Internationalized Domain Name (IDN) Extension Mapping for the Extensible Provisioning Protocol (EPP)

Abstract

This document describes an Extensible Provisioning Protocol (EPP) extension mapping for the provisioning and management of Internationalized Domain Names (IDN) stored in a shared central repository. Specified in XML, this mapping extends the EPP domain name mapping to provide additional features required for the provisioning of IDNs adhering to the Internationalized Domain Names in Applications (IDNA) standards.

Status of This Document

This document specifies an extension to the EPP protocol first implemented in AusRegistry's Domain Name Registry EPP service. Please refer to AusRegistry for more information on the status of this document. Distribution of this document and use of the protocol extensions defined within is unrestricted and unlimited.

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1. Introduction

This document describes an extension mapping for version 1.0 of the Extensible Provisioning Protocol (EPP) described in RFC 5730 **[RFC5730]**. This mapping, an extension of the domain name mapping described in RFC 5731 **[RFC5731]**, is specified using the Extensible Markup Language (XML) 1.0 **[W3C.REC–xml–20040204]** and XML Schema notation (**[W3C.REC–xmlschema–1–20041028] [W3C.REC–xmlschema–2–20041028]**).

The EPP core protocol specification **[RFC5730]** provides a complete description of EPP command and response structures. A thorough understanding of the base protocol specification is necessary to understand the mapping described in this document. Familiarity with the IDNA protocol described in **[RFC5890]**, **[RFC5891]**, **[RFC5892]**, **[RFC5893]**, and **[RFC5894]** is required to understand the concepts described in this document.

The EPP mapping described in this document specifies a mechanism for the provisioning and management of Internationalized Domain Names in a shared central repository.

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1.1. Conventions Used In This Document

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 **[RFC2119]**.

In examples, "C:" represents lines sent by a protocol client and "S:" represents lines returned by a protocol server. Indentation and white space in examples are provided only to illustrate element relationships and is not a mandatory feature of this protocol.

XML is case sensitive. Unless stated otherwise, XML specifications and examples provided in this document MUST be interpreted in the character case presented in order to develop a conforming implementation.

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2. Object Attributes

This extension adds additional elements to the EPP domain name mapping **[RFC5731]**. Only those new elements are described here.

2.1. Internationalized Domain Name

Internationalized Domain Names in Applications introduces a mechanism to convert a domain name expressed in Unicode to an ASCII-compatible encoding (ACE) form that is a valid DNS label compatible with existing applications and infrastructure. This mechanism gives rise to two representations of the domain name:

- one or more A-labels with zero or more non-internationalized labels
- one or more U-labels with zero or more non-internationalized labels

This mapping requires the client supply both the A-label and U-label representations of the domain name during registration to remove any ambiguity between server and client as to the name being registered.

The <userForm> element in this document maps to the U-label representation of the domain name and MUST NOT contain any A-labels. The <name> element specified in the domain mapping **[RFC5731]** maps to the A-label representation of the domain name and MUST NOT contain any U-labels.

2.2. Language Table Identifier

A language table identifies the list of Unicode code points that are permitted for registration of domain names. They may also include other rules applied to the registration of domain names matching the code points identified in the language table. Language table identifiers provided by the client maps the registered domain name to a language table supported by the server. Language table identifiers should be consistent with BCP 47 , using language tags consistent with **[RFC5646]**.

2.3. Canonical Form

The canonical form of a domain name is used as the unique identifier to map one or more domain names to one registration object. Servers that support server-side management of domain name variants will have a canonical form derived from information in the language table. Servers that do not support the server-side management of domain name variants will use the domain name itself as the canonical form.

3. EPP Command Mapping

A detailed description of the EPP syntax and semantics can be found in the EPP core protocol specification **[RFC5730]**. The command mappings described here are specifically for use in provisioning Internationalized Domain Names via EPP.

3.1. EPP Query Commands

EPP provides three commands to retrieve object information: <check> to determine if
an object is known to the server, <info> to retrieve detailed information associated
with an object, and <transfer> to retrieve object transfer status information.

3.1.1. EPP Command

This extension does not add any elements to the EPP <check> command or <check>
response described in the EPP domain mapping **[RFC5731]**.

3.1.2. EPP Command

This extension does not add any elements to the EPP <info> command described in the
EPP domain mapping **[RFC5731]**. However, additional elements are defined for the
<info> response.

The response to this command MAY vary depending on the identity of the querying
client, use of authorisation information, and server policy towards unauthorised clients.

When an <info> command has been successfully processed, the EPP <resData>
element in the <info> response MUST contain child elements as described in the EPP
domain mapping **[RFC5731]**. In addition, the EPP <extension> element SHOULD
contain a child <infData> element that identifies the extension namespace. The
<infData> element contains the following child elements:

- A <userForm> element that contains the fully qualified name of the registered
  domain in presentation form. A MANDATORY "language" attribute indicates the
  language table identified at registration.
- A <canonicalForm> element that contains the canonical form of the registered
  domain.

Example <info> response:

```
S:<epp xmlns="urn:ietf:params:xml:ns:epp-1.0">
S:  <response>
S:    <result code="1000">
S:      <msg lang="en">Command completed successfully</msg>
S:    </result>
S:    <resData>
S:      <infData xmlns="urn:ietf:params:xml:ns:domain-1.0">
S:        <name>xn--3xan.example</name>
S:        <roid>EXAMPLE1-REP</roid>
S:        <status s="ok" />
S:        <registrant>jd1234</registrant>
S:        <contact type="admin">sh8013</contact>
S:        <contact type="tech">sh8013</contact>
S:        <ns>
S:          <hostObj>ns1.example.com</hostObj>
S:          <hostObj>ns1.example.net</hostObj>
S:        </ns>
S:        <clID>ClientX</clID>
S:        <crID>ClientY</crID>
```

```
S:        <crDate>1999-04-03T22:00:00.0Z</crDate>
S:        <upID>ClientX</domain:upID>
S:        <upDate>1999-12-03T09:00:00.0Z</upDate>
S:        <exDate>2005-04-03T22:00:00.0Z</exDate>
S:        <trDate>2000-04-08T09:00:00.0Z</trDate>
S:        <authInfo>
S:          <pw>2fooBAR</pw>
S:        </authInfo>
S:      </infData>
S:    </resData>
S:    <extension>
S:      <infData xmlns="urn:X-ar:params:xml:ns:idnadomain-1.0">
S:        <userForm language="gr">&#x03C9;&#x03C2;.example</userForm>
S:        <canonicalForm>&#x03C9;&#x03C2;.example</canonicalForm>
S:      </infData>
S:    </extension>
S:    <trID>
S:      <clTRID>ABC-12345</clTRID>
S:      <svTRID>54321-XYZ</svTRID>
S:    </trID>
S:  </response>
S:</epp>
```

An EPP error response MUST be returned if an <info> command cannot be processed
for any reason

3.1.3. EPP <transfer> Command

This extension does not add any elements to the EPP <transfer> command or
<transfer> response described in the EPP domain mapping **[RFC5731]**.

3.2. EPP Transform Commands

EPP provides five commands to transform objects: <create> to create an instance of
an object, <delete> to delete an instance of an object, <renew> to extend the validity
period of an object, <transfer> to manage object sponsorship changes, and <update>
to change information associated with an object.

3.2.1. EPP <create> Command

This extension adds elements to the EPP <create> command as well as the EPP
<create> response, both described in the EPP domain mapping **[RFC5731]**.

In addition to the EPP command elements described in the EPP domain mapping
[RFC5731], the <create> command MAY contain an <extension> element, which MAY
contain a <create> element identifying the idnadomain namespace. The <create>
element contains the following child elements:

- One <userForm> element that contains the presentation form of the fully-
  qualified name of the domain to be queried. A "language" attribute MUST be
  present to indicate the language table used for this domain name.

Example <create> command:

```
C:<?xml version="1.0" encoding="UTF-8"?>
C:<epp xmlns="urn:ietf:params:xml:ns:epp-1.0">
C:  <command>
C:    <create>
C:      <create xmlns="urn:ietf:params:xml:ns:domain-1.0">
C:        <name>xn--3xan.example</name>
C:        <period unit="y">2</period>
C:        <ns>
C:          <hostObj>ns1.example.net</hostObj>
C:          <hostObj>ns2.example.net</hostObj>
C:        </ns>
C:        <registrant>jd1234</registrant>
C:        <contact type="admin">sh8013</contact>
C:        <contact type="tech">sh8013</contact>
C:        <authInfo>
C:          <pw>2fooBAR</pw>
C:        </authInfo>
C:      </create>
C:    </create>
C:    <extension>
C:      <create xmlns="urn:X-ar:params:xml:ns:idnadomain-1.0">
C:        <userForm language="gr">&#x03C9;&#x03C2;.example</userForm>
C:        <canonicalForm>&#x03C9;&#x03C2;.example</canonicalForm>
C:      </create>
C:    </extension>
C:    <clTRID>ABC-12345</clTRID>
C:  </command>
C:</epp>
```

When a <create> command has been successfully processed, the EPP <resData> element in the <create> response MUST contain child elements as described in the EPP domain mapping **[RFC5731]**. In addition, the <create> response MUST contain an EPP <extension> element, which MUST contain an <creData> element identifying the idnadomain namespace. The <creData> contains the following child elements:

- A <userForm> element that contains the fully qualified name of the registered domain in native presentation form. A MANDATORY "language" attribute indicates the language table identifier used in registration.
- A <canonicalForm> element that contains the canonical form of the registered domain.

Example <create> response:

```
S:<?xml version="1.0" encoding="UTF-8"?>
S:<epp xmlns="urn:ietf:params:xml:ns:epp-1.0">
S:  <response>
S:    <result code="1000">
S:      <msg lang="en">Command completed successfully</msg>
S:    </result>
S:    <resData>
S:      <creData xmlns="urn:ietf:params:xml:ns:domain-1.0">
S:        <name>xn--3xan.example</name>
S:        <crDate>1999-04-03T22:00:00.0Z</crDate>
S:        <exDate>2001-04-03T22:00:00.0Z</exDate>
S:      </creData>
S:    </resData>
S:    <extension>
S:      <creData xmlns="urn:X-ar:params:xml:ns:idnadomain-1.0">
S:        <userForm language="gr">&#x03C9;&#x03C2;.example</userForm>
S:        <canonicalForm>&#x03C9;&#x03C2;.example</canonicalForm>
S:      </creData>
```

```
S:      </extension>
S:      <trID>
S:        <clTRID>ABC-12345</clTRID>
S:        <svTRID>54321-XYZ</svTRID>
S:      </trID>
S:    </response>
S:</epp>
```

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3.2.2. EPP <delete> Command

This extension does not add any elements to the EPP <delete> command or <delete> response described in the EPP domain mapping **[RFC5731]**.

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3.2.3. EPP <renew> Command

This extension does not add any elements to the EPP <renew> command or <renew> response described in the EPP domain mapping **[RFC5731]**.

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3.2.4. EPP <transfer> Command

This extension does not add any elements to the EPP <transfer> command or <transfer> response described in the EPP domain mapping **[RFC5731]**.

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3.2.5. EPP Command

This extension does not add any elements to the EPP <update> command or <update> response described in the EPP domain mapping **[RFC5731]**.

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4. Formal Syntax

An EPP object mapping is specified in XML Schema notation. The formal syntax presented here is a complete schema representation of the object mapping suitable for automated validation of EPP XML instances. The BEGIN and END tags are not part of the schema; they are used to note the beginning and ending of the schema for URI registration purposes.

```
BEGIN
<?xml version="1.0" encoding="UTF-8"?>
<schema targetNamespace="urn:X-ar:params:xml:ns:idnadomain-1.0"
  xmlns:idn="urn:X-ar:params:xml:ns:idnadomain-1.0"
  xmlns:eppcom="urn:ietf:params:xml:ns:eppcom-1.0"
  xmlns="http://www.w3.org/2001/XMLSchema"
  elementFormDefault="qualified">
```

```
<!-- Import common element types. -->
<import namespace="urn:ietf:params:xml:ns:eppcom-1.0"
  schemaLocation="eppcom-1.0.xsd" />

<annotation>
  <documentation>
    Internationalized Domain Name Extensions to the Extensible
    Provisioning Protocol v1.0 schema.
  </documentation>
</annotation>

<complexType name="i16dLabelType">
  <simpleContent>
    <extension base="eppcom:labelType">
      <attribute name="language" type="language" use="required" />
    </extension>
  </simpleContent>
</complexType>

<!-- Custom extensions -->
<element name="create" type="idn:createType" />

<!-- Child elements of the <create> command extension. -->
<complexType name="createType">
  <sequence>
    <element name="userForm" type="idn:i16dLabelType" />
  </sequence>
</complexType>

<!-- Custom response -->
<element name="infData" type="idn:resDataType" />
<element name="creData" type="idn:resDataType" />

<!-- Response extension elements. -->
<complexType name="resDataType">
  <sequence>
    <element name="userForm" type="idn:i16dLabelType" />
    <element name="canonicalForm" type="eppcom:labelType" />
  </sequence>
</complexType>

<!-- End of schema. -->
</schema>
END
```

5. Internationalization Considerations

EPP is represented in XML, which provides native support for encoding information using the Unicode character set and its more compact representations including UTF-8 **[RFC3629]**. Conformant XML processors recognise both UTF-8 and UTF-16 **[RFC2781]**. Though XML includes provisions to identify and use other character encodings through use of an "encoding" attribute in an <?xml?> declaration, use of UTF-8 is RECOMMENDED in environments where parser encoding support incompatibility exists.

As an extension of the EPP domain mapping **[RFC5731]**, the internationalization requirements in the EPP domain mapping **[RFC5731]** are followed by this extension. This extension does not override any of the EPP domain mapping **[RFC5731]** internationalization features.

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6. Security Considerations

The mapping extensions described in this document do not provide any security services beyond those described by EPP **[RFC5730]**, the EPP domain name mapping **[RFC5731]**, and protocol layers used by EPP. The security considerations described in these other specifications apply to this specification as well.

As with other domain object transforms, the EPP transform operations described in this document MUST be restricted to the sponsoring client as authenticated using the mechanisms described in Sections 2.9.1.1 and 7 of **[RFC5730]**. Any attempt to perform a transform operation on a domain object by any client other than the sponsoring client MUST be rejected with an appropriate EPP authorization error.

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7. References

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7.1. Normative References

[RFC2119]	**Bradner, S.**, "**Key words for use in RFCs to Indicate Requirement Levels**," BCP 14, RFC 2119, March 1997 (**TXT**, **HTML**, **XML**).
[RFC5646]	Phillips, A. and M. Davis, "**Tags for Identifying Languages**," BCP 47, RFC 5646, September 2009 (**TXT**
[RFC5730]	Hollenbeck, S., "**Extensible Provisioning Protocol (EPP)**," STD 69, RFC 5730, August 2009 (**TXT**).
[RFC5731]	Hollenbeck, S., "**Extensible Provisioning Protocol (EPP) Domain Name Mapping**," STD 69, RFC 573 August 2009 (**TXT**).
[RFC5890]	Klensin, J., "**Internationalized Domain Names for Applications (IDNA): Definitions and Documen Framework**," RFC 5890, August 2010 (**TXT**).
[RFC5891]	Klensin, J., "**Internationalized Domain Names in Applications (IDNA): Protocol**," RFC 5891, August 2010 (**TXT**).
[RFC5892]	Faltstrom, P., "**The Unicode Code Points and Internationalized Domain Names for Applications (IDNA)**," RFC 5892, August 2010 (**TXT**).
[RFC5893]	Alvestrand, H. and C. Karp, "**Right-to-Left Scripts for Internationalized Domain Names for Applications (IDNA)**," RFC 5893, August 2010 (**TXT**).
[RFC5894]	Klensin, J., "**Internationalized Domain Names for Applications (IDNA): Background, Explanation and Rationale**," RFC 5894, August 2010 (**TXT**).
[W3C.REC-xml-20040204]	Bray, T., Maler, E., Paoli, J., Yergeau, F., and C. Sperberg-McQueen, "**Extensible Markup Language (XML) 1.0 (Third Edition)**," World Wide Web Consortium FirstEdition REC-xml-20040204, February 200 (**HTML**).
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[W3C.REC-xmlschema-2-20041028]	Malhotra, A. and P. Biron, "**XML Schema Part 2: Datatypes Second Edition**," World Wide Web Consortium Recommendation REC-xmlschema-2-20041028, October 2004 (**HTML**).

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7.2. Informative References

[RFC2781]	**Hoffman, P.** and **F. Yergeau**, "**UTF-16, an encoding of ISO 10646**," RFC 2781, February 2000 (**TXT**).
[RFC3629]	Yergeau, F., "**UTF-8, a transformation format of ISO 10646**," STD 63, RFC 3629, November 2003 (**TXT**).

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