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A YANG Data Model for Tunnel Interface Types

Abstract

This document specifies the initial version of a YANG module "iana-tunnel-type", which contains a collection of IANA-maintained YANG identities used as interface types for tunnel interfaces. The module reflects the "tunnelType" registry maintained by IANA. The latest revision of this YANG module can be obtained from the IANA website.

Tunnel type values are not directly added to the Tunnel Interface Types YANG module; they must instead be added to the "tunnelType" IANA registry. Once a new tunnel type registration is made by IANA for a new tunneling scheme or even an existing one that is not already listed in the current registry (e.g., LISP, NSH), IANA will update the Tunnel Interface Types YANG module accordingly.

Some of the IETF-defined tunneling techniques are not listed in the current IANA registry. It is not the intent of this document to update the existing IANA registry with a comprehensive list of tunnel technologies. Registrants must follow the IETF registration procedure for interface types whenever a new tunnel type is needed.

Status of This Memo

This is an Internet Standards Track document.

This document is a product of the Internet Engineering Task Force (IETF). It represents the consensus of the IETF community. It has received public review and has been approved for publication by the Internet Engineering Steering Group (IESG). Further information on Internet Standards is available in Section 2 of RFC 7841.

Information about the current status of this document, any errata, and how to provide feedback on it may be obtained at https://www.rfc-editor.org/info/rfc8675.

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1. Introduction

This document specifies the initial version of the iana-tunnel-type YANG module containing a collection of IANA-maintained YANG identities identifying tunnel interface types. The module reflects IANA's tunnelType registry under the SMI Numbers registry [TUNNELTYPE-IANA-REGISTRY]. The latest revision of this module can be obtained from the IANA website.

Tunnel-specific extensions may be added to the Interface module [RFC8343] as a function of the tunnel type. An example of this is provided in Appendix A. It is not the intention of this document to define tunnel-specific extensions for every tunnel encapsulation technology; those are discussed in dedicated documents such as [RFC8676]. Likewise, it is out of the scope of this document to update the existing IANA tunnelType registry [TUNNELTYPE-IANA-REGISTRY] with a comprehensive list of tunnel technologies. Guidelines and registration procedures for interface types and sub-types are discussed in [IFTYPE-REG].

This document uses the common YANG types defined in [RFC6991] and adopts the Network Management Datastore Architecture (NMDA [RFC8342]).

The terminology for describing YANG modules is defined in [RFC7950]. The meanings of the symbols used in the tree diagram are defined in [RFC8340].

2. IANA Tunnel Type YANG Module

The iana-tunnel-type module imports the 'iana-if-type' module defined in [RFC7224].

The initial version of the module includes tunnel types defined in [RFC4087], [RFC7856], [RFC7870], and [RFC6346].

```
<CODE BEGINS> file "iana-tunnel-type@2019-11-16.yang"
module iana-tunnel-type {
  yang-version 1.1;
  namespace "urn:ietf:params:xml:ns:yang:iana-tunnel-type";
  prefix iana-tunnel-type;

  import iana-if-type {
    prefix ift;
    reference
      "RFC 7224: IANA Interface Type YANG Module";
  }

  organization
    "IANA";
  contact
    "Internet Assigned Numbers Authority

     Postal: ICANN
          12025 Waterfront Drive, Suite 300
          Los Angeles, CA  90094-2536
          United States of America
     Tel:    +1 310 301 5800
     <mailto:iana@iana.org>";
  description
    "This module contains a collection of YANG identities defined
     by IANA and used as interface types for tunnel interfaces.

     Copyright (c) 2019 IETF Trust and the persons identified as
     authors of the code.  All rights reserved.

     Redistribution and use in source and binary forms, with or
     without modification, is permitted pursuant to, and subject
     to the license terms contained in, the Simplified BSD License
     set forth in Section 4.c of the IETF Trust's Legal Provisions
     Relating to IETF Documents
     (https://trustee.ietf.org/license-info).

     This version of this YANG module is part of RFC 8675; see
     the RFC itself for full legal notices.";

  revision 2019-11-16 {
    description
      "Initial revision.";
    reference
      "RFC 8675: A YANG Data Model for Tunnel Interface Types";
  }

  identity other {
    base ift:tunnel;
    description
      "None of the following values.";
    reference
      "RFC 4087: IP Tunnel MIB";
  }

  identity direct {
```

```
  base ift:tunnel;
  description
    "No intermediate header.";
  reference
    "RFC 2003: IP Encapsulation within IP
     RFC 4213: Basic Transition Mechanisms for IPv6 Hosts
               and Routers";
}

identity gre {
  base ift:tunnel;
  description
    "GRE encapsulation.";
  reference
    "RFC 1701: Generic Routing Encapsulation (GRE)
     RFC 1702: Generic Routing Encapsulation over IPv4 networks
     RFC 7676: IPv6 Support for Generic Routing Encapsulation
               (GRE)";
}

identity minimal {
  base ift:tunnel;
  description
    "Minimal encapsulation.";
  reference
    "RFC 2004: Minimal Encapsulation within IP";
}

identity l2tp {
  base ift:tunnel;
  description
    "L2TP encapsulation.";
  reference
    "RFC 2661: Layer Two Tunneling Protocol 'L2TP'";
}

identity pptp {
  base ift:tunnel;
  description
    "PPTP encapsulation.";
  reference
    "RFC 2637: Point-to-Point Tunneling Protocol (PPTP)";
}

identity l2f {
  base ift:tunnel;
  description
    "L2F encapsulation.";
  reference
    "RFC 2341: Cisco Layer Two Forwarding (Protocol) 'L2F'";
}

identity udp {
  base ift:tunnel;
  description
    "UDP encapsulation.";
```

```
  reference
    "RFC 1234: Tunneling IPX Traffic through IP Networks,
     RFC 8085: UDP Usage Guidelines, Section 3.1.11";
}

identity atmp {
  base ift:tunnel;
  description
    "ATMP encapsulation.";
  reference
    "RFC 2107: Ascend Tunnel Management Protocol - ATMP";
}

identity msdp {
  base ift:tunnel;
  description
    "MSDP encapsulation.";
  reference
    "RFC 3618: Multicast Source Discovery Protocol (MSDP)";
}

identity sixtofour {
  base ift:tunnel;
  description
    "6to4 encapsulation.";
  reference
    "RFC 3056: Connection of IPv6 Domains via IPv4 Clouds";
}

identity sixoverfour {
  base ift:tunnel;
  description
    "6over4 encapsulation.";
  reference
    "RFC 2529: Transmission of IPv6 over IPv4 Domains without
               Explicit Tunnels";
}

identity isatap {
  base ift:tunnel;
  description
    "ISATAP encapsulation.";
  reference
    "RFC 5214:  Intra-Site Automatic Tunnel Addressing Protocol
               (ISATAP)";
}

identity teredo {
  base ift:tunnel;
  description
    "Teredo encapsulation.";
  reference
    "RFC 4380: Teredo: Tunneling IPv6 over UDP through
               Network Address Translations (NATs)";
}
```

```
  identity iphttps {
    base ift:tunnel;
    description
      "IP over HTTPS (IP-HTTPS) Tunneling Protocol.";
    reference
      "Microsoft Corporation, IP over HTTPS (IP-HTTPS) Tunneling
       Protocol Specification,
       https://msdn.microsoft.com/en-us/library/dd358571.aspx";
  }

  identity softwiremesh {
    base ift:tunnel;
    description
      "softwire mesh tunnel.";
    reference
      "RFC 5565: Softwire Mesh Framework";
  }

  identity dslite {
    base ift:tunnel;
    description
      "DS-Lite tunnel.";
    reference
      "RFC 6333: Dual-Stack Lite Broadband Deployments Following
                 IPv4 Exhaustion";
  }

  identity aplusp {
    base ift:tunnel;
    description
      "A+P encapsulation.";
    reference
      "RFC 6346: The Address plus Port (A+P) Approach to the IPv4
                 Address Shortage";
  }
}
<CODE ENDS>
```

3. Security Considerations

The YANG module specified in this document defines a schema for data that is designed to be accessed via network management protocols such as NETCONF [RFC6241] or RESTCONF [RFC8040]. The lowest NETCONF layer is the secure transport layer, and the mandatory-to-implement secure transport is Secure Shell (SSH) [RFC6242]. The lowest RESTCONF layer is HTTPS, and the mandatory-to-implement secure transport is TLS [RFC8446].

The Network Configuration Access Control Model (NACM) [RFC8341] provides the means to restrict access for particular NETCONF or RESTCONF users to a preconfigured subset of all available NETCONF or RESTCONF protocol operations and content.

The module defined in this document defines YANG identities for the iana-tunnel-types registry. These identities are intended to be referenced by other YANG modules, and by themselves do not expose any

nodes which are writable, contain read-only state, or RPCs. As such, there are no additional security issues to be considered relating to the module defined in this document.

4. IANA Considerations

4.1. YANG Module

IANA has registered the following URI in the "ns" subregistry within the "IETF XML Registry" [RFC3688]:

URI: urn:ietf:params:xml:ns:yang:iana-tunnel-type
Registrant Contact: IANA
XML: N/A; the requested URI is an XML namespace.

IANA registered the following YANG module in the "YANG Module Names" subregistry [RFC7950] within the "YANG Parameters" registry.

Name: iana-tunnel-type
Namespace: urn:ietf:params:xml:ns:yang:iana-tunnel-type
Prefix: iana-tunnel-type
Reference: RFC 8675

This document defines the initial version of the IANA-maintained iana-tunnel-type YANG module. IANA has added this note to the registry:

> Tunnel type values must not be directly added to the iana-tunnel-type YANG module. They must instead be added to the "tunnelType" subregistry (under the "ifType definitions" registry) at [IANA registry smi-numbers].

When a tunnel type is added to the "tunnelType" subregistry, a new "identity" statement must be added to the iana-tunnel-type YANG module. The name of the "identity" is the lower-case of the corresponding enumeration in the IANAifType-MIB (i.e., IANAtunnelType). The "identity" statement should have the following sub-statements defined:

"base": Contains 'ift:tunnel'.

"description": Replicates the description from the registry.

"reference": Replicates the reference from the registry and adds the title of the document.

Unassigned or reserved values are not present in the module.

When the iana-tunnel-type YANG module is updated, a new "revision" statement must be added in front of the existing revision statements.

IANA has added the following note to "tunnelType" subregistry:

> When this registry is modified, the YANG module iana-tunnel-type must be updated as defined in RFC 8675.

4.2. Updates to the IANA tunnelType Table

IANA has updated the following entries in the tunnelType registry under the SMI Numbers registry [TUNNELTYPE-IANA-REGISTRY].

OLD:

Decimal	Name	Description	References
2	direct	no intermediate header	[RFC4087]
3	gre	GRE encapsulation	[RFC4087]
4	minimal	Minimal encapsulation	[RFC4087]
5	l2tp	L2TP encapsulation	[RFC4087]
6	pptp	PPTP encapsulation	[RFC4087]
7	l2f	L2F encapsulation	[RFC4087]
8	udp	UDP encapsulation	[RFC4087]
9	atmp	ATMP encapsulation	[RFC4087]
10	msdp	MSDP encapsulation	[RFC4087]
11	sixToFour	6to4 encapsulation	[RFC4087]
12	sixOverFour	6over4 encapsulation	[RFC4087]
13	isatap	ISATAP encapsulation	[RFC4087]
14	teredo	Teredo encapsulation	[RFC4087]
16	softwireMesh	softwire mesh tunnel	[RFC7856]
17	dsLite	DS-Lite tunnel	[RFC7870]

Table 1

NEW:

Decimal	Name	Description	References
2	direct	no intermediate header	[RFC2003][RFC4213]
3	gre	GRE encapsulation	[RFC1701][RFC1702][RFC7676]
4	minimal	Minimal encapsulation	[RFC2004]

5	l2tp	L2TP encapsulation	[RFC2661]
6	pptp	PPTP encapsulation	[RFC2637]
7	l2f	L2F encapsulation	[RFC2341]
8	udp	UDP encapsulation	[RFC8085]
9	atmp	ATMP encapsulation	[RFC2107]
10	msdp	MSDP encapsulation	[RFC3618]
11	sixToFour	6to4 encapsulation	[RFC3056]
12	sixOverFour	6over4 encapsulation	[RFC2529]
13	isatap	ISATAP encapsulation	[RFC5214]
14	teredo	Teredo encapsulation	[RFC4380]
16	softwireMesh	softwire mesh tunnel	[RFC5565]
17	dsLite	DS-Lite tunnel	[RFC6333]

Table 2

5. References

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Appendix A. Example Usage

The following example illustrates how the Interface YANG module can be augmented with tunnel-specific parameters. In this example, the module is augmented with a 'remote-endpoint' for the tunnel. A tree structure is provided below:

```
module: example-iftunnel-extension
  augment /if:interfaces/if:interface:
    +--rw remote-endpoint?   inet:ipv6-address
```

The 'example-iftunnel-extension' module imports the modules defined in [RFC6991] and [RFC8343] in addition to the "iana-tunnel-type" module defined in this document.

```
module example-iftunnel-extension {
  yang-version 1.1;

  namespace "urn:ietf:params:xml:ns:yang:example-iftunnel-extension";
  prefix example;

  import ietf-inet-types {
    prefix inet;
    reference
      "RFC 6991: Common YANG Data Types, Section 4";
  }

  import ietf-interfaces {
    prefix if;
    reference
      "RFC 8343: A YANG Data Model for Interface Management";
  }

  import iana-tunnel-type  {
    prefix iana-tunnel-type;
    reference
      "RFC 8675:  A Tunnel Extension to the Interface Management
                  YANG Module";
  }

  organization "IETF Softwire Working Group";

  contact

    "WG Web:   <https://datatracker.ietf.org/wg/softwire/>
     WG List:  <mailto:softwire@ietf.org>

     Author:  Mohamed Boucadair
              <mailto:mohamed.boucadair@orange.com>";

   description
      "This is an example YANG module to extend the Interface YANG
       module with tunnel-specific parameters.

      Copyright (c) 2019 IETF Trust and the persons identified as
      authors of the code.  All rights reserved.

      Redistribution and use in source and binary forms, with or
      without modification, is permitted pursuant to, and subject
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      set forth in Section 4.c of the IETF Trust's Legal Provisions
      Relating to IETF Documents
      (http://trustee.ietf.org/license-info).
```

```
        This version of this YANG module is part of RFC 8675; see
        the RFC itself for full legal notices.";

    revision 2019-10-21 {
      description
        "Initial revision.";
      reference
        "RFC 8675:  Tunnel Interface Types YANG Module";
    }

    augment "/if:interfaces/if:interface" {
      when "derived-from(if:type, 'iana-tunnel-type:gre')";
      description
        "Augments Interface module with specific tunnel parameters.";

      leaf remote-endpoint {
        type inet:ipv6-address;
        description
          "IPv6 address of the remote GRE endpoint.";
      }
    }
  }
```


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