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

Status of This Memo

   This document specifies an Internet standards track protocol for the
   Internet community, and requests discussion and suggestions for
   improvements. Please refer to the current edition of the "Internet
   Official Protocol Standards" (STD 1) for the standardization state
   and status of this protocol. Distribution of this memo is unlimited.

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:

   o "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).

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

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

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

   o "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.

   o "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:

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

o '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:

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

o '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:

o <billingContact>

o <technicalContact>

o <administrativeContact>

o <legalContact>

o <zoneContact>

o <abuseContact>

o <securityContact>

o <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:

   o <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].

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

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

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

   o 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.

o <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.

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

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

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

o 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>

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

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

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

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

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

   o <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.

   o <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.

   o <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.

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

   o <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:

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

   o <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].

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

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

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

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

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

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

   o <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:

o   <contactHandle> - a registry-unique assigned identifier for this
    contact.

o   <commonName> - the name of the contact.

o   <language> - a specification of the language code to use to
    localize the data in this result.

o   <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.

o   <organization> - an element containing the organization name of
    the contact.

o   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).

o   <eMail> - elements containing an e-mail address for this contact.

o   <sip> - elements containing a SIP URI for this contact.

o   <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].

o   <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.

   o <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.

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

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

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

   o <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.

   o <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:

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

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

o 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").

o 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.

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

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

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

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

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

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

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

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

o 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:

      o URN/URI:

         * urn:ietf:params:xml:schema:ereg1

      o Contact:

         * Andrew Newton <andy@hxr.us>

      o XML:

         * The XML Schema specified in Section 4

      o URN/URI:

         * urn:ietf:params:xml:ns:ereg1

      o Contact:

         * Andrew Newton <andy@hxr.us>

      o 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].

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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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Acknowledgement

    Funding for the RFC Editor function is provided by the IETF
    Administrative Support Activity (IASA).