivacyType"
          nillable="true"
          minOccurs="0"
          maxOccurs="1" />
        <element
          name="lastModificationDateTime"
          type="ereg:dateTimePrivacyType"
          nillable="true"
          minOccurs="0"
          maxOccurs="1" />
        <element
          name="lastVerificationDateTime"
          type="ereg:dateTimePrivacyType"
          nillable="true"
          minOccurs="0"
          maxOccurs="1" />
        <element
          name="translatedContact"
          type="iris:entityType"
          minOccurs="0"
          maxOccurs="unbounded" />
        <element
          ref="iris:seeAlso"
          minOccurs="0"
          maxOccurs="unbounded" />
      </sequence>
    </extension>
  </complexContent>
</complexType>
```

```
<element
  name="contact"
  type="ereg:contactType"
  substitutionGroup="iris:result" />

<!--                                                -->
<!-- Registration Authority                         -->
<!--                                                -->

<complexType
  name="registrationAuthorityType">
  <complexContent>
    <extension
      base="iris:resultType">
      <sequence>
        <element
          name="serviceInstance"
          type="iris:entityType"
          minOccurs="0"
          maxOccurs="1" />
        <element
          name="organizationName"
          type="string"
          minOccurs="0"
          maxOccurs="1" />
        <element
          name="legalId"
          type="token"
          minOccurs="0"
          maxOccurs="1"/>
        <choice
          minOccurs="0"
          maxOccurs="3">
          <element
            name="registry">
            <complexType/>
          </element>
          <element
            name="registrar">
            <complexType/>
          </element>
          <element
            name="other">
            <complexType/>
          </element>
        </choice>
        <group ref="ereg:contactGroup" />
        <element
```

```
            ref="iris:seeAlso"
            minOccurs="0"
            maxOccurs="unbounded" />
        </sequence>
      </extension>
    </complexContent>
  </complexType>

  <element
    name="registrationAuthority"
    type="ereg:registrationAuthorityType"
    substitutionGroup="iris:result" />

  <!--                                              -->
  <!-- Validation Entity                            -->
  <!--                                              -->

  <complexType
    name="validationEntityType">
    <complexContent>
      <extension
        base="iris:resultType">
        <sequence>
          <element
            name="serviceInstance"
            type="iris:entityType"
            minOccurs="0"
            maxOccurs="1" />
          <element
            name="organizationName"
            type="string"
            minOccurs="0"
            maxOccurs="1" />
          <element
            name="legalId"
            type="token"
            minOccurs="0"
            maxOccurs="1"/>
          <group ref="ereg:contactGroup" />
          <element
            ref="iris:seeAlso"
            minOccurs="0"
            maxOccurs="unbounded" />
        </sequence>
      </extension>
    </complexContent>
  </complexType>
```

```
<element
  name="validationEntity"
  type="ereg:validationEntityType"
  substitutionGroup="iris:result" />

<!--                                                -->
<!-- Communication Service Provider                 -->
<!--                                                -->

<complexType
  name="communicationServiceProviderType">
  <complexContent>
    <extension
      base="iris:resultType">
      <sequence>
        <element
          name="serviceInstance"
          type="iris:entityType"
          minOccurs="0"
          maxOccurs="1" />
        <element
          name="organizationName"
          type="string"
          minOccurs="0"
          maxOccurs="1" />
        <element
          name="legalId"
          type="token"
          minOccurs="0"
          maxOccurs="1"/>
        <element
          name="cspId"
          type="token"
          minOccurs="0"
          maxOccurs="1"/>
        <choice
          minOccurs="0"
          maxOccurs="5">
          <element
            minOccurs="0"
            maxOccurs="1"
            name="line">
            <complexType/>
          </element>
          <element
            minOccurs="0"
            maxOccurs="1"
            name="data">
```

```
                <complexType/>
              </element>
              <element
                minOccurs="0"
                maxOccurs="1"
                name="voice">
                <complexType/>
              </element>
              <element
                minOccurs="0"
                maxOccurs="1"
                name="signal">
                <complexType/>
              </element>
              <element
                minOccurs="0"
                maxOccurs="1"
                name="other">
                <complexType/>
              </element>
            </choice>
            <group ref="ereg:contactGroup" />
            <element
              ref="iris:seeAlso"
              minOccurs="0"
              maxOccurs="unbounded" />
          </sequence>
        </extension>
      </complexContent>
    </complexType>

    <element
      name="communicationServiceProvider"
      type="ereg:communicationServiceProviderType"
      substitutionGroup="iris:result" />

    <!--                                                -->
    <!-- Validation Event                               -->
    <!--                                                -->

    <complexType
      name="validationEventType">
      <complexContent>
        <extension
          base="iris:resultType">
          <sequence>
            <element
              name="serial"
```

```
              type="token"
              minOccurs="0"
              maxOccurs="unbounded" />
            <element
              name="methodId"
              type="token"
              minOccurs="0"
              maxOccurs="unbounded" />
            <element
              name="validationEntity"
              type="iris:entityType"
              minOccurs="0"
              maxOccurs="unbounded" />
            <element
              name="registrar"
              type="iris:entityType"
              minOccurs="0"
              maxOccurs="unbounded" />
            <element
              name="executionDateTime"
              type="ereg:dateTimePrivacyType"
              nillable="true"
              minOccurs="0"
              maxOccurs="1" />
            <element
              name="expirationDateTime"
              type="ereg:dateTimePrivacyType"
              nillable="true"
              minOccurs="0"
              maxOccurs="1" />
            <element
              ref="iris:seeAlso"
              minOccurs="0"
              maxOccurs="unbounded" />
          </sequence>
        </extension>
      </complexContent>
    </complexType>

    <element
      name="validationEvent"
      type="ereg:validationEventType"
      substitutionGroup="iris:result" />

    <!--                                          -->
    <!-- Contact Group                            -->
    <!--                                          -->
```

```
    <group name="contactGroup">
      <sequence>
        <element
          name="billingContact"
          type="iris:entityType"
          minOccurs="0"
          maxOccurs="unbounded" />
        <element
          name="technicalContact"
          type="iris:entityType"
          minOccurs="0"
          maxOccurs="unbounded" />
        <element
          name="administrativeContact"
          type="iris:entityType"
          minOccurs="0"
          maxOccurs="unbounded" />
        <element
          name="legalContact"
          type="iris:entityType"
          minOccurs="0"
          maxOccurs="unbounded" />
        <element
          name="zoneContact"
          type="iris:entityType"
          minOccurs="0"
          maxOccurs="unbounded" />
        <element
          name="abuseContact"
          type="iris:entityType"
          minOccurs="0"
          maxOccurs="unbounded" />
        <element
          name="securityContact"
          type="iris:entityType"
          minOccurs="0"
          maxOccurs="unbounded" />
        <element
          name="otherContact"
          type="iris:entityType"
          minOccurs="0"
          maxOccurs="unbounded" />
      </sequence>
    </group>

    <!--                                              -->
    <!-- Privacy Label Types                          -->
    <!--                                              -->
```

```
<attributeGroup
  name="privacyLabelAttributeGroup">
  <attribute
    name="private"
    type="boolean" />
  <attribute
    name="denied"
    type="boolean" />
  <attribute
    name="doNotRedistribute"
    type="boolean" />
  <attribute
    name="specialAccess"
    type="boolean" />
</attributeGroup>

<complexType
  name="dateTimePrivacyType">
  <simpleContent>
    <extension
      base="dateTime">
      <attributeGroup
        ref="ereg:privacyLabelAttributeGroup" />
    </extension>
  </simpleContent>
</complexType>

<complexType
  name="stringPrivacyType">
  <simpleContent>
    <extension
      base="string">
      <attributeGroup
        ref="ereg:privacyLabelAttributeGroup" />
    </extension>
  </simpleContent>
</complexType>

<complexType
  name="normalizedStringPrivacyType">
  <simpleContent>
    <extension
      base="normalizedString">
      <attributeGroup
        ref="ereg:privacyLabelAttributeGroup" />
    </extension>
  </simpleContent>
</complexType>
```

```
<complexType
  name="tokenPrivacyType">
  <simpleContent>
    <extension
      base="token">
      <attributeGroup
        ref="ereg:privacyLabelAttributeGroup" />
    </extension>
  </simpleContent>
</complexType>

<complexType
  name="enumStatusType">
  <sequence>
    <element
      name="appliedDate"
      type="dateTime"
      minOccurs="0"
      maxOccurs="1" />
    <element
      name="description"
      minOccurs="0"
      maxOccurs="unbounded">
      <complexType>
        <simpleContent>
          <extension
            base="string">
            <attribute
              name="language"
              type="language"
              use="required" />
          </extension>
        </simpleContent>
      </complexType>
    </element>
    <element
      name="subStatus"
      minOccurs="0"
      maxOccurs="1">
      <complexType>
        <simpleContent>
          <extension
            base="token">
            <attribute
              type="token"
              use="required"
              name="authority"/>
          </extension>
```

```
            </simpleContent>
          </complexType>
        </element>
      </sequence>
      <attributeGroup
        ref="ereg:privacyLabelAttributeGroup" />
      <attribute
        name="actor">
        <simpleType>
          <restriction
            base="string">
            <enumeration
              value="registry"/>
            <enumeration
              value="registrar"/>
          </restriction>
        </simpleType>
      </attribute>
      <attribute
        name="disposition">
        <simpleType>
          <restriction
            base="string">
            <enumeration
              value="prohibited"/>
            <enumeration
              value="pending"/>
          </restriction>
        </simpleType>
      </attribute>
      <attribute
        name="scope"
        type="token" />
    </complexType>

    <complexType
      name="contactTypeType">
      <sequence>
        <element
          name="description"
          minOccurs="0"
          maxOccurs="unbounded">
          <complexType>
            <simpleContent>
              <extension
                base="string">
                <attribute
                  name="language"
```

```
                type="language"
                use="required" />
            </extension>
          </simpleContent>
        </complexType>
      </element>
    </sequence>
    <attributeGroup
      ref="ereg:privacyLabelAttributeGroup" />
  </complexType>

  <!-- ======================================== -->
  <!--                                          -->
  <!-- Error Codes                              -->
  <!--                                          -->
  <!-- ======================================== -->

  <!--                                          -->
  <!-- Search Too Wide                          -->
  <!--                                          -->

  <element
    name="searchTooWide"
    type="iris:codeType"
    substitutionGroup="iris:genericCode" />

  <!--                                          -->
  <!-- Language Not Supported                   -->
  <!--                                          -->

  <complexType
    name="languageNotSupportedType">
    <complexContent>
      <extension
        base="iris:codeType">
        <sequence>
          <element
            name="unsupportedLanguage"
            type="language"
            minOccurs="1"
            maxOccurs="unbounded" />
        </sequence>
      </extension>
    </complexContent>
  </complexType>

  <element
    name="languageNotSupported"
```

```
        type="ereg:languageNotSupportedType"
        substitutionGroup="iris:genericCode" />

    </schema>
```

Figure 1: ereg.xsd

5. Blocks Extensible Exchange Protocol (BEEP) Transport Compliance

IRIS allows several extensions of the core capabilities. This section outlines those extensions allowable by IRIS-BEEP [6].

5.1. Message Pattern

This registry type uses the default message pattern as described in IRIS-BEEP [6].

5.2. Server Authentication

This registry type only uses the basic Transport Layer Security (TLS) server authentication method as described in IRIS-BEEP [6].

6. URI Resolution

6.1. Application Service Label

The application service label associated with this registry type MUST be "EREG1". This is the abbreviated form of the URN for this registry type, urn:ietf:params:xml:ns:ereg1.

7. Internationalization Considerations

Implementers should be aware of considerations for internationalization in IRIS [5].

The social data associated with contacts may be non-ASCII, and could contain virtually any Unicode character. The <language> element is provided in queries that have potential to traverse such data. Clients should use these elements to indicate to the server of the target languages desired, and servers should use these elements to better enable normalization and search processes (see <http://www.unicode.org/reports/tr15/>).

Clients needing to localize the data tags in this protocol should take note that localization is only needed on the names of XML elements and attributes with the exception of elements containing date and time information. The schema for this registry has been designed so that clients need not interpret the content of elements

or attributes for localization, other than those elements containing date and time information.

Clients should also make use of the <language> elements provided in many of the results. Results containing data that may be in Unicode are accompanied by these elements in order to aid better presentation of the data to the user.

The "dateTimePrivacyType" element content conforms to the XML Schema [3] data type "dateTime". The contents of this element MUST be specified using the 'Z' indicator for Coordinated Universal Time (UTC).

8. IANA Considerations

8.1. XML Namespace URN Registration

This document makes use of a proposed XML namespace and schema registry specified in XML_URN [16]. Accordingly, the following registration information is provided for the IANA:

- URN/URI:
  - urn:ietf:params:xml:schema:ereg1
- Contact:
  - Andrew Newton <andy@hxr.us>
- XML:
  - The XML Schema specified in Section 4
- URN/URI:
  - urn:ietf:params:xml:ns:ereg1
- Contact:
  - Andrew Newton <andy@hxr.us>
- XML:
  - None.

8.2. S-NAPTR Registration

The following S-NAPTR application service tag [20] has been registered with IANA according to the IANA considerations defined in IRIS [5]:

EREG1

8.3. BEEP Registration

The following BEEP Profile URI has been registered with IANA (http://www.iana.org/assignments/beep-parameters), in addition to the registration provided in IRIS-BEEP [6].

http://iana.org/beep/iris1/ereg1

9. Security Considerations

This document lays out no new considerations for security precautions beyond that specified in IRIS [5].

10. Normative References

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Appendix A. Contributions and Acknowledgements

This document is a derivative of the specification used to define forward domain registries for IRIS. Marcos Sanz was a major contributor to that specification, and many of his words and ideas are present in this document. Other contributors include Alexander Mayrhofer, Bernie Hoeneisen, Otmar Lendl, and Scott Hollenbeck.

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