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OSPF Version 2 Management Information Base

Status of This Memo

This document specifies an Internet standards track protocol for the Internet community, and requests discussion and suggestions for improvements. Please refer to the current edition of the "Internet Official Protocol Standards" (STD 1) for the standardization state and status of this protocol. Distribution of this memo is unlimited.

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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 version 2 of the Open Shortest Path First Routing Protocol. Version 2 of the OSPF protocol is specific to the IPv4 address family. Version 3 of the OSPF protocol is specific to the IPv6 address family.

This memo obsoletes RFC 1850; however, it is designed to be backwards compatible. The functional differences between this memo and RFC 1850 are explained in Appendix B.

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1. Overview

1.1. The Internet-Standard Management Framework

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

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. MIB objects are generally accessed through the Simple Network Management Protocol (SNMP). Objects in the MIB are defined using the mechanisms defined in the Structure of Management Information (SMI). This memo specifies a MIB module that is compliant to the SMIV2, which is described in STD 58, RFC 2578 [RFC2578], STD 58, RFC 2579 [RFC2579] and STD 58, RFC 2580 [RFC2580].

1.2. Conceptual Row Creation

For the benefit of row-creation in "conceptual" tables, DEFVAL (Default Value) clauses are included in the definitions in section 3, suggesting values that an agent should use for instances of variables that need to be created due to a Set-Request, but that are not specified in the Set-Request. DEFVAL clauses have not been specified for some objects that are read-only, implying that they are zeroed upon row creation. These objects are of the SYNTAX Counter32 or Gauge32.

For those objects not having a DEFVAL clause, both management stations and agents should heed the Robustness Principle of the Internet (see [RFC791]):

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

Therefore, 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 columnar objects 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).

1.3. 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 (AS). 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 OSPF process automatically creates the areas required for the interfaces.

The simplest configuration of an OSPF process requires the following:

- 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. Non-broadcast multi-access (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.

1.4. OSPF Counters

This MIB defines several counters, namely:

- ospfOriginateNewLsas, ospfRxNewLsas in the ospfGeneralGroup
- ospfSpfRuns, ospfAreaNssaTranslatorEvents in the ospfAreaTable
- ospfIfEvents in the ospfIfTable
- ospfVirtIfEvents in the ospfVirtIfTable
- ospfNbrEvents in the ospfNbrTable
- ospfVirtNbrEvents in the ospfVirtNbrTable

As a best practice, a management entity, when reading these counters, should use the discontinuity object, ospfDiscontinuityTime, to determine if an event that would invalidate the management entity understanding of the counters has occurred. A restart of the OSPF routing process is a possible example of a discontinuity event.

1.5. Multiple OSPF Instances

SNMPv3 supports "Contexts" that can be used to implement MIB views on multiple OSPF instances on the same system. See [RFC3411] or its successors for details.

1.6. Conventions

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119 [RFC2119].

2. Structure of This MIB

This MIB is composed of the following sections:

- General Variables
- Area Data Structure
- Area Stub Metric Table
- Link State Database (LSDB)
- Address Range Table
- Host Table
- Interface Table
- Interface Metric Table
- Virtual Interface Table
- Neighbor Table
- Virtual Neighbor Table
- External Link State Database
- Aggregate Range Table
- Local Link State Database
- AS-scope Link State Database

It supports the base OSPFv2 specification [RFC2328] and extensions to OSPFv2 such as [RFC1765], [RFC1793], [RFC2370], [RFC3101] and [RFC3623].

There exists a separate MIB for notifications ("traps"), which is entirely optional.

2.1. The Purposes of the Sections in This MIB

2.1.1. General Variables

The general variables describe (as it may seem from the name) variables that are global to the OSPF Process.

2.1.2. Area Data Structure and Area Stub Metric Table

The Area Data Structure describes all of the OSPF Areas that the router participates in. The Area Table includes data for Not-So-Stubby-Area (NSSA) translation.

The Area Stub Metric Table describes the metrics advertised into a stub area by the default router(s).

2.1.3. Link State Database and External Link State Database

The link state database is provided primarily to provide detailed information for network debugging.

2.1.4. Address Table and Host Tables

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

2.1.5. 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. The Interface table includes link-local (Opaque type-9) link state advertisement (LSA) statistics.

2.1.6. Virtual Interface Table

The Virtual Interface Table describes virtual links to the OSPF Process, similarly to the (non-virtual) Interface Tables. This Table includes link-local (Opaque type-9) LSA statistics.

2.1.7. Neighbor and Virtual Neighbor Tables

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

2.1.8. Local Link State Database Table and Virtual Local Link State Database Table

The Local Link State Database Table and Virtual Local Link State Database Table are identical to the OSPF LSDB Table in format, but contain only link-local (Opaque type-9) link state advertisements for non-virtual and virtual links.

2.1.9. AS-scope Link State Database Table

The AS-scope Link State Database Table is identical to the OSPF LSDB Table in format, but contains only AS-scoped link state advertisements.

2.1.10. Area LSA Count Table

The table, which maintains number of link state advertisements on the per-area, per-LSA-type basis.

3. OSPF MIB Module

```
OSPF-MIB DEFINITIONS ::= BEGIN
```

```
IMPORTS
```

```
    MODULE-IDENTITY, OBJECT-TYPE, Counter32, Gauge32,
    Integer32, Unsigned32, IpAddress, mib-2
        FROM SNMPv2-SMI
    TEXTUAL-CONVENTION, TruthValue, RowStatus, TimeStamp
        FROM SNMPv2-TC
    MODULE-COMPLIANCE, OBJECT-GROUP
        FROM SNMPv2-CONF
    InterfaceIndexOrZero
        FROM IF-MIB;
```

```
ospf MODULE-IDENTITY
```

```
    LAST-UPDATED "200611100000Z" -- November 10, 2006 00:00:00 EST
    ORGANIZATION "IETF OSPF Working Group"
    CONTACT-INFO
        "WG E-Mail: ospf@ietf.org
```

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```

```
DESCRIPTION
```

```
    "The MIB module to describe the OSPF Version 2
    Protocol. Note that some objects in this MIB
    module may pose a significant security risk.
    Refer to the Security Considerations section
    in RFC 4750 for more information.
```


Copyright (C) The IETF Trust (2006).
This version of this MIB module is part of
RFC 4750; see the RFC itself for full legal
notices."

REVISION "200611100000Z" -- November 10, 2006 09:00:00 EST
DESCRIPTION

"Updated for latest changes to OSPF Version 2:
- updated the General Group with the new
 ospfRFC1583Compatibility, ospfReferenceBandwidth
 and ospfDiscontinuityTime objects
- added graceful-restart-related objects
- added stub-router-related objects
- updated the Area Table with NSSA-related objects
- added ospfAreaAggregateExtRouteTag object
- added Opaque LSA-related objects
- updates to the Compliances and Security sections
- added area LSA counter table
- added section describing translation of notification
 parameters between SNMP versions
- added ospfComplianceObsolete to contain obsolete
 object groups
- deprecated ospfExtLsdbTable
See Appendix B of RFC 4750 for more details.

This version published as part of RFC 4750"

REVISION "199501201225Z" -- Fri Jan 20 12:25:50 PST 1995
DESCRIPTION
 "The initial SMIV2 revision of this MIB module, published
 in RFC 1850."
::= { mib-2 14 }

AreaID ::= TEXTUAL-CONVENTION
 STATUS current
 DESCRIPTION
 "An OSPF Area Identifier.
 Note that 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."
 SYNTAX IpAddress

RouterID ::= TEXTUAL-CONVENTION
 STATUS current
 DESCRIPTION
 "A OSPF Router Identifier.
 Note that the Router ID, in OSPF, has the same format
 as an IP address, but identifies the router independent

of its IP address."
SYNTAX IpAddress

Metric ::= TEXTUAL-CONVENTION
DISPLAY-HINT "d-0"
STATUS current
DESCRIPTION
 "The OSPF internal metric.
 Note that the OSPF metric is defined as an unsigned value
 in the range."
SYNTAX Integer32 (0..'FFFF'h)

BigMetric ::= TEXTUAL-CONVENTION
DISPLAY-HINT "d-0"
STATUS current
DESCRIPTION
 "The OSPF external metric."
SYNTAX Integer32 (0..'FFFFFF'h)

Status ::= TEXTUAL-CONVENTION
STATUS current
DESCRIPTION
 "An indication of the operability of an OSPF
 function or feature. For example, the status
 of an interface: 'enabled' indicates that
 it is willing to communicate with other OSPF routers,
 and 'disabled' indicates that it is not."
SYNTAX INTEGER { enabled (1), disabled (2) }

PositiveInteger ::= TEXTUAL-CONVENTION
DISPLAY-HINT "d-0"
STATUS current
DESCRIPTION
 "A positive integer. Values in excess are precluded as
 unnecessary and prone to interoperability issues."
SYNTAX Integer32 (0..'7FFFFFFF'h)

HelloRange ::= TEXTUAL-CONVENTION
DISPLAY-HINT "d-0"
STATUS current
DESCRIPTION
 "The range of intervals in seconds on which Hello messages
 are exchanged."
SYNTAX Integer32 (1..'FFFF'h)

UpToMaxAge ::= TEXTUAL-CONVENTION
DISPLAY-HINT "d-0"
STATUS current

DESCRIPTION

"The values in seconds that one might find or configure for variables bounded by the maximum age of an LSA."

SYNTAX Integer32 (0..3600)

DesignatedRouterPriority ::= TEXTUAL-CONVENTION

DISPLAY-HINT "d-0"

STATUS current

DESCRIPTION

"The range of values defined for the priority of a system for becoming the designated router."

SYNTAX Integer32 (0..'FF'h)

TOSType ::= TEXTUAL-CONVENTION

DISPLAY-HINT "d-0"

STATUS current

DESCRIPTION

"Type of Service (TOS) is defined as a mapping to the IP Type of Service Flags as defined in the IP Forwarding Table MIB

PRECEDENCE	TYPE OF SERVICE	0
------------	-----------------	---

IP TOS				IP TOS			
Field		Policy		Field		Policy	
Contents		Code		Contents		Code	
0	0 0 0 0	==>	0	0	0 0 0 1	==>	2
0	0 1 0 0	==>	4	0	0 1 1 1	==>	6
0	1 0 0 0	==>	8	0	1 0 0 1	==>	10
0	1 1 0 0	==>	12	0	1 1 1 1	==>	14
1	0 0 0 0	==>	16	1	0 0 0 1	==>	18
1	0 1 0 0	==>	20	1	0 1 1 1	==>	22
1	1 0 0 0	==>	24	1	1 0 0 1	==>	26
1	1 1 0 0	==>	28	1	1 1 1 1	==>	30

The remaining values are left for future definition."

SYNTAX Integer32 (0..30)

OspfAuthenticationType ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"The authentication type."

SYNTAX INTEGER {

```

        none (0),
        simplePassword (1),
        md5 (2)
        -- reserved for specification by IANA (> 2)
    }

-- OSPF General Variables

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

ospfGeneralGroup OBJECT IDENTIFIER ::= { ospf 1 }

ospfRouterId OBJECT-TYPE
    SYNTAX      RouterID
    MAX-ACCESS   read-write
    STATUS      current
    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.

        This object is persistent and when written
        the entity SHOULD save the change to non-volatile storage."
    REFERENCE
        "OSPF Version 2, C.1 Global parameters"
    ::= { ospfGeneralGroup 1 }

ospfAdminStat OBJECT-TYPE
    SYNTAX      Status
    MAX-ACCESS   read-write
    STATUS      current
    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.

        This object is persistent and when written
        the entity SHOULD save the change to non-volatile storage."
    ::= { ospfGeneralGroup 2 }

ospfVersionNumber OBJECT-TYPE
    SYNTAX      INTEGER { version2 (2) }
    MAX-ACCESS   read-only
    STATUS      current

```

DESCRIPTION

"The current version number of the OSPF protocol is 2."

REFERENCE

"OSPF Version 2, Title"

::= { ospfGeneralGroup 3 }

ospfAreaBdrRtrStatus OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-only

STATUS current

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

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"A flag to note whether this router is configured as an Autonomous System Border Router."

This object is persistent and when written the entity SHOULD save the change to non-volatile storage."

REFERENCE

"OSPF Version 2, Section 3.3 Classification of routers"

::= { ospfGeneralGroup 5 }

ospfExternLsaCount OBJECT-TYPE

SYNTAX Gauge32

MAX-ACCESS read-only

STATUS current

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 }

ospfExternLsaChecksumSum OBJECT-TYPE

SYNTAX Integer32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The 32-bit 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. The value should be treated as unsigned when comparing two sums of checksums."

::= { ospfGeneralGroup 7 }

ospfTOSSupport OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"The router's support for type-of-service routing.

This object is persistent and when written the entity SHOULD save the change to non-volatile storage."

REFERENCE

"OSPF Version 2, Appendix F.1.2 Optional TOS support"

::= { ospfGeneralGroup 8 }

ospfOriginateNewLsas OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of new link state advertisements that have been originated. This number is incremented each time the router originates a new LSA.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ospfDiscontinuityTime."

::= { ospfGeneralGroup 9 }

ospfRxNewLsas OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of link state advertisements received that are determined to be new instantiations. This number does not include newer instantiations of self-originated link state advertisements.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ospfDiscontinuityTime."

::= { ospfGeneralGroup 10 }

ospfExtLsdbLimit OBJECT-TYPE

SYNTAX Integer32 (-1..'7FFFFFFF'h)

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"The maximum number of non-default AS-external LSAs entries that can be stored in the link state database. If the value is -1, then there is no limit.

When the number of non-default AS-external LSAs in a router's link state database reaches ospfExtLsdbLimit, the router enters overflow state. The router never holds more than ospfExtLsdbLimit non-default AS-external LSAs in its database. OspfExtLsdbLimit MUST be set identically in all routers attached to the OSPF backbone and/or any regular OSPF area (i.e., OSPF stub areas and NSSAs are excluded).

This object is persistent and when written the entity SHOULD save the change to non-volatile storage."

DEFVAL { -1 }

::= { ospfGeneralGroup 11 }

ospfMulticastExtensions OBJECT-TYPE

SYNTAX Integer32

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"A bit mask indicating whether the router is forwarding IP multicast (Class D) datagrams based on the algorithms defined in the multicast extensions to OSPF.

Bit 0, if set, indicates that the router can

forward IP multicast datagrams in the router's directly attached areas (called intra-area multicast routing).

Bit 1, if set, indicates that the router can forward IP multicast datagrams between OSPF areas (called inter-area multicast routing).

Bit 2, if set, indicates that the router can forward IP multicast datagrams between Autonomous Systems (called inter-AS multicast routing).

Only certain combinations of bit settings are allowed, namely: 0 (no multicast forwarding is enabled), 1 (intra-area multicasting only), 3 (intra-area and inter-area multicasting), 5 (intra-area and inter-AS multicasting), and 7 (multicasting everywhere). By default, no multicast forwarding is enabled.

This object is persistent and when written the entity SHOULD save the change to non-volatile storage."

DEFVAL { 0 }
::= { ospfGeneralGroup 12 }

ospfExitOverflowInterval OBJECT-TYPE

SYNTAX PositiveInteger
MAX-ACCESS read-write
STATUS current
DESCRIPTION

"The number of seconds that, after entering OverflowState, a router will attempt to leave OverflowState. This allows the router to again originate non-default AS-external LSAs. When set to 0, the router will not leave overflow state until restarted.

This object is persistent and when written the entity SHOULD save the change to non-volatile storage."

DEFVAL { 0 }
::= { ospfGeneralGroup 13 }

ospfDemandExtensions OBJECT-TYPE

SYNTAX TruthValue
MAX-ACCESS read-write

STATUS current
DESCRIPTION
"The router's support for demand routing.
This object is persistent and when written
the entity SHOULD save the change to non-volatile
storage."
REFERENCE
"Extending OSPF to Support Demand Circuits"
::= { ospfGeneralGroup 14 }

ospfRFC1583Compatibility OBJECT-TYPE
SYNTAX TruthValue
MAX-ACCESS read-write
STATUS current
DESCRIPTION
"Indicates metrics used to choose among multiple
AS-external LSAs. When RFC1583Compatibility is set to
enabled, only cost will be used when choosing among
multiple AS-external LSAs advertising the same
destination. When RFC1583Compatibility is set to
disabled, preference will be driven first by type of
path using cost only to break ties.

This object is persistent and when written
the entity SHOULD save the change to non-volatile
storage."
REFERENCE
"OSPF Version 2, Section 16.4.1 External path
preferences"
::= { ospfGeneralGroup 15 }

ospfOpaqueLsaSupport OBJECT-TYPE
SYNTAX TruthValue
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The router's support for Opaque LSA types."
REFERENCE
"The OSPF Opaque LSA Option"
::= { ospfGeneralGroup 16 }

ospfReferenceBandwidth OBJECT-TYPE
SYNTAX Unsigned32
UNITS "kilobits per second"
MAX-ACCESS read-write
STATUS current
DESCRIPTION
"Reference bandwidth in kilobits/second for

calculating default interface metrics. The default value is 100,000 Kbps (100 Mbps).

This object is persistent and when written the entity SHOULD save the change to non-volatile storage."

::= { ospfGeneralGroup 17 }

ospfRestartSupport OBJECT-TYPE

SYNTAX INTEGER { none (1),
plannedOnly (2),
plannedAndUnplanned (3)
}

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"The router's support for OSPF graceful restart. Options include: no restart support, only planned restarts, or both planned and unplanned restarts.

This object is persistent and when written the entity SHOULD save the change to non-volatile storage."

::= { ospfGeneralGroup 18 }

ospfRestartInterval OBJECT-TYPE

SYNTAX Integer32 (1..1800)

UNITS "seconds"

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"Configured OSPF graceful restart timeout interval.

This object is persistent and when written the entity SHOULD save the change to non-volatile storage."

::= { ospfGeneralGroup 19 }

ospfRestartStrictLsaChecking OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"Indicates if strict LSA checking is enabled for graceful restart.

This object is persistent and when written the entity SHOULD save the change to non-volatile

```

        storage."
 ::= { ospfGeneralGroup 20 }

ospfRestartStatus OBJECT-TYPE
    SYNTAX      INTEGER { notRestarting (1),
                          plannedRestart (2),
                          unplannedRestart (3)
    }
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
        "Current status of OSPF graceful restart."
 ::= { ospfGeneralGroup 21 }

ospfRestartAge OBJECT-TYPE
    SYNTAX      Unsigned32
    UNITS       "seconds"
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
        "Remaining time in current OSPF graceful restart
        interval."
 ::= { ospfGeneralGroup 22 }

ospfRestartExitReason OBJECT-TYPE
    SYNTAX      INTEGER { none (1),          -- none attempted
                          inProgress (2),     -- restart in
                                              -- progress
                          completed (3),      -- successfully
                                              -- completed
                          timedOut (4),       -- timed out
                          topologyChanged (5) -- aborted due to
                                              -- topology change.
    }
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
        "Describes the outcome of the last attempt at a
        graceful restart.  If the value is 'none', no restart
        has yet been attempted.  If the value is 'inProgress',
        a restart attempt is currently underway."
 ::= { ospfGeneralGroup 23 }

ospfAsLsaCount OBJECT-TYPE
    SYNTAX      Gauge32
    MAX-ACCESS   read-only
    STATUS       current

```

DESCRIPTION

"The number of AS-scope link state advertisements in the AS-scope link state database."

::= { ospfGeneralGroup 24 }

ospfAsLsaCksumSum OBJECT-TYPE

SYNTAX Unsigned32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The 32-bit unsigned sum of the LS checksums of the AS link state advertisements contained in the AS-scope link state database. This sum can be used to determine if there has been a change in a router's AS-scope link state database, and to compare the AS-scope link state database of two routers."

::= { ospfGeneralGroup 25 }

ospfStubRouterSupport OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The router's support for stub router functionality."

REFERENCE

"OSPF Stub Router Advertisement"

::= { ospfGeneralGroup 26 }

ospfStubRouterAdvertisement OBJECT-TYPE

SYNTAX INTEGER {
doNotAdvertise (1),
advertise (2)
}

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"This object controls the advertisement of stub router LSAs by the router. The value doNotAdvertise will result in the advertisement of a standard router LSA and is the default value."

This object is persistent and when written the entity SHOULD save the change to non-volatile storage."

::= { ospfGeneralGroup 27 }

ospfDiscontinuityTime OBJECT-TYPE

SYNTAX TimeStamp

MAX-ACCESS read-only
 STATUS current
 DESCRIPTION

"The value of sysUpTime on the most recent occasion at which any one of this MIB's counters suffered a discontinuity.

If no such discontinuities have occurred since the last re-initialization of the local management subsystem, then this object contains a zero value."

::= { ospfGeneralGroup 28 }

-- OSPF Area Table
 -- The OSPF Area Table contains information
 -- regarding the various areas.

ospfAreaTable OBJECT-TYPE

SYNTAX SEQUENCE OF OspfAreaEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Information describing the configured parameters and cumulative statistics of the router's attached areas. The interfaces and virtual links are configured as part of these areas. Area 0.0.0.0, by definition, is the backbone area."

REFERENCE

"OSPF Version 2, Section 6 The Area Data Structure"

::= { ospf 2 }

ospfAreaEntry OBJECT-TYPE

SYNTAX OspfAreaEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Information describing the configured parameters and cumulative statistics of one of the router's attached areas. The interfaces and virtual links are configured as part of these areas. Area 0.0.0.0, by definition, is the backbone area.

Information in this table is persistent and when this object is written the entity SHOULD save the change to non-volatile storage."

INDEX { ospfAreaId }

::= { ospfAreaTable 1 }

```

OspfAreaEntry ::=
    SEQUENCE {
        ospfAreaId
            AreaID,
        ospfAuthType
            OspfAuthenticationType,
        ospfImportAsExtern
            INTEGER,
        ospfSpfRuns
            Counter32,
        ospfAreaBdrRtrCount
            Gauge32,
        ospfAsBdrRtrCount
            Gauge32,
        ospfAreaLsaCount
            Gauge32,
        ospfAreaLsaCksumSum
            Integer32,
        ospfAreaSummary
            INTEGER,
        ospfAreaStatus
            RowStatus,
        ospfAreaNssaTranslatorRole
            INTEGER,
        ospfAreaNssaTranslatorState
            INTEGER,
        ospfAreaNssaTranslatorStabilityInterval
            PositiveInteger,
        ospfAreaNssaTranslatorEvents
            Counter32
    }

ospfAreaId OBJECT-TYPE
    SYNTAX      AreaID
    MAX-ACCESS   read-only -- read-only since originally
                           -- an SMIV1 index
    STATUS      current
    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      OspfAuthenticationType
    MAX-ACCESS   read-create
    STATUS      obsolete

```

DESCRIPTION

"The authentication type specified for an area."

REFERENCE

"OSPF Version 2, Appendix D Authentication"

DEFVAL { none } -- no authentication, by default

::= { ospfAreaEntry 2 }

ospfImportAsExtern OBJECT-TYPE

SYNTAX INTEGER {
importExternal (1),
importNoExternal (2),
importNssa (3)
}

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"Indicates if an area is a stub area, NSSA, or standard area. Type-5 AS-external LSAs and type-11 Opaque LSAs are not imported into stub areas or NSSAs. NSSAs import AS-external data as type-7 LSAs"

REFERENCE

"OSPF Version 2, Appendix C.2 Area parameters"

DEFVAL { importExternal }

::= { ospfAreaEntry 3 }

ospfSpfRuns OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

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.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ospfDiscontinuityTime."

::= { ospfAreaEntry 4 }

ospfAreaBdrRtrCount OBJECT-TYPE

SYNTAX Gauge32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The total number of Area Border Routers reachable within this area. This is initially zero and is calculated in each Shortest Path First (SPF) pass."

```

 ::= { ospfAreaEntry 5 }

ospfAsBdrRtrCount OBJECT-TYPE
    SYNTAX      Gauge32
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
        "The total number of Autonomous System Border
        Routers reachable within this area. This is
        initially zero and is calculated in each SPF
        pass."
    ::= { ospfAreaEntry 6 }

ospfAreaLsaCount OBJECT-TYPE
    SYNTAX      Gauge32
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
        "The total number of link state advertisements
        in this area's link state database, excluding
        AS-external LSAs."
    ::= { ospfAreaEntry 7 }

ospfAreaLsaCksumSum OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
        "The 32-bit 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. The value should be treated as unsigned
        when comparing two sums of checksums."
    DEFVAL { 0 }
    ::= { ospfAreaEntry 8 }

ospfAreaSummary OBJECT-TYPE
    SYNTAX      INTEGER {
                    noAreaSummary (1),
                    sendAreaSummary (2)
                }
    MAX-ACCESS   read-create
    STATUS       current
    DESCRIPTION

```


"The variable ospfAreaSummary controls the import of summary LSAs into stub and NSSA areas. It has no effect on other areas.

If it is noAreaSummary, the router will not originate summary LSAs into the stub or NSSA area. It will rely entirely on its default route.

If it is sendAreaSummary, the router will both summarize and propagate summary LSAs."

```
DEFVAL { noAreaSummary }
::= { ospfAreaEntry 9 }
```

ospfAreaStatus OBJECT-TYPE

```
SYNTAX      RowStatus
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
```

"This object permits management of the table by facilitating actions such as row creation, construction, and destruction.

The value of this object has no effect on whether other objects in this conceptual row can be modified."

```
::= { ospfAreaEntry 10 }
```

ospfAreaNssaTranslatorRole OBJECT-TYPE

```
SYNTAX      INTEGER { always (1), candidate (2) }
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
```

"Indicates an NSSA border router's ability to perform NSSA translation of type-7 LSAs into type-5 LSAs."

```
DEFVAL { candidate }
::= { ospfAreaEntry 11 }
```

ospfAreaNssaTranslatorState OBJECT-TYPE

```
SYNTAX      INTEGER { enabled (1),
                      elected (2),
                      disabled (3)
                    }
```

```
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
```

"Indicates if and how an NSSA border router is performing NSSA translation of type-7 LSAs into type-5

LSAs. When this object is set to enabled, the NSSA Border router's OspfAreaNssaExtTranslatorRole has been set to always. When this object is set to elected, a candidate NSSA Border router is Translating type-7 LSAs into type-5. When this object is set to disabled, a candidate NSSA border router is NOT translating type-7 LSAs into type-5."

```
::= { ospfAreaEntry 12 }
```

ospfAreaNssaTranslatorStabilityInterval OBJECT-TYPE

```
SYNTAX      PositiveInteger
UNITS       "seconds"
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
    "The number of seconds after an elected translator
    determines its services are no longer required, that
    it should continue to perform its translation duties."
DEFVAL { 40 }
::= { ospfAreaEntry 13 }
```

ospfAreaNssaTranslatorEvents OBJECT-TYPE

```
SYNTAX      Counter32
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "Indicates the number of translator state changes
    that have occurred since the last boot-up."

    Discontinuities in the value of this counter can occur
    at re-initialization of the management system, and at other
    times as indicated by the value of ospfDiscontinuityTime."
::= { ospfAreaEntry 14 }
```

-- OSPF Area Default Metric Table

ospfStubAreaTable OBJECT-TYPE

```
SYNTAX      SEQUENCE OF OspfStubAreaEntry
MAX-ACCESS  not-accessible
STATUS      current
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
```

MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION

"The metric for a given Type of Service that
 will be advertised by a default Area Border
 Router into a stub area."

Information in this table is persistent and when this object
 is written the entity SHOULD save the change to non-volatile
 storage."

REFERENCE

"OSPF Version 2, Appendix C.2, Area Parameters"

INDEX { ospfStubAreaId, ospfStubTOS }
 ::= { ospfStubAreaTable 1 }

OspfStubAreaEntry ::=

```
SEQUENCE {
    ospfStubAreaId
        AreaID,
    ospfStubTOS
        TOSType,
    ospfStubMetric
        BigMetric,
    ospfStubStatus
        RowStatus,
    ospfStubMetricType
        INTEGER
}
```

ospfStubAreaId OBJECT-TYPE

```
SYNTAX      AreaID
MAX-ACCESS  read-only -- read-only since originally an
                  -- SMIV1 index
STATUS      current
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
MAX-ACCESS  read-only -- read-only since originally an
                  -- SMIV1 index
STATUS      current
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
 MAX-ACCESS read-create
 STATUS current
 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 RowStatus
 MAX-ACCESS read-create
 STATUS current
 DESCRIPTION

"This object permits management of the table by facilitating actions such as row creation, construction, and destruction."

The value of this object has no effect on whether other objects in this conceptual row can be modified."

::= { ospfStubAreaEntry 4 }

ospfStubMetricType OBJECT-TYPE

SYNTAX INTEGER {
 ospfMetric (1), -- OSPF Metric
 comparableCost (2), -- external type 1
 nonComparable (3) -- external type 2
 }

MAX-ACCESS read-create
 STATUS current
 DESCRIPTION

"This variable displays the type of metric advertised as a default route."

DEFVAL { ospfMetric }
 ::= { ospfStubAreaEntry 5 }

-- OSPF Link State Database

ospfLsdbTable OBJECT-TYPE

SYNTAX SEQUENCE OF OspfLsdbEntry
 MAX-ACCESS not-accessible
 STATUS current

DESCRIPTION

"The OSPF Process's link state database (LSDB).
The LSDB contains the link state advertisements
from throughout the areas that the device is attached to."

REFERENCE

"OSPF Version 2, Section 12 Link State Advertisements"

::= { ospf 4 }

ospfLsdbEntry OBJECT-TYPE

SYNTAX OspfLsdbEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"A single link state advertisement."

INDEX { ospfLsdbAreaId, ospfLsdbType,
ospfLsdbLsid, ospfLsdbRouterId }

::= { ospfLsdbTable 1 }

OspfLsdbEntry ::=

```
SEQUENCE {
    ospfLsdbAreaId
        AreaID,
    ospfLsdbType
        INTEGER,
    ospfLsdbLsid
        IPAddress,
    ospfLsdbRouterId
        RouterID,
    ospfLsdbSequence
        Integer32,
    ospfLsdbAge
        Integer32,
    ospfLsdbChecksum
        Integer32,
    ospfLsdbAdvertisement
        OCTET STRING
}
```

ospfLsdbAreaId OBJECT-TYPE

SYNTAX AreaID

MAX-ACCESS read-only -- read-only since originally an
-- SMIV1 index

STATUS current

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), -- but see ospfAsLsdbTable
                    multicastLink (6),
                    nssaExternalLink (7),
                    areaOpaqueLink (10)
                  }
```

```
MAX-ACCESS      read-only -- read-only since originally an
                        -- SMIV1 index
```

```
STATUS          current
```

```
DESCRIPTION
```

```
"The type of the link state advertisement.
Each link state type has a separate advertisement
format."
```

```
Note: External link state advertisements are permitted
for backward compatibility, but should be displayed
in the ospfAsLsdbTable rather than here."
```

```
REFERENCE
```

```
"OSPF Version 2, Appendix A.4.1 The Link State
Advertisement header"
```

```
::= { ospfLsdbEntry 2 }
```

```
ospfLsdbLsid OBJECT-TYPE
```

```
SYNTAX          IpAddress
```

```
MAX-ACCESS      read-only -- read-only since originally an
                        -- SMIV1 index
```

```
STATUS          current
```

```
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
```

```
MAX-ACCESS      read-only -- read-only since originally an
                        -- SMIV1 index
```

```
STATUS          current
```

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 }

ospfLsdbSequence OBJECT-TYPE

SYNTAX Integer32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The sequence number field is a signed 32-bit 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. 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 Integer32 -- Should be 0..MaxAge, except when
-- doNotAge bit is set

UNITS "seconds"

MAX-ACCESS read-only

STATUS current

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 Integer32

MAX-ACCESS read-only

STATUS current

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 (SIZE (1..65535))

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The entire link state advertisement, including its header."

Note that for variable length LSAs, SNMP agents may not be able to return the largest string size."

REFERENCE

"OSPF Version 2, Section 12 Link State Advertisements"

::= { ospfLsdbEntry 8 }

-- Address Range Table

ospfAreaRangeTable OBJECT-TYPE

SYNTAX SEQUENCE OF OspfAreaRangeEntry

MAX-ACCESS not-accessible

STATUS obsolete

DESCRIPTION

"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 that is known beyond its borders. It contains a set of IP address ranges 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."

Note that this table is obsoleted and is replaced by the Area Aggregate Table."

REFERENCE

"OSPF Version 2, Appendix C.2 Area parameters"

::= { ospf 5 }

ospfAreaRangeEntry OBJECT-TYPE

SYNTAX OspfAreaRangeEntry

MAX-ACCESS not-accessible

STATUS obsolete

DESCRIPTION

"A single area address range.

Information in this table is persistent and when this object is written the entity SHOULD save the change to non-volatile storage."

REFERENCE

"OSPF Version 2, Appendix C.2 Area parameters"

INDEX { ospfAreaRangeAreaId, ospfAreaRangeNet }
 ::= { ospfAreaRangeTable 1 }

OspfAreaRangeEntry ::=

```
SEQUENCE {
    ospfAreaRangeAreaId
        AreaID,
    ospfAreaRangeNet
        IPAddress,
    ospfAreaRangeMask
        IPAddress,
    ospfAreaRangeStatus
        RowStatus,
    ospfAreaRangeEffect
        INTEGER
}
```

ospfAreaRangeAreaId OBJECT-TYPE

```
SYNTAX      AreaID
MAX-ACCESS  read-only -- read-only since originally an
                  -- SMIV1 index

STATUS      obsolete
DESCRIPTION
    "The area that the address range is to be found
    within."
REFERENCE
    "OSPF Version 2, Appendix C.2 Area parameters"
    ::= { ospfAreaRangeEntry 1 }
```

ospfAreaRangeNet OBJECT-TYPE

```
SYNTAX      IPAddress
MAX-ACCESS  read-only -- read-only since originally an
                  -- SMIV1 index

STATUS      obsolete
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
 MAX-ACCESS read-create
 STATUS obsolete

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 RowStatus
 MAX-ACCESS read-create
 STATUS obsolete

DESCRIPTION

"This object permits management of the table by facilitating actions such as row creation, construction, and destruction."

The value of this object has no effect on whether other objects in this conceptual row can be modified."

::= { ospfAreaRangeEntry 4 }

ospfAreaRangeEffect OBJECT-TYPE

SYNTAX INTEGER {
 advertiseMatching (1),
 doNotAdvertiseMatching (2)
 }
 MAX-ACCESS read-create
 STATUS obsolete

DESCRIPTION

"Subnets subsumed by ranges either trigger the advertisement of the indicated summary (advertiseMatching) or result in the subnet's not being advertised at all outside the area."

DEFVAL { advertiseMatching }

::= { ospfAreaRangeEntry 5 }

-- OSPF Host Table

ospfHostTable OBJECT-TYPE

SYNTAX SEQUENCE OF OspfHostEntry
 MAX-ACCESS not-accessible
 STATUS current

DESCRIPTION

"The Host/Metric Table indicates what hosts are directly

attached to the router, what metrics and types of service should be advertised for them, and what areas they are found within."

REFERENCE

"OSPF Version 2, Appendix C.7 Host route parameters"

::= { ospf 6 }

ospfHostEntry OBJECT-TYPE

SYNTAX OspfHostEntry
MAX-ACCESS not-accessible
STATUS current

DESCRIPTION

"A metric to be advertised, for a given type of service, when a given host is reachable.

Information in this table is persistent and when this object is written the entity SHOULD save the change to non-volatile storage."

INDEX { ospfHostIpAddress, ospfHostTOS }

::= { ospfHostTable 1 }

OspfHostEntry ::=

```
SEQUENCE {
    ospfHostIpAddress
        IpAddress,
    ospfHostTOS
        TOSType,
    ospfHostMetric
        Metric,
    ospfHostStatus
        RowStatus,
    ospfHostAreaID
        AreaID,
    ospfHostCfgAreaID
        AreaID
}
```

ospfHostIpAddress OBJECT-TYPE

SYNTAX IpAddress
MAX-ACCESS read-only -- read-only since originally an
 -- SMIV1 index

STATUS current

DESCRIPTION

"The IP address of the host."

REFERENCE

"OSPF Version 2, Appendix C.7 Host route parameters"

::= { ospfHostEntry 1 }

ospfHostTOS OBJECT-TYPE

SYNTAX TOSType
MAX-ACCESS read-only -- read-only since originally an
-- SMIV1 index
STATUS current
DESCRIPTION
"The Type of Service of the route being configured."
REFERENCE
"OSPF Version 2, Appendix C.7 Host route parameters"
::= { ospfHostEntry 2 }

ospfHostMetric OBJECT-TYPE

SYNTAX Metric
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"The metric to be advertised."
REFERENCE
"OSPF Version 2, Appendix C.7 Host route parameters"
::= { ospfHostEntry 3 }

ospfHostStatus OBJECT-TYPE

SYNTAX RowStatus
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"This object permits management of the table by
facilitating actions such as row creation,
construction, and destruction.

The value of this object has no effect on
whether other objects in this conceptual row can be
modified."
::= { ospfHostEntry 4 }

ospfHostAreaID OBJECT-TYPE

SYNTAX AreaID
MAX-ACCESS read-only
STATUS deprecated
DESCRIPTION
"The OSPF area to which the host belongs.
Deprecated by ospfHostCfgAreaID."
REFERENCE
"OSPF Version 2, Appendix C.7 Host parameters"
::= { ospfHostEntry 5 }

ospfHostCfgAreaID OBJECT-TYPE

SYNTAX AreaID

```

MAX-ACCESS      read-create
STATUS          current
DESCRIPTION
    "To configure the OSPF area to which the host belongs."
REFERENCE
    "OSPF Version 2, Appendix C.7 Host parameters"
::= { ospfHostEntry 6 }

```

-- OSPF Interface Table

```

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

```

```

ospfIfEntry OBJECT-TYPE
    SYNTAX          OspfIfEntry
    MAX-ACCESS      not-accessible
    STATUS          current
    DESCRIPTION
        "The OSPF interface entry describes one interface
        from the viewpoint of OSPF.

        Information in this table is persistent and when this object
        is written the entity SHOULD save the change to non-volatile
        storage."
    INDEX { ospfIfIpAddress, ospfAddressLessIf }
    ::= { ospfIfTable 1 }

```

```

OspfIfEntry ::=
    SEQUENCE {
        ospfIfIpAddress
            IpAddress,
        ospfAddressLessIf
            InterfaceIndexOrZero,
        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
        Counter32,
    ospfIfAuthKey
        OCTET STRING,
    ospfIfStatus
        RowStatus,
    ospfIfMulticastForwarding
        INTEGER,
    ospfIfDemand
        TruthValue,
    ospfIfAuthType
        OspfAuthenticationType,
    ospfIfLsaCount
        Gauge32,
    ospfIfLsaCksumSum
        Unsigned32,
    ospfIfDesignatedRouterId
        RouterID,
    ospfIfBackupDesignatedRouterId
        RouterID
}

```

ospfIfIpAddress OBJECT-TYPE

SYNTAX IpAddress

MAX-ACCESS read-only -- read-only since originally an
-- SMIV1 index

STATUS current

DESCRIPTION

"The IP address of this OSPF interface."

```
::= { ospfIfEntry 1 }
```

```
ospfAddressLessIf OBJECT-TYPE
```

```
SYNTAX      InterfaceIndexOrZero
```

```
MAX-ACCESS  read-only -- read-only since originally an
                  -- SMIV1 index
```

```
STATUS      current
```

```
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
```

```
MAX-ACCESS  read-create
```

```
STATUS      current
```

```
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),
                pointToMultipoint (5)
            }
```

```
MAX-ACCESS  read-create
```

```
STATUS      current
```

```
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 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
```

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The OSPF interface's administrative status.

The value 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

MAX-ACCESS read-create

STATUS current

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

UNITS "seconds"

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The estimated number of seconds it takes to transmit a link state update packet over this interface. Note that the minimal value SHOULD be 1 second."

DEFVAL { 1 }

::= { ospfIfEntry 7 }

ospfIfRetransInterval OBJECT-TYPE

SYNTAX UpToMaxAge

UNITS "seconds"

MAX-ACCESS read-create

STATUS current

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.

Note that minimal value SHOULD be 1 second."

DEFVAL { 5 }

::= { ospfIfEntry 8 }

ospfIfHelloInterval OBJECT-TYPE

SYNTAX HelloRange

UNITS "seconds"

MAX-ACCESS read-create

STATUS current

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

UNITS "seconds"

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The number of seconds that a router's Hello packets have not been seen before its 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

UNITS "seconds"

MAX-ACCESS read-create

STATUS current

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)
    }
MAX-ACCESS      read-only
STATUS          current
DESCRIPTION
    "The OSPF Interface State."
DEFVAL { down }
::= { ospfIfEntry 12 }

ospfIfDesignatedRouter OBJECT-TYPE
    SYNTAX      IpAddress
    MAX-ACCESS   read-only
    STATUS      current
    DESCRIPTION
        "The IP address of the designated router."
    DEFVAL { '00000000'H } -- 0.0.0.0
    ::= { ospfIfEntry 13 }

ospfIfBackupDesignatedRouter OBJECT-TYPE
    SYNTAX      IpAddress
    MAX-ACCESS   read-only
    STATUS      current
    DESCRIPTION
        "The IP address of the backup designated
        router."
    DEFVAL { '00000000'H } -- 0.0.0.0
    ::= { ospfIfEntry 14 }

ospfIfEvents OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS   read-only
    STATUS      current
    DESCRIPTION
        "The number of times this OSPF interface has
        changed its state or an error has occurred.

        Discontinuities in the value of this counter can occur
        at re-initialization of the management system, and at other
        times as indicated by the value of ospfDiscontinuityTime."
    ::= { ospfIfEntry 15 }

ospfIfAuthKey OBJECT-TYPE
    SYNTAX      OCTET STRING (SIZE (0..256))
    MAX-ACCESS   read-create
    STATUS      current

```

DESCRIPTION

"The cleartext password used as an OSPF authentication key when simplePassword security is enabled. This object does not access any OSPF cryptographic (e.g., MD5) authentication key under any circumstance.

If the key length is shorter than 8 octets, the agent will left adjust and zero fill to 8 octets.

Unauthenticated interfaces need no authentication key, and simple password authentication cannot use a key of more than 8 octets.

Note that the use of simplePassword authentication is NOT recommended when there is concern regarding attack upon the OSPF system. SimplePassword authentication is only sufficient to protect against accidental misconfigurations because it re-uses cleartext passwords [RFC1704].

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 }

ospfIfStatus OBJECT-TYPE

SYNTAX RowStatus
MAX-ACCESS read-create
STATUS current

DESCRIPTION

"This object permits management of the table by facilitating actions such as row creation, construction, and destruction.

The value of this object has no effect on whether other objects in this conceptual row can be modified."

::= { ospfIfEntry 17 }

ospfIfMulticastForwarding OBJECT-TYPE

SYNTAX INTEGER {
 blocked (1), -- no multicast forwarding
 multicast (2), -- using multicast address
 unicast (3) -- to each OSPF neighbor

```

    }
MAX-ACCESS      read-create
STATUS          current
DESCRIPTION
    "The way multicasts should be forwarded on this
    interface: not forwarded, forwarded as data
    link multicasts, or forwarded as data link
    unicasts. Data link multicasting is not
    meaningful on point-to-point and NBMA interfaces,
    and setting ospfMulticastForwarding to 0 effectively
    disables all multicast forwarding."
DEFVAL { blocked }
::= { ospfIfEntry 18 }

```

```

ospfIfDemand OBJECT-TYPE
SYNTAX          TruthValue
MAX-ACCESS      read-create
STATUS          current
DESCRIPTION
    "Indicates whether Demand OSPF procedures (hello
    suppression to FULL neighbors and setting the
    DoNotAge flag on propagated LSAs) should be
    performed on this interface."
DEFVAL { false }
::= { ospfIfEntry 19 }

```

```

ospfIfAuthType OBJECT-TYPE
SYNTAX          OspfAuthenticationType
MAX-ACCESS      read-create
STATUS          current
DESCRIPTION
    "The authentication type specified for an interface.

    Note that this object can be used to engage
    in significant attacks against an OSPF router."
REFERENCE
    "OSPF Version 2, Appendix D Authentication"
DEFVAL { none } -- no authentication, by default
::= { ospfIfEntry 20 }

```

```

ospfIfLsaCount OBJECT-TYPE
SYNTAX          Gauge32
MAX-ACCESS      read-only
STATUS          current
DESCRIPTION
    "The total number of link-local link state advertisements
    in this interface's link-local link state database."
::= { ospfIfEntry 21 }

```

ospfIfLsaChecksumSum OBJECT-TYPE

SYNTAX Unsigned32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The 32-bit unsigned sum of the Link State Advertisements' LS checksums contained in this interface's link-local link state database. The sum can be used to determine if there has been a change in the interface's link state database and to compare the interface link state database of routers attached to the same subnet."

::= { ospfIfEntry 22 }

ospfIfDesignatedRouterId OBJECT-TYPE

SYNTAX RouterID

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The Router ID of the designated router."

::= { ospfIfEntry 23 }

ospfIfBackupDesignatedRouterId OBJECT-TYPE

SYNTAX RouterID

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The Router ID of the backup designated router."

::= { ospfIfEntry 24 }

-- OSPF Interface Metric Table

ospfIfMetricTable OBJECT-TYPE

SYNTAX SEQUENCE OF OspfIfMetricEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"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:

$\text{Metric} = \text{referenceBandwidth} / \text{ifSpeed}$

is the default value.

The default reference bandwidth is 10^8 .

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.

Note that the default reference bandwidth can be configured using the general group object ospfReferenceBandwidth."

REFERENCE

"OSPF Version 2, Appendix C.3 Router interface parameters"
`::= { ospf 8 }`

ospfIfMetricEntry OBJECT-TYPE

SYNTAX OspfIfMetricEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"A particular TOS metric for a non-virtual interface identified by the interface index.

Information in this table is persistent and when this object is written the entity SHOULD save the change to non-volatile storage."

REFERENCE

"OSPF Version 2, Appendix C.3 Router interface parameters"

INDEX { ospfIfMetricIpAddress,
 ospfIfMetricAddressLessIf,
 ospfIfMetricTOS }

`::= { ospfIfMetricTable 1 }`

```

OspfIfMetricEntry ::=
    SEQUENCE {
        ospfIfMetricIpAddress
            IpAddress,
        ospfIfMetricAddressLessIf
            InterfaceIndexOrZero,
        ospfIfMetricTOS
            TOSType,
        ospfIfMetricValue
            Metric,
        ospfIfMetricStatus
            RowStatus
    }

ospfIfMetricIpAddress OBJECT-TYPE
    SYNTAX      IpAddress
    MAX-ACCESS   read-only -- read-only since originally an
                           -- SMIV1 index
    STATUS      current
    DESCRIPTION
        "The IP address of this OSPF interface.  On row
        creation, this can be derived from the instance."
    ::= { ospfIfMetricEntry 1 }

ospfIfMetricAddressLessIf OBJECT-TYPE
    SYNTAX      InterfaceIndexOrZero
    MAX-ACCESS   read-only -- read-only since originally an
                           -- SMIV1 index
    STATUS      current
    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
    MAX-ACCESS   read-only -- read-only since originally an
                           -- SMIV1 index
    STATUS      current
    DESCRIPTION
        "The Type of Service metric being referenced.
        On row creation, this can be derived from the
        instance."
    ::= { ospfIfMetricEntry 3 }

```

ospfIfMetricValue OBJECT-TYPE

SYNTAX Metric

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The metric of using this Type of Service on this interface. The default value of the TOS 0 metric is $10^8 / \text{ifSpeed}$."

::= { ospfIfMetricEntry 4 }

ospfIfMetricStatus OBJECT-TYPE

SYNTAX RowStatus

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"This object permits management of the table by facilitating actions such as row creation, construction, and destruction.

The value of this object has no effect on whether other objects in this conceptual row can be modified."

::= { ospfIfMetricEntry 5 }

-- OSPF Virtual Interface Table

ospfVirtIfTable OBJECT-TYPE

SYNTAX SEQUENCE OF OspfVirtIfEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Information about this router's virtual interfaces that the OSPF Process is configured to carry on."

REFERENCE

"OSPF Version 2, Appendix C.4 Virtual link parameters"

::= { ospf 9 }

ospfVirtIfEntry OBJECT-TYPE

SYNTAX OspfVirtIfEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Information about a single virtual interface.

Information in this table is persistent and when this object is written the entity SHOULD save the change to non-volatile storage."


```

INDEX { ospfVirtIfAreaId, ospfVirtIfNeighbor }
 ::= { ospfVirtIfTable 1 }

```

```

OspfVirtIfEntry ::=
  SEQUENCE {
    ospfVirtIfAreaId
      AreaID,
    ospfVirtIfNeighbor
      RouterID,
    ospfVirtIfTransitDelay
      UpToMaxAge,
    ospfVirtIfRetransInterval
      UpToMaxAge,
    ospfVirtIfHelloInterval
      HelloRange,
    ospfVirtIfRtrDeadInterval
      PositiveInteger,
    ospfVirtIfState
      INTEGER,
    ospfVirtIfEvents
      Counter32,
    ospfVirtIfAuthKey
      OCTET STRING,
    ospfVirtIfStatus
      RowStatus,
    ospfVirtIfAuthType
      OspfAuthenticationType,
    ospfVirtIfLsaCount
      Gauge32,
    ospfVirtIfLsaCksumSum
      Unsigned32
  }

```

```

ospfVirtIfAreaId OBJECT-TYPE
  SYNTAX      AreaID
  MAX-ACCESS   read-only -- read-only since originally an
                        -- SMIV1 index
  STATUS       current
  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
  MAX-ACCESS   read-only -- read-only since originally an
                        -- SMIV1 index
  STATUS       current

```

DESCRIPTION

"The Router ID of the virtual neighbor."

::= { ospfVirtIfEntry 2 }

ospfVirtIfTransitDelay OBJECT-TYPE

SYNTAX UpToMaxAge

UNITS "seconds"

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The estimated number of seconds it takes to transmit a Link State update packet over this interface. Note that the minimal value SHOULD be 1 second."

DEFVAL { 1 }

::= { ospfVirtIfEntry 3 }

ospfVirtIfRetransInterval OBJECT-TYPE

SYNTAX UpToMaxAge

UNITS "seconds"

MAX-ACCESS read-create

STATUS current

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. Note that the minimal value SHOULD be 1 second."

DEFVAL { 5 }

::= { ospfVirtIfEntry 4 }

ospfVirtIfHelloInterval OBJECT-TYPE

SYNTAX HelloRange

UNITS "seconds"

MAX-ACCESS read-create

STATUS current

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
UNITS       "seconds"
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
    "The number of seconds that a router's Hello
    packets have not been seen before its
    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
            }
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "OSPF virtual interface states."
DEFVAL { down }
::= { ospfVirtIfEntry 7 }

```

ospfVirtIfEvents OBJECT-TYPE

```

SYNTAX      Counter32
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "The number of state changes or error events on
    this virtual link.

    Discontinuities in the value of this counter can occur
    at re-initialization of the management system, and at other
    times as indicated by the value of ospfDiscontinuityTime."
::= { ospfVirtIfEntry 8 }

```

ospfVirtIfAuthKey OBJECT-TYPE

```

SYNTAX      OCTET STRING (SIZE(0..256))
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
    "The cleartext password used as an OSPF
    authentication key when simplePassword security
    is enabled. This object does not access any OSPF
    cryptographic (e.g., MD5) authentication key under
    any circumstance.

```

If the key length is shorter than 8 octets, the agent will left adjust and zero fill to 8 octets.

Unauthenticated interfaces need no authentication key, and simple password authentication cannot use a key of more than 8 octets.

Note that the use of simplePassword authentication is NOT recommended when there is concern regarding attack upon the OSPF system. SimplePassword authentication is only sufficient to protect against accidental misconfigurations because it re-uses cleartext passwords. [RFC1704]

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
 ::= { ospfVirtIfEntry 9 }

ospfVirtIfStatus OBJECT-TYPE

SYNTAX RowStatus
 MAX-ACCESS read-create
 STATUS current

DESCRIPTION

"This object permits management of the table by facilitating actions such as row creation, construction, and destruction.

The value of this object has no effect on whether other objects in this conceptual row can be modified."

::= { ospfVirtIfEntry 10 }

ospfVirtIfAuthType OBJECT-TYPE

SYNTAX OspfAuthenticationType
 MAX-ACCESS read-create
 STATUS current

DESCRIPTION

"The authentication type specified for a virtual interface.

Note that this object can be used to engage in significant attacks against an OSPF router."

REFERENCE

"OSPF Version 2, Appendix E Authentication"

DEFVAL { none } -- no authentication, by default

```
 ::= { ospfVirtIfEntry 11 }
```

```
ospfVirtIfLsaCount OBJECT-TYPE
```

```
SYNTAX          Gauge32
MAX-ACCESS      read-only
STATUS          current
DESCRIPTION
```

```
    "The total number of link-local link state advertisements
    in this virtual interface's link-local link state database."
```

```
 ::= { ospfVirtIfEntry 12 }
```

```
ospfVirtIfLsaCksumSum OBJECT-TYPE
```

```
SYNTAX          Unsigned32
MAX-ACCESS      read-only
STATUS          current
DESCRIPTION
```

```
    "The 32-bit unsigned sum of the link state
    advertisements' LS checksums contained in this
    virtual interface's link-local link state database.
    The sum can be used to determine if there has
    been a change in the virtual interface's link state
    database, and to compare the virtual interface
    link state database of the virtual neighbors."
```

```
 ::= { ospfVirtIfEntry 13 }
```

```
-- OSPF Neighbor Table
```

```
ospfNbrTable OBJECT-TYPE
```

```
SYNTAX          SEQUENCE OF OspfNbrEntry
MAX-ACCESS      not-accessible
STATUS          current
DESCRIPTION
```

```
    "A table describing all non-virtual neighbors
    in the locality of the OSPF router."
```

```
REFERENCE
```

```
    "OSPF Version 2, Section 10 The Neighbor Data
    Structure"
```

```
 ::= { ospf 10 }
```

```
ospfNbrEntry OBJECT-TYPE
```

```
SYNTAX          OspfNbrEntry
MAX-ACCESS      not-accessible
STATUS          current
DESCRIPTION
```

```
    "The information regarding a single neighbor.
```

```
    Information in this table is persistent and when this object
    is written the entity SHOULD save the change to non-volatile
```

storage."

REFERENCE

"OSPF Version 2, Section 10 The Neighbor Data Structure"

INDEX { ospfNbrIpAddress, ospfNbrAddressLessIndex }
 ::= { ospfNbrTable 1 }

OspfNbrEntry ::=

```
SEQUENCE {
    ospfNbrIpAddress
        IpAddress,
    ospfNbrAddressLessIndex
        InterfaceIndexOrZero,
    ospfNbrRtrId
        RouterID,
    ospfNbrOptions
        Integer32,
    ospfNbrPriority
        DesignatedRouterPriority,
    ospfNbrState
        INTEGER,
    ospfNbrEvents
        Counter32,
    ospfNbrLsRetransQLen
        Gauge32,
    ospfNbmaNbrStatus
        RowStatus,
    ospfNbmaNbrPermanence
        INTEGER,
    ospfNbrHelloSuppressed
        TruthValue,
    ospfNbrRestartHelperStatus
        INTEGER,
    ospfNbrRestartHelperAge
        Unsigned32,
    ospfNbrRestartHelperExitReason
        INTEGER
}
```

ospfNbrIpAddress OBJECT-TYPE

SYNTAX IpAddress

MAX-ACCESS read-only -- read-only since originally an
 -- SMIV1 index

STATUS current

DESCRIPTION

"The IP address this neighbor is using in its IP source address. Note that, on addressless links, this will not be 0.0.0.0 but the

address of another of the neighbor's interfaces."
 ::= { ospfNbrEntry 1 }

ospfNbrAddressLessIndex OBJECT-TYPE

SYNTAX InterfaceIndexOrZero
 MAX-ACCESS read-only -- read-only since originally an
 -- SMIV1 index

STATUS current

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
 MAX-ACCESS read-only
 STATUS current

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 Integer32
 MAX-ACCESS read-only
 STATUS current

DESCRIPTION

"A bit mask corresponding to the neighbor's
 options field.

Bit 0, 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.

Bit 1, if set, indicates that the associated
 area accepts and operates on external
 information; if zero, it is a stub area.

Bit 2, if set, indicates that the system is
 capable of routing IP multicast datagrams, that is
 that it implements the multicast extensions to
 OSPF.

Bit 3, if set, indicates that the associated area is an NSSA. These areas are capable of carrying type-7 external advertisements, which are translated into type-5 external advertisements at NSSA borders."

REFERENCE

"OSPF Version 2, Section 12.1.2 Options"

DEFVAL { 0 }

::= { ospfNbrEntry 4 }

ospfNbrPriority OBJECT-TYPE

SYNTAX DesignatedRouterPriority

MAX-ACCESS read-create

STATUS current

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)
 }

MAX-ACCESS read-only

STATUS current

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 Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of times this neighbor relationship has changed state or an error has occurred.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ospfDiscontinuityTime."

::= { ospfNbrEntry 7 }

ospfNbrLsRetransQLen OBJECT-TYPE

SYNTAX Gauge32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The current length of the retransmission queue."

::= { ospfNbrEntry 8 }

ospfNbmaNbrStatus OBJECT-TYPE

SYNTAX RowStatus

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"This object permits management of the table by facilitating actions such as row creation, construction, and destruction.

The value of this object has no effect on whether other objects in this conceptual row can be modified."

::= { ospfNbrEntry 9 }

ospfNbmaNbrPermanence OBJECT-TYPE

SYNTAX INTEGER {
dynamic (1), -- learned through protocol
permanent (2) -- configured address
}

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This variable displays the status of the entry; 'dynamic' and 'permanent' refer to how the neighbor became known."

DEFVAL { permanent }

::= { ospfNbrEntry 10 }

ospfNbrHelloSuppressed OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-only

```

STATUS          current
DESCRIPTION
    "Indicates whether Hellos are being suppressed
    to the neighbor."
 ::= { ospfNbrEntry 11 }

```

```

ospfNbrRestartHelperStatus OBJECT-TYPE
    SYNTAX          INTEGER { notHelping (1),
                             helping (2)
                           }
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        "Indicates whether the router is acting
        as a graceful restart helper for the neighbor."
    ::= { ospfNbrEntry 12 }

```

```

ospfNbrRestartHelperAge OBJECT-TYPE
    SYNTAX          Unsigned32
    UNITS           "seconds"
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        "Remaining time in current OSPF graceful restart
        interval, if the router is acting as a restart
        helper for the neighbor."
    ::= { ospfNbrEntry 13 }

```

```

ospfNbrRestartHelperExitReason OBJECT-TYPE
    SYNTAX          INTEGER { none (1),          -- not attempted
                             inProgress (2),     -- restart in
                                                -- progress
                             completed (3),      -- successfully
                                                -- completed
                             timedOut (4),       -- timed out
                             topologyChanged (5) -- aborted due to
                                                -- topology
                                                -- change.
                           }
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        "Describes the outcome of the last attempt at acting
        as a graceful restart helper for the neighbor."
    ::= { ospfNbrEntry 14 }

```

```
-- OSPF Virtual Neighbor Table
```

```
ospfVirtNbrTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF OspfVirtNbrEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "This table describes all virtual neighbors.
        Since virtual links are configured
        in the Virtual Interface Table, this table is read-only."
    REFERENCE
        "OSPF Version 2, Section 15 Virtual Links"
    ::= { ospf 11 }
```

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

```
OspfVirtNbrEntry ::=
    SEQUENCE {
        ospfVirtNbrArea
            AreaID,
        ospfVirtNbrRtrId
            RouterID,
        ospfVirtNbrIpAddr
            IpAddress,
        ospfVirtNbrOptions
            Integer32,
        ospfVirtNbrState
            INTEGER,
        ospfVirtNbrEvents
            Counter32,
        ospfVirtNbrLsRetransQLen
            Gauge32,
        ospfVirtNbrHelloSuppressed
            TruthValue,
        ospfVirtNbrRestartHelperStatus
            INTEGER,
        ospfVirtNbrRestartHelperAge
            Unsigned32,
        ospfVirtNbrRestartHelperExitReason
            INTEGER
    }
```

```
ospfVirtNbrArea OBJECT-TYPE
```

```

SYNTAX      AreaID
MAX-ACCESS  read-only -- read-only since originally an
                  -- SMIV1 index
STATUS      current
DESCRIPTION
    "The Transit Area Identifier."
 ::= { ospfVirtNbrEntry 1 }

```

```

ospfVirtNbrRtrId OBJECT-TYPE
SYNTAX      RouterID
MAX-ACCESS  read-only -- read-only since originally an
                  -- SMIV1 index
STATUS      current
DESCRIPTION
    "A 32-bit integer uniquely identifying the
     neighboring router in the Autonomous System."
 ::= { ospfVirtNbrEntry 2 }

```

```

ospfVirtNbrIpAddr OBJECT-TYPE
SYNTAX      IpAddress
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "The IP address this virtual neighbor is using."
 ::= { ospfVirtNbrEntry 3 }

```

```

ospfVirtNbrOptions OBJECT-TYPE
SYNTAX      Integer32
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "A bit mask corresponding to the neighbor's
     options field.

    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.

    Bit 2, if set, indicates that the system is
    network multicast capable, i.e., that it
    implements OSPF multicast routing."
 ::= { ospfVirtNbrEntry 4 }

```

```

ospfVirtNbrState OBJECT-TYPE
SYNTAX      INTEGER {
                down (1),
                attempt (2),

```

```

        init (3),
        twoWay (4),
        exchangeStart (5),
        exchange (6),
        loading (7),
        full (8)
    }
MAX-ACCESS      read-only
STATUS          current
DESCRIPTION
    "The state of the virtual neighbor relationship."
 ::= { ospfVirtNbrEntry 5 }

ospfVirtNbrEvents OBJECT-TYPE
SYNTAX          Counter32
MAX-ACCESS      read-only
STATUS          current
DESCRIPTION
    "The number of times this virtual link has
     changed its state or an error has occurred.

     Discontinuities in the value of this counter can occur
     at re-initialization of the management system, and at other
     times as indicated by the value of ospfDiscontinuityTime."
 ::= { ospfVirtNbrEntry 6 }

ospfVirtNbrLsRetransQLen OBJECT-TYPE
SYNTAX          Gauge32
MAX-ACCESS      read-only
STATUS          current
DESCRIPTION
    "The current length of the retransmission
     queue."
 ::= { ospfVirtNbrEntry 7 }

ospfVirtNbrHelloSuppressed OBJECT-TYPE
SYNTAX          TruthValue
MAX-ACCESS      read-only
STATUS          current
DESCRIPTION
    "Indicates whether Hellos are being suppressed
     to the neighbor."
 ::= { ospfVirtNbrEntry 8 }

ospfVirtNbrRestartHelperStatus OBJECT-TYPE
SYNTAX          INTEGER { notHelping (1),
                          helping (2)
                          }

```

```

MAX-ACCESS      read-only
STATUS          current
DESCRIPTION
    "Indicates whether the router is acting
    as a graceful restart helper for the neighbor."
 ::= { ospfVirtNbrEntry 9 }

```

```
ospfVirtNbrRestartHelperAge OBJECT-TYPE
```

```

SYNTAX          Unsigned32
UNITS           "seconds"
MAX-ACCESS      read-only
STATUS          current
DESCRIPTION
    "Remaining time in current OSPF graceful restart
    interval, if the router is acting as a restart
    helper for the neighbor."
 ::= { ospfVirtNbrEntry 10 }

```

```
ospfVirtNbrRestartHelperExitReason OBJECT-TYPE
```

```

SYNTAX          INTEGER { none (1),          -- not attempted
                                inProgress (2), -- restart in
                                                -- progress
                                completed (3),  -- successfully
                                                -- completed
                                timedOut (4),    -- timed out
                                topologyChanged (5) -- aborted due to
                                                -- topology
                                                -- change.
                                }
MAX-ACCESS      read-only
STATUS          current
DESCRIPTION
    "Describes the outcome of the last attempt at acting
    as a graceful restart helper for the neighbor."
 ::= { ospfVirtNbrEntry 11 }

```

```
-- OSPF Link State Database, External
```

```
ospfExtLsdbTable OBJECT-TYPE
```

```

SYNTAX          SEQUENCE OF OspfExtLsdbEntry
MAX-ACCESS      not-accessible
STATUS          deprecated
DESCRIPTION
    "The OSPF Process's external LSA link state database.

    This table is identical to the OSPF LSDB Table
    in format, but contains only external link state
    advertisements. The purpose is to allow external

```

LSAs to be displayed once for the router rather than once in each non-stub area.

Note that external LSAs are also in the AS-scope link state database."

REFERENCE

"OSPF Version 2, Section 12 Link State Advertisements"
 ::= { ospf 12 }

ospfExtLsdbEntry OBJECT-TYPE

SYNTAX OspfExtLsdbEntry

MAX-ACCESS not-accessible

STATUS deprecated

DESCRIPTION

"A single link state advertisement."

INDEX { ospfExtLsdbType, ospfExtLsdbLsid, ospfExtLsdbRouterId }
 ::= { ospfExtLsdbTable 1 }

OspfExtLsdbEntry ::=

```
SEQUENCE {
    ospfExtLsdbType
        INTEGER,
    ospfExtLsdbLsid
        IPAddress,
    ospfExtLsdbRouterId
        RouterID,
    ospfExtLsdbSequence
        Integer32,
    ospfExtLsdbAge
        Integer32,
    ospfExtLsdbChecksum
        Integer32,
    ospfExtLsdbAdvertisement
        OCTET STRING
}
```

ospfExtLsdbType OBJECT-TYPE

SYNTAX INTEGER {
 asExternalLink (5)
 }

MAX-ACCESS read-only -- read-only since originally an
 -- SMIV1 index

STATUS deprecated

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"

::= { ospfExtLsdbEntry 1 }

ospfExtLsdbLsid OBJECT-TYPE

SYNTAX IpAddress

MAX-ACCESS read-only -- read-only since originally an
-- SMIV1 index

STATUS deprecated

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"

::= { ospfExtLsdbEntry 2 }

ospfExtLsdbRouterId OBJECT-TYPE

SYNTAX RouterID

MAX-ACCESS read-only -- read-only since originally an
-- SMIV1 index

STATUS deprecated

DESCRIPTION

"The 32-bit number that uniquely identifies the originating router in the Autonomous System."

REFERENCE

"OSPF Version 2, Appendix C.1 Global parameters"

::= { ospfExtLsdbEntry 3 }

ospfExtLsdbSequence OBJECT-TYPE

SYNTAX Integer32

MAX-ACCESS read-only

STATUS deprecated

DESCRIPTION

"The sequence number field is a signed 32-bit 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. 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"

::= { ospfExtLsdbEntry 4 }

ospfExtLsdbAge OBJECT-TYPE

SYNTAX Integer32 -- Should be 0..MaxAge, except when
-- doNotAge bit is set

UNITS "seconds"

MAX-ACCESS read-only

STATUS deprecated

DESCRIPTION

"This field is the age of the link state advertisement in seconds."

REFERENCE

"OSPF Version 2, Section 12.1.1 LS age"

::= { ospfExtLsdbEntry 5 }

ospfExtLsdbChecksum OBJECT-TYPE

SYNTAX Integer32

MAX-ACCESS read-only

STATUS deprecated

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"

::= { ospfExtLsdbEntry 6 }

ospfExtLsdbAdvertisement OBJECT-TYPE

SYNTAX OCTET STRING (SIZE(36))

MAX-ACCESS read-only

STATUS deprecated

DESCRIPTION

"The entire link state advertisement, including its header."

REFERENCE

"OSPF Version 2, Section 12 Link State Advertisements"

::= { ospfExtLsdbEntry 7 }

-- OSPF Use of the CIDR Route Table

ospfRouteGroup OBJECT IDENTIFIER ::= { ospf 13 }

-- The IP Forwarding Table defines a number of objects for use by
-- the routing protocol to externalize its information. Most of

```

--      the variables (ipForwardDest, ipForwardMask, ipForwardPolicy,
--      ipForwardNextHop, ipForwardIfIndex, ipForwardType,
--      ipForwardProto, ipForwardAge, and ipForwardNextHopAS) are
--      defined there.

--      Those that leave some discretion are defined here.

--      ipCidrRouteProto is, of course, ospf (13).

--      ipCidrRouteAge is the time since the route was first
--      calculated, as opposed to the time since the last SPF run.
--      ipCidrRouteInfo is an OBJECT IDENTIFIER for use by the routing
--      protocol. The following values shall be found there depending
--      on the way the route was calculated.

ospfIntraArea      OBJECT IDENTIFIER ::= { ospfRouteGroup 1 }
ospfInterArea      OBJECT IDENTIFIER ::= { ospfRouteGroup 2 }
ospfExternalType1  OBJECT IDENTIFIER ::= { ospfRouteGroup 3 }
ospfExternalType2  OBJECT IDENTIFIER ::= { ospfRouteGroup 4 }

--      ipCidrRouteMetric1 is, by definition, the primary routing
--      metric. Therefore, it should be the metric that route
--      selection is based on. For intra-area and inter-area routes,
--      it is an OSPF metric. For External Type 1 (comparable value)
--      routes, it is an OSPF metric plus the External Metric. For
--      external Type 2 (non-comparable value) routes, it is the
--      external metric.

--      ipCidrRouteMetric2 is, by definition, a secondary routing
--      metric. Therefore, it should be the metric that breaks a tie
--      among routes having equal metric1 values and the same
--      calculation rule. For intra-area, inter-area routes, and
--      External Type 1 (comparable value) routes, it is unused. For
--      External Type 2 (non-comparable value) routes, it is the metric
--      to the AS border router.

--      ipCidrRouteMetric3, ipCidrRouteMetric4, and ipCidrRouteMetric5
--      are unused.

--      The OSPF Area Aggregate Table
--
--      This table replaces the OSPF Area Summary Table, being an
--      extension of that for CIDR routers.

ospfAreaAggregateTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF OspfAreaAggregateEntry
    MAX-ACCESS  not-accessible
    STATUS      current

```

DESCRIPTION

"The Area Aggregate Table acts as an adjunct to the Area Table. It describes those address aggregates that are configured to be propagated from an area. Its purpose is to reduce the amount of information that is known beyond an Area's borders.

It contains a set of IP address ranges specified by an IP address/IP network mask pair. For example, a 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.

Note that if ranges are configured such that one range subsumes another range (e.g., 10.0.0.0 mask 255.0.0.0 and 10.1.0.0 mask 255.255.0.0), the most specific match is the preferred one."

REFERENCE

"OSPF Version 2, Appendix C.2 Area parameters"
 ::= { ospf 14 }

ospfAreaAggregateEntry OBJECT-TYPE

SYNTAX OspfAreaAggregateEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"A single area aggregate entry.

Information in this table is persistent and when this object is written the entity SHOULD save the change to non-volatile storage."

REFERENCE

"OSPF Version 2, Appendix C.2 Area parameters"

INDEX { ospfAreaAggregateAreaID, ospfAreaAggregateLsdbType,
 ospfAreaAggregateNet, ospfAreaAggregateMask }

::= { ospfAreaAggregateTable 1 }

OspfAreaAggregateEntry ::=

SEQUENCE {

ospfAreaAggregateAreaID
 AreaID,

ospfAreaAggregateLsdbType
 INTEGER,

ospfAreaAggregateNet
 IPAddress,

ospfAreaAggregateMask
 IPAddress,

ospfAreaAggregateStatus

```

        RowStatus,
ospfAreaAggregateEffect
    INTEGER,
ospfAreaAggregateExtRouteTag
    Unsigned32
}

```

ospfAreaAggregateAreaID OBJECT-TYPE

```

SYNTAX      AreaID
MAX-ACCESS  read-only -- read-only since originally an
                        -- SMIV1 index

STATUS      current
DESCRIPTION
    "The area within which the address aggregate is to be
    found."
REFERENCE
    "OSPF Version 2, Appendix C.2 Area parameters"
::= { ospfAreaAggregateEntry 1 }

```

ospfAreaAggregateLsdbType OBJECT-TYPE

```

SYNTAX      INTEGER {
                    summaryLink (3),
                    nssaExternalLink (7)
                }
MAX-ACCESS  read-only -- read-only since originally an
                        -- SMIV1 index

STATUS      current
DESCRIPTION
    "The type of the address aggregate. This field
    specifies the Lsdb type that this address
    aggregate applies to."
REFERENCE
    "OSPF Version 2, Appendix A.4.1 The Link State
    Advertisement header"
::= { ospfAreaAggregateEntry 2 }

```

ospfAreaAggregateNet OBJECT-TYPE

```

SYNTAX      IpAddress
MAX-ACCESS  read-only -- read-only since originally an
                        -- SMIV1 index

STATUS      current
DESCRIPTION
    "The IP address of the net or subnet indicated
    by the range."
REFERENCE
    "OSPF Version 2, Appendix C.2 Area parameters"
::= { ospfAreaAggregateEntry 3 }

```

ospfAreaAggregateMask OBJECT-TYPE

SYNTAX IpAddress

MAX-ACCESS read-only -- read-only since originally an
-- SMIV1 index

STATUS current

DESCRIPTION

"The subnet mask that pertains to the net or
subnet."

REFERENCE

"OSPF Version 2, Appendix C.2 Area parameters"

::= { ospfAreaAggregateEntry 4 }

ospfAreaAggregateStatus OBJECT-TYPE

SYNTAX RowStatus

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"This object permits management of the table by
facilitating actions such as row creation,
construction, and destruction."The value of this object has no effect on
whether other objects in this conceptual row can be
modified."

::= { ospfAreaAggregateEntry 5 }

ospfAreaAggregateEffect OBJECT-TYPE

SYNTAX INTEGER {
advertiseMatching (1),
doNotAdvertiseMatching (2)
}

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"Subnets subsumed by ranges either trigger the
advertisement of the indicated aggregate
(advertiseMatching) or result in the subnet's not
being advertised at all outside the area."

DEFVAL { advertiseMatching }

::= { ospfAreaAggregateEntry 6 }

ospfAreaAggregateExtRouteTag OBJECT-TYPE

SYNTAX Unsigned32

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"External route tag to be included in NSSA (type-7)
LSAs."

```

DEFVAL { 0 }
::= { ospfAreaAggregateEntry 7 }

```

```
-- OSPF Link State Database, link-local for non-virtual links
```

```

ospfLocalLsdbTable OBJECT-TYPE
    SYNTAX          SEQUENCE OF OspfLocalLsdbEntry
    MAX-ACCESS      not-accessible
    STATUS          current
    DESCRIPTION
        "The OSPF Process's link-local link state database
        for non-virtual links.
        This table is identical to the OSPF LSDB Table
        in format, but contains only link-local Link State
        Advertisements for non-virtual links. The purpose is
        to allow link-local LSAs to be displayed for each
        non-virtual interface. This table is implemented to
        support type-9 LSAs that are defined
        in 'The OSPF Opaque LSA Option'."
    REFERENCE
        "OSPF Version 2, Section 12 Link State Advertisements
        and The OSPF Opaque LSA Option"
    ::= { ospf 17 }

ospfLocalLsdbEntry OBJECT-TYPE
    SYNTAX          OspfLocalLsdbEntry
    MAX-ACCESS      not-accessible
    STATUS          current
    DESCRIPTION
        "A single link state advertisement."
    INDEX { ospfLocalLsdbIpAddress, ospfLocalLsdbAddressLessIf,
            ospfLocalLsdbType, ospfLocalLsdbLsid, ospfLocalLsdbRouterId
            }
    ::= { ospfLocalLsdbTable 1 }

OspfLocalLsdbEntry ::=
    SEQUENCE {
        ospfLocalLsdbIpAddress
            IpAddress,
        ospfLocalLsdbAddressLessIf
            InterfaceIndexOrZero,
        ospfLocalLsdbType
            INTEGER,
        ospfLocalLsdbLsid
            IpAddress,
        ospfLocalLsdbRouterId
            RouterID,

```

```
    ospfLocalLsdbSequence
        Integer32,
    ospfLocalLsdbAge
        Integer32,
    ospfLocalLsdbChecksum
        Integer32,
    ospfLocalLsdbAdvertisement
        OCTET STRING
    }

ospfLocalLsdbIpAddress OBJECT-TYPE
    SYNTAX      IpAddress
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
        "The IP address of the interface from
        which the LSA was received if the interface is
        numbered."
    REFERENCE
        "OSPF Version 2, Appendix C.3 Interface parameters"
    ::= { ospfLocalLsdbEntry 1 }

ospfLocalLsdbAddressLessIf OBJECT-TYPE
    SYNTAX      InterfaceIndexOrZero
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
        "The interface index of the interface from
        which the LSA was received if the interface is
        unnumbered."
    REFERENCE
        "OSPF Version 2, Appendix C.3 Interface parameters"
    ::= { ospfLocalLsdbEntry 2 }

ospfLocalLsdbType OBJECT-TYPE
    SYNTAX      INTEGER { localOpaqueLink (9) }
    MAX-ACCESS   not-accessible
    STATUS       current
    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"
    ::= { ospfLocalLsdbEntry 3 }

ospfLocalLsdbLsid OBJECT-TYPE
```

SYNTAX IpAddress
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION
 "The Link State ID is an LS Type Specific field
 containing a 32-bit identifier in IP address format;
 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"
 ::= { ospfLocalLsdbEntry 4 }

ospfLocalLsdbRouterId OBJECT-TYPE

SYNTAX RouterID
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION
 "The 32-bit number that uniquely identifies the
 originating router in the Autonomous System."
 REFERENCE
 "OSPF Version 2, Appendix C.1 Global parameters"
 ::= { ospfLocalLsdbEntry 5 }

ospfLocalLsdbSequence OBJECT-TYPE

SYNTAX Integer32
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION
 "The sequence number field is a signed 32-bit
 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.
 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"
 ::= { ospfLocalLsdbEntry 6 }

ospfLocalLsdbAge OBJECT-TYPE

SYNTAX Integer32 -- Should be 0..MaxAge, except when
 -- doNotAge bit is set
 UNITS "seconds"
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION

"This field is the age of the link state advertisement in seconds."

REFERENCE

"OSPF Version 2, Section 12.1.1 LS age"

::= { ospfLocalLsdbEntry 7 }

ospfLocalLsdbChecksum OBJECT-TYPE

SYNTAX Integer32

MAX-ACCESS read-only

STATUS current

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"

::= { ospfLocalLsdbEntry 8 }

ospfLocalLsdbAdvertisement OBJECT-TYPE

SYNTAX OCTET STRING (SIZE (1..65535))

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The entire link state advertisement, including its header."

Note that for variable length LSAs, SNMP agents may not be able to return the largest string size."

REFERENCE

"OSPF Version 2, Section 12 Link State Advertisements"

::= { ospfLocalLsdbEntry 9 }

-- OSPF Link State Database, link-local for virtual Links

ospfVirtLocalLsdbTable OBJECT-TYPE

SYNTAX SEQUENCE OF OspfVirtLocalLsdbEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The OSPF Process's link-local link state database for virtual links."

This table is identical to the OSPF LSDB Table in format, but contains only link-local Link State Advertisements for virtual links. The purpose is to allow link-local LSAs to be displayed for each virtual interface. This table is implemented to support type-9 LSAs that are defined in 'The OSPF Opaque LSA Option'."

REFERENCE

"OSPF Version 2, Section 12 Link State Advertisements and The OSPF Opaque LSA Option"

::= { ospf 18 }

ospfVirtLocalLsdbEntry OBJECT-TYPE

SYNTAX OspfVirtLocalLsdbEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"A single link state advertisement."

INDEX { ospfVirtLocalLsdbTransitArea,
ospfVirtLocalLsdbNeighbor,
ospfVirtLocalLsdbType,
ospfVirtLocalLsdbLsid,
ospfVirtLocalLsdbRouterId
}

::= { ospfVirtLocalLsdbTable 1 }

OspfVirtLocalLsdbEntry ::=

```
SEQUENCE {
    ospfVirtLocalLsdbTransitArea
        AreaID,
    ospfVirtLocalLsdbNeighbor
        RouterID,
    ospfVirtLocalLsdbType
        INTEGER,
    ospfVirtLocalLsdbLsid
        IpAddress,
    ospfVirtLocalLsdbRouterId
        RouterID,
    ospfVirtLocalLsdbSequence
        Integer32,
    ospfVirtLocalLsdbAge
        Integer32,
    ospfVirtLocalLsdbChecksum
        Integer32,
    ospfVirtLocalLsdbAdvertisement
        OCTET STRING
}
```

ospfVirtLocalLsdbTransitArea OBJECT-TYPE

```

SYNTAX          AreaID
MAX-ACCESS      not-accessible
STATUS          current
DESCRIPTION
    "The transit area that the virtual link
    traverses.  By definition, this is not 0.0.0.0."
REFERENCE
    "OSPF Version 2, Appendix C.3 Interface parameters"
::= { ospfVirtLocalLsdbEntry 1 }

```

ospfVirtLocalLsdbNeighbor OBJECT-TYPE

```

SYNTAX          RouterID
MAX-ACCESS      not-accessible
STATUS          current
DESCRIPTION
    "The Router ID of the virtual neighbor."
REFERENCE
    "OSPF Version 2, Appendix C.3 Interface parameters"
::= { ospfVirtLocalLsdbEntry 2 }

```

ospfVirtLocalLsdbType OBJECT-TYPE

```

SYNTAX          INTEGER { localOpaqueLink (9) }
MAX-ACCESS      not-accessible
STATUS          current
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"
::= { ospfVirtLocalLsdbEntry 3 }

```

ospfVirtLocalLsdbLsid OBJECT-TYPE

```

SYNTAX          IpAddress
MAX-ACCESS      not-accessible
STATUS          current
DESCRIPTION
    "The Link State ID is an LS Type Specific field
    containing a 32-bit identifier in IP address format;
    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"
::= { ospfVirtLocalLsdbEntry 4 }

```

ospfVirtLocalLsdbRouterId OBJECT-TYPE

```

SYNTAX          RouterID

```

MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION
 "The 32-bit number that uniquely identifies the
 originating router in the Autonomous System."
 REFERENCE
 "OSPF Version 2, Appendix C.1 Global parameters"
 ::= { ospfVirtLocalLsdbEntry 5 }

ospfVirtLocalLsdbSequence OBJECT-TYPE

SYNTAX Integer32
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION
 "The sequence number field is a signed 32-bit
 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.
 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"
 ::= { ospfVirtLocalLsdbEntry 6 }

ospfVirtLocalLsdbAge OBJECT-TYPE

SYNTAX Integer32 -- Should be 0..MaxAge, except when
 -- doNotAge bit is set
 UNITS "seconds"
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION
 "This field is the age of the link state
 advertisement in seconds."
 REFERENCE
 "OSPF Version 2, Section 12.1.1 LS age"
 ::= { ospfVirtLocalLsdbEntry 7 }

ospfVirtLocalLsdbChecksum OBJECT-TYPE

SYNTAX Integer32
 MAX-ACCESS read-only
 STATUS current
 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"
 ::= { ospfVirtLocalLsdbEntry 8 }

ospfVirtLocalLsdbAdvertisement OBJECT-TYPE

SYNTAX OCTET STRING (SIZE (1..65535))

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The entire link state advertisement, including its header."

REFERENCE

"OSPF Version 2, Section 12 Link State Advertisements."

Note that for variable length LSAs, SNMP agents may not be able to return the largest string size."
 ::= { ospfVirtLocalLsdbEntry 9 }

-- OSPF Link State Database, AS-scope

ospfAsLsdbTable OBJECT-TYPE

SYNTAX SEQUENCE OF OspfAsLsdbEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The OSPF Process's AS-scope LSA link state database. The database contains the AS-scope Link State Advertisements from throughout the areas that the device is attached to."

This table is identical to the OSPF LSDB Table in format, but contains only AS-scope Link State Advertisements. The purpose is to allow AS-scope LSAs to be displayed once for the router rather than once in each non-stub area."

REFERENCE

"OSPF Version 2, Section 12 Link State Advertisements"
 ::= { ospf 19 }

ospfAsLsdbEntry OBJECT-TYPE

SYNTAX OspfAsLsdbEntry

```

MAX-ACCESS    not-accessible
STATUS        current
DESCRIPTION
    "A single link state advertisement."
INDEX { ospfAsLsdbType, ospfAsLsdbLsid, ospfAsLsdbRouterId }
::= { ospfAsLsdbTable 1 }

```

```

OspfAsLsdbEntry ::=
SEQUENCE {
    ospfAsLsdbType
        INTEGER,
    ospfAsLsdbLsid
        IPAddress,
    ospfAsLsdbRouterId
        RouterID,
    ospfAsLsdbSequence
        Integer32,
    ospfAsLsdbAge
        Integer32,
    ospfAsLsdbChecksum
        Integer32,
    ospfAsLsdbAdvertisement
        OCTET STRING
}

```

```

ospfAsLsdbType OBJECT-TYPE
SYNTAX        INTEGER {
                    asExternalLink (5),
                    asOpaqueLink   (11)
                }
MAX-ACCESS    not-accessible
STATUS        current
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"
::= { ospfAsLsdbEntry 1 }

```

```

ospfAsLsdbLsid OBJECT-TYPE
SYNTAX        IPAddress
MAX-ACCESS    not-accessible
STATUS        current
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"

::= { ospfAsLsdbEntry 2 }

ospfAsLsdbRouterId OBJECT-TYPE

SYNTAX RouterID

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The 32-bit number that uniquely identifies the originating router in the Autonomous System."

REFERENCE

"OSPF Version 2, Appendix C.1 Global parameters"

::= { ospfAsLsdbEntry 3 }

ospfAsLsdbSequence OBJECT-TYPE

SYNTAX Integer32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The sequence number field is a signed 32-bit 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. 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"

::= { ospfAsLsdbEntry 4 }

ospfAsLsdbAge OBJECT-TYPE

SYNTAX Integer32 -- Should be 0..MaxAge, except when
-- doNotAge bit is set

UNITS "seconds"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This field is the age of the link state advertisement in seconds."

REFERENCE

"OSPF Version 2, Section 12.1.1 LS age"

::= { ospfAsLsdbEntry 5 }

ospfAsLsdbChecksum OBJECT-TYPE

SYNTAX Integer32
MAX-ACCESS read-only
STATUS current

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"
::= { ospfAsLsdbEntry 6 }

ospfAsLsdbAdvertisement OBJECT-TYPE

SYNTAX OCTET STRING (SIZE (1..65535))
MAX-ACCESS read-only
STATUS current

DESCRIPTION

"The entire link state advertisement, including its header."

REFERENCE

"OSPF Version 2, Section 12 Link State Advertisements."

Note that for variable length LSAs, SNMP agents may not be able to return the largest string size."
::= { ospfAsLsdbEntry 7 }

-- OSPF Area LSA Counter Table

ospfAreaLsaCountTable OBJECT-TYPE

SYNTAX SEQUENCE OF OspfAreaLsaCountEntry
MAX-ACCESS not-accessible
STATUS current

DESCRIPTION

"This table maintains per-area, per-LSA-type counters"
::= { ospf 20 }

ospfAreaLsaCountEntry OBJECT-TYPE

SYNTAX OspfAreaLsaCountEntry
MAX-ACCESS not-accessible
STATUS current

DESCRIPTION

"An entry with a number of link advertisements"

of a given type for a given area."
 INDEX { ospfAreaLsaCountAreaId, ospfAreaLsaCountLsaType }
 ::= { ospfAreaLsaCountTable 1 }

OspfAreaLsaCountEntry ::=
 SEQUENCE {
 ospfAreaLsaCountAreaId
 AreaID,
 ospfAreaLsaCountLsaType
 INTEGER,
 ospfAreaLsaCountNumber
 Gauge32
 }

ospfAreaLsaCountAreaId OBJECT-TYPE
 SYNTAX AreaID
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION
 "This entry Area ID."
 ::= { ospfAreaLsaCountEntry 1 }

ospfAreaLsaCountLsaType OBJECT-TYPE
 SYNTAX INTEGER {
 routerLink (1),
 networkLink (2),
 summaryLink (3),
 asSummaryLink (4),
 multicastLink (6),
 nssaExternalLink (7),
 areaOpaqueLink (10)
 }
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION
 "This entry LSA type."
 ::= { ospfAreaLsaCountEntry 2 }

ospfAreaLsaCountNumber OBJECT-TYPE
 SYNTAX Gauge32
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION
 "Number of LSAs of a given type for a given area."
 ::= { ospfAreaLsaCountEntry 3 }

-- conformance information

```

ospfConformance OBJECT IDENTIFIER ::= { ospf 15 }

ospfGroups          OBJECT IDENTIFIER ::= { ospfConformance 1 }
ospfCompliances     OBJECT IDENTIFIER ::= { ospfConformance 2 }

-- compliance statements

ospfCompliance MODULE-COMPLIANCE
    STATUS          deprecated
    DESCRIPTION
        "The compliance statement for OSPF systems
        conforming to RFC 1850."
    MODULE          -- this module
    MANDATORY-GROUPS {
        ospfBasicGroup,
        ospfAreaGroup,
        ospfStubAreaGroup,
        ospfIfGroup,
        ospfIfMetricGroup,
        ospfVirtIfGroup,
        ospfNbrGroup,
        ospfVirtNbrGroup,
        ospfAreaAggregateGroup
    }
    GROUP ospfHostGroup
    DESCRIPTION
        "This group is mandatory for OSPF systems that support
        attached hosts."
    GROUP ospfLsdbGroup
    DESCRIPTION
        "This group is mandatory for OSPF systems that display
        their per-area link state database."
    GROUP ospfExtLsdbGroup
    DESCRIPTION
        "This group is mandatory for OSPF systems that display
        their external link state database."
    ::= { ospfCompliances 1 }

ospfCompliance2 MODULE-COMPLIANCE
    STATUS          current
    DESCRIPTION
        "The compliance statement."
    MODULE          -- this module
    MANDATORY-GROUPS {
        ospfBasicGroup2,
        ospfAreaGroup2,
        ospfStubAreaGroup,
        ospfIfGroup2,

```

```

    ospfIfMetricGroup,
    ospfVirtIfGroup2,
    ospfNbrGroup2,
    ospfVirtNbrGroup2,
    ospfAreaAggregateGroup2
  }
GROUP ospfHostGroup2
  DESCRIPTION
    "This group is mandatory for OSPF systems that support
    attached hosts."
GROUP ospfLsdbGroup
  DESCRIPTION
    "This group is mandatory for OSPF systems that display
    their per-area link state database."
GROUP ospfAsLsdbGroup
  DESCRIPTION
    "This group is mandatory for OSPF systems that display
    their AS-scope link state database."
GROUP ospfLocalLsdbGroup
  DESCRIPTION
    "This group is mandatory for OSPF systems that display
    their per-link link state database for non-virtual
    links."
GROUP ospfVirtLocalLsdbGroup
  DESCRIPTION
    "This group is mandatory for OSPF systems that display
    their per-link link state database for virtual links."
GROUP ospfAreaLsaCountGroup
  DESCRIPTION
    "This group is mandatory for OSPF systems that display
    per-area, per-LSA-type counters."
::= { ospfCompliances 2 }

ospfComplianceObsolete MODULE-COMPLIANCE
  STATUS      obsolete
  DESCRIPTION
    "Contains obsolete object groups."
  MODULE      -- this module
  GROUP ospfAreaRangeGroup
    DESCRIPTION
      "This group is obsolete, and it is mandatory only
      for non-Classless Inter-Domain Routing (CIDR) OSPF
      systems that support multiple areas."
  GROUP ospfObsoleteGroup
    DESCRIPTION
      "This group contains obsolete objects,
      which are no longer required for OSPF systems."
  ::= { ospfCompliances 3 }

```

-- units of conformance

```
ospfBasicGroup      OBJECT-GROUP
  OBJECTS {
    ospfRouterId,
    ospfAdminStat,
    ospfVersionNumber,
    ospfAreaBdrRtrStatus,
    ospfASBdrRtrStatus,
    ospfExternLsaCount,
    ospfExternLsaCksumSum,
    ospfTOSSupport,
    ospfOriginateNewLsas,
    ospfRxNewLsas,
    ospfExtLsdbLimit,
    ospfMulticastExtensions,
    ospfExitOverflowInterval,
    ospfDemandExtensions
  }
  STATUS      deprecated
  DESCRIPTION
    "These objects are used to monitor/manage
    global OSPF parameters.  This object group
    conforms to RFC 1850."
    ::= { ospfGroups 1 }

ospfAreaGroup       OBJECT-GROUP
  OBJECTS {
    ospfAreaId,
    ospfImportAsExtern,
    ospfSpfRuns,
    ospfAreaBdrRtrCount,
    ospfAsBdrRtrCount,
    ospfAreaLsaCount,
    ospfAreaLsaCksumSum,
    ospfAreaSummary,
    ospfAreaStatus
  }
  STATUS      deprecated
  DESCRIPTION
    "These objects are used for OSPF systems
    supporting areas per RFC 1850."
    ::= { ospfGroups 2 }

ospfStubAreaGroup   OBJECT-GROUP
  OBJECTS {
    ospfStubAreaId,
    ospfStubTOS,
```

```
        ospfStubMetric,
        ospfStubStatus,
        ospfStubMetricType
    }
    STATUS          current
    DESCRIPTION
        "These objects are used for OSPF systems
        supporting stub areas."
    ::= { ospfGroups 3 }

ospfLsdbGroup      OBJECT-GROUP
    OBJECTS {
        ospfLsdbAreaId,
        ospfLsdbType,
        ospfLsdbLsid,
        ospfLsdbRouterId,
        ospfLsdbSequence,
        ospfLsdbAge,
        ospfLsdbChecksum,
        ospfLsdbAdvertisement
    }
    STATUS          current
    DESCRIPTION
        "These objects are used for OSPF systems
        that display their link state database."
    ::= { ospfGroups 4 }

ospfAreaRangeGroup OBJECT-GROUP
    OBJECTS {
        ospfAreaRangeAreaId,
        ospfAreaRangeNet,
        ospfAreaRangeMask,
        ospfAreaRangeStatus,
        ospfAreaRangeEffect
    }
    STATUS          obsolete
    DESCRIPTION
        "These objects are used for non-CIDR OSPF
        systems that support multiple areas.  This
        object group is obsolete."
    ::= { ospfGroups 5 }

ospfHostGroup      OBJECT-GROUP
    OBJECTS {
        ospfHostIpAddress,
        ospfHostTOS,
        ospfHostMetric,
        ospfHostStatus,
```

```
        ospfHostAreaID
    }
    STATUS          deprecated
    DESCRIPTION
        "These objects are used for OSPF systems
        that support attached hosts."
    ::= { ospfGroups 6 }

ospfIfGroup      OBJECT-GROUP
    OBJECTS {
        ospfIfIpAddress,
        ospfAddressLessIf,
        ospfIfAreaId,
        ospfIfType,
        ospfIfAdminStat,
        ospfIfRtrPriority,
        ospfIfTransitDelay,
        ospfIfRetransInterval,
        ospfIfHelloInterval,
        ospfIfRtrDeadInterval,
        ospfIfPollInterval,
        ospfIfState,
        ospfIfDesignatedRouter,
        ospfIfBackupDesignatedRouter,
        ospfIfEvents,
        ospfIfAuthType,
        ospfIfAuthKey,
        ospfIfStatus,
        ospfIfMulticastForwarding,
        ospfIfDemand
    }
    STATUS          deprecated
    DESCRIPTION
        "These objects are used to monitor/manage OSPF
        interfaces.  This object group conforms to RFC 1850."
    ::= { ospfGroups 7 }

ospfIfMetricGroup  OBJECT-GROUP
    OBJECTS {
        ospfIfMetricIpAddress,
        ospfIfMetricAddressLessIf,
        ospfIfMetricTOS,
        ospfIfMetricValue,
        ospfIfMetricStatus
    }
    STATUS          current
    DESCRIPTION
        "These objects are used for OSPF systems for supporting
```

```
    interface metrics."
 ::= { ospfGroups 8 }

ospfVirtIfGroup      OBJECT-GROUP
OBJECTS {
    ospfVirtIfAreaId,
    ospfVirtIfNeighbor,
    ospfVirtIfTransitDelay,
    ospfVirtIfRetransInterval,
    ospfVirtIfHelloInterval,
    ospfVirtIfRtrDeadInterval,
    ospfVirtIfState,
    ospfVirtIfEvents,
    ospfVirtIfAuthType,
    ospfVirtIfAuthKey,
    ospfVirtIfStatus
}
STATUS      deprecated
DESCRIPTION
    "These objects are used for OSPF systems for supporting
    virtual interfaces.  This object group conforms
    to RFC 1850."
 ::= { ospfGroups 9 }

ospfNbrGroup        OBJECT-GROUP
OBJECTS {
    ospfNbrIpAddress,
    ospfNbrAddressLessIndex,
    ospfNbrRtrId,
    ospfNbrOptions,
    ospfNbrPriority,
    ospfNbrState,
    ospfNbrEvents,
    ospfNbrLsRetransQLen,
    ospfNbmaNbrStatus,
    ospfNbmaNbrPermanence,
    ospfNbrHelloSuppressed
}
STATUS      deprecated
DESCRIPTION
    "These objects are used to monitor/manage OSPF neighbors.
    This object group conforms to RFC 1850."
 ::= { ospfGroups 10 }

ospfVirtNbrGroup     OBJECT-GROUP
OBJECTS {
    ospfVirtNbrArea,
    ospfVirtNbrRtrId,
```

```
    ospfVirtNbrIpAddress,
    ospfVirtNbrOptions,
    ospfVirtNbrState,
    ospfVirtNbrEvents,
    ospfVirtNbrLsRetransQLen,
    ospfVirtNbrHelloSuppressed
  }
STATUS      deprecated
DESCRIPTION
  "These objects are used to monitor/manage OSPF virtual
  neighbors.  This object group conforms to RFC 1850."

 ::= { ospfGroups 11 }
```

```
ospfExtLsdbGroup      OBJECT-GROUP
OBJECTS {
    ospfExtLsdbType,
    ospfExtLsdbLsid,
    ospfExtLsdbRouterId,
    ospfExtLsdbSequence,
    ospfExtLsdbAge,
    ospfExtLsdbChecksum,
    ospfExtLsdbAdvertisement
}
STATUS      deprecated
DESCRIPTION
  "These objects are used for OSPF systems that display
  their link state database.  This object group
  conforms to RFC 1850.

  This object group is replaced by the ospfAsLsdbGroup
  in order to support any AS-scope LSA type in a single
  table."
 ::= { ospfGroups 12 }
```

```
ospfAreaAggregateGroup  OBJECT-GROUP
OBJECTS {
    ospfAreaAggregateAreaID,
    ospfAreaAggregateLsdbType,
    ospfAreaAggregateNet,
    ospfAreaAggregateMask,
    ospfAreaAggregateStatus,
    ospfAreaAggregateEffect
}
STATUS      deprecated
DESCRIPTION
  "These objects are used for OSPF systems to support
  network prefix aggregation across areas."
```



```
 ::= { ospfGroups 13 }

ospfLocalLsdbGroup      OBJECT-GROUP
  OBJECTS {
    ospfLocalLsdbSequence,
    ospfLocalLsdbAge,
    ospfLocalLsdbChecksum,
    ospfLocalLsdbAdvertisement
  }
  STATUS      current
  DESCRIPTION
    "These objects are used for OSPF systems
     that display their link-local link state databases
     for non-virtual links."
  ::= { ospfGroups 14 }

ospfVirtLocalLsdbGroup  OBJECT-GROUP
  OBJECTS {
    ospfVirtLocalLsdbSequence,
    ospfVirtLocalLsdbAge,
    ospfVirtLocalLsdbChecksum,
    ospfVirtLocalLsdbAdvertisement
  }
  STATUS      current
  DESCRIPTION
    "These objects are used for OSPF systems
     that display their link-local link state databases
     for virtual links."
  ::= { ospfGroups 15 }

ospfAsLsdbGroup        OBJECT-GROUP
  OBJECTS {
    ospfAsLsdbSequence,
    ospfAsLsdbAge,
    ospfAsLsdbChecksum,
    ospfAsLsdbAdvertisement
  }
  STATUS      current
  DESCRIPTION
    "These objects are used for OSPF systems
     that display their AS-scope link state database."
  ::= { ospfGroups 16 }

ospfBasicGroup2        OBJECT-GROUP
  OBJECTS {
    ospfRouterId,
    ospfAdminStat,
    ospfVersionNumber,
```

```

    ospfAreaBdrRtrStatus,
    ospfASBdrRtrStatus,
    ospfExternLsaCount,
    ospfExternLsaCksumSum,
    ospfTOSSupport,
    ospfOriginateNewLsas,
    ospfRxNewLsas,
    ospfExtLsdbLimit,
    ospfMulticastExtensions,
    ospfExitOverflowInterval,
    ospfDemandExtensions,
    ospfRFC1583Compatibility,
    ospfOpaqueLsaSupport,
    ospfReferenceBandwidth,
    ospfRestartSupport,
    ospfRestartInterval,
    ospfRestartStrictLsaChecking,
    ospfRestartStatus,
    ospfRestartAge,
    ospfRestartExitReason,
    ospfAsLsaCount,
    ospfAsLsaCksumSum,
    ospfStubRouterSupport,
    ospfStubRouterAdvertisement,
    ospfDiscontinuityTime
  }
STATUS          current
DESCRIPTION
  "These objects are used to monitor/manage OSPF global
  parameters."
 ::= { ospfGroups 17 }

```

```

ospfAreaGroup2    OBJECT-GROUP
  OBJECTS {
    ospfAreaId,
    ospfImportAsExtern,
    ospfSpfRuns,
    ospfAreaBdrRtrCount,
    ospfAsBdrRtrCount,
    ospfAreaLsaCount,
    ospfAreaLsaCksumSum,
    ospfAreaSummary,
    ospfAreaStatus,
    ospfAreaNssaTranslatorRole,
    ospfAreaNssaTranslatorState,
    ospfAreaNssaTranslatorStabilityInterval,
    ospfAreaNssaTranslatorEvents
  }

```

```
STATUS          current
DESCRIPTION
    "These objects are used by OSPF systems
    to support areas."
 ::= { ospfGroups 18 }
```

```
ospfIfGroup2     OBJECT-GROUP
```

```
OBJECTS {
    ospfIfIpAddress,
    ospfAddressLessIf,
    ospfIfAreaId,
    ospfIfType,
    ospfIfAdminStat,
    ospfIfRtrPriority,
    ospfIfTransitDelay,
    ospfIfRetransInterval,
    ospfIfHelloInterval,
    ospfIfRtrDeadInterval,
    ospfIfPollInterval,
    ospfIfState,
    ospfIfDesignatedRouter,
    ospfIfBackupDesignatedRouter,
    ospfIfEvents,
    ospfIfAuthType,
    ospfIfAuthKey,
    ospfIfStatus,
    ospfIfMulticastForwarding,
    ospfIfDemand,
    ospfIfLsaCount,
    ospfIfLsaCksumSum
}
```

```
STATUS          current
DESCRIPTION
    "These objects are used to monitor/manage OSPF interfaces."
 ::= { ospfGroups 19 }
```

```
ospfVirtIfGroup2 OBJECT-GROUP
```

```
OBJECTS {
    ospfVirtIfAreaId,
    ospfVirtIfNeighbor,
    ospfVirtIfTransitDelay,
    ospfVirtIfRetransInterval,
    ospfVirtIfHelloInterval,
    ospfVirtIfRtrDeadInterval,
    ospfVirtIfState,
    ospfVirtIfEvents,
    ospfVirtIfAuthType,
    ospfVirtIfAuthKey,
```

```

        ospfVirtIfStatus,
        ospfVirtIfLsaCount,
        ospfVirtIfLsaCksumSum,
        ospfIfDesignatedRouterId,
        ospfIfBackupDesignatedRouterId
    }
STATUS          current
DESCRIPTION
    "These objects are used to monitor/manage OSPF
    virtual interfaces."
::= { ospfGroups 20 }

ospfNbrGroup2    OBJECT-GROUP
OBJECTS {
    ospfNbrIpAddress,
    ospfNbrAddressLessIndex,
    ospfNbrRtrId,
    ospfNbrOptions,
    ospfNbrPriority,
    ospfNbrState,
    ospfNbrEvents,
    ospfNbrLsRetransQLen,
    ospfNbmaNbrStatus,
    ospfNbmaNbrPermanence,
    ospfNbrHelloSuppressed,
    ospfNbrRestartHelperStatus,
    ospfNbrRestartHelperAge,
    ospfNbrRestartHelperExitReason
}
STATUS          current
DESCRIPTION
    "These objects are used to monitor/manage OSPF
    neighbors."
::= { ospfGroups 21 }

ospfVirtNbrGroup2    OBJECT-GROUP
OBJECTS {
    ospfVirtNbrArea,
    ospfVirtNbrRtrId,
    ospfVirtNbrIpAddress,
    ospfVirtNbrOptions,
    ospfVirtNbrState,
    ospfVirtNbrEvents,
    ospfVirtNbrLsRetransQLen,
    ospfVirtNbrHelloSuppressed,
    ospfVirtNbrRestartHelperStatus,
    ospfVirtNbrRestartHelperAge,
    ospfVirtNbrRestartHelperExitReason

```

```

    }
    STATUS          current
    DESCRIPTION
        "These objects are used to monitor/manage OSPF
        virtual neighbors."
    ::= { ospfGroups 22 }

```

```

ospfAreaAggregateGroup2    OBJECT-GROUP
    OBJECTS {
        ospfAreaAggregateAreaID,
        ospfAreaAggregateLsdbType,
        ospfAreaAggregateNet,
        ospfAreaAggregateMask,
        ospfAreaAggregateStatus,
        ospfAreaAggregateEffect,
        ospfAreaAggregateExtRouteTag
    }
    STATUS          current
    DESCRIPTION
        "These objects are used for OSPF systems to support
        network prefix aggregation across areas."
    ::= { ospfGroups 23 }

```

```

ospfAreaLsaCountGroup      OBJECT-GROUP
    OBJECTS {
        ospfAreaLsaCountNumber
    }
    STATUS          current
    DESCRIPTION
        "These objects are used for OSPF systems that display
        per-area, per-LSA-type counters."
    ::= { ospfGroups 24 }

```

```

ospfHostGroup2            OBJECT-GROUP
    OBJECTS {
        ospfHostIpAddress,
        ospfHostTOS,
        ospfHostMetric,
        ospfHostStatus,
        ospfHostCfgAreaID
    }
    STATUS          current
    DESCRIPTION
        "These objects are used for OSPF systems
        that support attached hosts."
    ::= { ospfGroups 25 }

```

-- This object group is included for SMI conformance. It is not a

```
--      mandatory group for compliance with this MIB

ospfObsoleteGroup      OBJECT-GROUP
    OBJECTS {
        ospfAuthType
    }
    STATUS      obsolete
    DESCRIPTION
        "These objects are obsolete and are no longer required for
        OSPF systems.  They are placed into this group for SMI
        conformance."
    ::= { ospfGroups 26 }
```

END

4. OSPF Trap Overview

4.1. Introduction

OSPF is an event-driven routing protocol, where an event can be a change in an OSPF interface's link-level status, the expiration of an OSPF timer, or the reception of an OSPF protocol packet. Many of the actions that OSPF takes as a result of these events will result in a change of the routing topology.

As routing topologies become large and complex, it is often difficult to locate the source of a topology change or unpredicted routing path by polling a large number of routers. Because of the difficulty of polling a large number of devices, a more prudent approach is for devices to notify a network manager of potentially critical OSPF events using SNMP traps.

This section defines a set of traps, objects, and mechanisms to enhance the ability to manage IP internetworks that use OSPF as their Interior Gateway Protocol (IGP). It is an optional but very useful extension to the OSPF MIB.

4.2. Approach

The mechanism for sending traps is straightforward. When an exception event occurs, the application notifies the local agent, who sends a trap to the appropriate SNMP management stations. The message includes the trap type and may include a list of trap-specific variables. Section 5 gives the trap definitions, which includes the variable lists. The Router ID of the originator of the trap is included in the variable list so that the network manager may easily determine the source of the trap.

To limit the frequency of OSPF traps, the following additional mechanisms are suggested.

4.3. Ignoring Initial Activity

The majority of critical events occur when OSPF is enabled on a router, at which time the designated router is elected and neighbor adjacencies are formed. During this initial period, a potential flood of traps is unnecessary since the events are expected. To avoid unnecessary traps, a router should not originate expected OSPF interface-related traps until two of that interface's dead timer intervals have elapsed. The expected OSPF interface traps are `ospfIfStateChange`, `ospfVirtIfStateChange`, `ospfNbrStateChange`, `ospfVirtNbrStateChange`, `ospfTxRetransmit`, and `ospfVirtIfTxRetransmit`. Additionally, `ospfMaxAgeLsa` and `ospfOriginateLsa` traps should not be originated until two dead timer intervals have elapsed where the dead timer interval used should be the dead timer with the smallest value.

4.4. Throttling Traps

The mechanism for throttling the traps is similar to the mechanism explained in RFC 1224 [RFC1224]. The basic premise of the throttling mechanism is that of a sliding window, defined in seconds and an upper bound on the number of traps that may be generated within this window. Note that unlike RFC 1224, traps are not sent to inform the network manager that the throttling mechanism has kicked in.

A single window should be used to throttle all OSPF trap types except for the `ospfLsdbOverflow` and the `ospfLsdbApproachingOverflow` traps, which should not be throttled. For example, with a window time of 3, an upper bound of 3, and events to cause trap types 1, 3, 5, and 7 (4 traps within a 3-second period), the type-7 (the 4th) trap should not be generated.

Appropriate values are 7 traps with a window time of 10 seconds.

4.5. One Trap Per OSPF Event

Several of the traps defined in section 5 are generated as the result of finding an unusual condition while parsing an OSPF packet or a processing a timer event. There may be more than one unusual condition detected while handling the event. For example, a link state update packet may contain several retransmitted link state advertisements (LSAs), or a retransmitted database description packet may contain several database description entries. To limit the number of traps and variables, OSPF should generate at most one trap per OSPF event. Only the variables associated with the first unusual condition should be included with the trap. Similarly, if more than one type of unusual condition is encountered while parsing the packet, only the first event will generate a trap.

4.6. Polling Event Counters

Many of the tables in the OSPF MIB contain generalized event counters. By enabling the traps defined in this document, a network manager can obtain more specific information about these events. A network manager may want to poll these event counters and enable specific OSPF traps when a particular counter starts increasing abnormally.

The following table shows the relationship between the event counters defined in the OSPF MIB and the trap types.

Counter32	Trap Type
-----	-----
ospfOriginateNewLsas	ospfOriginateLsa
ospfIfEvents	ospfIfStateChange
	ospfConfigError
	ospfIfAuthFailure
	ospfRxBadPacket
	ospfTxRetransmit
ospfVirtIfEvents	ospfVirtIfStateChange
	ospfVirtIfConfigError
	ospfVirtIfAuthFailure
	ospfVirtIfRxBadPacket
	ospfVirtIfTxRetransmit
ospfNbrEvents	ospfNbrStateChange
ospfVirtNbrEvents	ospfVirtNbrStateChange
ospfExternLSACount	ospfLsdbApproachingOverflow
ospfExternLSACount	ospfLsdbOverflow

4.7. Translating Notification Parameters

The definition of the OSPF notifications pre-dates the RFC 2578 [RFC2578] requirement of having a zero value for the penultimate sub-identifier for translating SNMPv2/SNMPv3 trap parameters to SNMPv1 trap parameters. RFC 3584 [RFC3584], section 3, defines the translation rules that can be implemented by intermediate proxy-agents or multi-lingual agents to convert SNMPv2/SNMPv3 notifications to SNMPv1 notifications and vice versa. The conversion is not reversible, that is, a conversion to one SNMP version and then back again will result in an incorrectly formatted version of the notification.

According to the rules specified in RFC 3584, section 3.1, translation of OSPF notifications from SNMPv1 to SNMPv2/SNMPv3 would result in the SNMPv2/SNMPv3 snmpTrapOID being the concatenation of the SNMPv1 'enterprise' parameter and two additional sub-identifiers, '0' and the SNMPv1 'specific-trap' parameter.

According to the rules specified in RFC 3584, section 3.2, translation of OSPF notifications from SNMPv2/SNMPv3 to SNMPv1, as the notifications are defined in this MIB, would result in the SNMPv1 'enterprise' parameter being set to the SNMPv2/SNMPv3 snmpTrapOID parameter value with the last sub-identifier removed and the 'specific-trap' parameter being set to the last sub-identifier of the SNMPv2/SNMPv3 snmpTrapOID parameter.

Note that a notification originated from an SNMPv1 agent will not be converted into the same notification that would be originated from a native SNMPv2/SNMPv3 agent.

4.8. Historical Artifacts

The MIB modules that are updated by this document were originally written in SMIV1 for SNMPv1 when only traps were used. Since this version of the MIB module is written in SMIV2, it should be understood that all types of notifications, trap and inform PDUs, may be used by native SNMPv2 and SNMPv3 agents, although only traps are mentioned. Also, for backwards compatibility, the OSPF Trap module remains rooted at {ospf 16}.

5. OSPF Trap Definitions

```
OSPF-TRAP-MIB DEFINITIONS ::= BEGIN
```

```
IMPORTS
```

```
    MODULE-IDENTITY, OBJECT-TYPE, NOTIFICATION-TYPE, IpAddress
    FROM SNMPv2-SMI
```

```
    MODULE-COMPLIANCE, OBJECT-GROUP, NOTIFICATION-GROUP
    FROM SNMPv2-CONF
```

```
    ospfRouterId, ospfIfIpAddress, ospfAddressLessIf, ospfIfState,
    ospfVirtIfAreaId, ospfVirtIfNeighbor, ospfVirtIfState,
    ospfNbrIpAddress, ospfNbrAddressLessIndex, ospfNbrRtrId,
    ospfNbrState, ospfVirtNbrArea, ospfVirtNbrRtrId,
    ospfVirtNbrState, ospfLsdbType, ospfLsdbLsid, ospfLsdbRouterId,
    ospfLsdbAreaId, ospfExtLsdbLimit, ospf, ospfAreaId,
    ospfAreaNssaTranslatorState, ospfRestartStatus,
    ospfRestartInterval, ospfRestartExitReason,
    ospfNbrRestartHelperStatus, ospfNbrRestartHelperAge,
    ospfNbrRestartHelperExitReason, ospfVirtNbrRestartHelperStatus,
    ospfVirtNbrRestartHelperAge, ospfVirtNbrRestartHelperExitReason
    FROM OSPF-MIB;
```

```
ospfTrap MODULE-IDENTITY
```

```
    LAST-UPDATED "200611100000Z" -- November 10, 2006 00:00:00 EST
    ORGANIZATION "IETF OSPF Working Group"
```

```
    CONTACT-INFO
```

```
        "WG E-Mail: ospf@ietf.org"
```

```
        WG Chairs: accee@cisco.com
                   rohit@gmail.com
```

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        Editors:  Dan Joyal
                   Nortel
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```
                   Piotr Galecki
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                   CSFB
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```

spencer.giacalone@gmail.com"

DESCRIPTION

"The MIB module to describe traps for the OSPF Version 2 Protocol.

Copyright (C) The IETF Trust (2006).

This version of this MIB module is part of RFC 4750; see the RFC itself for full legal notices."

REVISION "200611100000Z" -- November 10, 2006 00:00:00 EST

DESCRIPTION

"Updated for latest changes to OSPFv2:
 -added graceful restart related traps
 -added new config error types
 -added ospfNssaTranslatorStatusChange trap.
 See Appendix B of RFC 4750 for more details.

This version published as part of RFC 4750"

REVISION "199501201225Z" -- Fri Jan 20 12:25:50 PST 1995

DESCRIPTION

"The initial SMIV2 revision of this MIB module, published in RFC 1850."

::= { ospf 16 }

-- Trap Support Objects

-- The following are support objects for the OSPF traps.

ospfTrapControl OBJECT IDENTIFIER ::= { ospfTrap 1 }
 ospfTraps OBJECT IDENTIFIER ::= { ospfTrap 2 }

ospfSetTrap OBJECT-TYPE

SYNTAX OCTET STRING (SIZE(4))

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"A 4-octet string serving as a bit map for the trap events defined by the OSPF traps. This object is used to enable and disable specific OSPF traps where a 1 in the bit field represents enabled. The right-most bit (least significant) represents trap 0.

This object is persistent and when written

the entity SHOULD save the change to non-volatile storage."
 ::= { ospfTrapControl 1 }

ospfConfigErrorType OBJECT-TYPE

SYNTAX INTEGER {
 badVersion (1),
 areaMismatch (2),
 unknownNbmaNbr (3), -- Router is DR eligible
 unknownVirtualNbr (4),
 authTypeMismatch (5),
 authFailure (6),
 netMaskMismatch (7),
 helloIntervalMismatch (8),
 deadIntervalMismatch (9),
 optionMismatch (10),
 mtuMismatch (11),
 duplicateRouterId (12),
 noError (13) }

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Potential types of configuration conflicts.
Used by the ospfConfigError and
ospfConfigVirtError traps. When the last value
of a trap using this object is needed, but no
traps of that type have been sent, this value
pertaining to this object should be returned as
noError."

::= { ospfTrapControl 2 }

ospfPacketType OBJECT-TYPE

SYNTAX INTEGER {
 hello (1),
 dbDescript (2),
 lsReq (3),
 lsUpdate (4),
 lsAck (5),
 nullPacket (6) }

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"OSPF packet types. When the last value of a trap
using this object is needed, but no traps of
that type have been sent, this value pertaining
to this object should be returned as nullPacket."

::= { ospfTrapControl 3 }

```

ospfPacketSrc OBJECT-TYPE
    SYNTAX      IpAddress
    MAX-ACCESS   read-only
    STATUS      current
    DESCRIPTION
        "The IP address of an inbound packet that cannot
        be identified by a neighbor instance.  When
        the last value of a trap using this object is
        needed, but no traps of that type have been sent,
        this value pertaining to this object should
        be returned as 0.0.0.0."
    ::= { ospfTrapControl 4 }

-- Traps

ospfVirtIfStateChange NOTIFICATION-TYPE
    OBJECTS { ospfRouterId, -- The originator of the trap
              ospfVirtIfAreaId,
              ospfVirtIfNeighbor,
              ospfVirtIfState -- The new state
            }
    STATUS      current
    DESCRIPTION
        "An ospfVirtIfStateChange trap signifies that there
        has been a change in the state of an OSPF virtual
        interface.

        This trap should be generated when the interface
        state regresses (e.g., goes from Point-to-Point to Down)
        or progresses to a terminal state
        (i.e., Point-to-Point)."
```

```

    ::= { ospfTraps 1 }

ospfNbrStateChange NOTIFICATION-TYPE
    OBJECTS { ospfRouterId, -- The originator of the trap
              ospfNbrIpAddr,
              ospfNbrAddressLessIndex,
              ospfNbrRtrId,
              ospfNbrState -- The new state
            }
    STATUS      current
    DESCRIPTION
        "An ospfNbrStateChange trap signifies that
        there has been a change in the state of a
        non-virtual OSPF neighbor.  This trap should be
        generated when the neighbor state regresses
        (e.g., goes from Attempt or Full to 1-Way or
        Down) or progresses to a terminal state (e.g.,
```

2-Way or Full). When an neighbor transitions from or to Full on non-broadcast multi-access and broadcast networks, the trap should be generated by the designated router. A designated router transitioning to Down will be noted by ospfIfStateChange."

::= { ospfTraps 2 }

ospfVirtNbrStateChange NOTIFICATION-TYPE

OBJECTS { ospfRouterId, -- The originator of the trap
ospfVirtNbrArea,
ospfVirtNbrRtrId,
ospfVirtNbrState -- The new state
}

STATUS current

DESCRIPTION

"An ospfVirtNbrStateChange trap signifies that there has been a change in the state of an OSPF virtual neighbor. This trap should be generated when the neighbor state regresses (e.g., goes from Attempt or Full to 1-Way or Down) or progresses to a terminal state (e.g., Full)."

::= { ospfTraps 3 }

ospfIfConfigError NOTIFICATION-TYPE

OBJECTS { ospfRouterId, -- The originator of the trap
ospfIfIpAddress,
ospfAddressLessIf,
ospfPacketSrc, -- The source IP address
ospfConfigErrorType, -- Type of error
ospfPacketType
}

STATUS current

DESCRIPTION

"An ospfIfConfigError trap signifies that a packet has been received on a non-virtual interface from a router whose configuration parameters conflict with this router's configuration parameters. Note that the event optionMismatch should cause a trap only if it prevents an adjacency from forming."

::= { ospfTraps 4 }

ospfVirtIfConfigError NOTIFICATION-TYPE

OBJECTS { ospfRouterId, -- The originator of the trap
ospfVirtIfAreaId,
ospfVirtIfNeighbor,
ospfConfigErrorType, -- Type of error

```

        ospfPacketType
    }
STATUS          current
DESCRIPTION
    "An ospfVirtIfConfigError trap signifies that a
    packet has been received on a virtual interface
    from a router whose configuration parameters
    conflict with this router's configuration
    parameters. Note that the event optionMismatch
    should cause a trap only if it prevents an
    adjacency from forming."
 ::= { ospfTraps 5 }

ospfIfAuthFailure NOTIFICATION-TYPE
OBJECTS { ospfRouterId, -- The originator of the trap
          ospfIfIpAddress,
          ospfAddressLessIf,
          ospfPacketSrc, -- The source IP address
          ospfConfigErrorType, -- authTypeMismatch or
                                -- authFailure

          ospfPacketType
        }
STATUS          current
DESCRIPTION
    "An ospfIfAuthFailure trap signifies that a
    packet has been received on a non-virtual
    interface from a router whose authentication key
    or authentication type conflicts with this
    router's authentication key or authentication
    type."
 ::= { ospfTraps 6 }

ospfVirtIfAuthFailure NOTIFICATION-TYPE
OBJECTS { ospfRouterId, -- The originator of the trap
          ospfVirtIfAreaId,
          ospfVirtIfNeighbor,
          ospfConfigErrorType, -- authTypeMismatch or
                                -- authFailure

          ospfPacketType
        }
STATUS          current
DESCRIPTION
    "An ospfVirtIfAuthFailure trap signifies that a
    packet has been received on a virtual interface
    from a router whose authentication key or
    authentication type conflicts with this router's
    authentication key or authentication type."

```

```
::= { ospfTraps 7 }

ospfIfRxBadPacket NOTIFICATION-TYPE
  OBJECTS { ospfRouterId, -- The originator of the trap
            ospfIfIpAddress,
            ospfAddressLessIf,
            ospfPacketSrc, -- The source IP address
            ospfPacketType
          }
  STATUS      current
  DESCRIPTION
    "An ospfIfRxBadPacket trap signifies that an
    OSPF packet has been received on a non-virtual
    interface that cannot be parsed."
  ::= { ospfTraps 8 }

ospfVirtIfRxBadPacket NOTIFICATION-TYPE
  OBJECTS { ospfRouterId, -- The originator of the trap
            ospfVirtIfAreaId,
            ospfVirtIfNeighbor,
            ospfPacketType
          }
  STATUS      current
  DESCRIPTION
    "An ospfVirtIfRxBadPacket trap signifies that an OSPF
    packet has been received on a virtual interface
    that cannot be parsed."
  ::= { ospfTraps 9 }

ospfTxRetransmit NOTIFICATION-TYPE
  OBJECTS { ospfRouterId, -- The originator of the trap
            ospfIfIpAddress,
            ospfAddressLessIf,
            ospfNbrRtrId, -- Destination
            ospfPacketType,
            ospfLsdbType,
            ospfLsdbLsid,
            ospfLsdbRouterId
          }
  STATUS      current
  DESCRIPTION
    "An ospfTxRetransmit trap signifies that an
    OSPF packet has been retransmitted on a
    non-virtual interface. All packets that may be
    retransmitted are associated with an LSDB entry.
    The LS type, LS ID, and Router ID are used to
    identify the LSDB entry."
  ::= { ospfTraps 10 }
```



```
ospfVirtIfTxRetransmit NOTIFICATION-TYPE
  OBJECTS { ospfRouterId, -- The originator of the trap
             ospfVirtIfAreaId,
             ospfVirtIfNeighbor,
             ospfPacketType,
             ospfLsdbType,
             ospfLsdbLsid,
             ospfLsdbRouterId
           }
  STATUS      current
  DESCRIPTION
    "An ospfVirtIfTxRetransmit trap signifies that an
    OSPF packet has been retransmitted on a virtual
    interface. All packets that may be retransmitted
    are associated with an LSDB entry. The LS
    type, LS ID, and Router ID are used to identify
    the LSDB entry."
    ::= { ospfTraps 11 }

ospfOriginateLsa NOTIFICATION-TYPE
  OBJECTS { ospfRouterId, -- The originator of the trap
             ospfLsdbAreaId, -- 0.0.0.0 for AS Externals
             ospfLsdbType,
             ospfLsdbLsid,
             ospfLsdbRouterId
           }
  STATUS      current
  DESCRIPTION
    "An ospfOriginateLsa trap signifies that a new
    LSA has been originated by this router. This
    trap should not be invoked for simple refreshes
    of LSAs (which happens every 30 minutes), but
    instead will only be invoked when an LSA is
    (re)originated due to a topology change.
    Additionally, this trap does not include LSAs that
    are being flushed because they have reached
    MaxAge."
    ::= { ospfTraps 12 }

ospfMaxAgeLsa NOTIFICATION-TYPE
  OBJECTS { ospfRouterId, -- The originator of the trap
             ospfLsdbAreaId, -- 0.0.0.0 for AS Externals
             ospfLsdbType,
             ospfLsdbLsid,
             ospfLsdbRouterId
           }
  STATUS      current
  DESCRIPTION
```

```
"An ospfMaxAgeLsa trap signifies that one of
the LSAs in the router's link state database has
aged to MaxAge."
 ::= { ospfTraps 13 }

ospfLsdbOverflow NOTIFICATION-TYPE
  OBJECTS { ospfRouterId, -- The originator of the trap
            ospfExtLsdbLimit
          }

  STATUS      current
  DESCRIPTION
    "An ospfLsdbOverflow trap signifies that the
    number of LSAs in the router's link state
    database has exceeded ospfExtLsdbLimit."
  ::= { ospfTraps 14 }

ospfLsdbApproachingOverflow NOTIFICATION-TYPE
  OBJECTS { ospfRouterId, -- The originator of the trap
            ospfExtLsdbLimit
          }

  STATUS      current
  DESCRIPTION
    "An ospfLsdbApproachingOverflow trap signifies
    that the number of LSAs in the router's
    link state database has exceeded ninety percent of
    ospfExtLsdbLimit."
  ::= { ospfTraps 15 }

ospfIfStateChange NOTIFICATION-TYPE
  OBJECTS { ospfRouterId, -- The originator of the trap
            ospfIfIpAddress,
            ospfAddressLessIf,
            ospfIfState    -- The new state
          }

  STATUS      current
  DESCRIPTION
    "An ospfIfStateChange trap signifies that there
    has been a change in the state of a non-virtual
    OSPF interface. This trap should be generated
    when the interface state regresses (e.g., goes
    from Dr to Down) or progresses to a terminal
    state (i.e., Point-to-Point, DR Other, Dr, or
    Backup)."
```

```
 ::= { ospfTraps 16 }

ospfNssaTranslatorStatusChange NOTIFICATION-TYPE
  OBJECTS { ospfRouterId, -- The originator of the trap
```

```

        ospfAreaId,
        ospfAreaNssaTranslatorState -- The current translation
                                   -- status
    }
    STATUS          current
    DESCRIPTION
        "An ospfNssaTranslatorStatusChange trap indicates that
        there has been a change in the router's ability to
        translate OSPF type-7 LSAs into OSPF type-5 LSAs.
        This trap should be generated when the translator
        status transitions from or to any defined status on
        a per-area basis."
    ::= { ospfTraps 17 }

ospfRestartStatusChange NOTIFICATION-TYPE
    OBJECTS { ospfRouterId, -- The originator of the trap
              ospfRestartStatus,
              ospfRestartInterval,
              ospfRestartExitReason
            }
    STATUS          current
    DESCRIPTION
        "An ospfRestartStatusChange trap signifies that
        there has been a change in the graceful restart
        state for the router. This trap should be
        generated when the router restart status
        changes."
    ::= { ospfTraps 18 }

ospfNbrRestartHelperStatusChange NOTIFICATION-TYPE
    OBJECTS { ospfRouterId, -- The originator of the trap
              ospfNbrIpAddress,
              ospfNbrAddressLessIndex,
              ospfNbrRtrId,
              ospfNbrRestartHelperStatus,
              ospfNbrRestartHelperAge,
              ospfNbrRestartHelperExitReason
            }
    STATUS          current
    DESCRIPTION
        "An ospfNbrRestartHelperStatusChange trap signifies that
        there has been a change in the graceful restart
        helper state for the neighbor. This trap should be
        generated when the neighbor restart helper status
        transitions for a neighbor."
    ::= { ospfTraps 19 }

ospfVirtNbrRestartHelperStatusChange NOTIFICATION-TYPE

```

```

OBJECTS { ospfRouterId, -- The originator of the trap
           ospfVirtNbrArea,
           ospfVirtNbrRtrId,
           ospfVirtNbrRestartHelperStatus,
           ospfVirtNbrRestartHelperAge,
           ospfVirtNbrRestartHelperExitReason
         }
STATUS      current
DESCRIPTION
    "An ospfVirtNbrRestartHelperStatusChange trap signifies
    that there has been a change in the graceful restart
    helper state for the virtual neighbor. This trap should
    be generated when the virtual neighbor restart helper
    status transitions for a virtual neighbor."
 ::= { ospfTraps 20 }

-- conformance information

ospfTrapConformance OBJECT IDENTIFIER ::= { ospfTrap 3 }
ospfTrapGroups      OBJECT IDENTIFIER ::= { ospfTrapConformance 1 }
ospfTrapCompliances OBJECT IDENTIFIER ::= { ospfTrapConformance 2 }

-- compliance statements

ospfTrapCompliance MODULE-COMPLIANCE
    STATUS      obsolete
    DESCRIPTION
        "The compliance statement."
    MODULE      -- this module
    MANDATORY-GROUPS { ospfTrapControlGroup }

    GROUP      ospfTrapControlGroup
    DESCRIPTION
        "This group is optional but recommended for all
        OSPF systems."
    ::= { ospfTrapCompliances 1 }

ospfTrapCompliance2 MODULE-COMPLIANCE
    STATUS      current
    DESCRIPTION
        "The compliance statement."
    MODULE      -- this module
    MANDATORY-GROUPS { ospfTrapControlGroup, ospfTrapEventGroup }
    OBJECT      ospfConfigErrorType
    MIN-ACCESS   accessible-for-notify
    DESCRIPTION
        "This object is only required to be supplied within
        notifications."

```

```

OBJECT      ospfPacketType
MIN-ACCESS  accessible-for-notify
DESCRIPTION
    "This object is only required to be supplied within
    notifications."
OBJECT      ospfPacketSrc
MIN-ACCESS  accessible-for-notify
DESCRIPTION
    "This object is only required to be supplied within
    notifications."
::= { ospfTrapCompliances 2 }

```

```
-- units of conformance
```

```

ospfTrapControlGroup    OBJECT-GROUP
    OBJECTS { ospfSetTrap,
                ospfConfigErrorType,
                ospfPacketType,
                ospfPacketSrc }
    STATUS      current
    DESCRIPTION
        "These objects are required to control traps
        from OSPF systems."
    ::= { ospfTrapGroups 1 }

```

```

ospfTrapEventGroup      NOTIFICATION-GROUP
    NOTIFICATIONS {
        ospfVirtIfStateChange,
        ospfNbrStateChange,
        ospfVirtNbrStateChange,
        ospfIfConfigError,
        ospfVirtIfConfigError,
        ospfIfAuthFailure,
        ospfVirtIfAuthFailure,
        ospfIfRxBadPacket,
        ospfVirtIfRxBadPacket,
        ospfTxRetransmit,
        ospfVirtIfTxRetransmit,
        ospfOriginateLsa,
        ospfMaxAgeLsa,
        ospfLsdbOverflow,
        ospfLsdbApproachingOverflow,
        ospfIfStateChange,
        ospfNssaTranslatorStatusChange,
        ospfRestartStatusChange,
        ospfNbrRestartHelperStatusChange,
        ospfVirtNbrRestartHelperStatusChange
    }

```

```
STATUS          current
DESCRIPTION
    "A grouping of OSPF trap events, as specified
    in NOTIFICATION-TYPE constructs."
 ::= { ospfTrapGroups 2 }
```

END

6. Security Considerations

There are a number of management objects defined in this MIB that have a MAX-ACCESS clause of read-write and/or read-create. Such objects may be considered sensitive or vulnerable in some network environments. The support for SET operations in a non-secure environment without proper protection can have a negative effect on network operations.

It is recommended that attention be specifically given to implementing the MAX-ACCESS clause in a number of objects, including ospfIfAuthKey, ospfIfAuthType, ospfVirtIfAuthKey, and ospfVirtIfAuthType in scenarios that DO NOT use SNMPv3 strong security (i.e., authentication and encryption). Extreme caution must be used to minimize the risk of cascading security vulnerabilities when SNMPv3 strong security is not used. When SNMPv3 strong security is not used, these objects should have access of read-only, not read-create.

SNMPv1 by itself is not a secure environment. Even if the network itself is secure (for example by using IPsec), even then, there is no control as to who on the secure network is allowed to access and GET/SET (read/change/create/delete) the objects in this MIB.

It is recommended that the implementers consider the security features as provided by the SNMPv3 framework. Specifically, the use of the User-based Security Model RFC 3414 [RFC3414] and the View-based Access Control Model RFC 3415 [RFC3415] is recommended.

It is then a customer/user responsibility to ensure that the SNMP entity giving access to an instance of this MIB, is properly configured to give access to the objects only to those principals (users) that have legitimate rights to indeed GET or SET (change/create/delete) them.

7. IANA Considerations

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

Descriptor	OBJECT IDENTIFIER value
-----	-----
ospf	{ mib-2 14 }

8. Acknowledgements

This document was produced by the OSPF Working Group and is based on the MIB for OSPF version 2 by Rob Coltun and Fred Baker [RFC1850]. The editors would like to acknowledge John Moy, Rob Coltun, Randall Atkinson, David T. Perkins, Ken Chapman, Brian Field, Acee Lindem, Vishwas Manral, Roy Jose, Don Goodspeed, Vivek Dubey, Keith McCloghrie, Bill Fenner, and Dan Romascanu for their constructive comments.

9. References

9.1. Normative References

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Appendix A. TOS Support

For backward compatibility with previous versions of the OSPF MIB specification, TOS-specific information has been retained in this document, though the TOS routing option has been deleted from OSPF [RFC2328].

Appendix B. Changes from RFC 1850

This section documents the differences between this memo and RFC 1850.

Appendix B.1. General Group Changes

Added object `ospfRFC1583Compatibility` to indicate support with "RFC 1583 Compatibility" [RFC1583]. This object has DEFVAL of "enabled".

Added object `ospfReferenceBandwidth` to allow configuration of a reference bandwidth for calculation of default interface metrics.

Added objects `ospfRestartSupport`, `ospfRestartInterval`, `ospfRestartAge`, `ospfRestartStrictLsaChecking`, and `ospfRestartExitReason` to support graceful restart.

Added objects `ospfStubRouterSupport` and `ospfStubRouteAdvertisement` to support stub routers.

Added object `ospfDiscontinuityTime` in order for a management entity to detect counter discontinuity events.

Appendix B.2. OSPF NSSA Enhancement Support

Added new objects to `OspfAreaTable` including the following:

- `ospfAreaNssaTranslatorRole` to indicate the configured NSSA translation role.

- `ospfAreaNssaTranslatorState` to indicate the current NSSA translation role.

- `ospfAreaNssaTranslatorStabilityInterval` to indicate time to continue to perform at current translation status.

- `ospfAreaNssaTranslatorEvents` to indicate the number of times OSPF translation state has changed.

Added new object `ospfAreaAggregateExtRouteTag` to `ospfAreaAggregateTable`.

Added new object `ospfNssaTranslatorStatusChange` to `ospfTraps` in OSPF-TRAP-MIB DEFINITIONS.

Added `ospfAreaId` to IMPORTS in OSPF-TRAP-MIB DEFINITIONS to support `ospfNssaTranslatorStatusChange`.

Added `ospfAreaExtNssaTranslatorStatus` to IMPORTS in OSPF-TRAP-MIB DEFINITIONS to support `ospfNssaTranslatorStatusChange`.

Modified the DESCRIPTION clause of the `ospfAreaSummary` object in the `ospfAreaTable` to indicate support for NSSA.

Modified the DESCRIPTION clause of the `ospfImportAsExtern` object in the `ospfAreaTable` for clarity.

Appendix B.3. Opaque LSA Support

Added object `ospfOpaqueLsaSupport` to `ospfGeneralGroup` to indicate support of OSPF Opaque LSAs.

Created `ospfLocalLsdbTable`, for link-local (type-9) LSA support. This table is indexed by the following:

- `ospfLocalLsdbIpAddress`
- `ospfLocalLsdbAddressLessIf`
- `ospfLocalLsdbType`
- `ospfLocalLsdbLsid`
- `ospfLocalLsdbRouterId`

`ospfLocalLsdbTable` contains the following (columnar) objects:

- `ospfLocalLsdbSequence`, to indicate LSA instance
- `ospfLocalLsdbAge`
- `ospfLocalLsdbChecksum`
- `ospfLocalLsdbAdvertisement`, containing the entire LSA

Created `ospfVirLocalLsdbTable`, for link-local (type-9) LSA support on virtual links. This table is indexed by the following:

- `ospfVirtLocalLsdbTransitArea`

-ospfVirtLocalLsdbNeighbor, to indicate the router ID of the virtual neighbor

-ospfVirLocalLsdbType

-ospfVirLocalLsdbLsid

-ospfVirLocalLsdbRouterId

ospfVirLocalLsdbTable contains the following (columnar) objects:

-ospfVirLocalLsdbSequence, to indicate LSA instance

-ospfVirLocalLsdbAge

-ospfVirLocalLsdbChecksum

-ospfVirLocalLsdbAdvertisement, containing the entire LSA

Added objects to ospfIfTable to support link-local (type-9) LSAs, including the following:

-ospfIfLsaCount

-ospfIfLsaChecksumSum, to indicate the sum of the type-9 link state advertisement checksums on this interface

Added objects to ospfVirIfTable, to support link-local (type-9) LSAs on virtual links, including the following:

-ospfVirIfLsaCount

-ospfVirIfLsaChecksumSum, to indicate the sum of the type-9 link state advertisement checksums on this link

To support area scope (type-10) LSAs, the enumeration areaOpaqueLink (10) was added to ospfLsdbType in the ospfLsdbTable.

Created ospfAsLsdbTable, for AS-scope LSA support. This table is indexed by the following:

-ospfAsLsdbType

-ospfAsLsdbLsid

-ospfAsLsdbRouterId

ospfAsLsdbTable contains the following (columnar) objects:

- ospfAsLsdbSequence, to indicate LSA instance
- ospfAsLsdbAge
- ospfAsLsdbChecksum
- ospfAsLsdbAdvertisement, containing the entire LSA

Appendix B.4. Graceful Restart Support

Added objects ospfRestartSupport, ospfRestartInterval, ospfRestartAge, ospfRestartStrictLsaChecking, and ospfRestartExitReason to general group.

Added objects ospfNbrRestartHelperStatus, ospfNbrRestartHelperAge, and ospfNbrRestartHelperExitReason to OspfNbrTable.

Added objects ospfVirtNbrRestartHelperStatus, ospfVirtNbrRestartHelperAge, and ospfVirtNbrRestartHelperExitReason to OspfVirtNbrTable.

Appendix B.5. OSPF Compliances

New compliance statements were added for new and for obsoleted conformance groups. These statements include the following:

- ospfCompliance2
- ospfComplianceObsolete

New conformance groups were created to support new objects added to the group. These groups include the following:

- ospfBasicGroup2
- ospfAreaGroup2
- ospfIfGroup2
- ospfVirtIfGroup2
- ospfNbrGroup2
- ospfVirtNbrGroup2
- ospfAreaAggregateGroup2

Added completely new conformance groups, including the following:

- ospfLocalLsdbGroup, which specifies support for link-local (type-9) LSAs
- ospfVirtLocalLsdbGroup, which specifies support for link-local (type-9) LSAs on virtual links
- ospfObsoleteGroup, for obsolete objects and SMI compatibility

Appendix B.6. OSPF Authentication and Security

As there has been significant concern in the community regarding cascading security vulnerabilities, the following changes have been incorporated:

- Modified the DESCRIPTION clause of ospfIfAuthKey due to security concerns and to increase clarity
- Modified the DESCRIPTION clause of ospfVirtIfAuthKey due to security concerns and to increase clarity
- Modified the DESCRIPTION clause of ospfIfAuthType due to security concerns and to increase clarity
- Modified the DESCRIPTION clause of ospfVirtIfType due to security concerns and to increase clarity
- Modified the OSPF MIB MODULE DESCRIPTION due to security concerns and to include a reference to the Security Considerations section in this document that will transcend compilation
- Modified the Security Considerations section to provide detail

Appendix B.7. OSPF Trap MIB

Added ospfTrapEventGroup.

Added importation of NOTIFICATION-GROUP.

Changed the STATUS of the ospfTrapCompliance MODULE-COMPLIANCE construct to obsolete.

Added ospfTrapCompliance2 MODULE-COMPLIANCE construct, which replaces ospfTrapCompliance. OspfTrapCompliance includes an updated MANDATORY-GROUPS clause and new MIN-ACCESS specifications.

Added mtuMismatch enumeration to ospfConfigErrorType object in ospfTrapControl to imply MTU mismatch trap generation. in ospfIfConfigError.

Added noError enumeration to ospfConfigErrorType object for situations when traps are requested but none have been sent. Updated the DESCRIPTION clause accordingly.

Added nullPacket enumeration to ospfPacketType object for situations when traps are requested but none have been sent. Updated the DESCRIPTION clause accordingly.

Updated the DESCRIPTION clause of ospfPacketSrc for situations when traps are requested, but none have been sent.

Added NOTIFICATION-TYPE for ospfRestartStatusChange.

Added NOTIFICATION-TYPE for ospfNbrRestartHelperStatusChange.

Added NOTIFICATION-TYPE for ospfVirtNbrRestartHelperStatusChange.

Appendix B.8. Miscellaneous

Various sections have been moved or modified for clarity. Most of these changes are semantic in nature and include, but are not limited to the following:

- The OSPF overview section's format was revised. Unneeded information was removed. Removed information includes OSPF TOS default values.

- The trap overview section's format and working were revised. Unneeded information was removed.

- Modified the DESCRIPTION clause of "Status" "TEXTUAL-CONVENTION" for clarity.

- The Updates section was moved from the overview to its own section.

- Updated "REFERENCE" clauses in all objects, as needed.

- Modified the SEQUENCE of the OspfIfTable to reflect the true order of the objects in the table.

- Modified the DESCRIPTION clause of all row management objects for clarity.

Added ospfHostCfgAreaID to object to Host table with read-create access. Deprecated ospfHostAreaID.

Added importation of InterfaceIndexOrZero from IF-MIB. This TEXTUAL-CONVENTION will replace the InterfaceIndex TEXTUAL-CONVENTION.

Changed the SYNTAX clause of ospfNbrAddressLessIndex to use the semantically identical InterfaceIndexOrZero TEXTUAL-CONVENTION, as permitted by the SMI.

Changed the STATUS clause of the TEXTUAL-CONVENTION InterfaceIndex to obsolete and modified the DESCRIPTION accordingly.

Changed the SYNTAX clause of ospfAddressLessIf to use the semantically identical InterfaceIndexOrZero TEXTUAL-CONVENTION, as permitted by the SMI.

Changed the SYNTAX clause of ospfIfMetricAddressLessIf to use the semantically identical InterfaceIndexOrZero TEXTUAL-CONVENTION, as permitted by the SMI.

Changed importation of mib-2 from RFC1213-MIB to SNMPv2-SMI

Added Intellectual Property Rights section.

Updated REVISION DESCRIPTION clauses with description of major MIB modifications.

Moved all relevant MIB comments to objects' DESCRIPTION clauses.

Added reasoning for object deprecation.

Added persistence information for read-write, read-create objects.

Described conditions when columns can be modified in RowStatus managed rows as required by RFC 2579.

Defined OspfAuthenticationType TC and modified authentication type objects to use the new type.

Made index objects of new tables not accessible.

Added the UNITS clause to several objects.

Added ospfIfDesignatedRouterId and ospfIfBackupDesignatedRouterId to the OspfIfEntry.

Added the area LSA counter table.

Added IANA Considerations section.

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