                  IRIS: A Domain Registry (dreg) 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.

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Abstract

   This document describes an Internet Registry Information Service
   (IRIS) registry schema for registered DNS 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 domain registries and registrars.

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1. Introduction

   This document describes an IRIS registry schema for Internet domain
   registries using an XML Schema [4] derived from and using the IRIS
   [5] schema. The query and result types outlined in this document are
   based on the functional requirements described in CRISP [17].

   The schema given is this document is specified by 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].

   Examples of client/server XML exchanges with this registry type are
   available in Appendix A.

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 BCP 14, RFC 2119 [10].

3. Schema Description

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

   References to XML elements without a 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. This section will use terms defined
   by RFC 2119 [10] to describe these. While reading this section,
   please reference Section 4 for needed details on the formal XML
   syntax.

3.1. Query Derivatives

3.1.1. <findRegistrarsByName> Query

   <findRegistrarsByName> searches for a registration authority
   designated as a registrar for the registry of the server.

   If present, the <baseDomain> element MUST restrict the results of the
   search to registrars capable of registering subdomains in the domain
   signified by the content of this element.

   The <namePart> element restricts the scope of the query with its
   child elements. The <beginsWith> element specifies the beginning of
   the registrar's name. The <endsWith> element specifies the end of
   the registrar's name. The <exactMatch> element specifies equivalence
   to the registrar's name.

   If the <namePart> element is not present, the query MUST return all
   registrars applicable (i.e., in consideration of <baseDomain>).

   This query MUST return a result set of zero or more
   <registrationAuthority> elements. See Section 3.2.5.

3.1.2. <findDomainsByContact> Query

   <findDomainsByContact> finds domains by searches on fields associated
   with a domain's contact. A search constraint of <baseDomain> MUST
   restrict the results to domains underneath the domain specified by
   its content, if it is present.

   The allowable search fields are handled with either the
   <contactHandle> element or one of the elements in the
   "contactSearchGroup" (see Section 3.1.7). The <contactHandle>
   element allows the domains to be selected based on the contact having
   the specified contact handle.

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

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

3.1.3. <findDomainsByName> Query

   The <findDomainsByName> query finds domains by the name of a domain
   as it is known in DNS. The <namePart> element restricts the scope of
   the query with its child elements. The <beginsWith> element
   specifies the beginning of the domain name. The <endsWith> element
   specifies the end of the domain name.

3.1.4. <findDomainsByIDN> Query

   This query differs from the <findDomainsByName> query by allowing the
   scope of the query to take internationalized domain names into
   consideration. This query will return the union of the desired
   domain and any associated variants, therefore differing from a lookup
   in the "idn" entity class (Section 3.4) (which only returns the
   domain or no results).

   The <namePart> element restricts the scope of the query with its
   child element. Its child, the <exactMatch> element, is designed to
   contain IDNs and not ACE labels, and thus MUST match only against
   equivalent IDNs, according to the notion of equivalence defined in
   RFC 3490 [14].

   This query also provides optional <language> elements containing
   language tags. Clients MAY use these elements to hint about the

natural language(s) of the affected element. Servers MAY use this
information in processing the query, such as in tailoring
normalization routines to aid in more effective searches.

3.1.5. <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 3.1.7).

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

3.1.6. <findDomainsByHost> Query

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

3.1.7. 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 constrain the query either
by an exact match using the <exactMatch> element, or 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> element MUST only contain a valid
domain name (i.e., without an '@' 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 the 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 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 by
      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 "domainStatusType" -- contains the optional element of
      <appliedDate>, indicating the date and time when the status was
      applied, and the optional element of <description> with the
      required attribute 'language', indicating a description of the
      status. This element also has the optional attribute 'scope',
      indicating the scope or origin of the status value.

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

   As specified, these elements can have nil values 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 at 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 granted to 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 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. <domain> Result

   An example of a <domain> result:

   <domain
     authority="iana.org" registryType="dreg1"
     entityClass="domain-handle" entityName="example-com-1">
     <domainName>example.com</domainName>
     <domainHandle>tcs-com-1</domainHandle>
     <nameServer
       iris:referentType="host"
       authority="iana.org" registryType="dreg1"
       entityClass="host-handle" entityName="research7" />
     <nameServer
       iris:referentType="host"
       authority="iana.org" registryType="dreg1"
       entityClass="host-handle" entityName="nsol184" />
     <registry
       iris:referentType="registrationAuthority"
       authority="com"
       registryType="dreg1"
       entityClass="contact-handle"
       entityName="VGRS" />
     <registrar
       iris:referentType="registrationAuthority"
       authority="iana.org" registryType="dreg1"
       entityClass="contact-handle" entityName="dbarton" />

```
   <initialDelegationDateTime xsi:nil="true"/>
</domain>
```

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

o <domainName> -- the full name of the domain as it is in DNS. The
   contents of this element MUST be a domain name as specified by RFC
   1035 [9].

o <idn> -- the name of the domain in nameprep form, if applicable.
   See RFC 3491 [15].

o <domainHandle> -- a registry unique assigned identifier for a
   domain.

o <nameServer> -- MUST contain an entity reference to a referent of
   type <host> (Section 3.2.3).

o <registrant> -- contains an entity reference to the registrant of
   this domain. The referent MUST be a <contact> result (Section
   3.2.4).

o Domain contacts -- the following elements contain an entity
   reference with a relationship to the domain. The referent of each
   MUST be a <contact> (Section 3.2.4).
   * <billingContacts>
   * <technicalContacts>
   * <administrativeContacts>
   * <legalContacts>
   * <zoneContacts>
   * <abuseContacts>
   * <securityContacts>
   * <otherContacts>

o <status> -- This may contain at least one of the following
   elements of type 'domainStatusType' (see Section 3.2.1), but none
   of these elements may appear more than once.
   * <reservedDelegation> -- permanently inactive
   * <assignedAndActive> -- normal state
   * <assignedAndInactive> -- registration assigned but delegation
      inactive
   * <assignedAndOnHold> -- dispute
   * <revoked> -- database purge pending
   * <transferPending> -- change of authority pending
   * <registryLock> -- on hold by registry
   * <registrarLock> -- on hold by registrar

o <domainVariant> -- contains an entity reference, the referent of
   which MUST be a <domain> (Section 3.2.2).

o <registrationReference> -- contains an entity reference, the
   referent of which MUST be a <domain> (Section 3.2.2). This
   element is intended to point to the downstream registration
   reference. Therefore, if this is a result given back by a domain
   registry, it should point to the domain in the domain registrar or
   registrant service.

o <registry> -- contains an entity reference specifying the domain
   registry operator for this domain, which MUST be a
   <registrationAuthority> (Section 3.2.5). This element has an
   optional boolean 'hosting' attribute. When the value of this
   attribute is positive, it indicates that the registry is
   responsible for authoritatively answering DNS queries for this
   domain.

o <registrar> -- contains an entity reference specifying the domain
   registrar operator for this domain, which MUST be a
   <registrationAuthority> (Section 3.2.5). This element has an
   optional boolean 'hosting' attribute. When the value of this
   attribute is positive, it indicates that the registrar is
   responsible for authoratively answering DNS queries for this
   domain.

o <initialDelegationDateTime> -- contains the date and time of the
   initial delegation of this domain.

o <lastRenewalDateTime> -- contains the date and time of last
   renewal of this domain.

o <expirationDateTime> -- contains the date and time of the
   expiration of this domain.

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

o <lastContactModificationBy> -- contains an entity reference. The
   referent MUST be a <contact> (Section 3.2.4) responsible for the
   last addition or removal of a contact for this domain.

o <lastDelegationModificationDateTime> -- contains the date and time
   of the last time one of the nameservers was added or removed for
   the delegation of this domain.

   o <lastDelegationModificationBy> -- contains an entity reference.
      The referent MUST be a <contact> result (Section 3.2.4) and MUST
      be responsible for the last addition or removal of a nameserver
      for this domain.

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

   o <iris:seeAlso> -- contains an entity reference specifying a
      referent indirectly associated with this domain.

3.2.3. <host> Result

    An example of a <host> result:

   <host
     authority="iana.org" registryType="dreg1"
     entityClass="host-handle" entityName="nsol184" >
     <hostHandle>nsol184</hostHandle>
     <hostName>a.iana-servers.net</hostName>
     <ipV4Address>192.0.2.43</ipV4Address>
     <hostContact
       iris:referentType="contact"
       authority="iana.org" registryType="dreg1"
       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 domain name and MUST conform to RFC
      1035 [9].

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

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

   o <hostContact> -- contains an entity reference specifying a contact
      associated with this host. The referent MUST be <contact>
      (Section 3.2.4) results.

   o <createdDateTime> -- contains the date and time when this host was
      created.

   o <lastModificationDateTime> -- contains the date and time when this
      host was last modified.

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

   o <iris:seeAlso> -- contains an entity reference specifying a
      referent indirectly associated with this host.

3.2.4. <contact> Result

   An example of a <contact> result:

   <contact
     authority="iana.org" registryType="dreg1"
     entityClass="contact-handle" entityName="dbarton" >
     <contactHandle>dbarton</contactHandle>
     <commonName>IANA Manager</commonName>
     <organization>Internet Assigned Numbers Authority</organization>
     <eMail>res-dom@iana.org</eMail>
     <postalAddress>
       <address>4676 Admiralty Way, Suite 330</address>
       <city>Marina del Rey</city>
       <region>CA</region>
       <postalCode>92092</postalCode>
       <country>US</country>
     </postalAddress>
     <phone>+1.3108239358</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> -- contains the organization name of the contact.

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

   o <IDNeMail> -- contains an e-mail address within an
      internationalized domain name [14].

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

   o <postalAddress> -- contains children representing a postal
      address. <postalAddress> has the following children:
      * <address> -- contains the street address for this contact.
      * <city> -- contains the city for this contact.
      * <region> -- contains the national region for this contact.
      * <postalCode> -- contains the postal code for this contact.
      * <country> -- contains the country for this contact. This
         SHOULD be a two-letter country code compliant with ISO 3166
         [11].

   o <phone> -- contains a voice phone number for this contact. If it
      begins with a '+' (plus) character, it MUST be a number defined by
      E164 [13]. The format number defined in E164 [13] is RECOMMENDED.

   o <fax> -- contains a facsimile phone number for this contact. If
      it begins with a '+' (plus) character, it MUST be a number defined
      by E164 [13]. The format number defined in E164 [13] is
      RECOMMENDED.

   o <createdDateTime> -- contains the date and time when this contact
      was created.

   o <lastModificationDateTime> -- contains the date and time when this
      contact was last modified.

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

   o <translatedContacts> -- contains an entity reference specifying
      equivalents of this contact that have been translated into other
      languages. The referent MUST be <contact> results (Section
      3.2.4).

   o <iris:seeAlso> -- contains an entity reference specifying a
      referent indirectly associated with this contact.

3.2.5. <registrationAuthority>

   An example of a <registrationAuthority> result:

   <registrationAuthority
     authority="iana.org" registryType="dreg1"
     entityClass="registration-authority" entityName="iana" >
     <serviceInstance
       iris:referentType="iris:serviceIdentification"
       authority="iana.org" registryType="dreg1"
       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 authority areas found in the referent MUST
   be domains for which a given registration authority has control.

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

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

   The <domain> child elements each contain one domain name signifying
   the domains for which this registration authority may register sub-
   domains.

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 under the policies of the
   server operator.

3.3.2. <languageNotSupported>

   The queries <findDomainsByRegistrant>, <findDomainsByIDNName>, 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 which 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 3.2.3) in the response.

   o host-handle -- The registry unique identifier given a nameserver.
      It yields a <host> (Section 3.2.3) in the response.

   o domain-name -- The fully qualified name of a domain. This a
      domain name as specified by RFC 1035 [9]. It yields a <domain>
      (Section 3.2.2) in the response.

   o idn -- The fully qualified name of a domain in nameprep form (see
      RFC 3491 [15]). It yields a <domain> (Section 3.2.2) in the
      response.

   o domain-handle -- The registry unique identifier given a domain.
      It yields a <domain> (Section 3.2.2) in the response.

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

   o ipv4-address -- The IPv4 address of a nameserver. It yields a
      <host> (Section 3.2.3) in the response.

   o ipv6-address -- The IPv6 address of a nameserver. It yields a
      <host> (Section 3.2.3) in the response.

   o registration-authority -- The name of a registration authority.
      It yields a <registrationAuthority> (Section 3.2.5) in the
      response.

   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:dreg="urn:ietf:params:xml:ns:dreg1"
     xmlns:iris="urn:ietf:params:xml:ns:iris1"
     targetNamespace="urn:ietf:params:xml:ns:dreg1"
     elementFormDefault="qualified" >

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

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

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

     <!--   -->
     <!-- Find Registrars By Name   -->
     <!--   -->

     <complexType
       name="findRegistrarsByNameType">
       <complexContent>
         <extension
           base="iris:queryType">
           <sequence>
             <element
               ref="dreg:baseDomain"
               minOccurs="0"
               maxOccurs="1" />
             <element
               name="namePart"
               type="dreg:exactOrPartialMatchParameter"

```
                  minOccurs="0"
                  maxOccurs="1" />
              </sequence>
            </extension>
          </complexContent>
        </complexType>

        <element
          name="findRegistrarsByName"
          type="dreg:findRegistrarsByNameType"
          substitutionGroup="iris:query" />

        <!--                                          -->
        <!-- Find Domains By Contact                  -->
        <!--                                          -->

        <complexType
          name="findDomainsByContactType">
          <complexContent>
            <extension
              base="iris:queryType">
              <sequence>
                <element
                  ref="dreg:baseDomain"
                  minOccurs="0"
                  maxOccurs="1" />
                <choice>
                  <group
                    ref="dreg:contactSearchGroup" />
                  <element
                    name="contactHandle"
                    type="dreg: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="findDomainsByContact"
    type="dreg:findDomainsByContactType"
    substitutionGroup="iris:query" />

  <!--                                              -->
  <!-- Find Domains By Name                         -->
  <!--                                              -->

  <complexType
    name="findDomainsByNameType">
    <complexContent>
      <extension
        base="iris:queryType">
        <sequence>
          <element
            name="namePart"
            type="dreg:partialMatchParameter" />
        </sequence>
      </extension>
    </complexContent>
  </complexType>

  <element
    name="findDomainsByName"
```

```
          type="dreg:findDomainsByNameType"
          substitutionGroup="iris:query" />

     <!--                                          -->
     <!-- Find Domains By Internationalized Name   -->
     <!--                                          -->

     <complexType
       name="findDomainsByIDNType">
       <complexContent>
         <extension
           base="iris:queryType">
           <sequence>
             <element
               name="namePart"
               type="dreg:exactMatchParameter" />
             <element
               name="language"
               type="language"
               minOccurs="0"
               maxOccurs="unbounded"/>
           </sequence>
         </extension>
       </complexContent>
     </complexType>

     <element
       name="findDomainsByIDN"
       type="dreg:findDomainsByIDNType"
       substitutionGroup="iris:query" />

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

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

```
          </sequence>
        </extension>
      </complexContent>
    </complexType>

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

    <!--                                            -->
    <!-- Find Domains By Host                       -->
    <!--                                            -->

    <complexType
      name="findDomainsByHostType">
      <complexContent>
        <extension
          base="iris:queryType">
          <sequence>
            <element
              ref="dreg:baseDomain"
              minOccurs="0"
              maxOccurs="1" />
            <choice>
              <element
                name="hostName"
                type="dreg:exactMatchParameter" />
              <element
                name="hostHandle"
                type="dreg:exactMatchParameter" />
              <element
                name="ipV4Address"
                type="dreg:exactMatchParameter" />
              <element
                name="ipV6Address"
                type="dreg:exactMatchParameter" />
            </choice>
          </sequence>
        </extension>
      </complexContent>
    </complexType>

    <element
      name="findDomainsByHost"
      type="dreg:findDomainsByHostType"
      substitutionGroup="iris:query" />
```

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

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

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

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

     <complexType
       name="partialMatchParameter">
       <sequence>
         <group
```

```
              ref="dreg:partialMatchGroup" />
      </sequence>
    </complexType>

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

    <element
      name="baseDomain"
      type="normalizedString" />

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

```
            <restriction
              base="token">
              <minLength
                value="1"/>
            </restriction>
          </simpleType>
        </element>
      </choice>
    </group>

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

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

    <!--                                        -->
    <!-- Domain                                 -->
    <!--                                        -->

    <complexType
      name="domainType">
      <complexContent>
        <extension
          base="iris:resultType">
          <sequence>
            <element
              name="domainName"
              type="token" />
            <element
              name="idn"
              type="token"
              minOccurs="0"
              maxOccurs="1" />
            <element
              name="domainHandle"
              type="dreg: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="1" />
              <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" />
                <element
                  name="lastContactModificationDateTime"
                  type="dreg: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>
                    <all>
                      <element
                        name="reservedDelegation"
                        minOccurs="0"
                        maxOccurs="1"
                        type="dreg:domainStatusType" />
                      <element
                        name="assignedAndActive"
                        minOccurs="0"
                        maxOccurs="1"
                        type="dreg:domainStatusType" />
                      <element
                        name="assignedAndInactive"
                        minOccurs="0"
                        maxOccurs="1"
                        type="dreg:domainStatusType" />
                      <element
                        name="assignedAndOnHold"
                        minOccurs="0"
                        maxOccurs="1"
                        type="dreg:domainStatusType" />
                      <element
                        name="revoked"
                        minOccurs="0"
                        maxOccurs="1"
                        type="dreg:domainStatusType" />
                      <element
                        name="transferPending"
                        minOccurs="0"
```

```
                maxOccurs="1"
                type="dreg:domainStatusType" />
              <element
                name="registryLock"
                minOccurs="0"
                maxOccurs="1"
                type="dreg:domainStatusType" />
              <element
                name="registrarLock"
                minOccurs="0"
                maxOccurs="1"
                type="dreg:domainStatusType" />
              <element
                name="other"
                minOccurs="0"
                maxOccurs="1"
                type="dreg:domainStatusType" />
            </all>
          </complexType>
        </element>
        <element
          name="domainVariant"
          type="iris:entityType"
          minOccurs="0"
          maxOccurs="unbounded" />
        <element
          name="registrationReference"
          type="iris:entityType"
          minOccurs="0"
          maxOccurs="1" />
        <element
          name="registry"
          minOccurs="0"
          maxOccurs="1">
          <complexType>
            <complexContent>
              <extension
                base="iris:entityType">
                <attribute
                  name="hosting"
                  type="boolean" />
              </extension>
            </complexContent>
          </complexType>
        </element>
        <element
          name="registrar"
          minOccurs="0"
```

```
                    maxOccurs="1">
                    <complexType>
                      <complexContent>
                        <extension
                          base="iris:entityType">
                          <attribute
                            name="hosting"
                            type="boolean" />
                        </extension>
                      </complexContent>
                    </complexType>
                  </element>
                  <element
                    name="initialDelegationDateTime"
                    type="dreg:dateTimePrivacyType"
                    nillable="true"
                    minOccurs="0"
                    maxOccurs="1" />
                  <element
                    name="lastRenewalDateTime"
                    type="dreg:dateTimePrivacyType"
                    nillable="true"
                    minOccurs="0"
                    maxOccurs="1" />
                  <element
                    name="expirationDateTime"
                    type="dreg:dateTimePrivacyType"
                    nillable="true"
                    minOccurs="0"
                    maxOccurs="1" />
                  <element
                    name="lastDelegationModificationDateTime"
                    type="dreg:dateTimePrivacyType"
                    nillable="true"
                    minOccurs="0"
                    maxOccurs="1" />
                  <element
                    name="lastDelegationModificationBy"
                    type="iris:entityType"
                    minOccurs="0"
                    maxOccurs="1" />
                  <element
                    name="lastVerificationDateTime"
                    type="dreg:dateTimePrivacyType"
                    nillable="true"
                    minOccurs="0"
                    maxOccurs="1" />
                  <element
```

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

    <element
      name="domain"
      type="dreg:domainType"
      substitutionGroup="iris:result" />

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

    <complexType
      name="hostType">
      <complexContent>
        <extension
          base="iris:resultType">
          <sequence>
            <element
              name="hostHandle"
              type="dreg: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="dreg:dateTimePrivacyType"
                 nillable="true"
                 minOccurs="0"
                 maxOccurs="1" />
             <element
               name="lastModificationDateTime"
               type="dreg:dateTimePrivacyType"
               nillable="true"
               minOccurs="0"
               maxOccurs="1" />
             <element
               name="lastVerificationDateTime"
               type="dreg:dateTimePrivacyType"
               nillable="true"
               minOccurs="0"
               maxOccurs="1" />
             <element
               ref="iris:seeAlso"
               minOccurs="0"
               maxOccurs="unbounded" />
           </sequence>
         </extension>
       </complexContent>
     </complexType>

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

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

     <complexType
       name="contactType">
       <complexContent>
         <extension
           base="iris:resultType">
           <sequence>
             <element
               name="contactHandle"
               type="dreg:normalizedStringPrivacyType"
               nillable="true"
               minOccurs="0"
               maxOccurs="1" />
             <element
```

```
              name="commonName"
              type="dreg: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="dreg:contactTypeType" />
                <element
                  name="organization"
                  type="dreg:contactTypeType" />
                <element
                  name="role"
                  type="dreg:contactTypeType" />
                <element
                  name="other"
                  type="dreg:contactTypeType" />
              </choice>
            </complexType>
          </element>
          <element
            name="organization"
            type="dreg:normalizedStringPrivacyType"
            nillable="true"
            minOccurs="0"
            maxOccurs="1" />
          <element
            name="eMail"
            type="dreg:stringPrivacyType"
            nillable="true"
            minOccurs="0"
            maxOccurs="unbounded" />
          <element
            name="IDNeMail"
            type="dreg:stringPrivacyType"
            nillable="true"
            minOccurs="0"
```

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

```
                type="dreg:normalizedStringPrivacyType"
                nillable="true"
                minOccurs="0"
                maxOccurs="unbounded" />
            <element
              name="fax"
              type="dreg:normalizedStringPrivacyType"
              nillable="true"
              minOccurs="0"
              maxOccurs="unbounded" />
            <element
              name="createdDateTime"
              type="dreg:dateTimePrivacyType"
              nillable="true"
              minOccurs="0"
              maxOccurs="1" />
            <element
              name="lastModificationDateTime"
              type="dreg:dateTimePrivacyType"
              nillable="true"
              minOccurs="0"
              maxOccurs="1" />
            <element
              name="lastVerificationDateTime"
              type="dreg: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="dreg: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" />
             <choice
               minOccurs="0"
               maxOccurs="3">
               <element
                 name="registry">
                 <complexType/>
               </element>
               <element
                 name="registrar">
                 <complexType/>
               </element>
               <element
                 name="other">
                 <complexType/>
               </element>
             </choice>
             <element
               name="domain"
               type="token"
               minOccurs="0"
               maxOccurs="unbounded" />
           </sequence>
         </extension>
       </complexContent>
     </complexType>

     <element
       name="registrationAuthority"
       type="dreg:registrationAuthorityType"
```

```
      substitutionGroup="iris:result" />

<!--                                           -->
<!-- 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="dreg:privacyLabelAttributeGroup" />
    </extension>
  </simpleContent>
</complexType>

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

<complexType
  name="normalizedStringPrivacyType">
  <simpleContent>
    <extension
```

```
          base="normalizedString">
          <attributeGroup
            ref="dreg:privacyLabelAttributeGroup" />
        </extension>
      </simpleContent>
    </complexType>

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

    <complexType
      name="domainStatusType">
      <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>
      </sequence>
      <attributeGroup
        ref="dreg:privacyLabelAttributeGroup" />
      <attribute
        name="scope"
        type="string" />
```

```
        </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="dreg: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="dreg:languageNotSupportedType"
    substitutionGroup="iris:genericCode" />

</schema>
```

                        Figure 5: dreg.xsd

5. BEEP Transport Compliance

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

5.1. Message Pattern

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

5.2. Server Authentication

   This registry type only uses the basic 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 "DREG1". This is the abbreviated form of the URN for this
   registry type: urn:ietf:params:xml:ns:dreg1.

6.2. Bottom-Up Resolution

   The bottom-up alternative resolution method MUST be identified as
   'bottom' in IRIS URI's.

   The process for this resolution method differs from the direct-
   resolution method if the authority is only a domain name (i.e.,
   without the port number). The process for this condition is as
   follows:

   1. The IRIS [5] direct-resolution process is tried on the domain name
      (e.g., "example.com").

   2. If the direct-resolution process yields no server for which a
      connection can be made, then the leftmost label of the domain name
      is removed, and the first step is repeated again (e.g., "com").

   3. If all the labels of the domain name are removed and no server
      connections have been made, then the DNS is queried for the
      address records corresponding to the original domain name, and the
      port used is the well-known port for the default protocol of IRIS.

6.3. Top-Down Resolution

   The top-down alternative resolution method MUST be identified as
   'top' in IRIS URIs.

   The process for this resolution method differs from the direct-
   resolution method if the authority is only a domain name (i.e.,
   without the port number). The process for this condition is as
   follows:

   1. The domain name is reduced to its rightmost label. This is always
      '.'.

   2. The IRIS [5] direct-resolution process is tried on the domain
      name.

   3. If the direct-resolution process yields no server for which a
      connection can be made, then the original label to the left of the
      rightmost label of the domain name is prepended, and the second
      step is repeated again (e.g., if ".", then "com"; if "com", then
      "example.com").

   4. If all the labels of the original domain are present and no server
      connections have been made, then the DNS is queried for the
      address records corresponding to the original domain name, and the
      port used is the well-known port for the default protocol of IRIS.

7. Internationalization Considerations

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

   This document specifies the lookup of domain names, both the
   traditional ASCII form and the IDN form. In addition, the social
   data associated with contacts may also be non-ASCII and could contain
   virtually any Unicode character. The <language> element is provided
   in queries that have the potential to traverse such data. Clients
   should use this element to indicate the desired target languages to
   the server, and servers should use this element to better enable
   normalization and search processes (see [18]).

   For clients needing to localize the data tags in this protocol, 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 that of 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 type contains the XML Schema [3]
   data type "dateTime". The contents of this element MUST be specified
   by 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:ns:dreg1
      o Contact:
         * Andrew Newton <andy@hxr.us>
         * Marcos Sanz <sanz@denic.de>
      o XML:
         * The XML Schema specified in Section 4

8.2. S-NAPTR Registration

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

      DREG1

8.3. BEEP Registration

   The following BEEP Profile URI has been registered with IANA, in
   addition to the registration provided in IRIS-BEEP [6].

      http://iana.org/beep/iris1/dreg1

9. Security Considerations

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

10. References

10.1. Normative References

   [1] World Wide Web Consortium, "Extensible Markup Language (XML)
        1.0", W3C XML, February 1998, <http://www.w3.org/TR/1998/REC-
        xml-19980210>.

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Appendix A. Examples of Requests and Responses

   The examples in this section use the string "C:" to denote data sent
   by a client to a server and the string "S:" to denote data sent by a
   server to a client.

A.1. Example 1

   The following is an example of an entity lookup in a dreg1 registry
   for the domain-name of 'example.com'. The response shows the ability
   to specify data as being withheld because it is private.

```
C: <?xml version="1.0"?>
C: <request xmlns="urn:ietf:params:xml:ns:iris1"
C:   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
C:
C:    <searchSet>
C:
C:      <lookupEntity
C:        registryType="urn:ietf:params:xml:ns:dreg1"
C:        entityClass="domain-name"
C:        entityName="example.com" />
C:
C:    </searchSet>
C:
C: </request>

S: <?xml version="1.0"?>
S: <iris:response xmlns:iris="urn:ietf:params:xml:ns:iris1"
S:   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
S:
S:    <iris:resultSet>
S:      <iris:answer>
S:
S:        <domain xmlns="urn:ietf:params:xml:ns:dreg1"
S:          authority="iana.org" registryType="dreg1"
S:          entityClass="domain-handle" entityName="example-com-1">
S:
S:          <domainName>example.com</domainName>
S:          <domainHandle>tcs-com-1</domainHandle>
S:
S:          <nameServer iris:referentType="host" authority="iana.org"
S:            registryType="dreg1" entityClass="host-handle"
S:            entityName="research7" />
S:
S:          <nameServer iris:referentType="host" authority="iana.org"
S:            registryType="dreg1" entityClass="host-handle"
S:            entityName="nsol184" />
```

```
S:
S:           <technicalContact iris:referentType="contact"
S:             authority="iana.org" registryType="dreg1"
S:             entityClass="contact-handle" entityName="dbarton" />
S:
S:           <status>
S:             <assignedAndActive denied="true" />
S:           </status>
S:
S:           <registry iris:referentType="registrationAuthority"
S:             authority="com" registryType="dreg1"
S:             entityClass="contact-handle" entityName="VGRS" />
S:
S:           <initialDelegationDateTime xsi:nil="true"/>
S:
S:           <iris:seeAlso iris:referentType="ANY" authority="iana.org"
S:             registryType="dreg1" entityClass="local"
S:             entityName="notice"  />
S:
S:         </domain>
S:
S:       </iris:answer>
S:     </iris:resultSet>
S: </iris:response>
```

                        Figure 6: Example 1

A.2. Example 2

   The following is an example of an entity lookup in a dreg1 registry
   for the contact-handle of 'mak21'. The response shows the ability to
   specify data as being withheld because it is private.

```
C: <?xml version="1.0"?>
C: <request xmlns="urn:ietf:params:xml:ns:iris1"
C:   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
C:
C:   <searchSet>
C:
C:     <lookupEntity
C:       registryType="urn:ietf:params:xml:ns:dreg1"
C:       entityClass="contact-handle"
C:       entityName="mak21" />
C:
C:   </searchSet>
C:
C: </request>
S: <?xml version="1.0"?>
```

```
S: <response xmlns="urn:ietf:params:xml:ns:iris1"
S:   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
S:
S:    <resultSet>
S:      <answer>
S:
S:        <contact xmlns="urn:ietf:params:xml:ns:dreg1"
S:          authority="com" registryType="dreg1"
S:          entityClass="contact-handle" entityName="mak21" >
S:
S:          <contactHandle>mak21</contactHandle>
S:
S:          <commonName>
S:            Mark Kosters
S:          </commonName>
S:
S:          <organization>
S:            VeriSign, Inc.
S:          </organization>
S:
S:          <eMail>markk@verisignlabs.com</eMail>
S:
S:          <phone private="true" xsi:nil="true" />
S:
S:        </contact>
S:
S:      </answer>
S:    </resultSet>
S:
S: </response>
```

                          Figure 7: Example 2

A.3. Example 3

   The following is an example of a domain search based on a
   registrant's name beginning with the string 'The Cobbler Shoppe'.
   This example also shows the use of bags.

```
C: <?xml version="1.0"?>
C: <request xmlns="urn:ietf:params:xml:ns:iris1"
C:          xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
C:
C:    <searchSet>
C:
C:      <findDomainsByContact
C:        xmlns="urn:ietf:params:xml:ns:dreg1" >
C:        <baseDomain>com</baseDomain>
```

```
C:          <commonName>
C:            <beginsWith>
C:              The Cobbler Shoppe
C:            </beginsWith>
C:          </commonName>
C:          <role>registrant</role>
C:        </findDomainsByContact>
C:
C:    </searchSet>
C:
C: </request>

S: <?xml version="1.0"?>
S: <response xmlns="urn:ietf:params:xml:ns:iris1"
S:           xmlns:iris="urn:ietf:params:xml:ns:iris1"
S:           xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
S:
S:    <resultSet>
S:      <answer>
S:        <dreg:domain
S:          xmlns="urn:ietf:params:xml:ns:dreg1"
S:          xmlns:dreg="urn:ietf:params:xml:ns:dreg1"
S:          authority="com" registryType="dreg1"
S:          entityClass="domain-handle" entityName="tcs-com-1" >
S:          <domainName>example.com</domainName>
S:          <nameServer
S:            iris:referentType="dreg:host"
S:            authority="com" registryType="dreg1"
S:            entityClass="host-handle" entityName="research7" />
S:          <nameServer
S:            iris:referentType="dreg:host"
S:            authority="com" registryType="dreg1"
S:            entityClass="host-handle" entityName="nsol184" />
S:          <registrant
S:            iris:referentType="dreg:contact"
S:            authority="com" registryType="dreg1"
S:            entityClass="contact-handle" entityName="beb140">
S:            <iris:displayName language="en">
S:              Bill Eckels
S:            </iris:displayName>
S:          </registrant>
S:          <technicalContact
S:            bagRef="x1"
S:            iris:referentType="dreg:contact"
S:            authority="com" registryType="dreg1"
S:            entityClass="contact-handle" entityName="mak21">
S:            <iris:displayName language="en">
S:              Mark Kosters
```

```
S:              </iris:displayName>
S:            </technicalContact>
S:            <status>
S:              <transferPending denied="true" />
S:              <assignedAndActive denied="true" />
S:            </status>
S:            <registry
S:              iris:referentType="dreg:registrationAuthority"
S:              authority="com" registryType="dreg1"
S:              entityClass="local" entityName="VRSN"
S:              hosting="false" />
S:            <iris:seeAlso
S:              iris:referentType="ANY"
S:              authority="com" registryType="dreg1"
S:              entityClass="local" entityName="notice" />
S:          </dreg:domain>
S:        </answer>
S:        <additional>
S:          <dreg:contact
S:            xmlns="urn:ietf:params:xml:ns:dreg1"
S:            xmlns:dreg="urn:ietf:params:xml:ns:dreg1"
S:            authority="com" registryType="dreg1"
S:            entityClass="contact-handle" entityName="beb140" >
S:            <contactHandle>beb140</contactHandle>
S:            <commonName>
S:              Bill Eckels
S:            </commonName>
S:            <language>en</language>
S:            <type>
S:              <person>
S:              <description language="en">
S:                Bill sells shoes down by the sea shore.
S:              </description>
S:              <description language="de">
S:               Rechnung verkauft Schuhe unten durch das Seeufer.
S:              </description>
S:              </person>
S:            </type>
S:            <organization>
S:              The Cobbler Shoppe
S:            </organization>
S:            <eMail private="true" xsi:nil="true" />
S:            <postalAddress>
S:              <address>
S:                21 North Main Street
S:              </address>
S:              <city>
S:                 Britt
```

```
S:            </city>
S:            <region>
S:               IA
S:            </region>
S:            <postalCode>
S:               50423
S:            </postalCode>
S:            <country>
S:               US
S:            </country>
S:          </postalAddress>
S:          <phone>
S:             +1.5158433521
S:          </phone>
S:        </dreg:contact>
S:        <simpleEntity
S:          authority="com" registryType="dreg1"
S:          entityClass="local" entityName="notice" >
S:          <property name="legal" language="en">
S:             It is illegal to use information from this service
S:             for the purposes of sending unsolicited bulk email.
S:          </property>
S:        </simpleEntity>
S:      </additional>
S:    </resultSet>
S:    <bags>
S:      <bag id="x1">
S:        <simpleBag xmlns="http://example.com/">
S:          AAAAB3NzaC1yc2EAAAABIwAAAIEA0ddD+W3Agl0Lel98G1r77fZ
S:          c3nBl8CHdkmKuVGUy/ijmvdO5QxuSlU0R4BoCLZk/Sob22RApTn
S:          T+ROMbXFQBrxGH08daAOy98WqpfAutWJri61JLpubIbaqhGyB48
S:          Qt69V6OhYfFsJjvoNEOh1k2dgzXhSlzP3OMVSKRlBzGcO8=
S:        </simpleBag>
S:      </bag>
S:    </bags>
S:
S: </response>
```

                        Figure 8: Example 3

Appendix B. An Example of Database Serialization

   The following is an example of serializing domain data.

   This example shows the serialization of a domain, a host, and a
   referral.

   <iris:serialization
     xmlns:iris="urn:ietf:params:xml:ns:iris1"
     xmlns:dreg="urn:ietf:params:xml:ns:dreg1"
     xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">

     <dreg:domain
       xmlns="urn:ietf:params:xml:ns:dreg1"
       authority="com" registryType="dreg1"
       entityClass="domain-handle" entityName="tcs-com-1" >
       <domainName>example.com</domainName>
       <nameServer
         iris:referentType="dreg:host"
         authority="" registryType="dreg1"
         entityClass="host-handle" entityName="research7" />
       <nameServer
         iris:referentType="dreg:host"
         authority="" registryType="dreg1"
         entityClass="host-handle" entityName="nsol184" />
       <registrant
         iris:referentType="dreg:contact"
         authority="iana.org" registryType="dreg1"
         entityClass="contact-handle" entityName="beb140" />
       <technicalContact
         iris:referentType="dreg:contact"
         authority="net" registryType="dreg1"
         entityClass="contact-handle"
         entityName="mak21" >
         <iris:displayName language="en">
           IANA Administrator
         </iris:displayName>
       </technicalContact>
     </dreg:domain>

     <dreg:host
       xmlns="urn:ietf:params:xml:ns:dreg1"
       authority="com" registryType="dreg1"
       entityClass="host-handle" entityName="nsol184" >
       <hostHandle>nsol184</hostHandle>
       <hostName>ns1.iana.org</hostName>
       <ipV4Address>192.0.2.1</ipV4Address>
       <hostContact

```
      iris:referentType="dreg:contact"
      authority="com" registryType="dreg1"
      entityClass="contact-handle"
      entityName="dbarton" >
      <iris:displayName language="en">
        IANA Techie
      </iris:displayName>
    </hostContact>
  </dreg:host>

  <iris:serializedReferral>
    <iris:source
      authority="com" registryType="dreg1"
      entityClass="contact-handle"
      entityName="dbarton" />
    <iris:searchContinuation
      authority="net">

      <dreg:findRegistrarsByName>
        <dreg:baseDomain>com</dreg:baseDomain>
      </dreg:findRegistrarsByName>

    </iris:searchContinuation>
  </iris:serializedReferral>

</iris:serialization>
```

                    Figure 9: dreg-serialization.xml

Appendix C. Acknowledgements

   Many of the concepts concerning the use of SRV records for step-wise
   refinement toward finding authoritative servers and many of the
   details of result objects in this document were originally created by
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   CRISP requirements. These concepts have contributed significantly to
   the development of this protocol.

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   IRIS implementation and his experienced judgment. He also
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