Softwire
Internet-Draft
Intended status: Standards Track
Expires: September 13, 2012

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March 12, 2012

Softwire Mesh Management Information Base(MIB) draft-cui-softwire-mesh-mib-04

Abstract

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. In particular it defines objects for managing softwire mesh [RFC5565].

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1. Introduction

Softwire mesh framework RFC 5565 [RFC5565]is a tunneling mechanism which enables connectivity between islands of IPv4, IPv6 or dual-stack networks across single IPv4 or IPv6 backbone networks. In softwire mesh solution, extended multiprotocol-BGP (MP-BGP)is used to set up tunnels and advertise prefixes among address family border routers (AFBRs).

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. In particular it defines objects for managing softwire mesh [RFC5565].

2. The Internet-Standard Management Framework

For a detailed overview of the documents that describe the current Internet-Standard Management Framework, please refer to section 7 of RFC 3410 [RFC3410].

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. MIB objects are generally accessed through the Simple Network Management Protocol (SNMP). They are defined using the mechanisms stated in the Structure of Management Information (SMI). This memo specifies a MIB module that is compliant to the SMIv2, which is described in STD 58, RFC 2578 [RFC2578], STD 58, RFC 2579 [RFC2579] and STD 58, RFC 2580 [RFC2580].

3. Terminology

This document uses terminology from softwire problem statement RFC 4925 [RFC4925] and softwire mesh framework RFC5565 [RFC5565].

4. Conventions

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].

5. Structure of the MIB Module

The softwire mesh MIB provides a method to configure and manage the softwire mesh objects through SNMP.

5.1. The swmSupportedTunnlTable Subtree

Since AFBR need to negotiate with BGP peer what kind of tunnel they will use, it should firstly announce the types of tunnels it

supports. The swmSupportedTunnlTable subtree provides the information. According to section 4 of RFC 5512[RFC5512], current softwire mesh tunnel types include IP-IP, GRE and L2TPv3.

5.2. The swmEncapsTable Subtree

The swmEncapsTable subtree provides softwire mesh NLRI-NH information about the AFBR. It indicates which I-IP destination address will be encapsulated according to the arriving packet's E-IP destination address. The definitions of E-IP and I-IP are explained in section 4.1 of RFC 5565[RFC5565].

5.3. The swmBGPNeighborTable Subtree

The subtree provides softwire mesh BGP neighbor information about the AFBR. It includes the address of softwire mesh BGP peer, and the kind of tunnel that the AFBR would use to communicate with this BGP peer.

5.4. The swmMIBConformance Subtree

The subtree provides conformance information of MIB objects.

6. Relationship to Other MIB Modules

6.1. Relationship to the IF-MIB

The Interfaces MIB [RFC2863] defines generic managed objects for managing interfaces. Each logical interface (physical or virtual) has an ifEntry. Tunnels are handled by creating a logical interface (ifEntry) for each tunnel. Softwire mesh tunnel also acts as a virtual interface, which has corresponding entries in IP Tunnel MIB and Interface MIB. Those corresponding entries are indexed by ifIndex.

The ifOperStatus in ifTable would be used to represent whether the mesh function of the AFBR has been started. During the BGP OPEN phase, if the softwire mesh capability is negotiated, the mesh function could be considered to be started, and ifOperStatus is "up". Otherwise the ifOperStatus is "down".

If it is IPv4-over-IPv6 softwire mesh tunnel, the ifInUcastPkts will represent the number of IPv6 packets which can be decapsulated to IPv4 in the virtual interface. The ifOutUcastPkts contains the number of IPv6 packets which have been encapsulated with IPv4 packets in it. Particularly, if these IPv4 packets need to be fragmented, the number counted here is the packets after fragmentation.

If it is IPv6-over-IPv4 softwire mesh tunnel, the ifInUcastPkts stands for the number of IPv4 packets which would be decapsulated to IPv6 in the virtual interface. The ifOutUcastPkts represents the number of IPv4 packets which have been encapsulated from IPv6. Particularly, if these IPv6 packets need to be fragmented, the number counted here is the packets after fragmentation. Similar definition apply to other counting objects in ifTalbe.

6.2. Relationship to the IP Tunnel MIB

The IP Tunnel MIB [RFC4087] contains objects common to all IP tunnels, including softwire mesh. Additionally, tunnel encapsulation specific MIB (as is defined in this document) extends the IP tunnel MIB to further described encapsulation specific information.

Since softwire mesh is a point to multi-point tunnel, we need to specify an encapsulation table to support E-IP routing among AFBRs. With the encapsulation information, the correct forwarding of E-IP packets will be performed among AFBRs by using I-IP encapsulation. Each AFBR also needs to know information about remote BGP peers (AFBRs), so that these AFBRs can negotiate E-IP information and the tunnel types they support.

The implementation of the IP Tunnel MIB is required for softwire mesh. The tunnelIfEncapsMethod in the tunnelIfEntry should be set to softwireMesh("xx"), and corresponding entry in the softwire mesh MIB module will exist for every tunnelIfEntry with this tunnelIfEncapsMethod. The tunnelIfRemoteInetAddress must be set to 0.0.0.0 for IPv4 or :: for IPv6 because it is a point to multi-point tunnel.

Since tunnelIfAddressType in tunnelIfTable represents the type of address in the corresponding tunnelIfLocalInetAddress and tunnelIfRemoteInetAddress objects, we can also use the tunnelIfAddressType to specify the softwire mesh tunnel is IPv4-over-IPv6 or IPv6-over-IPv4. When tunnelIfAddressType is IPv4, the encapsulation would be IPv6- over-IPv4; When tunnelIfAddressType is IPv6, the encapsulation would be IPv4-over-IPv6.

6.3. MIB modules required for IMPORTS

The following MIB module IMPORTS objects from SNMPv2-SMI [RFC2578], SNMPv2-TC [RFC2579], SNMPv2-CONF [RFC2580], IF-MIB [RFC2863] and INET-ADDRESS-MIB [RFC4001].

7. Definitions

```
SOFTWIRE-MESH-MIB DEFINITIONS ::= BEGIN
```

```
IMPORTS
   TruthValue, TEXTUAL-CONVENTION
   TimeStamp
       FROM SNMPv2-TC

   OBJECT-GROUP, MODULE-COMPLIANCE
       FROM SNMPv2-CONF

   MODULE-IDENTITY, OBJECT-TYPE, mib-2, Unsigned32, Counter32,
   Counter64
       FROM SNMPv2-SMI

   IANAtunnelType          FROM IANAifType-MIB;

   InetAddress, InetAddressPrefixLength
       FROM INET-ADDRESS-MIB

swmMIB MODULE-IDENTITY
    LAST-UPDATED "201112290000Z"        -- December 29, 2011
    ORGANIZATION "Softwire Working Group"
    CONTACT-INFO "

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     "

   DESCRIPTION
       "This MIB module contains managed object definitions for
        the softwire mesh framework."

   REVISION    "201203120000Z"
   DESCRIPTION
       "draft-04 version"
::= {transmission xxx} --xxx to be replaced with correct value

   -- swmSupportedTunnelTable
```

```
        swmSupportedTunnelTable OBJECT-TYPE
            SYNTAX      SEQUENCE OF swmSupportedTunnelEntry
            MAX-ACCESS  not-accessible
            STATUS      current
            DESCRIPTION
                "A table of objects that shows what kind of tunnels
                can be supported in the AFBR."
            ::= { swmMIB 1 }

        swmSupportedTunnelEntry  OBJECT-TYPE
            SYNTAX      swmSupportedTunnelEntry
            MAX-ACCESS  not-accessible
            STATUS      current
            DESCRIPTION
                "A set of objects that shows what kind of tunnels
                can be supported in the AFBR. If the AFBR supports
                several kinds of tunnel type, the
                swmSupportedTunnelTalbe would has several entries."
            INDEX { swmSupportedTunnelType }
            ::= { swmSupportedTunnelTable 1 }

        swmSupportedTunnelEntry ::=
            SEQUENCE {
                swmSupportedTunnelType              IANATunnelType
            }

        swmSupportedTunnelType OBJECT-TYPE
            SYNTAX      IANATunnelType
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                "Represents the kind of tunneling type that the AFBR
                support. "
            ::= { swmSupportedTunnelTypeEntry 1 }
        -- end of swmSupportedTunnelTable

        --swmEncapsTable
        swmEncapsTable OBJECT-TYPE
            SYNTAX      SEQUENCE OF swmEncapsEntry
            MAX-ACCESS  not-accessible
            STATUS      current
            DESCRIPTION
                "A table of objects that display and control the
                softwire mesh encapsulation information."
            ::= { swmMIB 2 }

        swmEncapsEntry  OBJECT-TYPE
            SYNTAX      swmEncapsEntry
```

```
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "A set of objects that display and control the
            softwire mesh encapsulation information."
        INDEX { ifIndex,
                swmEncapsEIPDst,
                swmEncapsEIPMask
              }
        ::= { swmEncapsTable 1 }

    swmEncapsEntry ::=
        SEQUENCE {
            swmEncapsEIPDst          InetAddress,
            swmEncapsEIPMask         InetAddressPrefixLength,
            swmEncapsIIPDst          InetAddress
        }

    swmEncapsEIPDst OBJECT-TYPE
        SYNTAX      InetAddress
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "The destination E-IP address that decide which
            I-IP address will be encapsulated. The address Type
            is opposite to tunnelIfAddressType in tunnelIfTable."
        ::= { swmEncapsEntry 1 }

    swmEncapsEIPMask OBJECT-TYPE
        SYNTAX      InetAddressPrefixLength
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "The prefix length of E-IP address."
        ::= { swmEncapsEntry 2 }

    swmEncapsIIPDst OBJECT-TYPE
        SYNTAX      InetAddress
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "The I-IP address that will be encapsulated
             according to the E-IP address.The address Type
            is the same as tunnelIfAddressType in tunnelIfTable.
            Since the tunnelIfRemoteInetAddress in tunnelIfTable
            should be 0.0.0.0 or ::, swmEncapIIPDst is the
            destination address used in the outer IP header."
        ::= { swmEncapsEntry 3 }
```

```
        -- End of swmEncapsTable

        -- swmBGPNeighborTable
        swmBGPNeighborTable OBJECT-TYPE
            SYNTAX      SEQUENCE OF swmBGPNeighborEntry
            MAX-ACCESS  not-accessible
            STATUS      current
            DESCRIPTION
                "A table of objects that display the softwire mesh
                BGP neighbor information."
            ::= { swmMIB 3 }

        swmBGPNeighborEntry  OBJECT-TYPE
            SYNTAX      swmBGPNeighborEntry
            MAX-ACCESS  not-accessible
            STATUS      current
            DESCRIPTION
                "A set of objects that display the softwire mesh
                BGP neighbor information."
            INDEX {
                    ifIndex,
                    swmBGPNeighborInetAddress
                  }
            ::= { swmBGPNeighborTable 1 }

        swmBGPNeighborEntry ::=
            SEQUENCE {
                swmBGPNeighborInetAddress        InetAddress,
                swmBGPNeighborTunnelType         IANATunnelType
            }

        swmBGPNeighborInetAddress OBJECT-TYPE
            SYNTAX      InetAddress
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                "The address of the ABFR's BGP neighbor. The
                address type is the same as tunnelIfAddressType
                in tunnelIfTable"
            ::= { swmBGPNeighborEntry 1 }

        swmBGPNeighborTunnelType OBJECT-TYPE
            SYNTAX      IANATunnelType
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                "Represents the kind of tunneling type that the
                AFBR used to comunication with the BGP neighbor"
```

```
            ::= { swmBGPNeighborEntry 2 }
        -- End of swmBGPNeighborTable

    -- conformance information
     swmMIBConformance
                        OBJECT IDENTIFIER ::= { swmMIB 4 }
     swmMIBCompliances
                        OBJECT IDENTIFIER ::= { swmMIBConformance 1 }
     swmMIBGroups
                        OBJECT IDENTIFIER ::= { swmMIBConformance 2 }

    -- compliance statements
    swmMIBCompliance MODULE-COMPLIANCE
      STATUS current
      DESCRIPTION
          "Describes the requirements for conformance to the softwire
          mesh MIB."

      MODULE -- this module
      MANDATORY-GROUPS    {
                            swmSupportedTunnelGroup,
                            swmEncapsGroup,
                            swmBGPNeighborGroup
                          }
      ::= { swmMIBCompliances 1 }

    swmSupportedTunnelGroup    OBJECT-GROUP
      OBJECTS {
          swmSupportedTunnelType
      }
      STATUS  current
      DESCRIPTION
          "The collection of objects which are used to show
          what kind of tunnel the AFBR supports."
      ::= { swmMIBGroups 1 }

    swmEncapsGroup    OBJECT-GROUP
      OBJECTS {
                  swmEncapsEIPDst,
                  swmEncapsEIPMask,
                  swmEncapsIIPDst
      }
      STATUS  current
      DESCRIPTION
          "The collection of objects which are used to display
          softwire mesh encapsulation information."
      ::= { swmMIBGroups 2 }
```

```
    swmBGPNeighborGroup    OBJECT-GROUP
      OBJECTS {
                  swmBGPNeighborInetAddress,
                  swmBGPNeighborTunnelType
      }
      STATUS  current
      DESCRIPTION
          "The collection of objects which are used to display
           softwire mesh BGP neighbor information."
      ::= { swmMIBGroups 3 }

          END
```

8. Security Considerations

The swmMIB module can be used for configuration of certain objects, and anything that can be configured can be incorrectly configured, with potentially disastrous results. Because this MIB module reuses the IP tunnel MIB, the security considerations of the IP tunnel MIB is also applicable to the Softwire mesh MIB.

SNMP versions prior to SNMPv3 did not include adequate security. Even if the network itself is secure (for example by using IPsec), even then, there is no control as to who on the secure network is allowed to access and GET/SET (read/change/create/delete) the objects in this MIB module.

It is RECOMMENDED that implementers consider the security features as provided by the SNMPv3 framework (see [RFC3410], section 8), including full support for the SNMPv3 cryptographic mechanisms (for authentication and privacy).

Further, deployment of SNMP versions prior to SNMPv3 is NOT RECOMMENDED. Instead, it is RECOMMENDED to deploy SNMPv3 and to enable cryptographic security. It is then a customer/operator's responsibility to ensure that the SNMP entity giving access to an instance of this MIB module is properly configured to give access to the objects only to those principals (users) that have legitimate rights to indeed GET or SET (change/create/delete) them.

9. IANA Considerations

The MIB module in this document uses the following IANA-assigned OBJECT IDENTIFIER values recorded in the SMI Numbers registry, and the following IANA-assigned tunnelType values recorded in the IANAtunnelType-MIB registry:

```
Descriptor        OBJECT IDENTIFIER value
----------        ----------------------
swmMIB            { transmission XXX }


IANAtunnelType ::= TEXTUAL-CONVENTION
    SYNTAX     INTEGER {

                softwireMesh ("XX")        -- softwire Mesh tunnel

                }
```

10. References

10.1. Normative References

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10.2. Informative References

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