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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. This memo replaces RFC 1248 which contained some minor errors in referring to "experimental" and "standard-mib" in Section 5. Distribution of this memo is unlimited.

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1. Abstract

This memo defines a 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

```
RFC1252-MIB DEFINITIONS ::= BEGIN
```

```
IMPORTS
```

```
    Counter, Gauge, IpAddress
        FROM RFC1155-SMI
    mib-2
        FROM RFC1213-MIB
    OBJECT-TYPE
        FROM RFC-1212;
```

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

```
    ospf OBJECT IDENTIFIER ::= { mib-2 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,
ospfAreaLSASumSum
        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 of 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 of 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 { ospfNbrIpAddress, ospfNbrAddressLessIndex }
    ::= { ospfNbrTable 1 }
```

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

```
ospfNbrIpAddress 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."
    ::= { 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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7. References

- [1] Cerf, V., "IAB Recommendations for the Development of Internet Network Management Standards", RFC 1052, NRI, April 1988.
- [2] Cerf, V., "Report of the Second Ad Hoc Network Management Review Group", RFC 1109, NRI, August 1989.

- [3] Rose M., and K. McCloghrie, "Structure and Identification of Management Information for TCP/IP-based internets", RFC 1155, Performance Systems International, Hughes LAN Systems, May 1990.
- [4] McCloghrie K., and M. Rose, "Management Information Base for Network Management of TCP/IP-based internets", RFC 1156, Hughes LAN Systems, Performance Systems International, May 1990.
- [5] Case, J., Fedor, M., Schoffstall, M., and J. Davin, "Simple Network Management Protocol", RFC 1157, SNMP Research, Performance Systems International, Performance Systems International, MIT Laboratory for Computer Science, May 1990.
- [6] Rose M., Editor, "Management Information Base for Network Management of TCP/IP-based internets: MIB-II", RFC 1213, Performance Systems International, March 1991.
- [7] Information processing systems - Open Systems Interconnection - Specification of Abstract Syntax Notation One (ASN.1), International Organization for Standardization, International Standard 8824, December 1987.
- [8] Information processing systems - Open Systems Interconnection - Specification of Basic Encoding Rules for Abstract Notation One (ASN.1), International Organization for Standardization, International Standard 8825, December 1987.
- [9] Rose, M., and K. McCloghrie, Editors, "Concise MIB Definitions", RFC 1212, Performance Systems International, Hughes LAN Systems, March 1991.
- [10] Moy, J., Editor, "The OSPF Specification, Version 2", RFC 1247, Proteon, Inc., July 1991.

8. Security Considerations

Security issues are not discussed in this memo.

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