OSPF Version 2 Management Information Base

Status of this Memo

   This RFC specifies an IAB standards track protocol for the Internet
   community, and requests discussion and suggestions for improvements.
   Please refer to the current edition of the "IAB Official Protocol
   Standards" for the standardization state and status of this protocol.
   Distribution of this memo is unlimited.

Table of Contents

1. Abstract

     This memo defines an experimental portion of the Management
     Information Base (MIB) for use with network management protocols in
     TCP/IP-based internets. In particular, it defines objects for
     managing OSPF Version 2.

2. The Network Management Framework

     The Internet-standard Network Management Framework consists of three
     components. They are:

        RFC 1155 which defines the SMI, the mechanisms used for describing
        and naming objects for the purpose of management. RFC 1212
        defines a more concise description mechanism, which is wholly
        consistent with the SMI.

        RFC 1156 which defines MIB-I, the core set of managed objects for
        the Internet suite of protocols. RFC 1213, defines MIB-II, an
        evolution of MIB-I based on implementation experience and new
        operational requirements.

        RFC 1157 which defines the SNMP, the protocol used for network
        access to managed objects.

     The Framework permits new objects to be defined for the purpose of
     experimentation and evaluation.

3. Objects

     Managed objects are accessed via a virtual information store, termed
     the Management Information Base or MIB. Objects in the MIB are
     defined using the subset of Abstract Syntax Notation One (ASN.1) [7]
     defined in the SMI. In particular, each object has a name, a syntax,
     and an encoding. The name is an object identifier, an
     administratively assigned name, which specifies an object type. The
     object type together with an object instance serves to uniquely
     identify a specific instantiation of the object. For human
     convenience, we often use a textual string, termed the OBJECT
     DESCRIPTOR, to also refer to the object type.

     The syntax of an object type defines the abstract data structure
     corresponding to that object type. The ASN.1 language is used for
     this purpose. However, the SMI [3] purposely restricts the ASN.1

constructs which may be used. These restrictions are explicitly made
for simplicity.

The encoding of an object type is simply how that object type is
represented using the object type's syntax. Implicitly tied to the
notion of an object type's syntax and encoding is how the object type
is represented when being transmitted on the network.

The SMI specifies the use of the basic encoding rules of ASN.1 [8],
subject to the additional requirements imposed by the SNMP.

3.1. Format of Definitions

Section 5 contains contains the specification of all object types
contained in this MIB module. The object types are defined using the
conventions defined in the SMI, as amended by the extensions
specified in [9].

4. Overview

4.1. Textual Conventions

Several new data types are introduced as a textual convention in this
MIB document. These textual conventions enhance the readability of
the specification and can ease comparison with other specifications
if appropriate. It should be noted that the introduction of the
these textual conventions has no effect on either the syntax nor the
semantics of any managed objects. The use of these is merely an
artifact of the explanatory method used. Objects defined in terms of
one of these methods are always encoded by means of the rules that
define the primitive type. Hence, no changes to the SMI or the SNMP
are necessary to accommodate these textual conventions which are
adopted merely for the convenience of readers and writers in pursuit
of the elusive goal of clear, concise, and unambiguous MIB documents.

The new data types are AreaID, RouterID, TOSType, Metric, BigMetric,
TruthValue, Status, Validation, PositiveInteger, HelloRange,
UpToMaxAge, InterfaceIndex, and DesignatedRouterPriority.

4.2. Structure of MIB

The MIB is composed of the following sections:

        General Variables
        Area Data Structure
        Area Stub Metric Table
        Link State Database
        Address Range Table

                Host Table
                Interface Table
                Interface Metric Table
                Virtual Interface Table
                Neighbor Table
                Virtual Neighbor Table

4.2.1. General Variables

   The General Variables are about what they sound like; variables which
   are global to the OSPF Process.

4.2.2. Area Data Structure and Area Stub Metric Table

   The Area Data Structure describes the OSPF Areas that the router
   participates in. The Area Stub Metric Table describes the metrics
   advertised into a stub area by the default router(s).

4.2.3. Link State Database

   The Link State Database is provided primarily to provide detailed
   information for network debugging.

4.2.4. Address Table and Host Tables

   The Address Range Table and Host Table are provided to view
   configured Network Summary and Host Route information.

4.2.5. Interface and Interface Metric Tables

   The Interface Table and the Interface Metric Table together describe
   the various IP interfaces to OSPF. The metrics are placed in
   separate tables in order to simplify dealing with multiple types of
   service, and to provide flexibility in the event that the IP TOS
   definition is changed in the future. A Default Value specification
   is supplied for the TOS 0 (default) metric.

4.2.6. Virtual Interface Table

   Likewise, the Virtual Interface Table describe virtual links to the
   OSPF Process.

4.2.7. Neighbor and Virtual Neighbor Tables

   The Neighbor Table and the Virtual Neighbor Table describe the
   neighbors to the OSPF Process.

4.3. Conceptual Row Creation

   For the benefit of row-creation in "conceptual" (see [9]) tables,
   DEFVAL (Default Value) clauses are included in the definitions in
   section 5, suggesting values which an agent should use for instances
   of variables which need to be created due to a Set-Request, but which
   are not specified in the Set- Request. DEFVAL clauses have not been
   specified for some objects which are read-only, implying that they
   are zeroed upon row creation. These objects are of the SYNTAX
   Counter or Gauge.

   For those objects not having a DEFVAL clause, both management
   stations and agents should heed the Robustness Principle of the
   Internet (see RFC-791):

      "be liberal in what you accept, conservative in what
      you send"

   That is, management stations should include as many of these columnar
   objects as possible (e.g., all read-write objects) in a Set-Request
   when creating a conceptual row; agents should accept a Set-Request
   with as few of these as they need (e.g., the minimum contents of a
   row creating SET consists of those objects for which, as they cannot
   be intuited, no default is specified.).

   There are numerous read-write objects in this MIB, as it is designed
   for SNMP management of the protocol, not just SNMP monitoring of its
   state. However, in the absence of a standard SNMP Security
   architecture, it is acceptable for implementations to implement these
   as read-only with an alternative interface for their modification.

4.4. Default Configuration

   OSPF is a powerful routing protocol, equipped with features to handle
   virtually any configuration requirement that might reasonably be
   found within an Autonomous System. With this power comes a fair
   degree of complexity, which the sheer number of objects in the MIB
   will attest to. Care has therefore been taken, in constructing this
   MIB, to define default values for virtually every object, to minimize
   the amount of parameterization required in the typical case. That
   default configuration is as follows:

   Given the following assumptions:

           - IP has already been configured

           - The ifTable has already been configured

- ifSpeed is estimated by the interface drivers

- The OSPF Process automatically discovers all IP
Interfaces and creates corresponding OSPF Interfaces

- The TOS 0 metrics are autonomously derived from
ifSpeed

- The OSPF Process automatically creates the Areas
required for the Interfaces

The simplest configuration of an OSPF process requires that:

- The OSPF Process be Enabled.

This can be accomplished with a single SET:

                    ospfAdminStat := enabled.

The configured system will have the following attributes:

- The RouterID will be one of the IP addresses of the
device

- The device will be neither an Area Border Router nor
an Autonomous System Border Router.

- Every IP Interface, with or without an address, will
be an OSPF Interface.

- The AreaID of each interface will be 0.0.0.0, the
Backbone.

- Authentication will be disabled

- All Broadcast and Point to Point interfaces will be
operational. NBMA Interfaces require the configuration
of at least one neighbor.

- Timers on all direct interfaces will be:
        Hello Interval: 10 seconds
        Dead Timeout: 40 Seconds
        Retransmission: 5 Seconds
        Transit Delay: 1 Second
        Poll Interval: 120 Seconds

 - no direct links to hosts will be configured.

                    - no addresses will be summarized

                    - Metrics, being a measure of bit duration, are
                    unambiguous and intelligent.

                    - No Virtual Links will be configured.

5. Definitions

     RFC1248-MIB DEFINITIONS ::= BEGIN

     IMPORTS
              experimental, Counter, Gauge, IpAddress
                    FROM RFC1155-SMI
              OBJECT-TYPE
                    FROM RFC-1212;

     -- This MIB module uses the extended OBJECT-TYPE macro as
     -- defined in [9].

              ospf OBJECT IDENTIFIER ::= { standard-mib 13 }

     -- The Area ID, in OSPF, has the same format as an IP Address,
     -- but has the function of defining a summarization point for
     -- Link State Advertisements

              AreaID ::= IpAddress

     -- The Router ID, in OSPF, has the same format as an IP Address,
     -- but identifies the router independent of its IP Address.

              RouterID ::= IpAddress

     -- The OSPF Metric is defined as an unsigned value in the range

              Metric   ::= INTEGER (1..'FFFF'h)
              BigMetric ::= INTEGER (1..'FFFFFF'h)

     -- Boolean Values

              TruthValue ::= INTEGER { true (1), false (2) }

     -- Status Values

              Status ::= INTEGER { enabled (1), disabled (2) }

```
     --  Row Creation/Deletion Values

             Validation ::= INTEGER { valid (1), invalid (2) }

     --  Time Durations measured in seconds

             PositiveInteger ::= INTEGER (1..'FFFFFFFF'h)
             HelloRange      ::= INTEGER (1..'FFFF'h)
             UpToMaxAge      ::= INTEGER (1..3600)

     --  The range of ifIndex, i.e. (1..ifNumber)

             InterfaceIndex ::= INTEGER

     --  Potential Priorities for the Designated Router Election

             DesignatedRouterPriority ::= INTEGER (0..'FF'h)

     --  Type of Service is defined as a mapping to the IP Type of
     --  Service Flags as defined in the Router Requirements
     --  Document:
     --
     --      D => Low Delay          R => Reliable Route
     --      T => High Bandwidth

     --  D T R   TOS       D T R   TOS
     --  0 0 0 =>  0       0 0 1 =>  4
     --  0 1 0 =>  8       0 1 1 => 12
     --  1 0 0 => 16       1 0 1 => 20
     --  1 1 0 => 24       1 1 1 => 28

     --  The remaining values are left for future definition.

             TOSType ::= INTEGER (0..31)

     --  OSPF General Variables

     --      These parameters apply globally to the Router's
     --      OSPF Process.

     ospfGeneralGroup OBJECT IDENTIFIER ::= { ospf 1 }

     ospfRouterId OBJECT-TYPE
         SYNTAX    RouterID
         ACCESS    read-write
         STATUS    mandatory
         DESCRIPTION
            "A 32-bit integer uniquely identifying the router in
```

        the Autonomous System.

        By convention, to ensure uniqueness, this should
        default to the value of one of the router's IP
        interface addresses."
     REFERENCE
        "OSPF Version 2, C.1 Global parameters"
     ::= { ospfGeneralGroup 1 }

ospfAdminStat OBJECT-TYPE
    SYNTAX   Status
    ACCESS   read-write
    STATUS   mandatory
    DESCRIPTION
       "The administrative status of OSPF in the router. The
       value 'enabled' denotes that the OSPF Process is active
       on at least one interface; 'disabled' disables it on
       all interfaces."
    ::= { ospfGeneralGroup 2 }

ospfVersionNumber OBJECT-TYPE
    SYNTAX   INTEGER { version2 (2) }
    ACCESS   read-only
    STATUS   mandatory
    DESCRIPTION
       "The current version number of the OSPF protocol is 2."
    REFERENCE
       "OSPF Version 2, Title"
    ::= { ospfGeneralGroup 3 }

ospfAreaBdrRtrStatus OBJECT-TYPE
    SYNTAX   TruthValue
    ACCESS   read-only
    STATUS   mandatory
    DESCRIPTION
       "A flag to note whether this router is an area border
       router."
    REFERENCE
       "OSPF Version 2, Section 3 Splitting the AS into Areas"
    ::= { ospfGeneralGroup 4 }

ospfASBdrRtrStatus OBJECT-TYPE
    SYNTAX   TruthValue
    ACCESS   read-write
    STATUS   mandatory
    DESCRIPTION
       "A flag to note whether this router is an Autonomous
       System border router."

```
        REFERENCE
            "OSPF Version 2, Section 3.3 Classification of routers"
        ::= { ospfGeneralGroup 5 }

    ospfExternLSACount OBJECT-TYPE
        SYNTAX   Gauge
        ACCESS   read-only
        STATUS   mandatory
        DESCRIPTION
            "The number of external (LS type 5) link-state
            advertisements in the link-state database."
        REFERENCE
            "OSPF Version 2, Appendix A.4.5 AS external link
            advertisements"
        ::= { ospfGeneralGroup 6 }

    ospfExternLSACksumSum OBJECT-TYPE
        SYNTAX   INTEGER
        ACCESS   read-only
        STATUS   mandatory
        DESCRIPTION
            "The 32-bit unsigned sum of the LS checksums of the
            external link-state advertisements contained in the
            link-state database.  This sum can be used to determine
            if there has been a change in a router's link state
            database, and to compare the link-state database of two
            routers."
        ::= { ospfGeneralGroup 7 }

    ospfTOSSupport OBJECT-TYPE
        SYNTAX   TruthValue
        ACCESS   read-write
        STATUS   mandatory
        DESCRIPTION
            "The router's support for type-of-service routing."
        REFERENCE
            "OSPF Version 2, Appendix F.1.2 Optional TOS support"
        ::= { ospfGeneralGroup 8 }

    ospfOriginateNewLSAs OBJECT-TYPE
        SYNTAX   Counter
        ACCESS   read-only
        STATUS   mandatory
        DESCRIPTION
            "The number of new link-state advertisements that have
            been originated.  This number is incremented each time
            the router originates a new LSA."
        ::= { ospfGeneralGroup 9 }
```

```
        ospfRxNewLSAs OBJECT-TYPE
            SYNTAX    Counter
            ACCESS    read-only
            STATUS    mandatory
            DESCRIPTION
                "The number of link-state advertisements received
                determined to be new instantiations.  This number does
                not include newer instantiations of self-originated
                link-state advertisements."
            ::= { ospfGeneralGroup 10 }


        --       The OSPF Area Data Structure contains information
        --       regarding the various areas. The interfaces and
        --       virtual links are configured as part of these areas.
        --       Area 0.0.0.0, by definition, is the Backbone Area

        ospfAreaTable OBJECT-TYPE
            SYNTAX    SEQUENCE OF OspfAreaEntry
            ACCESS    not-accessible
            STATUS    mandatory
            DESCRIPTION
                "Information describing the configured parameters and
                cumulative statistics of the router's attached areas."
            REFERENCE
                "OSPF Version 2, Section 6  The Area Data Structure"
            ::= { ospf 2 }

        ospfAreaEntry OBJECT-TYPE
            SYNTAX    OspfAreaEntry
            ACCESS    not-accessible
            STATUS    mandatory
            DESCRIPTION
                "Information describing the configured parameters and
                cumulative statistics of one of the router's attached
                areas."
            INDEX { ospfAreaID }
            ::= { ospfAreaTable 1 }

        OspfAreaEntry ::=
            SEQUENCE {
                ospfAreaId
                    AreaID,
                ospfAuthType
                    INTEGER,
                ospfImportASExtern
                    TruthValue,
                ospfSpfRuns
```

```
                Counter,
            ospfAreaBdrRtrCount
                Gauge,
            ospfASBdrRtrCount
                Gauge,
            ospfLSACount
                Gauge,
            ospfAreaLSACksumSum
                INTEGER
        }

    ospfAreaId OBJECT-TYPE
        SYNTAX    AreaID
        ACCESS    read-write
        STATUS    mandatory
        DESCRIPTION
            "A 32-bit integer uniquely identifying an area.  Area
            ID 0.0.0.0 is used for the OSPF backbone."
        REFERENCE
            "OSPF Version 2, Appendix C.2 Area parameters"
        ::= { ospfAreaEntry 1 }

    ospfAuthType OBJECT-TYPE
        SYNTAX    INTEGER
                    -- none (0),
                    -- simplePassword (1)
                    -- reserved for specification by IANA (> 1)
        ACCESS    read-write
        STATUS    mandatory
        DESCRIPTION
            "The authentication type specified for an area.
            Additional authentication types may be assigned locally
            on a per Area basis."
        REFERENCE
            "OSPF Version 2, Appendix E Authentication"
        DEFVAL { 0 }          -- no authentication, by default
        ::= { ospfAreaEntry 2 }

    ospfImportASExtern OBJECT-TYPE
        SYNTAX    TruthValue
        ACCESS    read-write
        STATUS    mandatory
        DESCRIPTION
            "The area's support for importing AS external link-
            state advertisements."
        REFERENCE
            "OSPF Version 2, Appendix C.2 Area parameters"
        DEFVAL { true }
```

```
    ::= { ospfAreaEntry 3 }

ospfSpfRuns OBJECT-TYPE
    SYNTAX   Counter
    ACCESS   read-only
    STATUS   mandatory
    DESCRIPTION
       "The number of times that the intra-area route table
       has been calculated using this area's link-state
       database.  This is typically done using Dijkstra's
       algorithm."
    DEFVAL   { 0 }
    ::= { ospfAreaEntry 4 }

ospfAreaBdrRtrCount OBJECT-TYPE
    SYNTAX   Gauge
    ACCESS   read-only
    STATUS   mandatory
    DESCRIPTION
       "The total number of area border routers reachable
       within this area.  This is initially zero, and is
       calculated in each SPF Pass."
    DEFVAL   { 0 }
    ::= { ospfAreaEntry 5 }

ospfASBdrRtrCount OBJECT-TYPE
    SYNTAX   Gauge
    ACCESS   read-only
    STATUS   mandatory
    DESCRIPTION
       "The total number of Autonomous System border routers
       reachable within this area.  This is initially zero,
       and is calculated in each SPF Pass."
    DEFVAL   { 0 }
    ::= { ospfAreaEntry 6 }

ospfAreaLSACount OBJECT-TYPE
    SYNTAX   Gauge
    ACCESS   read-only
    STATUS   mandatory
    DESCRIPTION
       "The total number of link-state advertisements in this
       area's link-state database, excluding AS External
       LSA's."
    DEFVAL   { 0 }
    ::= { ospfAreaEntry 7 }
```

```
ospfAreaLSACksumSum OBJECT-TYPE
    SYNTAX   INTEGER
    ACCESS   read-only
    STATUS   mandatory
    DESCRIPTION
       "The 32-bit unsigned sum of the link-state
       advertisements' LS checksums contained in this area's
       link-state database.  This sum excludes external (LS
       type 5) link-state advertisements.  The sum can be used
       to determine if there has been a change in a router's
       link state database, and to compare the link-state
       database of two routers."
    DEFVAL   { 0 }
    ::= { ospfAreaEntry 8 }


-- OSPF Area Default Metric Table

--       The OSPF Area Default Metric Table describes the metrics
--       that a default Area Border Router will advertise into a
--       Stub area.

ospfStubAreaTable OBJECT-TYPE
    SYNTAX   SEQUENCE OF OspfStubAreaEntry
    ACCESS   not-accessible
    STATUS   mandatory
    DESCRIPTION
       "The set of metrics that will be advertised by a
       default Area Border Router into a stub area."
    REFERENCE
       "OSPF Version 2, Appendix C.2, Area Parameters"
    ::= { ospf 3 }

ospfStubAreaEntry OBJECT-TYPE
    SYNTAX   OspfStubAreaEntry
    ACCESS   not-accessible
    STATUS   mandatory
    DESCRIPTION
       "The metric for a given Type of Service that will be
       advertised by a default Area Border Router into a stub
       area."
    REFERENCE
       "OSPF Version 2, Appendix C.2, Area Parameters"
    INDEX { ospfStubAreaID, ospfStubTOS }
    ::= { ospfStubAreaTable 1 }
```

```
     OspfStubAreaEntry ::=
         SEQUENCE {
             ospfStubAreaID
                 AreaID,
             ospfStubTOS
                 TOSType,
             ospfStubMetric
                 BigMetric,
             ospfStubStatus
                 Validation
         }

     ospfStubAreaID OBJECT-TYPE
         SYNTAX    AreaID
         ACCESS    read-write
         STATUS    mandatory
         DESCRIPTION
            "The 32 bit identifier for the Stub Area.  On creation,
            this can be derived from the instance."
         ::= { ospfStubAreaEntry 1 }

     ospfStubTOS OBJECT-TYPE
         SYNTAX    TOSType
         ACCESS    read-write
         STATUS    mandatory
         DESCRIPTION
            "The Type of Service associated with the metric.  On
            creation, this can be derived from the instance."

         ::= { ospfStubAreaEntry 2 }

     ospfStubMetric OBJECT-TYPE
         SYNTAX    BigMetric
         ACCESS    read-write
         STATUS    mandatory
         DESCRIPTION
            "The metric value applied at the indicated type of
            service.  By default, this equals the least metric at
            the type of service among the interfaces to other
            areas."
         ::= { ospfStubAreaEntry 3 }

     ospfStubStatus OBJECT-TYPE
         SYNTAX    Validation
         ACCESS    read-write
         STATUS    mandatory
         DESCRIPTION
            "This variable displays the validity or invalidity of
```

```
            the entry.  Setting it to 'invalid' has the effect of
            rendering it inoperative.  The internal effect (row
            removal) is implementation dependent."
         DEFVAL   { valid }
         ::= { ospfStubAreaEntry 4 }


    --  OSPF Link State Database

    --      The Link State Database contains the Link State
    --      Advertisements from throughout the areas that the
    --      device is attached to.

    ospfLsdbTable OBJECT-TYPE
         SYNTAX    SEQUENCE OF OspfLsdbEntry
         ACCESS    not-accessible
         STATUS    mandatory
         DESCRIPTION
            "The OSPF Process's Links State Database."
         REFERENCE
            "OSPF Version 2, Section 12 Link State Advertisements"
         ::= { ospf 4 }

    ospfLsdbEntry OBJECT-TYPE
         SYNTAX    OspfLsdbEntry
         ACCESS    not-accessible
         STATUS    mandatory
         DESCRIPTION
            "A single Link State Advertisement."
         INDEX { ospfLsdbAreaId, ospfLsdbType,
                 ospfLsdbLSID, ospfLsdbRouterId }
         ::= { ospfLsdbTable 1 }

    OspfLsdbEntry ::=
         SEQUENCE {
             ospfLsdbAreaId
                 AreaID,
             ospfLsdbType
                 INTEGER,
             ospfLsdbLSID
                 IpAddress,
             ospfLsdbRouterId
                 RouterID,
             ospfLsdbSequence
                 INTEGER,
             ospfLsdbAge
                 INTEGER,
             ospfLsdbChecksum
```

```
            INTEGER,
         ospfLsdbAdvertisement
            OCTET STRING
    }


ospfLsdbAreaId OBJECT-TYPE
    SYNTAX    AreaID
    ACCESS    read-only
    STATUS    mandatory
    DESCRIPTION
       "The 32 bit identifier of the Area from which the LSA
       was received."
    REFERENCE
       "OSPF Version 2, Appendix C.2 Area parameters"
    ::= { ospfLsdbEntry 1 }

ospfLsdbType OBJECT-TYPE
    SYNTAX    INTEGER {
                routerLink (1),
                networkLink (2),
                summaryLink (3),
                asSummaryLink (4),
                asExternalLink (5)
             }
    ACCESS    read-only
    STATUS    mandatory
    DESCRIPTION
       "The type of the link state advertisement.  Each link
       state type has a separate advertisement format."
    REFERENCE
       "OSPF Version 2, Appendix A.4.1 The Link State
       Advertisement header"
    ::= { ospfLsdbEntry 2 }

ospfLsdbLSID OBJECT-TYPE
    SYNTAX    IpAddress
    ACCESS    read-only
    STATUS    mandatory
    DESCRIPTION
       "The Link State ID is an LS Type Specific field
       containing either a Router ID or an IP Address; it
       identifies the piece of the routing domain that is
       being described by the advertisement."
    REFERENCE
       "OSPF Version 2, Section 12.1.4 Link State ID"
    ::= { ospfLsdbEntry 3 }
```

```
ospfLsdbRouterId OBJECT-TYPE
    SYNTAX    RouterID
    ACCESS    read-only
    STATUS    mandatory
    DESCRIPTION
        "The 32 bit number that uniquely identifies the
        originating router in the Autonomous System."
    REFERENCE
        "OSPF Version 2, Appendix C.1 Global parameters"
    ::= { ospfLsdbEntry 4 }

-- Note that the OSPF Sequence Number is a 32 bit signed
-- integer.  It starts with the value '80000001'h,
-- or -'7FFFFFFF'h, and increments until '7FFFFFFF'h
-- Thus, a typical sequence number will be very negative.

ospfLsdbSequence OBJECT-TYPE
    SYNTAX    INTEGER
    ACCESS    read-only
    STATUS    mandatory
    DESCRIPTION
        "The sequence number field is a signed 32-bit integer.
        It is used to detect old and duplicate link state
        advertisements.  The space of sequence numbers is
        linearly ordered.  The larger the sequence number the
        more recent the advertisement."
    REFERENCE
        "OSPF Version 2, Section 12.1.6 LS sequence number"
    ::= { ospfLsdbEntry 5 }

ospfLsdbAge OBJECT-TYPE
    SYNTAX    INTEGER    -- Should be 0..MaxAge
    ACCESS    read-only
    STATUS    mandatory
    DESCRIPTION
        "This field is the age of the link state advertisement
        in seconds."
    REFERENCE
        "OSPF Version 2, Section 12.1.1 LS age"
    ::= { ospfLsdbEntry 6 }

ospfLsdbChecksum OBJECT-TYPE
    SYNTAX    INTEGER
    ACCESS    read-only
    STATUS    mandatory
    DESCRIPTION
        "This field is the checksum of the complete contents of
        the advertisement, excepting the age field.  The age
```

```
            field is excepted so that an advertisement's age can be
            incremented without updating the checksum.  The
            checksum used is the same that is used for ISO
            connectionless datagrams; it is commonly referred to as
            the Fletcher checksum."
        REFERENCE
            "OSPF Version 2, Section 12.1.7 LS checksum"
        ::= { ospfLsdbEntry 7 }

    ospfLsdbAdvertisement OBJECT-TYPE
        SYNTAX    OCTET STRING
        ACCESS    read-only
        STATUS    mandatory
        DESCRIPTION
            "The entire Link State Advertisement, including its
            header."
        REFERENCE
            "OSPF Version 2, Section 12 Link State Advertisements"
        ::= { ospfLsdbEntry 8 }


    -- Address Range Table

    --      The Address Range Table acts as an adjunct to the Area
    --      Table; It describes those Address Range Summaries that
    --      are configured to be propagated from an Area to reduce
    --      the amount of information about it which is known beyond
    --      its borders.

    ospfAreaRangeTable OBJECT-TYPE
        SYNTAX    SEQUENCE OF OspfAreaRangeEntry
        ACCESS    not-accessible
        STATUS    mandatory
        DESCRIPTION
            "A range if IP addresses specified by an IP address/IP
            network mask pair.  For example, class B address range
            of X.X.X.X with a network mask of 255.255.0.0 includes
            all IP addresses from X.X.0.0 to X.X.255.255"
        REFERENCE
            "OSPF Version 2, Appendix C.2  Area parameters"
        ::= { ospf 5 }

    ospfAreaRangeEntry OBJECT-TYPE
        SYNTAX    OspfAreaRangeEntry
        ACCESS    not-accessible
        STATUS    mandatory
        DESCRIPTION
            "A range if IP addresses specified by an IP address/IP
```

          network mask pair. For example, class B address range
          of X.X.X.X with a network mask of 255.255.0.0 includes
          all IP addresses from X.X.0.0 to X.X.255.255"
      REFERENCE
         "OSPF Version 2, Appendix C.2 Area parameters"
      INDEX { ospfAreaRangeAreaID, ospfAreaRangeNet }
      ::= { ospfAreaRangeTable 1 }

  OspfAreaRangeEntry ::=
      SEQUENCE {
          ospfAreaRangeAreaID
              AreaID,
          ospfAreaRangeNet
              IpAddress,
          ospfAreaRangeMask
              IpAddress,
          ospfAreaRangeStatus
              Validation
      }

  ospfAreaRangeAreaID OBJECT-TYPE
      SYNTAX   AreaID
      ACCESS   read-write
      STATUS   mandatory
      DESCRIPTION
         "The Area the Address Range is to be found within."
      REFERENCE
         "OSPF Version 2, Appendix C.2 Area parameters"
      ::= { ospfAreaRangeEntry 1 }

  ospfAreaRangeNet OBJECT-TYPE
      SYNTAX   IpAddress
      ACCESS   read-write
      STATUS   mandatory
      DESCRIPTION
         "The IP Address of the Net or Subnet indicated by the
         range."
      REFERENCE
         "OSPF Version 2, Appendix C.2 Area parameters"
      ::= { ospfAreaRangeEntry 2 }

  ospfAreaRangeMask OBJECT-TYPE
      SYNTAX   IpAddress
      ACCESS   read-write
      STATUS   mandatory
      DESCRIPTION
         "The Subnet Mask that pertains to the Net or Subnet."
      REFERENCE

```
            "OSPF Version 2, Appendix C.2 Area parameters"
        ::= { ospfAreaRangeEntry 3 }

    ospfAreaRangeStatus OBJECT-TYPE
        SYNTAX   Validation
        ACCESS   read-write
        STATUS   mandatory
        DESCRIPTION
           "This variable displays the validity or invalidity of
           the entry.  Setting it to 'invalid' has the effect of
           rendering it inoperative.  The internal effect (row
           removal) is implementation dependent."
        DEFVAL   { valid }
        ::= { ospfAreaRangeEntry 4 }


    --  OSPF Host Table

    --      The Host/Metric Table indicates what hosts are directly
    --      attached to the Router, and what metrics and types of
    --      service should be advertised for them.

    ospfHostTable OBJECT-TYPE
        SYNTAX   SEQUENCE OF OspfHostEntry
        ACCESS   not-accessible
        STATUS   mandatory
        DESCRIPTION
           "The list of Hosts, and their metrics, that the router
           will advertise as host routes."
        REFERENCE
           "OSPF Version 2, Appendix C.6  Host route parameters"
        ::= { ospf 6 }

    ospfHostEntry OBJECT-TYPE
        SYNTAX   OspfHostEntry
        ACCESS   not-accessible
        STATUS   mandatory
        DESCRIPTION
           "A metric to be advertised, for a given type of service,
           when a given host is reachable."
        INDEX { ospfHostIpAddress, ospfHostTOS }
        ::= { ospfHostTable 1 }

    OspfHostEntry ::=
        SEQUENCE {
           ospfHostIpAddress
               IpAddress,
           ospfHostTOS
```

```
                TOSType,
            ospfHostMetric
                Metric,
            ospfHostStatus
                Validation
        }

    ospfHostIpAddress OBJECT-TYPE
        SYNTAX    IpAddress
        ACCESS    read-write
        STATUS    mandatory
        DESCRIPTION
           "The IP Address of the Host."
        REFERENCE
           "OSPF Version 2, Appendix C.6 Host route parameters"
        ::= { ospfHostEntry 1 }

    ospfHostTOS OBJECT-TYPE
        SYNTAX    TOSType
        ACCESS    read-write
        STATUS    mandatory
        DESCRIPTION
           "The Type of Service of the route being configured."
        REFERENCE
           "OSPF Version 2, Appendix C.6 Host route parameters"
        ::= { ospfHostEntry 2 }

    ospfHostMetric OBJECT-TYPE
        SYNTAX    Metric
        ACCESS    read-write
        STATUS    mandatory
        DESCRIPTION
           "The Metric to be advertised."
        REFERENCE
           "OSPF Version 2, Appendix C.6 Host route parameters"
        ::= { ospfHostEntry 3 }

    ospfHostStatus OBJECT-TYPE
        SYNTAX    Validation
        ACCESS    read-write
        STATUS    mandatory
        DESCRIPTION
           "This variable displays the validity or invalidity of
           the entry.  Setting it to 'invalid' has the effect of
           rendering it inoperative.  The internal effect (row
           removal) is implementation dependent."
        DEFVAL    { valid }
        ::= { ospfHostEntry 4 }
```

```
     --  OSPF Interface Table

     --       The OSPF Interface Table augments the ifTable with OSPF
     --       specific information.

     ospfIfTable OBJECT-TYPE
         SYNTAX   SEQUENCE OF OspfIfEntry
         ACCESS   not-accessible
         STATUS   mandatory
         DESCRIPTION
            "The OSPF Interface Table describes the interfaces from
            the viewpoint of OSPF."
         REFERENCE
            "OSPF Version 2, Appendix C.3  Router interface
            parameters"
         ::= { ospf 7 }

     ospfIfEntry OBJECT-TYPE
         SYNTAX   OspfIfEntry
         ACCESS   not-accessible
         STATUS   mandatory
         DESCRIPTION
            "The OSPF Interface Entry describes one interface from
            the viewpoint of OSPF."
         INDEX { ospfIfIpAddress, ospfAddressLessIf }
         ::= { ospfIfTable 1 }

     OspfIfEntry ::=
         SEQUENCE {
             ospfIfIpAddress
                 IpAddress,
             ospfAddressLessIf
                 INTEGER,
             ospfIfAreaId
                 AreaID,
             ospfIfType
                 INTEGER,
             ospfIfAdminStat
                 Status,
             ospfIfRtrPriority
                 DesignatedRouterPriority,
             ospfIfTransitDelay
                 UpToMaxAge,
             ospfIfRetransInterval
                 UpToMaxAge,
             ospfIfHelloInterval
                 HelloRange,
             ospfIfRtrDeadInterval
```

```
            PositiveInteger,
        ospfIfPollInterval
            PositiveInteger,
        ospfIfState
            INTEGER,
        ospfIfDesignatedRouter
            IpAddress,
        ospfIfBackupDesignatedRouter
            IpAddress,
        ospfIfEvents
            Counter,
        ospfIfAuthKey
            OCTET STRING
    }

ospfIfIpAddress OBJECT-TYPE
    SYNTAX   IpAddress
    ACCESS   read-write
    STATUS   mandatory
    DESCRIPTION
       "The IP address of this OSPF interface."
    ::= { ospfIfEntry 1 }

ospfAddressLessIf OBJECT-TYPE
    SYNTAX   INTEGER
    ACCESS   read-write
    STATUS   mandatory
    DESCRIPTION
       "For the purpose of easing the instancing of addressed
       and addressless interfaces; This variable takes the
       value 0 on interfaces with IP Addresses, and the
       corresponding value of ifIndex for interfaces having no
       IP Address."
    ::= { ospfIfEntry 2 }

ospfIfAreaId OBJECT-TYPE
    SYNTAX   AreaID
    ACCESS   read-write
    STATUS   mandatory
    DESCRIPTION
       "A 32-bit integer uniquely identifying the area to
       which the interface connects.  Area ID 0.0.0.0 is used
       for the OSPF backbone."
    DEFVAL   { '00000000'H }    -- 0.0.0.0
    ::= { ospfIfEntry 3 }
```

```
    ospfIfType OBJECT-TYPE
        SYNTAX    INTEGER {
                    broadcast (1),
                    nbma (2),
                    pointToPoint (3)
                 }
        ACCESS    read-write
        STATUS    mandatory
        DESCRIPTION
           "The OSPF interface type.

           By way of a default, this field may be intuited from
           the corresponding value of ifType.  Broadcast LANs,
           such as Ethernet and IEEE 802.5, take the value
           'broadcast', X.25, Frame Relay, and similar
           technologies take the value 'nbma', and links that are
           definitively point to point take the value
           'pointToPoint'."
        ::= { ospfIfEntry 4 }

    ospfIfAdminStat OBJECT-TYPE
        SYNTAX    Status
        ACCESS    read-write
        STATUS    mandatory
        DESCRIPTION
           "The OSPF interface's administrative status.  The value
           'enabled' denotes that neighbor relationships may be
           formed on the interface, and the interface will be
           advertised as an internal route to some area.  The
           value 'disabled' denotes that the interface is external
           to OSPF."
        DEFVAL { enabled }
        ::= { ospfIfEntry 5 }

    ospfIfRtrPriority OBJECT-TYPE
        SYNTAX    DesignatedRouterPriority
        ACCESS    read-write
        STATUS    mandatory
        DESCRIPTION
           "The priority of this interface.  Used in multi-access
           networks, this field is used in the designated router
           election algorithm.  The value 0 signifies that the
           router is not eligible to become the designated router
           on this particular network.  In the event of a tie in
           this value, routers will use their router id as a tie
           breaker."
        DEFVAL { 1 }
        ::= { ospfIfEntry 6 }
```

```
    ospfIfTransitDelay OBJECT-TYPE
        SYNTAX    UpToMaxAge
        ACCESS    read-write
        STATUS    mandatory
        DESCRIPTION
           "The estimated number of seconds it takes to transmit a
           link- state update packet over this interface."
        DEFVAL { 1 }
        ::= { ospfIfEntry 7 }

    ospfIfRetransInterval OBJECT-TYPE
        SYNTAX    UpToMaxAge
        ACCESS    read-write
        STATUS    mandatory
        DESCRIPTION
           "The number of seconds between link-state advertisement
           retransmissions, for adjacencies belonging to this
           interface.  This value is also used when retransmitting
           database description and link-state request packets."
        DEFVAL { 5 }
        ::= { ospfIfEntry 8 }

    ospfIfHelloInterval OBJECT-TYPE
        SYNTAX    HelloRange
        ACCESS    read-write
        STATUS    mandatory
        DESCRIPTION
           "The length of time, in seconds, between the Hello
           packets that the router sends on the interface.  This
           value must be the same for all routers attached to a
           common network."
        DEFVAL { 10 }
        ::= { ospfIfEntry 9 }

    ospfIfRtrDeadInterval OBJECT-TYPE
        SYNTAX    PositiveInteger
        ACCESS    read-write
        STATUS    mandatory
        DESCRIPTION
           "The number of seconds that a router's Hello packets
           have not been seen before it's neighbors declare the
           router down.  This should be some multiple of the Hello
           interval.  This value must be the same for all routers
           attached to a common network."
        DEFVAL { 40 }
        ::= { ospfIfEntry 10 }
```

```
    ospfIfPollInterval OBJECT-TYPE
        SYNTAX   PositiveInteger
        ACCESS   read-write
        STATUS   mandatory
        DESCRIPTION
           "The larger time interval, in seconds, between the
           Hello packets sent to an inactive non-broadcast multi-
           access neighbor."
        DEFVAL { 120 }
        ::= { ospfIfEntry 11 }

    ospfIfState OBJECT-TYPE
        SYNTAX   INTEGER {
                    down (1),
                    loopback (2),
                    waiting (3),
                    pointToPoint (4),
                    designatedRouter (5),
                    backupDesignatedRouter (6),
                    otherDesignatedRouter (7)
                 }
        ACCESS   read-only
        STATUS   mandatory
        DESCRIPTION
           "The OSPF Interface State."
        DEFVAL { down }
        ::= { ospfIfEntry 12 }

    ospfIfDesignatedRouter OBJECT-TYPE
        SYNTAX   IpAddress
        ACCESS   read-only
        STATUS   mandatory
        DESCRIPTION
           "The IP Address of the Designated Router."
        DEFVAL   { '00000000'H }    -- 0.0.0.0
        ::= { ospfIfEntry 13 }

    ospfIfBackupDesignatedRouter OBJECT-TYPE
        SYNTAX   IpAddress
        ACCESS   read-only
        STATUS   mandatory
        DESCRIPTION
           "The IP Address of the Backup Designated Router."
        DEFVAL   { '00000000'H }    -- 0.0.0.0
        ::= { ospfIfEntry 14 }
```

```
    ospfIfEvents OBJECT-TYPE
        SYNTAX   Counter
        ACCESS   read-only
        STATUS   mandatory
        DESCRIPTION
           "The number of times this OSPF interface has changed
           its state, or an error has occurred."
        DEFVAL   { 0 }
        ::= { ospfIfEntry 15 }

    ospfIfAuthKey OBJECT-TYPE
        SYNTAX   OCTET STRING
        ACCESS   read-write
        STATUS   mandatory
        DESCRIPTION
           "The Authentication Key.  If the Area's Authorization
           Type is simplePassword, and the key length is shorter
           than 8 octets, the agent will left adjust and zero fill
           to 8 octets.

           When read, ospfIfAuthKey always returns an Octet String
           of length zero."
        REFERENCE
           "OSPF Version 2, Section 9 The Interface Data
           Structure"
        DEFVAL   { '0000000000000000'H }    -- 0.0.0.0.0.0.0.0
        ::= { ospfIfEntry 16 }


    --  OSPF Interface Metric Table

    --      The Metric Table describes the metrics to be advertised
    --      for a specified interface at the various types of service.
    --      As such, this table is an adjunct of the OSPF Interface
    --      Table.

    -- Types of service, as defined by RFC 791, have the ability
    -- to request low delay, high bandwidth, or reliable linkage.

    -- For the purposes of this specification, the measure of
    -- bandwidth

    --      Metric = 10^8 / ifSpeed

    -- is the default value.  For multiple link interfaces, note
    -- that ifSpeed is the sum of the individual link speeds.
    -- This yields a number having the following typical values:
```

```
        --        Network Type/bit rate    Metric

        --        >= 100 MBPS                   1
        --        Ethernet/802.3               10
        --        E1                           48
        --        T1 (ESF)                     65
        --         64 KBPS                    1562
        --         56 KBPS                    1785
        --         19.2 KBPS                  5208
        --          9.6 KBPS                 10416

    -- Routes that are not specified use the default (TOS 0) metric

    ospfIfMetricTable OBJECT-TYPE
        SYNTAX   SEQUENCE OF OspfIfMetricEntry
        ACCESS   not-accessible
        STATUS   mandatory
        DESCRIPTION
           "The TOS metrics for a non-virtual interface identified
           by the interface index."
        REFERENCE
           "OSPF Version 2, Appendix C.3  Router interface
           parameters"
        ::= { ospf 8 }

    ospfIfMetricEntry OBJECT-TYPE
        SYNTAX   OspfIfMetricEntry
        ACCESS   not-accessible
        STATUS   mandatory
        DESCRIPTION
           "A particular TOS metric for a non-virtual interface
           identified by the interface index."
        REFERENCE
           "OSPF Version 2, Appendix C.3  Router interface
           parameters"
        INDEX { ospfIfMetricIpAddress,
                ospfIfMetricAddressLessIf,
                ospfIfMetricTOS }
        ::= { ospfIfMetricTable 1 }

    OspfIfMetricEntry ::=
        SEQUENCE {
            ospfIfMetricIpAddress
                IpAddress,
            ospfIfMetricAddressLessIf
                INTEGER,
            ospfIfMetricTOS
                TOSType,
```

```
            ospfIfMetricMetric
                 Metric,
            ospfIfMetricStatus
                 Validation
        }

    ospfIfMetricIpAddress OBJECT-TYPE
        SYNTAX   IpAddress
        ACCESS   read-write
        STATUS   mandatory
        DESCRIPTION
           "The IP address of this OSPF interface.  On row
           creation, this can be derived from the instance."
        ::= { ospfIfMetricEntry 1 }

    ospfIfMetricAddressLessIf OBJECT-TYPE
        SYNTAX   INTEGER
        ACCESS   read-write
        STATUS   mandatory
        DESCRIPTION
           "For the purpose of easing the instancing of addressed
           and addressless interfaces; This variable takes the
           value 0 on interfaces with IP Addresses, and the value
           of ifIndex for interfaces having no IP Address.  On row
           creation, this can be derived from the instance."
        ::= { ospfIfMetricEntry 2 }

    ospfIfMetricTOS OBJECT-TYPE
        SYNTAX   TOSType
        ACCESS   read-write
        STATUS   mandatory
        DESCRIPTION
           "The type of service metric being referenced.  On row
           creation, this can be derived from the instance."
        ::= { ospfIfMetricEntry 3 }

    ospfIfMetricMetric OBJECT-TYPE
        SYNTAX   Metric
        ACCESS   read-write
        STATUS   mandatory
        DESCRIPTION
           "The metric of using this type of service on this
           interface.  The default value of the TOS 0 Metric is
           10^8 / ifSpeed.

           The value FFFF is distinguished to mean 'no route via
           this TOS'."
        ::= { ospfIfMetricEntry 4 }
```

```
    ospfIfMetricStatus OBJECT-TYPE
        SYNTAX   Validation
        ACCESS   read-write
        STATUS   mandatory
        DESCRIPTION
           "This variable displays the validity or invalidity of
           the entry.  Setting it to 'invalid' has the effect of
           rendering it inoperative.  The internal effect (row
           removal) is implementation dependent."
        DEFVAL   { valid }
        ::= { ospfIfMetricEntry 5 }


    -- OSPF Virtual Interface Table

    --      The Virtual Interface Table describes the virtual
    --      links that the OSPF Process is configured to
    --      carry on.

    ospfVirtIfTable OBJECT-TYPE
        SYNTAX   SEQUENCE OF OspfVirtIfEntry
        ACCESS   not-accessible
        STATUS   mandatory
        DESCRIPTION
           "Information about this router's virtual interfaces."
        REFERENCE
           "OSPF Version 2, Appendix C.4  Virtual link parameters"
        ::= { ospf 9 }

    ospfVirtIfEntry OBJECT-TYPE
        SYNTAX   OspfVirtIfEntry
        ACCESS   not-accessible
        STATUS   mandatory
        DESCRIPTION
           "Information about a single Virtual Interface."
        INDEX { ospfVirtIfAreaID, ospfVirtIfNeighbor }
        ::= { ospfVirtIfTable 1 }

    OspfVirtIfEntry ::=
        SEQUENCE {
            ospfVirtIfAreaID
                AreaID,
            ospfVirtIfNeighbor
                RouterID,
            ospfVirtIfTransitDelay
                UpToMaxAge,
            ospfVirtIfRetransInterval
                UpToMaxAge,
```

```
            ospfVirtIfHelloInterval
                HelloRange,
            ospfVirtIfRtrDeadInterval
                PositiveInteger,
            ospfVirtIfState
                INTEGER,
            ospfVirtIfEvents
                Counter,
            ospfVirtIfAuthKey
                OCTET STRING,
            ospfVirtIfStatus
                Validation
        }

    ospfVirtIfAreaID OBJECT-TYPE
        SYNTAX    AreaID
        ACCESS    read-write
        STATUS    mandatory
        DESCRIPTION
           "The Transit Area that the Virtual Link traverses.  By
           definition, this is not 0.0.0.0"
        ::= { ospfVirtIfEntry 1 }

    ospfVirtIfNeighbor OBJECT-TYPE
        SYNTAX    RouterID
        ACCESS    read-write
        STATUS    mandatory
        DESCRIPTION
           "The Router ID of the Virtual Neighbor."
        ::= { ospfVirtIfEntry 2 }

    ospfVirtIfTransitDelay OBJECT-TYPE
        SYNTAX    UpToMaxAge
        ACCESS    read-write
        STATUS    mandatory
        DESCRIPTION
           "The estimated number of seconds it takes to transmit a
           link- state update packet over this interface."
        DEFVAL { 1 }
        ::= { ospfVirtIfEntry 3 }

    ospfVirtIfRetransInterval OBJECT-TYPE
        SYNTAX    UpToMaxAge
        ACCESS    read-write
        STATUS    mandatory
        DESCRIPTION
           "The number of seconds between link-state advertisement
           retransmissions, for adjacencies belonging to this
```

          interface. This value is also used when retransmitting
          database description and link-state request packets.
          This value should be well over the expected round-trip
          time."
       DEFVAL { 5 }
       ::= { ospfVirtIfEntry 4 }

   ospfVirtIfHelloInterval OBJECT-TYPE
       SYNTAX   HelloRange
       ACCESS   read-write
       STATUS   mandatory
       DESCRIPTION
          "The length of time, in seconds, between the Hello
          packets that the router sends on the interface. This
          value must be the same for the virtual neighbor."
       DEFVAL { 10 }
       ::= { ospfVirtIfEntry 5 }

   ospfVirtIfRtrDeadInterval OBJECT-TYPE
       SYNTAX   PositiveInteger
       ACCESS   read-write
       STATUS   mandatory
       DESCRIPTION
          "The number of seconds that a router's Hello packets
          have not been seen before it's neighbors declare the
          router down. This should be some multiple of the Hello
          interval. This value must be the same for the virtual
          neighbor."
       DEFVAL { 60 }
       ::= { ospfVirtIfEntry 6 }

   ospfVirtIfState OBJECT-TYPE
       SYNTAX   INTEGER {
                   down (1),   -- these use the same encoding
                   pointToPoint (4)   -- as the ospfIfTable
                }
       ACCESS   read-only
       STATUS   mandatory
       DESCRIPTION
          "OSPF virtual interface states."
       DEFVAL   { down }
       ::= { ospfVirtIfEntry 7 }

   ospfVirtIfEvents OBJECT-TYPE
       SYNTAX   Counter
       ACCESS   read-only
       STATUS   mandatory
       DESCRIPTION

```
              "The number of state changes or error events on this
              Virtual Link"
          DEFVAL    { 0 }
          ::= { ospfVirtIfEntry 8 }

      ospfVirtIfAuthKey OBJECT-TYPE
          SYNTAX    OCTET STRING
          ACCESS    read-write
          STATUS    mandatory
          DESCRIPTION
              "If Authentication Type is simplePassword, the device
              will left adjust and zero fill to 8 octets.

              When read, ospfVifAuthKey always returns a string of
              length zero."
          REFERENCE
              "OSPF Version 2, Section 9 The Interface Data
              Structure"
          DEFVAL    { '0000000000000000'H }    -- 0.0.0.0.0.0.0.0
          ::= { ospfVirtIfEntry 9 }

      ospfVirtIfStatus OBJECT-TYPE
          SYNTAX    Validation
          ACCESS    read-write
          STATUS    mandatory
          DESCRIPTION
              "This variable displays the validity or invalidity of
              the entry.  Setting it to 'invalid' has the effect of
              rendering it inoperative.  The internal effect (row
              removal) is implementation dependent."
          DEFVAL    { valid }
          ::= { ospfVirtIfEntry 10 }


      --  OSPF Neighbor Table

      --      The OSPF Neighbor Table describes all neighbors in
      --      the locality of the subject router.

      ospfNbrTable OBJECT-TYPE
          SYNTAX    SEQUENCE OF OspfNbrEntry
          ACCESS    not-accessible
          STATUS    mandatory
          DESCRIPTION
              "A table of non-virtual neighbor information."
          REFERENCE
              "OSPF Version 2, Section 10 The Neighbor Data
              Structure"
```

```
        ::= { ospf 10 }

ospfNbrEntry OBJECT-TYPE
    SYNTAX   OspfNbrEntry
    ACCESS   not-accessible
    STATUS   mandatory
    DESCRIPTION
       "The information regarding a single neighbor."
    REFERENCE
       "OSPF Version 2, Section 10 The Neighbor Data
       Structure"
    INDEX { ospfNbrIpAddr, ospfNbrAddressLessIndex }
    ::= { ospfNbrTable 1 }

OspfNbrEntry ::=
    SEQUENCE {
        ospfNbrIpAddr
            IpAddress,
        ospfNbrAddressLessIndex
            InterfaceIndex,
        ospfNbrRtrId
            RouterID,
        ospfNbrOptions
            INTEGER,
        ospfNbrPriority
            DesignatedRouterPriority,
        ospfNbrState
            INTEGER,
        ospfNbrEvents
            Counter,
        ospfNbrLSRetransQLen
            Gauge,
        ospfNBMANbrStatus
            Validation
    }

ospfNbrIpAddr OBJECT-TYPE
    SYNTAX   IpAddress
    ACCESS   read-write
    STATUS   mandatory
    DESCRIPTION
       "The IP address of this neighbor."
    ::= { ospfNbrEntry 1 }

ospfNbrAddressLessIndex OBJECT-TYPE
    SYNTAX   InterfaceIndex
    ACCESS   read-write
    STATUS   mandatory
```

        DESCRIPTION
           " On an interface having an IP Address, zero. On
           addressless interfaces, the corresponding value of
           ifIndex in the Internet Standard MIB. On row creation,
           this can be derived from the instance."
        ::= { ospfNbrEntry 2 }

    ospfNbrRtrId OBJECT-TYPE
        SYNTAX   RouterID
        ACCESS   read-only
        STATUS   mandatory
        DESCRIPTION
           "A 32-bit integer (represented as a type IpAddress)
           uniquely identifying the neighboring router in the
           Autonomous System."
        DEFVAL   { '00000000'H }   -- 0.0.0.0
        ::= { ospfNbrEntry 3 }

    ospfNbrOptions OBJECT-TYPE
        SYNTAX   INTEGER
        ACCESS   read-only
        STATUS   mandatory
        DESCRIPTION
           "A Bit Mask corresponding to the neighbor's options
           field.

           Bit 0, if set, indicates that the area accepts and
           operates on external information; if zero, it is a stub
           area.

           Bit 1, if set, indicates that the system will operate
           on Type of Service metrics other than TOS 0. If zero,
           the neighbor will ignore all metrics except the TOS 0
           metric."
        REFERENCE
           "OSPF Version 2, Section 12.1.2 Options"
        DEFVAL { 0 }
        ::= { ospfNbrEntry 4 }

    ospfNbrPriority OBJECT-TYPE
        SYNTAX   DesignatedRouterPriority
        ACCESS   read-write
        STATUS   mandatory
        DESCRIPTION
           "The priority of this neighbor in the designated router
           election algorithm. The value 0 signifies that the
           neighbor is not eligible to become the designated
           router on this particular network."

```
        DEFVAL { 1 }
        ::= { ospfNbrEntry 5 }

    ospfNbrState OBJECT-TYPE
        SYNTAX   INTEGER {
                    down (1),
                    attempt (2),
                    init (3),
                    twoWay (4),
                    exchangeStart (5),
                    exchange (6),
                    loading (7),
                    full (8)
                 }
        ACCESS   read-only
        STATUS   mandatory
        DESCRIPTION
            "The State of the relationship with this Neighbor."
        REFERENCE
            "OSPF Version 2, Section 10.1 Neighbor States"
        DEFVAL   { down }
        ::= { ospfNbrEntry 6 }

    ospfNbrEvents OBJECT-TYPE
        SYNTAX   Counter
        ACCESS   read-only
        STATUS   mandatory
        DESCRIPTION
            "The number of times this neighbor relationship has
            changed state, or an error has occurred."
        DEFVAL   { 0 }
        ::= { ospfNbrEntry 7 }

    ospfNbrLSRetransQLen OBJECT-TYPE
        SYNTAX   Gauge
        ACCESS   read-only
        STATUS   mandatory
        DESCRIPTION
            "The current length of the retransmission queue."
        DEFVAL   { 0 }
        ::= { ospfNbrEntry 8 }

    ospfNBMANbrStatus OBJECT-TYPE
        SYNTAX   Validation
        ACCESS   read-write
        STATUS   mandatory
        DESCRIPTION
            "This variable displays the validity or invalidity of
```

```
             the entry.  Setting it to 'invalid' has the effect of
             rendering it inoperative.  The internal effect (row
             removal) is implementation dependent."
         DEFVAL { valid }
         ::= { ospfNbrEntry 9 }



    --  OSPF Virtual Neighbor Table

    --      This table describes all virtual neighbors.
    --      Since Virtual Links are configured in the
    --      virtual interface table, this table is read-only.

    ospfVirtNbrTable OBJECT-TYPE
        SYNTAX   SEQUENCE OF OspfVirtNbrEntry
        ACCESS   not-accessible
        STATUS   mandatory
        DESCRIPTION
           "A table of virtual neighbor information."
        REFERENCE
           "OSPF Version 2, Section 15  Virtual Links"
        ::= { ospf 11 }

    ospfVirtNbrEntry OBJECT-TYPE
        SYNTAX   OspfVirtNbrEntry
        ACCESS   not-accessible
        STATUS   mandatory
        DESCRIPTION
           "Virtual neighbor information."
        INDEX { ospfVirtNbrArea, ospfVirtNbrRtrId }
        ::= { ospfVirtNbrTable 1 }

    OspfVirtNbrEntry ::=
        SEQUENCE {
            ospfVirtNbrArea
                AreaID,
            ospfVirtNbrRtrId
                RouterID,
            ospfVirtNbrIpAddr
                IpAddress,
            ospfVirtNbrOptions
                INTEGER,
            ospfVirtNbrState
                INTEGER,
            ospfVirtNbrEvents
                Counter,
            ospfVirtNbrLSRetransQLen
                Gauge
```

```
        }

    ospfVirtNbrArea OBJECT-TYPE
        SYNTAX    AreaID
        ACCESS    read-only
        STATUS    mandatory
        DESCRIPTION
            "The Transit Area Identifier."
        ::= { ospfVirtNbrEntry 1 }

    ospfVirtNbrRtrId OBJECT-TYPE
        SYNTAX    RouterID
        ACCESS    read-only
        STATUS    mandatory
        DESCRIPTION
            "A 32-bit integer uniquely identifying the neighboring
            router in the Autonomous System."
        ::= { ospfVirtNbrEntry 2 }

    ospfVirtNbrIpAddr OBJECT-TYPE
        SYNTAX    IpAddress
        ACCESS    read-only
        STATUS    mandatory
        DESCRIPTION
            "The IP address this Virtual Neighbor is using."
        ::= { ospfVirtNbrEntry 3 }

    ospfVirtNbrOptions OBJECT-TYPE
        SYNTAX    INTEGER
        ACCESS    read-only
        STATUS    mandatory
        DESCRIPTION
            "A bit map corresponding to the neighbor's options
            field.  Thus, Bit 1, if set, indicates that the
            neighbor supports Type of Service Routing; if zero, no
            metrics other than TOS 0 are in use by the neighbor."
        ::= { ospfVirtNbrEntry 4 }

    ospfVirtNbrState OBJECT-TYPE
        SYNTAX    INTEGER {
                    down (1),
                    attempt (2),
                    init (3),
                    twoWay (4),
                    exchangeStart (5),
                    exchange (6),
                    loading (7),
                    full (8)
```

```
                    }
            ACCESS   read-only
            STATUS   mandatory
            DESCRIPTION
               "The state of the Virtual Neighbor Relationship."
            ::= { ospfVirtNbrEntry 5 }

        ospfVirtNbrEvents OBJECT-TYPE
            SYNTAX   Counter
            ACCESS   read-only
            STATUS   mandatory
            DESCRIPTION
               "The number of times this virtual link has changed its
               state, or an error has occurred."
            DEFVAL   { 0 }
            ::= { ospfVirtNbrEntry 6 }

        ospfVirtNbrLSRetransQLen OBJECT-TYPE
            SYNTAX   Gauge
            ACCESS   read-only
            STATUS   mandatory
            DESCRIPTION
               "The current length of the retransmission queue."
            ::= { ospfVirtNbrEntry 7 }

        END
```

6. Acknowledgements

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```
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        John Burress          Wellfleet
        Keith McCloghrie      Hughes LAN Systems
```

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8. Security Considerations

    Security issues are not discussed in this memo.

9. Authors' Addresses

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