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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.

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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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8. Security Considerations

Security issues are not discussed in this memo.

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