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Authors: L. Lhotka P. Spacek
CZ.NIC Internet Systems Consortium

YANG Types for DNS Classes and Resource Record Types

Abstract

This document introduces the YANG module "iana-dns-class-rr-type" that contains derived types reflecting two IANA registries: DNS CLASSes and Resource Record (RR) TYPEs. These YANG types are intended as a minimum basis for future data modeling work.

Status of This Memo

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1. Introduction

YANG [RFC7950] has become a de facto standard as a language for modeling configuration and state data, as well as specifying management operations and asynchronous notifications. It is reasonable to expect that the approach based on utilizing such data models along with standard management protocols such as NETCONF [RFC6241] and RESTCONF [RFC8040] can be effectively used in DNS operations, too. In fact, several efforts are currently underway that attempt to use NETCONF or RESTCONF for configuring and managing

- *authoritative servers
- *resolvers
- *zone data.

While it is possible to use the management protocols mentioned above with ad hoc or proprietary data models, their real potential can be realized only if there is a (completely or partly) unified data model supported by multiple DNS software implementations. Operators can then, for instance, run several DNS server implementations in parallel, and use a common configuration and management interface and data for all of them. Also, it becomes considerably easier to migrate to another implementation.

Based on the previous experience from the IETF Routing Area, it is to be expected that the development of unified data models for DNS will be a lengthy and complicated process that will require active cooperation and compromises from the vendors and developers of major DNS server platforms. Nevertheless, it is likely that any DNS-related data modeling effort will need to use various DNS parameters and enumerations that are specified in several IANA registries. For use with YANG, these parameters and enumerations have to be translated into corresponding YANG types or other structures. Such

translations should be straightforward and relatively uncontroversial.

This document provides a translation of two fundamental DNS-related IANA registries to YANG. It contains the initial revision of the YANG module "iana-dns-class-rr-type" that defines derived types for the common parameters of DNS resource records (RR): class and type. These YANG types, "dns-class" and "rr-type", reflect the IANA registries "DNS CLASSes" and "Resource Record (RR) TYPEs" [IANA-DNS-PARAMETERS].

Appendix A contains an XSLT 1.0 stylesheet that is intended to be used by IANA for generating the initial revision of the "iana-dns-class-rr-type" YANG module. Subsequently, whenever a new class or RR type is added to the above registries, IANA will also update the "iana-dns-class-rr-type" YANG module, following the instructions in Section 4 below.

2. Terminology

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in BCP 14 [RFC2119] [RFC8174] when, and only when, they appear in all capitals, as shown here.

The terminology for describing YANG data models can be found in [RFC7950]. DNS terminology used in this document can be found in [RFC1035] and [RFC8499].

3. YANG Design Considerations

At the time of writing, the IANA document "Domain Name System (DNS) Parameters" [IANA-DNS-PARAMETERS] contains altogether thirteen registries. The YANG module "iana-dns-class-rr-type" defines derived types corresponding to only two of the registries that are essential for data models involving zone data, namely "DNS CLASSes" and "Resource Record (RR) TYPEs". It is expected that the remaining registries in [IANA-DNS-PARAMETERS], as well as other DNS-related IANA registries, will be analogously reflected in future YANG modules as necessary. This way, an appropriate combination of YANG modules can be chosen depending on which YANG types are needed for a given data modeling purpose.

The registries "DNS CLASSes" and "Resource Record (RR) TYPEs" are transformed into YANG enumeration types "dns-class-name" and "rr-type-name", respectively. This is the initial fragment of the former:

```
typedef dns-class-name {
  type enumeration {
    enum IN {
      value 1;
      description
        "Internet (IN)";
      reference
        "RFC 1035";
    }
    ...
  }
  ...
}
```

The other derived type, "rr-type-name", is defined similarly.

[RFC3597] introduced the option of specifying a class or RR type via its assigned decimal number, as an alternative to the mnemonic name. For example, the "IN" class can be equivalently written as "CLASS1", and "AAAA" type can be written as "TYPE28".

Accordingly, the derived types "dns-class" and "rr-type" are defined in the YANG module as a union of two member types:

- 16-bit decimal integer ("uint16")

- mnemonic name belonging to the enumerations "dns-class-name" and "rr-type-name", respectively.

For instance, the "rr-type" type is defined as follows:

```
typedef rr-type {
  type union {
    type uint16;
    type rr-type-name;
  }
  description
    "This type allows for referring to a DNS resource record type
     using either the assigned mnemonic name or numeric value.";
}
```

As unassigned and reserved class and RR type values are not included in the mnemonic name enumerations, they can only be specified using their decimal values.

4. IANA Considerations

RFC Editor: In this section, replace all occurrences of "XXXX" with the actual RFC number (and remove this note).

This section deals with actions and processes necessary for IANA to undertake to maintain the "iana-dns-class-rr-type" YANG module. This YANG module is intended to reflect the "DNS CLASSes" and "Resource Record (RR) TYPEs" registries in [IANA-DNS-PARAMETERS]. The most recent revision of the YANG module is available from the "YANG Parameters" registry [IANA-YANG-PARAMETERS].

Upon publication of this document, the initial revision of the "iana-dns-class-rr-type" YANG module SHALL be created by applying the XSLT stylesheet from Appendix A to the XML version of [IANA-DNS-PARAMETERS].

IANA SHALL add this note to the "iana-dns-class-rr-type" item of the "YANG Module Names" registry [IANA-YANG-PARAMETERS]:

> Classes and types of DNS resource records must not be directly added to the "iana-dns-class-rr-type" YANG module. They must instead be added to the "DNS CLASSes" and "Resource Record (RR) TYPEs" registries, respectively.

When a new DNS class or RR type is added to the "DNS CLASSes" or "Resource Record (RR) TYPEs" registry, a new "enum" statement SHALL be added to the "dns-class-name" or "rr-type-name" type, respectively. The assigned name defined by the "enum" statement SHALL be the same as the mnemonic name of the new class or type. The following substatements to the "enum" statement SHALL be defined:

"value": Use the decimal value from the registry.

"status": Include only if a class or type registration has been deprecated or obsoleted. IANA "deprecated" maps to YANG status "deprecated", and IANA "obsolete" maps to YANG status "obsolete".

"description": Replicate the corresponding information from the registry, namely the full name of the new DNS class, or the meaning of the new RR type, if any.

"reference": Replicate the reference(s) from the registry.

Unassigned or reserved values SHALL NOT be included in the "dns-class-name" and "rr-type-name" enumeration types.

Each time the "iana-dns-class-rr-type" YANG module is updated, a new "revision" statement SHALL be added before the existing "revision" statements.

IANA SHALL add this new note to the "DNS CLASSes" and "Resource Record (RR) TYPEs" registries:

> When this registry is modified, the YANG module "iana-dns-class-rr-type" must be updated as defined in RFC XXXX.

The "Reference" text in the "DNS CLASSes" registry SHALL be updated as follows:

```
OLD:
  [RFC6895]

NEW:
  [RFC6895][RFCXXXX]
```

The "Reference" text in the "Resource Record (RR) TYPEs" registry SHALL be updated as follows:

```
OLD:
  [RFC6895][RFC1035]

NEW:
  [RFC6895][RFC1035][RFCXXXX]
```

4.1. URI Registrations

This document registers a URI in the "IETF XML Registry" [RFC3688]. The following registration has been made:

```
URI: urn:ietf:params:xml:ns:yang:iana-dns-class-rr-type
Registrant Contact: The IESG.
XML: N/A, the requested URI is an XML namespace.
```

4.2. YANG Module Registrations

This document registers a YANG module in the "YANG Module Names" registry [RFC6020]. The following registration has been made:

```
name:      iana-dns-class-rr-type
namespace: urn:ietf:params:xml:ns:yang:iana-dns-class-rr-type
prefix:    dnsct
reference: RFC XXXX
```

5. Security Considerations

This document translates two IANA registries into YANG data types and otherwise introduces no technology or protocol. The definitions themselves have no security impact on the Internet, but their use in concrete YANG modules might have. The security considerations

spelled out in the YANG specification [RFC7950] apply for this document as well.

6. Normative References

[IANA-DNS-PARAMETERS] Internet Assigned Numbers Authority, "Domain Name System (DNS) Parameters", <https://www.iana.org/assignments/dns-parameters>.

[IANA-YANG-PARAMETERS] Internet Assigned Numbers Authority, "YANG Parameters", <https://www.iana.org/assignments/yang-parameters>.

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, DOI 10.17487/RFC2119, March 1997, <https://www.rfc-editor.org/info/rfc2119>.

[RFC3688] Mealling, M., "The IETF XML Registry", BCP 81, RFC 3688, DOI 10.17487/RFC3688, January 2004, <https://www.rfc-editor.org/info/rfc3688>.

[RFC6020] Bjorklund, M., Ed., "YANG - A Data Modeling Language for the Network Configuration Protocol (NETCONF)", RFC 6020, DOI 10.17487/RFC6020, October 2010, <https://www.rfc-editor.org/info/rfc6020>.

[RFC7950] Bjorklund, M., Ed., "The YANG 1.1 Data Modeling Language", RFC 7950, DOI 10.17487/RFC7950, August 2016, <https://www.rfc-editor.org/info/rfc7950>.

[RFC8174] Leiba, B., "Ambiguity of Uppercase vs Lowercase in RFC 2119 Key Words", BCP 14, RFC 8174, DOI 10.17487/RFC8174, May 2017, <https://www.rfc-editor.org/info/rfc8174>.

[W3C.REC-xslt-19991116] Clark, J., "XSL Transformations (XSLT) Version 1.0", World Wide Web Consortium Recommendation REC-xslt-19991116, 16 November 1999, <https://www.w3.org/TR/1999/REC-xslt-19991116>.

7. Informative References

[RFC1035] Mockapetris, P., "Domain names - implementation and specification", STD 13, RFC 1035, DOI 10.17487/RFC1035, November 1987, <https://www.rfc-editor.org/info/rfc1035>.

[RFC3597] Gustafsson, A., "Handling of Unknown DNS Resource Record (RR) Types", RFC 3597, DOI 10.17487/RFC3597, September 2003, <https://www.rfc-editor.org/info/rfc3597>.

[RFC6241] Enns, R., Ed., Bjorklund, M., Ed., Schoenwaelder, J., Ed., and A. Bierman, Ed., "Network Configuration Protocol (NETCONF)", RFC 6241, DOI 10.17487/RFC6241, June 2011, <https://www.rfc-editor.org/info/rfc6241>.

[RFC8040] Bierman, A., Bjorklund, M., and K. Watsen, "RESTCONF Protocol", RFC 8040, DOI 10.17487/RFC8040, January 2017, <https://www.rfc-editor.org/info/rfc8040>.

[RFC8499] Hoffman, P., Sullivan, A., and K. Fujiwara, "DNS Terminology", BCP 219, RFC 8499, DOI 10.17487/RFC8499, January 2019, <https://www.rfc-editor.org/info/rfc8499>.

Appendix A. XSLT Stylesheet

RFC Editor: In this section, replace all occurrences of "XXXX" with the actual RFC number (and remove this note).

This appendix contains an XSLT 1.0 stylesheet [W3C.REC-xslt-19991116] that is intended to be used for generating the initial revision of the "iana-dns-class-rr-type" YANG module. This is achieved by applying the stylesheet to the XML version of the IANA registry "Domain Name System (DNS) Parameters" [IANA-DNS-PARAMETERS] that was current at the time when this document was published.

Using the ubiquitous xsltproc tool, the YANG module text can be generated with this command:

```
$ xsltproc iana-dns-class-rr-type.xsl dns-parameters.xml
```

```
<CODE BEGINS> file "iana-dns-class-rr-type.xsl"

<?xml version="1.0" standalone="yes"?>
<stylesheet xmlns="http://www.w3.org/1999/XSL/Transform"
            xmlns:iana="http://www.iana.org/assignments"
            version="1.0">
  <output method="text"/>
  <strip-space elements="*"/>

  <variable name="dq">"</variable>
  <variable name="sq">'</variable>

  <variable name="module-intro">
    <text>module iana-dns-class-rr-type {
  yang-version 1.1;
  namespace
    "urn:ietf:params:xml:ns:yang:iana-dns-class-rr-type";
  prefix dnsct;

  organization
    "Internet Assigned Numbers Authority (IANA)";

  contact
    "        Internet Assigned Numbers Authority

     Postal: ICANN
             4676 Admiralty Way, Suite 330
             Marina del Rey, CA 90292

     Tel:    +1 310 823 9358

     &lt;mailto:iana@iana.org&gt;";

  description
    "This YANG module translates IANA registries 'DNS CLASSes' and
     'Resource Record (RR) TYPEs' to YANG derived types.

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     authors of the code. All rights reserved.

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     forth in Section 4.c of the IETF Trust's Legal Provisions
     Relating to IETF Documents
     (https://trustee.ietf.org/license-info).

     This initial version of this YANG module was generated from
     the corresponding IANA registries using an XSLT stylesheet
     from Appendix A of RFC XXXX
```

```
   (https://www.rfc-editor.org/info/rfcXXXX); see the RFC itself
   for full legal notices.";

reference
  "IANA 'Domain Name System (DNS) Parameters' registry
   https://www.iana.org/assignments/dns-parameters";</text>
   <text>&#xA;&#xA;</text>
</variable>

<template name="enum">
  <param name="id"/>
  <value-of select="concat('      enum ', $id)"/>
  <text> {&#xA;        value </text>
  <value-of select="concat(iana:value, ';&#xA;')"/>
  <if test="contains(iana:description, 'OBSOLETE')">
    <text>        status obsolete;&#xA;</text>
  </if>
  <apply-templates select="iana:description"/>
  <variable name="xrefs" select="iana:xref[@type!='note']"/>
  <if test="$xrefs">
    <text>        reference&#xA;          "</text>
    <if test="count($xrefs)&gt;1">- </if>
    <apply-templates select="iana:xref[@type!='note']"/>
  </if>
  <text>      }&#xA;</text>
</template>

<template match="/">
  <value-of select="$module-intro"/>
  <apply-templates select="iana:registry[@id='dns-parameters']"/>
  <text>}&#xA;</text>
</template>

<template match="iana:registry[@id='dns-parameters']">
  <apply-templates select="iana:updated"/>
  <apply-templates
      select="iana:registry[@id='dns-parameters-2']"/>
  <apply-templates
      select="iana:registry[@id='dns-parameters-4']"/>
</template>

<template match="iana:updated">
  <value-of select="concat('  revision ', ., ' {')"/>
  <text>
  description
    "Initial revision.";
  reference
    "RFC XXXX: YANG Types for DNS Classes and Resource Record
     Types";
```

```
}

/* Typedefs */&#xA;&#xA;</text>
</template>

<template match="iana:registry[@id='dns-parameters-2']">
  <text>  typedef dns-class-name {&#xA;</text>
  <text>    type enumeration {&#xA;</text>
  <apply-templates
      select="iana:record[not(iana:description='Unassigned' or
              starts-with(iana:description,'Reserved'))]"
      mode="class"/>
  <text>    }
  description
    "This enumeration type defines mnemonic names and corresponding
     numeric values of DNS classes.";
  reference
    "RFC 6895: Domain Name System (DNS) IANA Considerations";
}

typedef dns-class {
  type union {
    type uint16;
    type dns-class-name;
  }
  description
    "This type allows for referring to a DNS class using either the
     assigned mnemonic name or numeric value.";
}&#xA;&#xA;</text>
</template>

<template match="iana:registry[@id='dns-parameters-4']">
  <text>  typedef rr-type-name {&#xA;</text>
  <text>    type enumeration {&#xA;</text>
  <apply-templates
      select="iana:record[iana:type!='Unassigned' and
              iana:type!='Private use' and iana:type!='Reserved']"
      mode="rr-type"/>
  <text>    }
  description
    "This enumeration type defines mnemonic names and corresponding
     numeric values of DNS resource record types.";
  reference
    "- RFC 6895: Domain Name System (DNS) IANA Considerations

     - RFC 1035: Domain Names - Implementation and Specification";
}

typedef rr-type {
```

```
  type union {
    type uint16;
    type rr-type-name;
  }
  description
    "This type allows for referring to a DNS resource record type
     using either the assigned mnemonic name or numeric value.";
}&#xA;</text>
</template>

<template match="iana:record" mode="class">
  <call-template name="enum">
    <with-param name="id">
      <choose>
        <when test="contains(iana:description,'(')">
          <value-of select="substring-before(substring-after(
                            iana:description, '('), ')')"/>
        </when>
        <otherwise>
          <value-of
              select="substring-after(iana:description, ' ')"/>
        </otherwise>
      </choose>
    </with-param>
  </call-template>
</template>

<template match="iana:record" mode="rr-type">
  <call-template name="enum">
    <with-param name="id" select="iana:type"/>
  </call-template>
</template>

<template match="iana:description">
  <text>        description&#xA;          </text>
  <value-of select="concat($dq, ., $dq, ';&#xA;')"/>
</template>

<template match="iana:xref">
  <choose>
    <when test="@type='rfc'">
      <value-of
          select="concat('RFC ', substring-after(@data, 'rfc'))"/>
    </when>
    <when test="@type='person'">
      <apply-templates
          select="/iana:registry/iana:people/iana:person[
                  @id=current()/@data]"/>
    </when>
```

```
      <when test="@type='text'">
        <value-of select="translate(., $dq, $sq)"/>
      </when>
      <otherwise>
        <value-of select="@data"/>
      </otherwise>
    </choose>
    <choose>
      <when test="position()=last()">
        <text>";&#xA;</text>
      </when>
      <otherwise>
        <text>&#xA;           - </text>
      </otherwise>
    </choose>
  </template>

  <template match="iana:person">
    <value-of select="concat(iana:name, ' &lt;', iana:uri, '&gt;')"/>
  </template>

</stylesheet>


<CODE ENDS>
```

Authors' Addresses

Ladislav Lhotka
CZ.NIC
Czech Republic

Email: ladislav.lhotka@nic.cz

Petr Spacek
Internet Systems Consortium
Czech Republic

Email: pspacek@isc.org