

Management Information Base for OSPFv3

Abstract

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in IPv6-based internets. In particular, it defines objects for managing the Open Shortest Path First (OSPF) Routing Protocol for IPv6, otherwise known as OSPF version 3 (OSPFv3).

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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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].

2. Overview

This memo defines a portion of the Management Information Base (MIB) for managing the Open Shortest Path First Routing Protocol for IPv6 [RFC5340], otherwise known as OSPF version 3 (OSPFv3). Though the fundamental mechanisms of OSPF version 2 (OSPFv2) [RFC2328] remain unchanged in OSPFv3, some changes were necessary due to differences in IP address size and in protocol semantics between IPv4 and IPv6. In many cases, where the protocol operations have not changed from OSPFv2, the specification for OSPFv3 does not restate the details but instead refers to the relevant sections in the OSPFv2 specification. This MIB module follows along the same lines and includes Reference clauses referring to the OSPFv2 specification when applicable.

2.1. IPv6 Interfaces

IPv6 interfaces attach to links [RFC2460]. A link is roughly defined as the layer below IPv6 (e.g., Ethernet, IPv4 Tunnel). One or more IPv6 prefixes can be associated with an IPv6 interface. IPv6 interfaces and the prefixes associated with those interfaces can be configured via the IP-MIB [RFC4293]. IPv6 interfaces are configured in the IPv6 Interface Table and IPv6 prefixes are configured in the Internet Address Prefix Table. An IPv6 interface is identified by a unique index value. IPv6 Address Prefix Table entries associated with an IPv6 interface reference the interface's index.

Whereas an Interface Identifier in OSPFv2 is a local IPv4 address or MIB-2 interface index, an OSPFv3 Interface Identifier is an IPv6 interface index. For example, the index value of an OSPFv3 Interface Table entry is the IPv6 interface index of the IPv6 interface over which OSPFv3 is configured to operate.

2.2. Addressing Semantics

Router ID, Area ID, and Link State ID remain at the OSPFv2 size of 32 bits. To ensure uniqueness, a router running both IPv4 and IPv6 concurrently can continue to use a local IPv4 host address, represented as an unsigned 32-bit value, as the OSPFv3 Router ID. Otherwise, the Router ID must be selected using another method (e.g., administratively assigned).

Router ID, Area ID, and Link State ID do not have addressing semantics in OSPFv3, so their syntax is changed to Unsigned32. The Router ID index component comes before the Link State ID index component in the OSPFv3 MIB module because the lack of addressing semantics in Link State IDs makes them less unique identifiers than the Router ID. It is more useful to do partial Object Identifier (OID) lookups extending to the Router ID rather than the Link State ID.

2.3. Authentication

In OSPFv3, authentication has been removed from the protocol itself. MIB objects related to authentication are not carried forward from the OSPFv2 MIB module.

2.4. Type of Service

OSPFv2 MIB module objects related to Type of Service (ToS) are not carried forward to the OSPFv3 MIB module.

2.5. Flooding Scope

Flooding scope for link state advertisements (LSAs) has been generalized and is now explicitly encoded in the LSA's LS type field. The action to take upon receipt of unknown LSA types is also encoded in the LS type field [[RFC5340](#)]. The OSPFv3 MIB module defines three Link State Database tables, one each for Area-scope LSAs, Link-scope LSAs, and Autonomous System (AS)-scope LSAs.

2.6. Virtual Links

Since addressing semantics have been removed from router-LSAs in OSPFv3, virtual links now need to be assigned an Interface ID for advertisement in Hello packets and in router-LSAs. A read-only object has been added to the Virtual Interface Table entry to view the assigned Interface ID.

2.7. Neighbors

The OSPFv3 Neighbor Table is a read-only table that contains information learned from Hellos received from neighbors, including configured neighbors. The OSPFv3 Configured Neighbor Table contains entries for manually configured neighbors for use on non-broadcast multi-access (NBMA) and Point-to-Multipoint interface types.

2.8. OSPFv3 Counters

This MIB module defines several counters, namely:

- ospfv3OriginateNewLsas and ospfv3RxNewLsas in the ospfv3GeneralGroup
- ospfv3AreaSpfRuns and ospfv3AreaNssaTranslatorEvents in the ospfv3AreaTable
- ospfv3IfEvents in the ospfv3IfTable
- ospfv3VirtIfEvents in the ospfv3VirtIfTable
- ospfv3NbrEvents in the ospfv3NbrTable
- ospfv3VirtNbrEvents in the ospfv3VirtNbrTable

As a best practice, a management entity, when reading these counters, should use the discontinuity object, ospfv3DiscontinuityTime, to determine if an event that would invalidate the management entity understanding of the counters has occurred. A restart of the OSPFv3 routing process is an example of a discontinuity event.

2.9. Multiple OSPFv3 Instances

SNMPv3 supports "contexts" that can be used to implement MIB views on multiple OSPFv3 instances on the same system. See [RFC3411] or its successors for details.

2.10. Notifications

Notifications define a set of notifications, objects, and mechanisms to enhance the ability to manage IP internetworks that use OSPFv3 as their Interior Gateway Protocol (IGP).

2.11. 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].

3. OSPFv3 Notification Overview

3.1. Introduction

OSPFv3 is an event-driven routing protocol, where an event can be a change in an OSPFv3 interface's link-level status, the expiration of an OSPFv3 timer, or the reception of an OSPFv3 protocol packet. Many of the actions that OSPFv3 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 notifications.

The `ospfv3NotificationEnable` object provides a coarse level of control over the generation of OSPFv3 notifications. It can be used to completely enable or disable generation of OSPFv3 notifications. Fine-grain control of individual notifications can be accomplished by utilizing the objects defined in [RFC 3413](#) [RFC3413], specifically those described in [Section 6](#).

3.2. Ignoring Initial Activity

The majority of critical events occur when OSPFv3 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 notifications is unnecessary since the events are expected. To avoid unnecessary notifications, a router should not originate expected OSPFv3 interface-related notifications until two of that interface's dead timer intervals have elapsed. The expected OSPFv3 interface notifications are `ospfv3IfStateChange`, `ospfv3VirtIfStateChange`, `ospfv3NbrStateChange`, and `ospfv3VirtNbrStateChange`.

3.3. Throttling Notifications

The mechanism for throttling the notifications 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 with an upper bound on the number of notifications that may be generated within this window. Note that unlike RFC 1224, notifications are not sent to inform the network manager that the throttling mechanism has kicked in.

A single window should be used to throttle all OSPFv3 notification types except for the `ospfv3LsdbOverflow` and the `ospfv3LsdbApproachingOverflow` notifications, which should not be throttled. For example, with a window time of 3, an upper bound of 3, and events to cause notifications 1, 2, 3, and 4 (4 notifications within a 3-second period), the 4th notification should not be generated.

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

3.4. One Notification per OSPFv3 Event

Several of the notifications defined in this MIB module are generated as the result of finding an unusual condition while parsing an OSPFv3 packet or 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 notifications and variables, OSPFv3 should generate at most one notification per OSPFv3 event. Only the variables associated with the first unusual condition should be included with the notification. Similarly, if more than one type of unusual condition is encountered while parsing the packet, only the first event will generate a notification.

3.5. Polling Event Counters

Many of the tables in the OSPFv3 MIB module contain generalized event counters. By enabling the notifications 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 OSPFv3 notifications when a particular counter starts increasing abnormally.

4. Structure of the OSPFv3 MIB Module

The MIB is composed of the following sections:

- General Variables
- Area Table
- Area-Scope Link State Database

Link-Scope Link State Databases (non-virtual and virtual)
AS-Scope Link State Database
Host Table
Interface Table
Virtual Interface Table
Neighbor Table
Configured Neighbor Table
Virtual Neighbor Table
Area Aggregate Table
Notifications

4.1. General Variables

The General Variables are global to the OSPFv3 Process.

4.2. Area Table

The Area Data Structure describes the OSPFv3 Areas that the router participates in.

4.3. Area-Scope, Link-Scope, and AS-Scope Link State Database

The link state databases are provided primarily to provide detailed information for network debugging. There are separate tables for Link-scope LSAs received over non-virtual and virtual interfaces.

4.4. Host Table

The Host Table is provided to view configured Host Route information.

4.5. Interface Table

The Interface Table describes the various IPv6 links on which OSPFv3 is configured.

4.6. Virtual Interface Table

The Virtual Interface Table describes virtual OSPFv3 links.

4.7. Neighbor, Configured Neighbor, and Virtual Neighbor Tables

The Neighbor Table, the Configured Neighbor Table, and the Virtual Neighbor Table describe the neighbors to the OSPFv3 Process.

4.8. Area Aggregate Table

The Area Aggregate Table describes prefixes, which summarize routing information for export outside of an Area.

4.9. Notifications

Notifications are defined for OSPFv3 events. Several objects are defined specifically as variables to be used with notifications.

5. Definitions

```
OSPFV3-MIB DEFINITIONS ::= BEGIN
```

```
IMPORTS
```

```
    MODULE-IDENTITY, OBJECT-TYPE, NOTIFICATION-TYPE, mib-2,
    Counter32, Gauge32, Integer32, Unsigned32
        FROM SNMPv2-SMI
    TEXTUAL-CONVENTION, TruthValue, RowStatus, TimeStamp
        FROM SNMPv2-TC
    MODULE-COMPLIANCE, OBJECT-GROUP, NOTIFICATION-GROUP
        FROM SNMPv2-CONF
    InterfaceIndex
        FROM IF-MIB
    InetAddressType, InetAddress, InetAddressPrefixLength,
    InetAddressIPv6
        FROM INET-ADDRESS-MIB
    Metric, BigMetric, Status,
    HelloRange, DesignatedRouterPriority
        FROM OSPF-MIB;
```

```
ospfv3MIB MODULE-IDENTITY
```

```
    LAST-UPDATED "200908130000Z"
    ORGANIZATION "IETF OSPF Working Group"
    CONTACT-INFO
```

```
        "WG E-Mail: ospf@ietf.org
        WG Chairs: Acee Lindem
                  acee@redback.com
```

```

        Abhay Roy
        akr@cisco.com
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```

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        India
        vishwas@ipinfusion.com"
```

DESCRIPTION

"The MIB module for OSPF version 3.

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This version of this MIB module is part of [RFC 5643](#); see the RFC itself for full legal notices."

REVISION "200908130000Z"

DESCRIPTION

"Initial version, published as [RFC 5643](#)"

::= { mib-2 191 }

-- Textual conventions

Ospfv3UpToRefreshIntervalTC ::= TEXTUAL-CONVENTION

DISPLAY-HINT "d"

STATUS current

DESCRIPTION

"The values one might be able to configure for variables bounded by the Refresh Interval."

REFERENCE

"OSPF Version 2, [Appendix B](#), Architectural Constants"

SYNTAX Unsigned32 (1..1800)

Ospfv3DeadIntervalRangeTC ::= TEXTUAL-CONVENTION

DISPLAY-HINT "d"

STATUS current

DESCRIPTION

"The range, in seconds, of dead interval value."

REFERENCE

"OSPF for IPv6, [Appendix C.3](#), Router Interface Parameters"

SYNTAX Unsigned32 (1..'FFFF'h)

Ospfv3RouterIdTC ::= TEXTUAL-CONVENTION

DISPLAY-HINT "d"

STATUS current

DESCRIPTION

"A 32-bit, unsigned integer uniquely identifying the router in the Autonomous System. To ensure uniqueness, this may default to the value of one of the router's IPv4 host addresses if IPv4 is configured on the router."

REFERENCE

"OSPF for IPv6, [Appendix C.1](#), Global Parameters"

SYNTAX Unsigned32 (1..'FFFFFFFF'h)

Ospfv3LsIdTC ::= TEXTUAL-CONVENTION

DISPLAY-HINT "d"

STATUS current

DESCRIPTION

"A unique 32-bit identifier of the piece of the routing domain that is being described by a link state advertisement. In contrast to OSPFv2, the Link State ID (LSID) has no addressing semantics."

REFERENCE

"OSPF Version 2, [Section 12.1.4](#), Link State ID"

SYNTAX Unsigned32 (1..'FFFFFFFF'h)

Ospfv3AreaIdTC ::= TEXTUAL-CONVENTION

DISPLAY-HINT "d"
STATUS current
DESCRIPTION
 "An OSPFv3 Area Identifier. A value of zero identifies the backbone area."
REFERENCE
 "OSPF for IPv6, [Appendix C.3](#) Router Interface Parameters"
SYNTAX Unsigned32 (0..'FFFFFFFF'h)

OspfV3IfInstIdTC ::= TEXTUAL-CONVENTION
 DISPLAY-HINT "d"
 STATUS current
 DESCRIPTION
 "An OSPFv3 Interface Instance ID."
 REFERENCE
 "OSPF for IPv6, [Appendix C.3](#), Router Interface Parameters"
 SYNTAX Unsigned32 (0..255)

OspfV3LsaSequenceTC ::= TEXTUAL-CONVENTION
 DISPLAY-HINT "d"
 STATUS current
 DESCRIPTION
 "The sequence number field is a signed 32-bit integer. It is used to detect old and duplicate link state advertisements. The space of sequence numbers is linearly ordered. The larger the sequence number, the more recent the advertisement."
 REFERENCE
 "OSPF Version 2, [Section 12.1.6](#), LS sequence number"
 SYNTAX Integer32

OspfV3LsaAgeTC ::= TEXTUAL-CONVENTION
 DISPLAY-HINT "d"
 STATUS current
 DESCRIPTION
 "The age of the link state advertisement in seconds. The high-order bit of the LS age field is considered the DoNotAge bit for support of on-demand circuits."
 REFERENCE
 "OSPF Version 2, [Section 12.1.1](#), LS age; Extending OSPF to Support Demand Circuits, [Section 2.2](#), The LS age field"
 SYNTAX Unsigned32 (0..3600 | 32768..36368)

```
-- Top-level structure of MIB
ospfv3Notifications OBJECT IDENTIFIER ::= { ospfv3MIB 0 }
ospfv3Objects        OBJECT IDENTIFIER ::= { ospfv3MIB 1 }
ospfv3Conformance    OBJECT IDENTIFIER ::= { ospfv3MIB 2 }

-- OSPFv3 General Variables

-- These parameters apply globally to the Router's
-- OSPFv3 Process.

ospfv3GeneralGroup OBJECT IDENTIFIER ::= { ospfv3Objects 1 }

ospfv3RouterId OBJECT-TYPE
    SYNTAX      Ospf3RouterIdTC
    MAX-ACCESS   read-write
    STATUS      current
    DESCRIPTION
        "A 32-bit unsigned integer uniquely identifying
        the router in the Autonomous System. To ensure
        uniqueness, this may default to the 32-bit
        unsigned integer representation of one of
        the router's IPv4 interface addresses (if IPv4
        is configured on the router).

        This object is persistent, and when written, the
        entity SHOULD save the change to non-volatile
        storage."
    REFERENCE
        "OSPF for IPv6, Appendix C.1, Global Parameters"
    ::= { ospfv3GeneralGroup 1 }

ospfv3AdminStatus OBJECT-TYPE
    SYNTAX      Status
    MAX-ACCESS   read-write
    STATUS      current
    DESCRIPTION
        "The administrative status of OSPFv3 in the
        router. The value 'enabled' denotes that the
        OSPFv3 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."
    ::= { ospfv3GeneralGroup 2 }
```

ospfv3VersionNumber OBJECT-TYPE
SYNTAX INTEGER { version3 (3) }
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The version number of OSPF for IPv6 is 3."
::= { ospfv3GeneralGroup 3 }

ospfv3AreaBdrRtrStatus OBJECT-TYPE
SYNTAX TruthValue
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"A flag to denote whether this router is an area border router. The value of this object is true (1) when the router is an area border router."
REFERENCE
"OSPF Version 2, [Section 3](#), Splitting the AS into Areas"
::= { ospfv3GeneralGroup 4 }

ospfv3ASBdrRtrStatus 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"
::= { ospfv3GeneralGroup 5 }

ospfv3AsScopeLsaCount OBJECT-TYPE
SYNTAX Gauge32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The number of AS-scope (e.g., AS-External) link state advertisements in the link state database."
::= { ospfv3GeneralGroup 6 }

ospfv3AsScopeLsaCksumSum OBJECT-TYPE
SYNTAX Unsigned32

MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The 32-bit unsigned sum of the LS checksums of
the AS-scoped 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 or
to compare the link state database of two
routers."
 ::= { ospfv3GeneralGroup 7 }

ospfv3OriginateNewLsas 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 ospfv3DiscontinuityTime."
 ::= { ospfv3GeneralGroup 8 }

ospfv3RxNewLsas 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 ospfv3DiscontinuityTime."
 ::= { ospfv3GeneralGroup 9 }

ospfv3ExtLsaCount OBJECT-TYPE
SYNTAX Gauge32
MAX-ACCESS read-only

```

STATUS          current
DESCRIPTION
    "The number of External (LS type 0x4005) in the
    link state database."
 ::= { ospfv3GeneralGroup 10 }

```

```

ospfv3ExtAreaLsdbLimit OBJECT-TYPE
    SYNTAX      Integer32 (-1..'7FFFFFFF'h)
    MAX-ACCESS   read-write
    STATUS      current
    DESCRIPTION
        "The maximum number of non-default
        AS-external-LSA 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
        ospfv3ExtAreaLsdbLimit, the router enters Overflow
        state.  The router never holds more than
        ospfv3ExtAreaLsdbLimit non-default AS-external-LSAs
        in its database.  ospfv3ExtAreaLsdbLimit MUST be set
        identically in all routers attached to the OSPFv3
        backbone and/or any regular OSPFv3 area (i.e.,
        OSPFv3 stub areas and not-so-stubby-areas (NSSAs)
        are excluded).

        This object is persistent, and when written, the
        entity SHOULD save the change to non-volatile
        storage."
 ::= { ospfv3GeneralGroup 11 }

```

```

ospfv3ExitOverflowInterval OBJECT-TYPE
    SYNTAX      Unsigned32
    UNITS       "seconds"
    MAX-ACCESS   read-write
    STATUS      current
    DESCRIPTION
        "The number of seconds that, after entering
        Overflow state, a router will attempt to leave
        Overflow state.  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."

```



```
::= { ospfv3GeneralGroup 12 }
```

```
ospfv3DemandExtensions OBJECT-TYPE
```

```
    SYNTAX      TruthValue
```

```
    MAX-ACCESS  read-write
```

```
    STATUS      current
```

```
    DESCRIPTION
```

```
        "The router's support for demand circuits.
        The value of this object is true (1) when
        demand circuits are supported.
```

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

```
    REFERENCE
```

```
        "OSPF Version 2; Extending OSPF to Support Demand
        Circuits"
```

```
::= { ospfv3GeneralGroup 13 }
```

```
ospfv3ReferenceBandwidth OBJECT-TYPE
```

```
    SYNTAX      Unsigned32
```

```
    UNITS       "kilobits per second"
```

```
    MAX-ACCESS  read-write
```

```
    STATUS      current
```

```
    DESCRIPTION
```

```
        "Reference bandwidth in kilobits per 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."
```

```
    REFERENCE
```

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

```
    DEFVAL { 100000 }
```

```
::= { ospfv3GeneralGroup 14 }
```

```
ospfv3RestartSupport 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."

REFERENCE "Graceful OSPF Restart, [Appendix B.1](#), Global Parameters (Minimum subset)"

::= { ospfv3GeneralGroup 15 }

ospfv3RestartInterval OBJECT-TYPE

SYNTAX OspfV3UpToRefreshIntervalTC

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."

REFERENCE "Graceful OSPF Restart, [Appendix B.1](#), Global Parameters (Minimum subset)"

DEFVAL { 120 }

::= { ospfv3GeneralGroup 16 }

ospfv3RestartStrictLsaChecking OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"Indicates if strict LSA checking is enabled for graceful restart. A value of true (1) indicates that strict LSA checking is enabled.

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

REFERENCE "Graceful OSPF Restart, [Appendix B.2](#), Global Parameters (Optional)"

DEFVAL { true }

::= { ospfv3GeneralGroup 17 }

ospfv3RestartStatus OBJECT-TYPE

SYNTAX INTEGER { notRestarting(1),
plannedRestart(2),
unplannedRestart(3)
}

MAX-ACCESS read-only

```

STATUS          current
DESCRIPTION
    "The current status of OSPF graceful restart capability."
 ::= { ospfv3GeneralGroup 18 }

```

ospfv3RestartAge OBJECT-TYPE

```

SYNTAX          OspfV3UpToRefreshIntervalTC
UNITS           "seconds"
MAX-ACCESS      read-only
STATUS          current
DESCRIPTION
    "Remaining time in the current OSPF graceful restart
    interval."
 ::= { ospfv3GeneralGroup 19 }

```

ospfv3RestartExitReason OBJECT-TYPE

```

SYNTAX          INTEGER { none(1),
                          inProgress(2),
                          completed(3),
                          timedOut(4),
                          topologyChanged(5)
                          }
MAX-ACCESS      read-only
STATUS          current
DESCRIPTION
    "Describes the outcome of the last attempt at a
    graceful restart.

    none:          no restart has yet been attempted.
    inProgress:    a restart attempt is currently underway.
    completed:     the last restart completed successfully.
    timedOut:      the last restart timed out.
    topologyChanged: the last restart was aborted due to
                    a topology change."
 ::= { ospfv3GeneralGroup 20 }

```

ospfv3NotificationEnable OBJECT-TYPE

```

SYNTAX          TruthValue
MAX-ACCESS      read-write
STATUS          current
DESCRIPTION
    "This object provides a coarse level of control
    over the generation of OSPFv3 notifications.

    If this object is set to true (1), then it enables
    the generation of OSPFv3 notifications. If it is
    set to false (2), these notifications are not
    generated."

```

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

::= { ospfv3GeneralGroup 21 }

ospfv3StubRouterSupport OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The router's support for stub router functionality. An object value of true (1) indicates that stub router functionality is supported."

REFERENCE

"OSPF Stub Router Advertisement"

::= { ospfv3GeneralGroup 22 }

ospfv3StubRouterAdvertisement OBJECT-TYPE

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

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"This object controls the advertisement of stub LSAs by the router. The value doNotAdvertise (1) will result in the advertisement of standard LSAs and is the default value."

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

REFERENCE

"OSPF Stub Router Advertisement, [Section 2](#), Proposed Solution"

DEFVAL { doNotAdvertise }

::= { ospfv3GeneralGroup 23 }

ospfv3DiscontinuityTime 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."

::= { ospfv3GeneralGroup 24 }

ospfv3RestartTime OBJECT-TYPE

SYNTAX TimeStamp

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The value of sysUpTime on the most recent occasion at which the ospfv3RestartExitReason was updated."

::= { ospfv3GeneralGroup 25 }

-- The OSPFv3 Area Data Structure contains information
-- regarding the various areas. The interfaces and
-- virtual links are configured as part of these areas.
-- Area 0, by definition, is the backbone area.

ospfv3AreaTable OBJECT-TYPE

SYNTAX SEQUENCE OF Ospfv3AreaEntry

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, by definition, is the backbone area."

REFERENCE

"OSPF Version 2, [Section 6](#), The Area Data Structure"

::= { ospfv3Objects 2 }

ospfv3AreaEntry OBJECT-TYPE

SYNTAX Ospfv3AreaEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Information describing the configured parameters and cumulative statistics of one of the router's attached areas."

The information in this table is persistent, and when written, the entity SHOULD save the a change to non-volatile storage."

INDEX { ospfv3AreaId }

::= { ospfv3AreaTable 1 }

```

Ospfv3AreaEntry ::= SEQUENCE {
    ospfv3AreaId
        Ospfv3AreaIdTC,
    ospfv3AreaImportAsExtern
        INTEGER,
    ospfv3AreaSpfRuns
        Counter32,
    ospfv3AreaBdrRtrCount
        Gauge32,
    ospfv3AreaAsBdrRtrCount
        Gauge32,
    ospfv3AreaScopeLsaCount
        Gauge32,
    ospfv3AreaScopeLsaCksumSum
        Unsigned32,
    ospfv3AreaSummary
        INTEGER,
    ospfv3AreaRowStatus
        RowStatus,
    ospfv3AreaStubMetric
        BigMetric,
    ospfv3AreaNssaTranslatorRole
        INTEGER,
    ospfv3AreaNssaTranslatorState
        INTEGER,
    ospfv3AreaNssaTranslatorStabInterval
        Unsigned32,
    ospfv3AreaNssaTranslatorEvents
        Counter32,
    ospfv3AreaStubMetricType
        INTEGER,
    ospfv3AreaTEEnabled
        TruthValue
}

ospfv3AreaId OBJECT-TYPE
    SYNTAX      Ospfv3AreaIdTC
    MAX-ACCESS   not-accessible
    STATUS      current
    DESCRIPTION
        "A 32-bit unsigned integer uniquely identifying an area.
        Area ID 0 is used for the OSPFv3 backbone."
    REFERENCE
        "OSPF Version 2, Appendix C.2, Area parameters"
    ::= { ospfv3AreaEntry 1 }

```

```

ospfv3AreaImportAsExtern OBJECT-TYPE
    SYNTAX          INTEGER {
                        importExternal(1),  -- normal area
                        importNoExternal(2), -- stub area
                        importNssa(3)       -- not-so-stubby-area
                    }
    MAX-ACCESS       read-create
    STATUS           current
    DESCRIPTION
        "Indicates whether an area is a stub area, NSSA, or
        standard area. AS-scope LSAs are not imported into stub
        areas or NSSAs. NSSAs import AS-External data as NSSA
        LSAs that have Area-scope."
    REFERENCE
        "OSPF Version 2, Appendix C.2, Area parameters"
    DEFVAL { importExternal }
    ::= { ospfv3AreaEntry 2 }

ospfv3AreaSpfRuns 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 ospfv3DiscontinuityTime."
    ::= { ospfv3AreaEntry 3 }

ospfv3AreaBdrRtrCount 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."
    DEFVAL { 0 }
    ::= { ospfv3AreaEntry 4 }

```

ospfv3AreaAsBdrRtrCount 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."
DEFVAL { 0 }
::= { ospfv3AreaEntry 5 }

ospfv3AreaScopeLsaCount OBJECT-TYPE
SYNTAX Gauge32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The total number of Area-scope link state
advertisements in this area's link state
database."
DEFVAL { 0 }
::= { ospfv3AreaEntry 6 }

ospfv3AreaScopeLsaCksumSum OBJECT-TYPE
SYNTAX Unsigned32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The 32-bit unsigned sum of the Area-scope link state
advertisements' LS checksums contained in this
area's link state database. The sum can be used
to determine if there has been a change in a
router's link state database or to compare the
link state database of two routers."
::= { ospfv3AreaEntry 7 }

ospfv3AreaSummary OBJECT-TYPE
SYNTAX INTEGER {
noAreaSummary(1),
sendAreaSummary(2)
}
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"The variable ospfv3AreaSummary controls the
import of Inter-Area LSAs into stub and
NSSA areas. It has no effect on other areas."

If it is noAreaSummary, the router will neither originate nor propagate Inter-Area LSAs into the stub or NSSA area. It will only advertise a default route.

If it is sendAreaSummary, the router will both summarize and propagate Inter-Area LSAs."

```
DEFVAL { sendAreaSummary }
::= { ospfv3AreaEntry 8 }
```

ospfv3AreaRowStatus 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."

```
::= { ospfv3AreaEntry 9 }
```

ospfv3AreaStubMetric OBJECT-TYPE

```
SYNTAX          BigMetric
MAX-ACCESS      read-create
STATUS          current
```

DESCRIPTION

"The metric value advertised for the default route into stub and NSSA areas. By default, this equals the least metric among the interfaces to other areas."

```
::= { ospfv3AreaEntry 10 }
```

ospfv3AreaNssaTranslatorRole OBJECT-TYPE

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

DESCRIPTION

"Indicates an NSSA border router's policy to perform NSSA translation of NSSA-LSAs into AS-External-LSAs."

```
DEFVAL { candidate }
```

```
::= { ospfv3AreaEntry 11 }
```

ospfv3AreaNssaTranslatorState 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 NSSA-LSAs into
        AS-External-LSAs.  When this object is set to
        'enabled', the NSSA border router's
        ospfv3AreaNssaTranslatorRole has been set to 'always'.
        When this object is set to 'elected', a candidate
        NSSA border router is translating NSSA-LSAs into
        AS-External-LSAs.  When this object is set to
        'disabled', a candidate NSSA Border router is NOT
        translating NSSA-LSAs into AS-External-LSAs."
    ::= { ospfv3AreaEntry 12 }

```

ospfv3AreaNssaTranslatorStabInterval OBJECT-TYPE

```

    SYNTAX          Unsigned32
    UNITS           "seconds"
    MAX-ACCESS      read-create
    STATUS          current
    DESCRIPTION
        "The stability interval defined as 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 }
    ::= { ospfv3AreaEntry 13 }

```

ospfv3AreaNssaTranslatorEvents OBJECT-TYPE

```

    SYNTAX          Counter32
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        "Indicates the number of Translator state changes
        that have occurred since the last start-up of the
        OSPFv3 routing process.

        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 ospfv3DiscontinuityTime."
    ::= { ospfv3AreaEntry 14 }

```

```

ospfv3AreaStubMetricType OBJECT-TYPE
    SYNTAX      INTEGER {
        ospfv3Metric(1),    -- OSPF Metric
        comparableCost(2),  -- external type 1
        nonComparable(3)    -- external type 2
    }
    MAX-ACCESS   read-create
    STATUS       current
    DESCRIPTION
        "This variable assigns the type of metric
        advertised as a default route."
    DEFVAL { ospfv3Metric }
    ::= { ospfv3AreaEntry 15 }

ospfv3AreaTEEnabled OBJECT-TYPE
    SYNTAX      TruthValue
    MAX-ACCESS   read-create
    STATUS       current
    DESCRIPTION
        "Indicates whether or not traffic engineering
        is enabled in the area. The object is set
        to the value true (1) to enable traffic engineering.
        Traffic engineering is disabled by default."
    DEFVAL { false }
    ::= { ospfv3AreaEntry 16 }

-- OSPFv3 AS-Scope Link State Database

ospfv3AsLsdbTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF Ospf3AsLsdbEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
        "The OSPFv3 Process's AS-scope link state database
        (LSDB). The LSDB contains the AS-scope link state
        advertisements from throughout the areas that the
        device is attached to."
    ::= { ospfv3Objects 3 }

ospfv3AsLsdbEntry OBJECT-TYPE
    SYNTAX      Ospf3AsLsdbEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
        "A single AS-scope link state advertisement."
    INDEX       { ospfv3AsLsdbType,
        ospfv3AsLsdbRouterId,
        ospfv3AsLsdbLsid }

```

```
::= { ospfv3AsLsdbTable 1 }
```

```
Ospfv3AsLsdbEntry ::= SEQUENCE {
    ospfv3AsLsdbType
        Unsigned32,
    ospfv3AsLsdbRouterId
        Ospf3RouterIdTC,
    ospfv3AsLsdbLsid
        Ospf3LsIdTC,
    ospfv3AsLsdbSequence
        Ospf3LsaSequenceTC,
    ospfv3AsLsdbAge
        Ospf3LsaAgeTC,
    ospfv3AsLsdbChecksum
        Integer32,
    ospfv3AsLsdbAdvertisement
        OCTET STRING,
    ospfv3AsLsdbTypeKnown
        TruthValue
}
```

```
ospfv3AsLsdbType OBJECT-TYPE
```

```
SYNTAX      Unsigned32(0..'FFFFFFF'h)
```

```
MAX-ACCESS  not-accessible
```

```
STATUS      current
```

```
DESCRIPTION
```

```
"The type of the link state advertisement.
Each link state type has a separate
advertisement format. AS-scope LSAs not recognized
by the router may be stored in the database."
```

```
::= { ospfv3AsLsdbEntry 1 }
```

```
ospfv3AsLsdbRouterId OBJECT-TYPE
```

```
SYNTAX      Ospf3RouterIdTC
```

```
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"
```

```
::= { ospfv3AsLsdbEntry 2 }
```

```
ospfv3AsLsdbLsid OBJECT-TYPE
```

```
SYNTAX      Ospf3LsIdTC
```

```
MAX-ACCESS  not-accessible
```

```
STATUS      current
```

DESCRIPTION

"The Link State ID is an LS type-specific field containing a unique identifier; it identifies the piece of the routing domain that is being described by the advertisement. In contrast to OSPFv2, the LSID has no addressing semantics."

::= { ospfv3AsLsdbEntry 3 }

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

ospfv3AsLsdbSequence OBJECT-TYPE

SYNTAX Ospfv3LsaSequenceTC

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The sequence number field is a signed 32-bit integer. It is used to detect old and duplicate link state advertisements. The space of sequence numbers is linearly ordered. The larger the sequence number, the more recent the advertisement."

REFERENCE

"OSPF Version 2, [Section 12.1.6](#), LS sequence number"

::= { ospfv3AsLsdbEntry 4 }

ospfv3AsLsdbAge OBJECT-TYPE

SYNTAX Ospfv3LsaAgeTC

UNITS "seconds"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This field is the age of the link state advertisement in seconds. The high-order bit of the LS age field is considered the DoNotAge bit for support of on-demand circuits."

REFERENCE

"OSPF Version 2, [Section 12.1.1](#), LS age;
 Extending OSPF to Support Demand Circuits,
[Section 2.2](#), The LS age field."

::= { ospfv3AsLsdbEntry 5 }

```

ospfv3AsLsdbChecksum 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"
    ::= { ospfv3AsLsdbEntry 6 }

ospfv3AsLsdbAdvertisement OBJECT-TYPE
    SYNTAX          OCTET STRING (SIZE (1..65535))
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        "The entire link state advertisement, including
        its header."
    ::= { ospfv3AsLsdbEntry 7 }

ospfv3AsLsdbTypeKnown OBJECT-TYPE
    SYNTAX          TruthValue
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        "The value true (1) indicates that the LSA type
        is recognized by this router."
    ::= { ospfv3AsLsdbEntry 8 }

-- OSPFv3 Area-Scope Link State Database

ospfv3AreaLsdbTable OBJECT-TYPE
    SYNTAX          SEQUENCE OF OspfV3AreaLsdbEntry
    MAX-ACCESS      not-accessible
    STATUS          current
    DESCRIPTION
        "The OSPFv3 Process's Area-scope LSDB.
        The LSDB contains the Area-scope link state
        advertisements from throughout the area that the
        device is attached to."
    ::= { ospfv3Objects 4 }

```

```
ospfv3AreaLsdbEntry OBJECT-TYPE
    SYNTAX          OspfV3AreaLsdbEntry
    MAX-ACCESS      not-accessible
    STATUS          current
    DESCRIPTION
        "A single Area-scope link state advertisement."
    INDEX            { ospfv3AreaLsdbAreaId,
                      ospfv3AreaLsdbType,
                      ospfv3AreaLsdbRouterId,
                      ospfv3AreaLsdbLsid }
    ::= { ospfv3AreaLsdbTable 1 }
```

```
OspfV3AreaLsdbEntry ::= SEQUENCE {
    ospfv3AreaLsdbAreaId
        OspfV3AreaIdTC,
    ospfv3AreaLsdbType
        Unsigned32,
    ospfv3AreaLsdbRouterId
        OspfV3RouterIdTC,
    ospfv3AreaLsdbLsid
        OspfV3LsidTC,
    ospfv3AreaLsdbSequence
        OspfV3LsaSequenceTC,
    ospfv3AreaLsdbAge
        OspfV3LsaAgeTC,
    ospfv3AreaLsdbChecksum
        Integer32,
    ospfv3AreaLsdbAdvertisement
        OCTET STRING,
    ospfv3AreaLsdbTypeKnown
        TruthValue
}
```

```
ospfv3AreaLsdbAreaId OBJECT-TYPE
    SYNTAX          OspfV3AreaIdTC
    MAX-ACCESS      not-accessible
    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"
    ::= { ospfv3AreaLsdbEntry 1 }
```

```
ospfv3AreaLsdbType OBJECT-TYPE
    SYNTAX          Unsigned32(0..'FFFFFFFF'h)
    MAX-ACCESS      not-accessible
    STATUS          current
```

DESCRIPTION

"The type of the link state advertisement.
Each link state type has a separate
advertisement format. Area-scope LSAs unrecognized
by the router are also stored in this database."

::= { ospfv3AreaLsdbEntry 2 }

ospfv3AreaLsdbRouterId OBJECT-TYPE

SYNTAX Ospfv3RouterIdTC

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"

::= { ospfv3AreaLsdbEntry 3 }

ospfv3AreaLsdbLsid OBJECT-TYPE

SYNTAX Ospfv3LsIdTC

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The Link State ID is an LS type-specific field
containing a unique identifier;
it identifies the piece of the routing domain
that is being described by the advertisement.
In contrast to OSPFv2, the LSID has no
addressing semantics."

::= { ospfv3AreaLsdbEntry 4 }

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

ospfv3AreaLsdbSequence OBJECT-TYPE

SYNTAX Ospfv3LsaSequenceTC

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The sequence number field is a signed 32-bit
integer. It is used to detect old and
duplicate link state advertisements. The space
of sequence numbers is linearly ordered. The
larger the sequence number, the more recent the
advertisement."

REFERENCE

"OSPF Version 2, [Section 12.1.6](#), LS sequence number"

::= { ospfv3AreaLsdbEntry 5 }

ospfv3AreaLsdbAge OBJECT-TYPE

SYNTAX Ospfv3LsaAgeTC

UNITS "seconds"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This field is the age of the link state advertisement in seconds. The high-order bit of the LS age field is considered the DoNotAge bit for support of on-demand circuits."

REFERENCE

"OSPF Version 2, [Section 12.1.1](#), LS age; Extending OSPF to Support Demand Circuits, [Section 2.2](#), The LS age field."

::= { ospfv3AreaLsdbEntry 6 }

ospfv3AreaLsdbChecksum 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"

::= { ospfv3AreaLsdbEntry 7 }

ospfv3AreaLsdbAdvertisement OBJECT-TYPE

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

MAX-ACCESS read-only

STATUS current

DESCRIPTION

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

::= { ospfv3AreaLsdbEntry 8 }

```

ospfv3AreaLsdbTypeKnown OBJECT-TYPE
    SYNTAX          TruthValue
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        "The value true (1) indicates that the LSA type is
        recognized by this router."
    ::= { ospfv3AreaLsdbEntry 9 }

-- OSPFv3 Link-Scope Link State Database, for non-virtual interfaces

ospfv3LinkLsdbTable OBJECT-TYPE
    SYNTAX          SEQUENCE OF Ospf3LinkLsdbEntry
    MAX-ACCESS      not-accessible
    STATUS          current
    DESCRIPTION
        "The OSPFv3 Process's Link-scope LSDB for non-virtual
        interfaces. The LSDB contains the Link-scope link
        state advertisements from the interfaces that the
        device is attached to."
    ::= { ospfv3Objects 5 }

ospfv3LinkLsdbEntry OBJECT-TYPE
    SYNTAX          Ospf3LinkLsdbEntry
    MAX-ACCESS      not-accessible
    STATUS          current
    DESCRIPTION
        "A single Link-scope link state advertisement."
    INDEX
        { ospfv3LinkLsdbIfIndex,
          ospfv3LinkLsdbIfInstId,
          ospfv3LinkLsdbType,
          ospfv3LinkLsdbRouterId,
          ospfv3LinkLsdbLsid }
    ::= { ospfv3LinkLsdbTable 1 }

Ospf3LinkLsdbEntry ::= SEQUENCE {
    ospfv3LinkLsdbIfIndex
        InterfaceIndex,
    ospfv3LinkLsdbIfInstId
        Ospf3IfInstIdTC,
    ospfv3LinkLsdbType
        Unsigned32,
    ospfv3LinkLsdbRouterId
        Ospf3RouterIdTC,
    ospfv3LinkLsdbLsid
        Ospf3LsidTC,
    ospfv3LinkLsdbSequence
        Ospf3LsaSequenceTC,

```

```

ospfv3LinkLsdbAge
    Ospf3LsaAgeTC,
ospfv3LinkLsdbChecksum
    Integer32,
ospfv3LinkLsdbAdvertisement
    OCTET STRING,
ospfv3LinkLsdbTypeKnown
    TruthValue
}

```

```

ospfv3LinkLsdbIfIndex OBJECT-TYPE
    SYNTAX      InterfaceIndex
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
        "The identifier of the link from which the LSA
        was received."
    ::= { ospfv3LinkLsdbEntry 1 }

```

```

ospfv3LinkLsdbIfInstId OBJECT-TYPE
    SYNTAX      Ospf3IfInstIdTC
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
        "The identifier of the interface instance from
        which the LSA was received."
    ::= { ospfv3LinkLsdbEntry 2 }

```

```

ospfv3LinkLsdbType OBJECT-TYPE
    SYNTAX      Unsigned32(0..'FFFFFFFF'h)
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
        "The type of the link state advertisement.
        Each link state type has a separate
        advertisement format. Link-scope LSAs unrecognized
        by the router are also stored in this database."
    ::= { ospfv3LinkLsdbEntry 3 }

```

```

ospfv3LinkLsdbRouterId OBJECT-TYPE
    SYNTAX      Ospf3RouterIdTC
    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"

```

```
::= { ospfv3LinkLsdbEntry 4 }
```

ospfv3LinkLsdbLsid OBJECT-TYPE

SYNTAX Ospfv3LsIdTC
MAX-ACCESS not-accessible
STATUS current

DESCRIPTION

"The Link State ID is an LS type-specific field containing a unique identifier; it identifies the piece of the routing domain that is being described by the advertisement. In contrast to OSPFv2, the LSID has no addressing semantics. However, in OSPFv3 the Link State ID always contains the flooding scope of the LSA."

```
::= { ospfv3LinkLsdbEntry 5 }
```

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

ospfv3LinkLsdbSequence OBJECT-TYPE

SYNTAX Ospfv3LsaSequenceTC
MAX-ACCESS read-only
STATUS current

DESCRIPTION

"The sequence number field is a signed 32-bit integer. It is used to detect old and duplicate link state advertisements. The space of sequence numbers is linearly ordered. The larger the sequence number, the more recent the advertisement."

REFERENCE

"OSPF Version 2, [Section 12.1.6](#), LS sequence number"

```
::= { ospfv3LinkLsdbEntry 6 }
```

ospfv3LinkLsdbAge OBJECT-TYPE

SYNTAX Ospfv3LsaAgeTC
UNITS "seconds"
MAX-ACCESS read-only
STATUS current

DESCRIPTION

"This field is the age of the link state advertisement in seconds. The high-order bit of the LS age field is considered the DoNotAge bit for support of on-demand circuits."

REFERENCE

"OSPF Version 2, [Section 12.1.1](#), LS age;
 Extending OSPF to Support Demand Circuits,
[Section 2.2](#), The LS age field."

::= { ospfv3LinkLsdbEntry 7 }

ospfv3LinkLsdbChecksum 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"

::= { ospfv3LinkLsdbEntry 8 }

ospfv3LinkLsdbAdvertisement OBJECT-TYPE

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

MAX-ACCESS read-only

STATUS current

DESCRIPTION

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

::= { ospfv3LinkLsdbEntry 9 }

ospfv3LinkLsdbTypeKnown OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The value true (1) indicates that the LSA type is recognized by this router."

::= { ospfv3LinkLsdbEntry 10 }

-- OSPF Host Table

ospfv3HostTable OBJECT-TYPE

SYNTAX SEQUENCE OF Ospfv3HostEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The Host/Metric Table indicates what hosts are directly attached to the router and their corresponding metrics."

REFERENCE

"OSPF Version 2, [Appendix C.7](#), Host route parameters"

::= { ospfv3Objects 6 }

ospfv3HostEntry OBJECT-TYPE

SYNTAX Ospfv3HostEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"A metric to be advertised when a given host is reachable."

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

INDEX { ospfv3HostAddressType,
 ospfv3HostAddress }

::= { ospfv3HostTable 1 }

```
Ospfv3HostEntry ::= SEQUENCE {
    ospfv3HostAddressType
        InetAddressType,
    ospfv3HostAddress
        InetAddress,
    ospfv3HostMetric
        Metric,
    ospfv3HostRowStatus
        RowStatus,
    ospfv3HostAreaID
        Ospfv3AreaIdTC
}
```

ospfv3HostAddressType OBJECT-TYPE

SYNTAX InetAddressType

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The address type of ospfv3HostAddress. Only IPv6 global address type is expected."

REFERENCE

"OSPF Version 2, [Appendix C.7](#), Host route parameters"

::= { ospfv3HostEntry 1 }

ospfv3HostAddress OBJECT-TYPE

SYNTAX InetAddress
MAX-ACCESS not-accessible
STATUS current

DESCRIPTION

"The IPv6 address of the host. Must be an IPv6 global address."

REFERENCE

"OSPF Version 2, [Appendix C.7](#), Host route parameters"

::= { ospfv3HostEntry 2 }

ospfv3HostMetric 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"

::= { ospfv3HostEntry 3 }

ospfv3HostRowStatus 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."

::= { ospfv3HostEntry 4 }

ospfv3HostAreaID OBJECT-TYPE

SYNTAX OspfV3AreaIdTC
MAX-ACCESS read-create
STATUS current

DESCRIPTION

"The Area the host entry is to be found within. By default, the area for the subsuming OSPFv3 interface, or Area 0 if there is no subsuming interface."

REFERENCE

"OSPF Version 2, [Appendix C.2](#), Area parameters"

```

 ::= { ospfv3HostEntry 5 }

-- OSPFv3 Interface Table

ospfv3IfTable OBJECT-TYPE
    SYNTAX          SEQUENCE OF Ospf3IfEntry
    MAX-ACCESS      not-accessible
    STATUS          current
    DESCRIPTION
        "The OSPFv3 Interface Table describes the
        interfaces from the viewpoint of OSPFv3."
    REFERENCE
        "OSPF for IPv6, Appendix C.3, Router Interface
        Parameters"
    ::= { ospfv3Objects 7 }

ospfv3IfEntry OBJECT-TYPE
    SYNTAX          Ospf3IfEntry
    MAX-ACCESS      not-accessible
    STATUS          current
    DESCRIPTION
        "The OSPFv3 Interface Entry describes one
        interface from the viewpoint of OSPFv3.

        The information in this table is persistent,
        and when written, the entity SHOULD save the
        change to non-volatile storage."
    INDEX           { ospfv3IfIndex,
                     ospfv3IfInstId }
    ::= { ospfv3IfTable 1 }

Ospf3IfEntry ::= SEQUENCE {
    ospfv3IfIndex
        InterfaceIndex,
    ospfv3IfInstId
        Ospf3IfInstIdTC,
    ospfv3IfAreaId
        Ospf3AreaIdTC,
    ospfv3IfType
        INTEGER,
    ospfv3IfAdminStatus
        Status,
    ospfv3IfRtrPriority
        DesignatedRouterPriority,
    ospfv3IfTransitDelay
        Ospf3UpToRefreshIntervalTC,
    ospfv3IfRetransInterval
        Ospf3UpToRefreshIntervalTC,

```



```

ospfv3IfHelloInterval
    HelloRange,
ospfv3IfRtrDeadInterval
    Ospf3DeadIntervalRangeTC,
ospfv3IfPollInterval
    Unsigned32,
ospfv3IfState
    INTEGER,
ospfv3IfDesignatedRouter
    Ospf3RouterIdTC,
ospfv3IfBackupDesignatedRouter
    Ospf3RouterIdTC,
ospfv3IfEvents
    Counter32,
ospfv3IfRowStatus
    RowStatus,
ospfv3IfDemand
    TruthValue,
ospfv3IfMetricValue
    Metric,
ospfv3IfLinkScopeLsaCount
    Gauge32,
ospfv3IfLinkLsaCksumSum
    Unsigned32,
ospfv3IfDemandNbrProbe
    TruthValue,
ospfv3IfDemandNbrProbeRetransLimit
    Unsigned32,
ospfv3IfDemandNbrProbeInterval
    Unsigned32,
ospfv3IfTEDisabled
    TruthValue,
ospfv3IfLinkLSASuppression
    TruthValue
}

```

ospfv3IfIndex OBJECT-TYPE

```

SYNTAX      InterfaceIndex
MAX-ACCESS  not-accessible
STATUS      current

```

DESCRIPTION

"The interface index of this OSPFv3 interface.
It corresponds to the interface index of the
IPv6 interface on which OSPFv3 is configured."

```
::= { ospfv3IfEntry 1 }
```

ospfv3IfInstId OBJECT-TYPE

SYNTAX OspfV3IfInstIdTC

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Enables multiple interface instances of OSPFv3 to be run over a single link. Each interface instance would be assigned a separate ID. This ID has local link significance only."

::= { ospfv3IfEntry 2 }

ospfv3IfAreaId OBJECT-TYPE

SYNTAX OspfV3AreaIdTC

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"A 32-bit integer uniquely identifying the area to which the interface connects. Area ID 0 is used for the OSPFv3 backbone."

DEFVAL { 0 }

::= { ospfv3IfEntry 3 }

ospfv3IfType OBJECT-TYPE

SYNTAX INTEGER {
broadcast(1),
nbma(2),
pointToPoint(3),
pointToMultipoint(5)
}

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The OSPFv3 interface type."

::= { ospfv3IfEntry 4 }

ospfv3IfAdminStatus OBJECT-TYPE

SYNTAX Status

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The OSPFv3 interface's administrative status. The value formed on the interface; the interface will be advertised as an internal route to some area. The value 'disabled' denotes that the interface is external to OSPFv3."

Note that a value of 'disabled' for the object ospfv3AdminStatus will override a value of 'enabled' for the interface."

```
DEFVAL          { enabled }
::= { ospfv3IfEntry 5 }
```

ospfv3IfRtrPriority 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 }
::= { ospfv3IfEntry 6 }
```

ospfv3IfTransitDelay OBJECT-TYPE

```
SYNTAX          Ospf3UpToRefreshIntervalTC
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. LSAs contained in the update packet must have their age incremented by this amount before transmission. This value should take into account the transmission and propagation delays of the interface."

REFERENCE

"OSPF for IPv6, [Appendix C.3](#), Router Interface Parameters."

```
DEFVAL          { 1 }
::= { ospfv3IfEntry 7 }
```

ospfv3IfRetransInterval OBJECT-TYPE

```
SYNTAX          Ospf3UpToRefreshIntervalTC
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."

DEFVAL { 5 }
::= { ospfv3IfEntry 8 }

ospfv3IfHelloInterval 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 }
::= { ospfv3IfEntry 9 }

ospfv3IfRtrDeadInterval OBJECT-TYPE

SYNTAX OspfV3DeadIntervalRangeTC
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 on the interface. 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 }
::= { ospfv3IfEntry 10 }

ospfv3IfPollInterval OBJECT-TYPE

SYNTAX Unsigned32
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 }
::= { ospfv3IfEntry 11 }

ospfv3IfState OBJECT-TYPE

SYNTAX INTEGER {
down(1),
loopback(2),
waiting(3),
pointToPoint(4),
designatedRouter(5),
backupDesignatedRouter(6),
otherDesignatedRouter(7),
standby(8)
}

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The OSPFv3 interface state. An interface may be in standby state if there are multiple interfaces on the link and another interface is active. The interface may be in Down state if the underlying IPv6 interface is down or if the admin status is 'disabled' either globally or for the interface."

::= { ospfv3IfEntry 12 }

ospfv3IfDesignatedRouter OBJECT-TYPE

SYNTAX OspfV3RouterIdTC

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The Router ID of the Designated Router."

::= { ospfv3IfEntry 13 }

ospfv3IfBackupDesignatedRouter OBJECT-TYPE

SYNTAX OspfV3RouterIdTC

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The Router ID of the Backup Designated Router."

::= { ospfv3IfEntry 14 }

ospfv3IfEvents OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of times this OSPFv3 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 ospfv3DiscontinuityTime."

```
::= { ospfv3IfEntry 15 }
```

ospfv3IfRowStatus 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."

```
::= { ospfv3IfEntry 16 }
```

ospfv3IfDemand OBJECT-TYPE

SYNTAX TruthValue
MAX-ACCESS read-create
STATUS current
DESCRIPTION

"Indicates whether Demand OSPFv3 procedures (Hello suppression to FULL neighbors and setting the DoNotAge flag on propagated LSAs) should be performed on this interface."

DEFVAL { false }

```
::= { ospfv3IfEntry 17 }
```

ospfv3IfMetricValue OBJECT-TYPE

SYNTAX Metric
MAX-ACCESS read-create
STATUS current
DESCRIPTION

"The metric assigned to this interface. The default value of the metric is 'Reference Bandwidth / ifSpeed'. The value of the reference bandwidth can be set in the ospfv3ReferenceBandwidth object."

```
::= { ospfv3IfEntry 18 }
```

ospfv3IfLinkScopeLsaCount OBJECT-TYPE

SYNTAX Gauge32
MAX-ACCESS read-only
STATUS current

DESCRIPTION

"The total number of Link-scope link state advertisements in this link's link state database."

::= { ospfv3IfEntry 19 }

ospfv3IfLinkLsaChecksumSum OBJECT-TYPE

SYNTAX Unsigned32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

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

::= { ospfv3IfEntry 20 }

ospfv3IfDemandNbrProbe OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"Indicates whether or not neighbor probing is enabled to determine whether or not the neighbor is inactive. Neighbor probing is disabled by default."

DEFVAL { false }

::= { ospfv3IfEntry 21 }

ospfv3IfDemandNbrProbeRetransLimit OBJECT-TYPE

SYNTAX Unsigned32

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The number of consecutive LSA retransmissions before the neighbor is deemed inactive and the neighbor adjacency is brought down."

DEFVAL { 10 }

::= { ospfv3IfEntry 22 }

ospfv3IfDemandNbrProbeInterval OBJECT-TYPE

SYNTAX Unsigned32

UNITS "seconds"

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"Defines how often the neighbor will be probed."

DEFVAL { 120 }
 ::= { ospfv3IfEntry 23 }

ospfv3IfTEDisabled OBJECT-TYPE

SYNTAX TruthValue
 MAX-ACCESS read-create
 STATUS current

DESCRIPTION

"Indicates whether or not traffic engineering is disabled on the interface when traffic engineering is enabled in the area where the interface is attached. The object is set to the value true (1) to disable traffic engineering on the interface. Traffic engineering is enabled by default on the interface when traffic engineering is enabled in the area where the interface is attached."

DEFVAL { false }
 ::= { ospfv3IfEntry 24 }

ospfv3IfLinkLSASuppression OBJECT-TYPE

SYNTAX TruthValue
 MAX-ACCESS read-create
 STATUS current

DESCRIPTION

"Specifies whether or not link LSA origination is suppressed for broadcast or NBMA interface types. The object is set to value true (1) to suppress the origination."

REFERENCE

"OSPF for IPv6, [Appendix C.3](#), Router Interface Parameters"

DEFVAL { false }
 ::= { ospfv3IfEntry 25 }

-- OSPFv3 Virtual Interface Table

ospfv3VirtIfTable OBJECT-TYPE

SYNTAX SEQUENCE OF OspfV3VirtIfEntry
 MAX-ACCESS not-accessible
 STATUS current

DESCRIPTION

"Information about this router's virtual interfaces that the OSPFv3 Process is configured to carry on."

REFERENCE

"OSPF for IPv6, [Appendix C.4](#), Virtual Link Parameters"

::= { ospfv3Objects 8 }

ospfv3VirtIfEntry OBJECT-TYPE

SYNTAX Ospfv3VirtIfEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Information about a single virtual interface.

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

INDEX { ospfv3VirtIfAreaId,
 ospfv3VirtIfNeighbor }

::= { ospfv3VirtIfTable 1 }

Ospfv3VirtIfEntry ::= SEQUENCE {

ospfv3VirtIfAreaId

 Ospfv3AreaIdTC,

ospfv3VirtIfNeighbor

 Ospfv3RouterIdTC,

ospfv3VirtIfIndex

 InterfaceIndex,

ospfv3VirtIfInstId

 Ospfv3IfInstIdTC,

ospfv3VirtIfTransitDelay

 Ospfv3UpToRefreshIntervalTC,

ospfv3VirtIfRetransInterval

 Ospfv3UpToRefreshIntervalTC,

ospfv3VirtIfHelloInterval

 HelloRange,

ospfv3VirtIfRtrDeadInterval

 Ospfv3DeadIntervalRangeTC,

ospfv3VirtIfState

 INTEGER,

ospfv3VirtIfEvents

 Counter32,

ospfv3VirtIfRowStatus

 RowStatus,

ospfv3VirtIfLinkScopeLsaCount

 Gauge32,

ospfv3VirtIfLinkLsaCksumSum

 Unsigned32

}

```

ospfv3VirtIfAreaId OBJECT-TYPE
    SYNTAX      Ospf3AreaIdTC
    MAX-ACCESS   not-accessible
    STATUS      current
    DESCRIPTION
        "The transit area that the virtual link
        traverses.  By definition, this is not
        Area 0."
    ::= { ospfv3VirtIfEntry 1 }

ospfv3VirtIfNeighbor OBJECT-TYPE
    SYNTAX      Ospf3RouterIdTC
    MAX-ACCESS   not-accessible
    STATUS      current
    DESCRIPTION
        "The Router ID of the virtual neighbor."
    ::= { ospfv3VirtIfEntry 2 }

ospfv3VirtIfIndex OBJECT-TYPE
    SYNTAX      InterfaceIndex
    MAX-ACCESS   read-only
    STATUS      current
    DESCRIPTION
        "The local interface index assigned by the
        OSPFv3 Process to this OSPFv3 virtual interface.
        It is advertised in Hellos sent over the virtual
        link and in the router's router-LSAs."
    ::= { ospfv3VirtIfEntry 3 }

ospfv3VirtIfInstId OBJECT-TYPE
    SYNTAX      Ospf3IfInstIdTC
    MAX-ACCESS   read-only
    STATUS      current
    DESCRIPTION
        "The local Interface Instance ID assigned by the
        OSPFv3 Process to this OSPFv3 virtual interface."
    ::= { ospfv3VirtIfEntry 4 }

ospfv3VirtIfTransitDelay OBJECT-TYPE
    SYNTAX      Ospf3UpToRefreshIntervalTC
    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."
    DEFVAL      { 1 }

```

```
::= { ospfv3VirtIfEntry 5 }
```

```
ospfv3VirtIfRetransInterval OBJECT-TYPE
```

```
SYNTAX      OspfV3UpToRefreshIntervalTC
```

```
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."

```
DEFVAL      { 5 }
```

```
::= { ospfv3VirtIfEntry 6 }
```

```
ospfv3VirtIfHelloInterval 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 }
```

```
::= { ospfv3VirtIfEntry 7 }
```

```
ospfv3VirtIfRtrDeadInterval OBJECT-TYPE
```

```
SYNTAX      OspfV3DeadIntervalRangeTC
```

```
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 }
```

```
::= { ospfv3VirtIfEntry 8 }
```

```
ospfv3VirtIfState OBJECT-TYPE
    SYNTAX          INTEGER {
                        down(1),
                        pointToPoint(4)
                    }
    MAX-ACCESS       read-only
    STATUS           current
    DESCRIPTION
        "OSPF virtual interface states. The same encoding
        as the ospfv3IfTable is used."
    ::= { ospfv3VirtIfEntry 9 }

ospfv3VirtIfEvents 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 ospfv3DiscontinuityTime."
    ::= { ospfv3VirtIfEntry 10 }

ospfv3VirtIfRowStatus 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."
    ::= { ospfv3VirtIfEntry 11 }

ospfv3VirtIfLinkScopeLsaCount OBJECT-TYPE
    SYNTAX          Gauge32
    MAX-ACCESS       read-only
    STATUS           current
    DESCRIPTION
        "The total number of Link-scope link state
        advertisements in this virtual link's link state
        database."
```

```

 ::= { ospfv3VirtIfEntry 12 }

ospfv3VirtIfLinkLsaCksumSum OBJECT-TYPE
    SYNTAX      Unsigned32
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
        "The 32-bit unsigned sum of the Link-scope link state
        advertisements' LS checksums contained in this
        virtual link's link state database. The sum can be used
        to determine if there has been a change in a
        router's link state database or to compare the
        link state database of two routers."
 ::= { ospfv3VirtIfEntry 13 }

-- OSPFv3 Neighbor Table

ospfv3NbrTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF OspfV3NbrEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
        "A table describing all neighbors in the
        locality of the OSPFv3 router."
    REFERENCE
        "OSPF Version 2, Section 10, The Neighbor Data
        Structure"
 ::= { ospfv3Objects 9 }

ospfv3NbrEntry OBJECT-TYPE
    SYNTAX      OspfV3NbrEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
        "The information regarding a single neighbor."
    REFERENCE
        "OSPF Version 2, Section 10, The Neighbor Data
        Structure"
    INDEX       { ospfv3NbrIfIndex,
                  ospfv3NbrIfInstId,
                  ospfv3NbrRtrId }
 ::= { ospfv3NbrTable 1 }

OspfV3NbrEntry ::= SEQUENCE {
    ospfv3NbrIfIndex
        InterfaceIndex,
    ospfv3NbrIfInstId
        OspfV3IfInstIdTC,

```

```

ospfv3NbrRtrId
    Ospf3RouterIdTC,
ospfv3NbrAddressType
    InetAddressType,
ospfv3NbrAddress
    InetAddress,
ospfv3NbrOptions
    Integer32,
ospfv3NbrPriority
    DesignatedRouterPriority,
ospfv3NbrState
    INTEGER,
ospfv3NbrEvents
    Counter32,
ospfv3NbrLsRetransQLen
    Gauge32,
ospfv3NbrHelloSuppressed
    TruthValue,
ospfv3NbrIfId
    InterfaceIndex,
ospfv3NbrRestartHelperStatus
    INTEGER,
ospfv3NbrRestartHelperAge
    Ospf3UpToRefreshIntervalTC,
ospfv3NbrRestartHelperExitReason
    INTEGER
}

```

ospfv3NbrIfIndex OBJECT-TYPE

```

SYNTAX      InterfaceIndex
MAX-ACCESS  not-accessible
STATUS      current

```

DESCRIPTION

"The Local Link ID of the link over which the neighbor can be reached."

```
::= { ospfv3NbrEntry 1 }
```

ospfv3NbrIfInstId OBJECT-TYPE

```

SYNTAX      Ospf3IfInstIdTC
MAX-ACCESS  not-accessible
STATUS      current

```

DESCRIPTION

"Interface instance over which the neighbor can be reached. This ID has local link significance only."

```
::= { ospfv3NbrEntry 2 }
```

ospfv3NbrRtrId OBJECT-TYPE
SYNTAX Ospfv3RouterIdTC
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
 "A 32-bit unsigned integer uniquely identifying the
 neighboring router in the Autonomous System."
 ::= { ospfv3NbrEntry 3 }

ospfv3NbrAddressType OBJECT-TYPE
SYNTAX InetAddressType
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "The address type of ospfv3NbrAddress. Only IPv6
 addresses without zone index are expected."
 ::= { ospfv3NbrEntry 4 }

ospfv3NbrAddress OBJECT-TYPE
SYNTAX InetAddress
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "The IPv6 address of the neighbor associated with
 the local link."
 ::= { ospfv3NbrEntry 5 }

ospfv3NbrOptions OBJECT-TYPE
SYNTAX Integer32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "A bit mask corresponding to the neighbor's
 options field."
REFERENCE
 "OSPF for IPv6, [Appendix A.2](#), The Options Field"
 ::= { ospfv3NbrEntry 6 }

ospfv3NbrPriority OBJECT-TYPE
SYNTAX DesignatedRouterPriority
MAX-ACCESS read-only
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."
 ::= { ospfv3NbrEntry 7 }

ospfv3NbrState 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"
::= { ospfv3NbrEntry 8 }

ospfv3NbrEvents 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 ospfv3DiscontinuityTime."
::= { ospfv3NbrEntry 9 }

ospfv3NbrLsRetransQLen OBJECT-TYPE

SYNTAX Gauge32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The current length of the retransmission
queue."
::= { ospfv3NbrEntry 10 }

ospfv3NbrHelloSuppressed OBJECT-TYPE

SYNTAX TruthValue
MAX-ACCESS read-only
STATUS current

DESCRIPTION

"Indicates whether Hellos are being suppressed to the neighbor."

::= { ospfv3NbrEntry 11 }

ospfv3NbrIfId OBJECT-TYPE

SYNTAX InterfaceIndex

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The Interface ID that the neighbor advertises in its Hello packets on this link, that is, the neighbor's local interface index."

::= { ospfv3NbrEntry 12 }

ospfv3NbrRestartHelperStatus 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."

::= { ospfv3NbrEntry 13 }

ospfv3NbrRestartHelperAge OBJECT-TYPE

SYNTAX OspfV3UpToRefreshIntervalTC

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."

::= { ospfv3NbrEntry 14 }

ospfv3NbrRestartHelperExitReason OBJECT-TYPE

SYNTAX INTEGER { none(1),
inProgress(2),
completed(3),
timedOut(4),
topologyChanged(5)
}

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Describes the outcome of the last attempt at acting as a graceful restart helper for the neighbor.

none: no restart has yet been attempted.
 inProgress: a restart attempt is currently underway.
 completed: the last restart completed successfully.
 timedOut: the last restart timed out.
 topologyChanged: the last restart was aborted due to a topology change."

::= { ospfv3NbrEntry 15 }

-- OSPFv3 Configured Neighbor Table

ospfv3CfgNbrTable OBJECT-TYPE

SYNTAX SEQUENCE OF OspfV3CfgNbrEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"A table describing all configured neighbors.

The Configured Neighbors table just gives OSPFv3 information for sending OSPFv3 packets to potential neighbors and is typically used on NBMA and Point-to-Multipoint networks. Once a Hello is received from a neighbor in the Configured Neighbor table, an entry for that neighbor is created in the Neighbor table and adjacency state is maintained there. Neighbors on multi-access or Point-to-Point networks can use multicast addressing, so only Neighbor table entries are created for them."

REFERENCE

"OSPF Version 2, [Section 10](#), The Neighbor Data Structure"

::= { ospfv3Objects 10 }

ospfv3CfgNbrEntry OBJECT-TYPE

SYNTAX OspfV3CfgNbrEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The information regarding a single configured neighbor.

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

REFERENCE

"OSPF Version 2, [Section 10](#), The Neighbor Data Structure"

```
INDEX          { ospfv3CfgNbrIfIndex,
                  ospfv3CfgNbrIfInstId,
                  ospfv3CfgNbrAddressType,
                  ospfv3CfgNbrAddress }
::= { ospfv3CfgNbrTable 1 }
```

```
Ospfv3CfgNbrEntry ::= SEQUENCE {
    ospfv3CfgNbrIfIndex
        InterfaceIndex,
    ospfv3CfgNbrIfInstId
        Ospf3IfInstIdTC,
    ospfv3CfgNbrAddressType
        InetAddressType,
    ospfv3CfgNbrAddress
        InetAddress,
    ospfv3CfgNbrPriority
        DesignatedRouterPriority,
    ospfv3CfgNbrRowStatus
        RowStatus
}
```

ospfv3CfgNbrIfIndex OBJECT-TYPE

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

"The Local Link ID of the link over which the neighbor can be reached."

```
::= { ospfv3CfgNbrEntry 1 }
```

ospfv3CfgNbrIfInstId OBJECT-TYPE

```
SYNTAX          Ospf3IfInstIdTC
MAX-ACCESS      not-accessible
STATUS          current
DESCRIPTION
```

"Interface instance over which the neighbor can be reached. This ID has local link significance only."

```
::= { ospfv3CfgNbrEntry 2 }
```

ospfv3CfgNbrAddressType OBJECT-TYPE

```
SYNTAX          InetAddressType
MAX-ACCESS      not-accessible
STATUS          current
```

DESCRIPTION

"The address type of ospfv3NbrAddress. Only IPv6 addresses without zone index are expected."

::= { ospfv3CfgrEntry 3 }

ospfv3CfgrNbrAddress OBJECT-TYPE

SYNTAX InetAddress

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The IPv6 address of the neighbor associated with the local link."

::= { ospfv3CfgrEntry 4 }

ospfv3CfgrNbrPriority 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 }

::= { ospfv3CfgrEntry 5 }

ospfv3CfgrNbrRowStatus 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."

::= { ospfv3CfgrEntry 6 }

-- OSPFv3 Virtual Neighbor Table

ospfv3VirtNbrTable OBJECT-TYPE

SYNTAX SEQUENCE OF OspfV3VirtNbrEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"A table describing all virtual neighbors."

REFERENCE

"OSPF Version 2, [Section 15](#), Virtual Links"
 ::= { ospfv3Objects 11 }

ospfv3VirtNbrEntry OBJECT-TYPE
 SYNTAX Ospfv3VirtNbrEntry
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION
 "Virtual neighbor information."
 INDEX { ospfv3VirtNbrArea,
 ospfv3VirtNbrRtrId }
 ::= { ospfv3VirtNbrTable 1 }

Ospfv3VirtNbrEntry ::= SEQUENCE {
 ospfv3VirtNbrArea
 Ospfv3AreaIdTC,
 ospfv3VirtNbrRtrId
 Ospfv3RouterIdTC,
 ospfv3VirtNbrIfIndex
 InterfaceIndex,
 ospfv3VirtNbrIfInstId
 Ospfv3IfInstIdTC,
 ospfv3VirtNbrAddressType
 InetAddressType,
 ospfv3VirtNbrAddress
 InetAddress,
 ospfv3VirtNbrOptions
 Integer32,
 ospfv3VirtNbrState
 INTEGER,
 ospfv3VirtNbrEvents
 Counter32,
 ospfv3VirtNbrLsRetransQLen
 Gauge32,
 ospfv3VirtNbrHelloSuppressed
 TruthValue,
 ospfv3VirtNbrIfId
 InterfaceIndex,
 ospfv3VirtNbrRestartHelperStatus
 INTEGER,
 ospfv3VirtNbrRestartHelperAge
 Ospfv3UpToRefreshIntervalTC,
 ospfv3VirtNbrRestartHelperExitReason
 INTEGER
 }

ospfv3VirtNbrArea OBJECT-TYPE
SYNTAX Ospfv3AreaIdTC
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
 "The transit area Identifier."
 ::= { ospfv3VirtNbrEntry 1 }

ospfv3VirtNbrRtrId OBJECT-TYPE
SYNTAX Ospfv3RouterIdTC
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
 "A 32-bit integer uniquely identifying the
 neighboring router in the Autonomous System."
 ::= { ospfv3VirtNbrEntry 2 }

ospfv3VirtNbrIfIndex OBJECT-TYPE
SYNTAX InterfaceIndex
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "The local Interface ID for the virtual link over
 which the neighbor can be reached."
 ::= { ospfv3VirtNbrEntry 3 }

ospfv3VirtNbrIfInstId OBJECT-TYPE
SYNTAX Ospfv3IfInstIdTC
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "The interface instance for the virtual link over
 which the neighbor can be reached."
 ::= { ospfv3VirtNbrEntry 4 }

ospfv3VirtNbrAddressType OBJECT-TYPE
SYNTAX InetAddressType
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "The address type of ospfv3VirtNbrAddress. Only IPv6
 addresses without zone index are expected."
 ::= { ospfv3VirtNbrEntry 5 }

ospfv3VirtNbrAddress OBJECT-TYPE
SYNTAX InetAddress
MAX-ACCESS read-only
STATUS current

DESCRIPTION

"The IPv6 address advertised by this virtual neighbor.
It must be a global scope address."

::= { ospfv3VirtNbrEntry 6 }

ospfv3VirtNbrOptions OBJECT-TYPE

SYNTAX Integer32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

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

REFERENCE

"OSPF for IPv6, [Appendix A.2](#), The Options Field"

::= { ospfv3VirtNbrEntry 7 }

ospfv3VirtNbrState 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."

::= { ospfv3VirtNbrEntry 8 }

ospfv3VirtNbrEvents 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 ospfv3DiscontinuityTime."

::= { ospfv3VirtNbrEntry 9 }

ospfv3VirtNbrLsRetransQLen OBJECT-TYPE

SYNTAX Gauge32
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION
 "The current length of the retransmission queue."
 ::= { ospfv3VirtNbrEntry 10 }

ospfv3VirtNbrHelloSuppressed OBJECT-TYPE

SYNTAX TruthValue
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION
 "Indicates whether Hellos are being suppressed to the neighbor."
 ::= { ospfv3VirtNbrEntry 11 }

ospfv3VirtNbrIfId OBJECT-TYPE

SYNTAX InterfaceIndex
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION
 "The Interface ID that the neighbor advertises in its Hello packets on this virtual link, that is, the neighbor's local Interface ID."
 ::= { ospfv3VirtNbrEntry 12 }

ospfv3VirtNbrRestartHelperStatus 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."
 ::= { ospfv3VirtNbrEntry 13 }

ospfv3VirtNbrRestartHelperAge OBJECT-TYPE

SYNTAX OspfV3UpToRefreshIntervalTC
 UNITS "seconds"
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION
 "Remaining time in the current OSPF graceful restart interval, if the router is acting as a restart helper for the neighbor."


```

 ::= { ospfv3VirtNbrEntry 14 }

ospfv3VirtNbrRestartHelperExitReason OBJECT-TYPE
    SYNTAX      INTEGER { none(1),
                          inProgress(2),
                          completed(3),
                          timedOut(4),
                          topologyChanged(5)
    }
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
        "Describes the outcome of the last attempt at acting
        as a graceful restart helper for the neighbor.

        none:          no restart has yet been attempted.
        inProgress:    a restart attempt is currently underway.
        completed:     the last restart completed successfully.
        timedOut:      the last restart timed out.
        topologyChanged: the last restart was aborted due to
                        a topology change."
 ::= { ospfv3VirtNbrEntry 15 }

--
-- The OSPFv3 Area Aggregate Table
--

ospfv3AreaAggregateTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF Ospfv3AreaAggregateEntry
    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.

        A range of IPv6 prefixes specified by a
        prefix / prefix length pair. Note that if
        ranges are configured such that one range
        subsumes another range, the most specific
        match is the preferred one."
 ::= { ospfv3Objects 12 }

```

```

ospfv3AreaAggregateEntry OBJECT-TYPE
    SYNTAX          OspfV3AreaAggregateEntry
    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
        { ospfv3AreaAggregateAreaID,
          ospfv3AreaAggregateAreaLsdbType,
          ospfv3AreaAggregatePrefixType,
          ospfv3AreaAggregatePrefix,
          ospfv3AreaAggregatePrefixLength }
    ::= { ospfv3AreaAggregateTable 1 }

OspfV3AreaAggregateEntry ::= SEQUENCE {
    ospfv3AreaAggregateAreaID
        OspfV3AreaIdTC,
    ospfv3AreaAggregateAreaLsdbType
        INTEGER,
    ospfv3AreaAggregatePrefixType
        InetAddressType,
    ospfv3AreaAggregatePrefix
        InetAddress,
    ospfv3AreaAggregatePrefixLength
        InetAddressPrefixLength,
    ospfv3AreaAggregateRowStatus
        RowStatus,
    ospfv3AreaAggregateEffect
        INTEGER,
    ospfv3AreaAggregateRouteTag
        Unsigned32
}

ospfv3AreaAggregateAreaID OBJECT-TYPE
    SYNTAX          OspfV3AreaIdTC
    MAX-ACCESS      not-accessible
    STATUS          current
    DESCRIPTION
        "The area the Address Aggregate is to be found
        within."
    REFERENCE
        "OSPF Version 2, Appendix C.2, Area parameters"
    ::= { ospfv3AreaAggregateEntry 1 }

```

ospfv3AreaAggregateAreaLsdbType OBJECT-TYPE

SYNTAX INTEGER {
interAreaPrefixLsa(8195), -- 0x2003
nssaExternalLsa(8199) -- 0x2007
}
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"The type of the Address Aggregate. This field specifies the Area LSDB type that this Address Aggregate applies to."
REFERENCE
"OSPF Version 2, [Appendix A.4.1](#), The LSA header"
::= { ospfv3AreaAggregateEntry 2 }

ospfv3AreaAggregatePrefixType OBJECT-TYPE

SYNTAX InetAddressType
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"The prefix type of ospfv3AreaAggregatePrefix. Only IPv6 addresses are expected."
::= { ospfv3AreaAggregateEntry 3 }

ospfv3AreaAggregatePrefix OBJECT-TYPE

SYNTAX InetAddress (SIZE (0..16))
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"The IPv6 prefix."
REFERENCE
"OSPF Version 2, [Appendix C.2](#), Area parameters"
::= { ospfv3AreaAggregateEntry 4 }

ospfv3AreaAggregatePrefixLength OBJECT-TYPE

SYNTAX InetAddressPrefixLength (3..128)
UNITS "bits"
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"The length of the prefix (in bits). A prefix can not be shorter than 3 bits."
REFERENCE
"OSPF Version 2, [Appendix C.2](#), Area parameters"
::= { ospfv3AreaAggregateEntry 5 }

ospfv3AreaAggregateRowStatus 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."

::= { ospfv3AreaAggregateEntry 6 }

ospfv3AreaAggregateEffect OBJECT-TYPE

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

MAX-ACCESS read-create
STATUS current

DESCRIPTION

"Prefixes subsumed by ranges will either trigger the advertisement of the indicated aggregate (advertiseMatching) or result in the prefix not being advertised at all outside the area."

DEFVAL { advertiseMatching }
::= { ospfv3AreaAggregateEntry 7 }

ospfv3AreaAggregateRouteTag OBJECT-TYPE

SYNTAX Unsigned32
MAX-ACCESS read-create
STATUS current

DESCRIPTION

"This tag is advertised only in the summarized As-External LSA when summarizing from NSSA-LSAs to AS-External-LSAs."

DEFVAL { 0 }
::= { ospfv3AreaAggregateEntry 8 }

-- OSPFv3 Link-Scope Link State Database, for virtual interfaces

ospfv3VirtLinkLsdbTable OBJECT-TYPE

SYNTAX SEQUENCE OF OspfV3VirtLinkLsdbEntry
MAX-ACCESS not-accessible
STATUS current

DESCRIPTION

"The OSPFv3 Process's Link-scope LSDB for virtual interfaces. The LSDB contains the Link-scope link state advertisements from virtual interfaces."

```
::= { ospfv3Objects 13 }
```

```
ospfv3VirtLinkLsdbEntry OBJECT-TYPE
    SYNTAX          OspfV3VirtLinkLsdbEntry
    MAX-ACCESS      not-accessible
    STATUS          current
    DESCRIPTION
        "A single Link-scope link state advertisement
        for a virtual interface."
    INDEX            { ospfv3VirtLinkLsdbIfAreaId,
                      ospfv3VirtLinkLsdbIfNeighbor,
                      ospfv3VirtLinkLsdbType,
                      ospfv3VirtLinkLsdbRouterId,
                      ospfv3VirtLinkLsdbLsid }
    ::= { ospfv3VirtLinkLsdbTable 1 }
```

```
OspfV3VirtLinkLsdbEntry ::= SEQUENCE {
    ospfv3VirtLinkLsdbIfAreaId
        OspfV3AreaIdTC,
    ospfv3VirtLinkLsdbIfNeighbor
        OspfV3RouterIdTC,
    ospfv3VirtLinkLsdbType
        Unsigned32,
    ospfv3VirtLinkLsdbRouterId
        OspfV3RouterIdTC,
    ospfv3VirtLinkLsdbLsid
        OspfV3LsIdTC,
    ospfv3VirtLinkLsdbSequence
        OspfV3LsaSequenceTC,
    ospfv3VirtLinkLsdbAge
        OspfV3LsaAgeTC,
    ospfv3VirtLinkLsdbChecksum
        Integer32,
    ospfv3VirtLinkLsdbAdvertisement
        OCTET STRING,
    ospfv3VirtLinkLsdbTypeKnown
        TruthValue
}
```

```
ospfv3VirtLinkLsdbIfAreaId OBJECT-TYPE
    SYNTAX          OspfV3AreaIdTC
    MAX-ACCESS      not-accessible
    STATUS          current
    DESCRIPTION
        "The transit area that the virtual link
        traverses. By definition, this is not
        Area 0."
    ::= { ospfv3VirtLinkLsdbEntry 1 }
```

```
ospfv3VirtLinkLsdbIfNeighbor OBJECT-TYPE
    SYNTAX      OspfV3RouterIdTC
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The Router ID of the virtual neighbor."
    ::= { ospfv3VirtLinkLsdbEntry 2 }

ospfv3VirtLinkLsdbType OBJECT-TYPE
    SYNTAX      Unsigned32(0..'FFFFFFFF'h)
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The type of the link state advertisement.
        Each link state type has a separate
        advertisement format. Link-scope LSAs unrecognized
        by the router are also stored in this database."
    ::= { ospfv3VirtLinkLsdbEntry 3 }

ospfv3VirtLinkLsdbRouterId OBJECT-TYPE
    SYNTAX      OspfV3RouterIdTC
    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"
    ::= { ospfv3VirtLinkLsdbEntry 4 }

ospfv3VirtLinkLsdbLsid OBJECT-TYPE
    SYNTAX      OspfV3LsIdTC
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The Link State ID is an LS type-specific field
        containing a unique identifier;
        it identifies the piece of the routing domain
        that is being described by the advertisement.
        In contrast to OSPFv2, the LSID has no
        addressing semantics."
    ::= { ospfv3VirtLinkLsdbEntry 5 }

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

ospfv3VirtLinkLsdbSequence OBJECT-TYPE
SYNTAX Ospfv3LsaSequenceTC
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "The sequence number field is a signed 32-bit integer. It is used to detect old and duplicate link state advertisements. The space of sequence numbers is linearly ordered. The larger the sequence number, the more recent the advertisement."
REFERENCE
 "OSPF Version 2, [Section 12.1.6](#), LS sequence number"
 ::= { ospfv3VirtLinkLsdbEntry 6 }

ospfv3VirtLinkLsdbAge OBJECT-TYPE
SYNTAX Ospfv3LsaAgeTC
UNITS "seconds"
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "This field is the age of the link state advertisement in seconds. The high-order bit of the LS age field is considered the DoNotAge bit for support of on-demand circuits."
REFERENCE
 "OSPF Version 2, [Section 12.1.1](#), LS age; Extending OSPF to Support Demand Circuits, [Section 2.2](#), The LS age field."
 ::= { ospfv3VirtLinkLsdbEntry 7 }

ospfv3VirtLinkLsdbChecksum 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"
 ::= { ospfv3VirtLinkLsdbEntry 8 }

```

ospfv3VirtLinkLsdbAdvertisement OBJECT-TYPE
    SYNTAX          OCTET STRING (SIZE (1..65535))
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        "The entire link state advertisement, including
        its header."
    ::= { ospfv3VirtLinkLsdbEntry 9 }

ospfv3VirtLinkLsdbTypeKnown OBJECT-TYPE
    SYNTAX          TruthValue
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        "The value true (1) indicates that the LSA type is
        recognized by this router."
    ::= { ospfv3VirtLinkLsdbEntry 10 }

-- The OspfV3 Notification Table

-- The OspfV3 Notification Table records fields that are
-- required for notifications.

ospfv3NotificationEntry OBJECT IDENTIFIER
    ::= { ospfv3Objects 14 }

ospfv3ConfigErrorType OBJECT-TYPE
    SYNTAX          INTEGER {
        badVersion(1),
        areaMismatch(2),
        unknownNbmaNbr(3), -- Router is DR eligible
        unknownVirtualNbr(4),
        helloIntervalMismatch(5),
        deadIntervalMismatch(6),
        optionMismatch(7),
        mtuMismatch(8),
        duplicateRouterId(9),
        noError(10) }
    MAX-ACCESS      accessible-for-notify
    STATUS          current
    DESCRIPTION
        "Potential types of configuration conflicts.
        Used by the ospfv3ConfigError and
        ospfv3ConfigVirtError notifications."
    ::= { ospfv3NotificationEntry 1 }

```



```
ospfv3PacketType OBJECT-TYPE
    SYNTAX          INTEGER {
                        hello(1),
                        dbDescript(2),
                        lsReq(3),
                        lsUpdate(4),
                        lsAck(5),
                        nullPacket(6) }
    MAX-ACCESS      accessible-for-notify
    STATUS          current
    DESCRIPTION
        "OSPFv3 packet types."
    ::= { ospfv3NotificationEntry 2 }
```

```
ospfv3PacketSrc OBJECT-TYPE
    SYNTAX          InetAddressIPv6
    MAX-ACCESS      accessible-for-notify
    STATUS          current
    DESCRIPTION
        "The IPv6 address of an inbound packet that cannot
        be identified by a neighbor instance.

        Only IPv6 addresses without zone index are expected."
    ::= { ospfv3NotificationEntry 3 }
```

```
-- Notification Definitions
```

```
-- The notifications need to be throttled so as to not overwhelm the
-- management agent in case of rapid changes to the OSPFv3 module.
```

```
ospfv3VirtIfStateChange NOTIFICATION-TYPE
    OBJECTS { ospfv3RouterId, -- The originator of the notification
              ospfv3VirtIfState -- The new state
            }
    STATUS          current
    DESCRIPTION
        "An ospfv3VirtIfStateChange notification signifies that
        there has been a change in the state of an OSPFv3 virtual
        interface.

        This notification 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)."
```

```
 ::= { ospfv3Notifications 1 }
```

```
ospfv3NbrStateChange NOTIFICATION-TYPE
    OBJECTS { ospfv3RouterId, -- The originator of the notification
              ospfv3NbrState -- The new state
```

```

    }
    STATUS          current
    DESCRIPTION
        "An ospfv3NbrStateChange notification signifies that
        there has been a change in the state of a
        non-virtual OSPFv3 neighbor. This notification 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 a neighbor transitions
        from or to Full on non-broadcast multi-access
        and broadcast networks, the notification should be
        generated by the Designated Router. A Designated
        Router transitioning to Down will be noted by
        ospfIfStateChange."
    ::= { ospfv3Notifications 2 }

ospfv3VirtNbrStateChange NOTIFICATION-TYPE
    OBJECTS { ospfv3RouterId, -- The originator of the notification
              ospfv3VirtNbrState -- The new state
            }
    STATUS          current
    DESCRIPTION
        "An ospfv3VirtNbrStateChange notification signifies
        that there has been a change in the state of an OSPFv3
        virtual neighbor. This notification 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).".
    ::= { ospfv3Notifications 3 }

ospfv3IfConfigError NOTIFICATION-TYPE
    OBJECTS { ospfv3RouterId, -- The originator of the notification
              ospfv3IfState,   -- State of the interface
              ospfv3PacketSrc, -- IPv6 address of source
              ospfv3ConfigErrorType, -- Type of error
              ospfv3PacketType -- Type of packet
            }
    STATUS          current
    DESCRIPTION
        "An ospfv3IfConfigError notification 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 notification only if it
        prevents an adjacency from forming."
    ::= { ospfv3Notifications 4 }

```

```
ospfv3VirtIfConfigError NOTIFICATION-TYPE
  OBJECTS { ospfv3RouterId, -- The originator of the notification
             ospfv3VirtIfState, -- State of the interface
             ospfv3ConfigErrorType, -- Type of error
             ospfv3PacketType
           }
  STATUS      current
  DESCRIPTION
    "An ospfv3VirtIfConfigError notification 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 notification only if it prevents an
    adjacency from forming."
  ::= { ospfv3Notifications 5 }

ospfv3IfRxBadPacket NOTIFICATION-TYPE
  OBJECTS { ospfv3RouterId, -- The originator of the notification
             ospfv3IfState, -- State of the interface
             ospfv3PacketSrc, -- The source IPv6 address
             ospfv3PacketType -- Type of packet
           }
  STATUS      current
  DESCRIPTION
    "An ospfv3IfRxBadPacket notification signifies that an
    OSPFv3 packet that cannot be parsed has been received on a
    non-virtual interface."
  ::= { ospfv3Notifications 6 }

ospfv3VirtIfRxBadPacket NOTIFICATION-TYPE
  OBJECTS { ospfv3RouterId, -- The originator of the notification
             ospfv3VirtIfState, -- State of the interface
             ospfv3PacketType -- Type of packet
           }
  STATUS      current
  DESCRIPTION
    "An ospfv3VirtIfRxBadPacket notification signifies
    that an OSPFv3 packet that cannot be parsed has been
    received on a virtual interface."
  ::= { ospfv3Notifications 7 }

ospfv3LsdbOverflow NOTIFICATION-TYPE
  OBJECTS { ospfv3RouterId, -- The originator of the notification
             ospfv3ExtAreaLsdbLimit -- Limit on External LSAs
           }
  STATUS      current
```

DESCRIPTION

"An ospfv3LsdbOverflow notification signifies that the number of LSAs in the router's link state database has exceeded ospfv3ExtAreaLsdbLimit."

::= { ospfv3Notifications 8 }

ospfv3LsdbApproachingOverflow NOTIFICATION-TYPE

OBJECTS { ospfv3RouterId, -- The originator of the notification
ospfv3ExtAreaLsdbLimit
}

STATUS current

DESCRIPTION

"An ospfv3LsdbApproachingOverflow notification signifies that the number of LSAs in the router's link state database has exceeded ninety percent of ospfv3ExtAreaLsdbLimit."

::= { ospfv3Notifications 9 }

ospfv3IfStateChange NOTIFICATION-TYPE

OBJECTS { ospfv3RouterId, -- The originator of the notification
ospfv3IfState -- The new state
}

STATUS current

DESCRIPTION

"An ospfv3IfStateChange notification signifies that there has been a change in the state of a non-virtual OSPFv3 interface. This notification 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)."

::= { ospfv3Notifications 10 }

ospfv3NssaTranslatorStatusChange NOTIFICATION-TYPE

OBJECTS { ospfv3RouterId, -- The originator of the notification
ospfv3AreaNssaTranslatorState -- new state
}

STATUS current

DESCRIPTION

"An ospfv3NssaTranslatorStatusChange notification indicates that there has been a change in the router's ability to translate OSPFv3 NSSA LSAs into OSPFv3 External LSAs. This notification should be generated when the Translator Status transitions from or to any defined status on a per-area basis."

::= { ospfv3Notifications 11 }

ospfv3RestartStatusChange NOTIFICATION-TYPE

```
OBJECTS { ospfv3RouterId, -- The originator of the notification
          ospfv3RestartStatus, -- new status
          ospfv3RestartInterval,
          ospfv3RestartExitReason
        }
```

```
STATUS      current
```

DESCRIPTION

"An ospfv3RestartStatusChange notification signifies that there has been a change in the graceful restart state for the router. This notification should be generated when the router restart status changes."

```
::= { ospfv3Notifications 12 }
```

ospfv3NbrRestartHelperStatusChange NOTIFICATION-TYPE

```
OBJECTS { ospfv3RouterId, -- The originator of the notification
          ospfv3NbrRestartHelperStatus, -- new status
          ospfv3NbrRestartHelperAge,
          ospfv3NbrRestartHelperExitReason
        }
```

```
STATUS      current
```

DESCRIPTION

"An ospfv3NbrRestartHelperStatusChange notification signifies that there has been a change in the graceful restart helper state for the neighbor. This notification should be generated when the neighbor restart helper status transitions for a neighbor."

```
::= { ospfv3Notifications 13 }
```

ospfv3VirtNbrRestartHelperStatusChange NOTIFICATION-TYPE

```
OBJECTS { ospfv3RouterId, -- The originator of the notification
          ospfv3VirtNbrRestartHelperStatus, -- new status
          ospfv3VirtNbrRestartHelperAge,
          ospfv3VirtNbrRestartHelperExitReason
        }
```

```
STATUS      current
```

DESCRIPTION

"An ospfv3VirtNbrRestartHelperStatusChange notification signifies that there has been a change in the graceful restart helper state for the virtual neighbor. This notification should be generated when the virtual neighbor restart helper status transitions for a virtual neighbor."

```
::= { ospfv3Notifications 14 }
```

-- Conformance Information

```
ospfv3Groups      OBJECT IDENTIFIER ::= { ospfv3Conformance 1 }
ospfv3Compliances OBJECT IDENTIFIER ::= { ospfv3Conformance 2 }

-- Compliance Statements

ospfv3FullCompliance MODULE-COMPLIANCE
    STATUS          current
    DESCRIPTION      "The compliance statement"
    MODULE           -- this module
    MANDATORY-GROUPS {
        ospfv3BasicGroup,
        ospfv3AreaGroup,
        ospfv3IfGroup,
        ospfv3VirtIfGroup,
        ospfv3NbrGroup,
        ospfv3CfgNbrGroup,
        ospfv3VirtNbrGroup,
        ospfv3AreaAggregateGroup
    }

    GROUP            ospfv3AsLsdbGroup
    DESCRIPTION      "This group is required for OSPFv3 systems that
        display their AS-scope link state database."

    GROUP            ospfv3AreaLsdbGroup
    DESCRIPTION      "This group is required for OSPFv3 systems that
        display their Area-scope link state database."

    GROUP            ospfv3LinkLsdbGroup
    DESCRIPTION      "This group is required for OSPFv3 systems that
        display their Link-scope link state database
        for non-virtual interfaces."

    GROUP            ospfv3VirtLinkLsdbGroup
    DESCRIPTION      "This group is required for OSPFv3 systems that
        display their Link-scope link state database
        for virtual interfaces."

    GROUP            ospfv3HostGroup
    DESCRIPTION      "This group is required for OSPFv3 systems that
        support attached hosts."
```

```

GROUP          ospfv3NotificationObjectGroup
DESCRIPTION
    "This group is required for OSPFv3 systems that
    support OSPFv3 notifications."

GROUP          ospfv3NotificationGroup
DESCRIPTION
    "This group is required for OSPFv3 systems that
    support OSPFv3 notifications."

OBJECT         ospfv3NbrAddressType
SYNTAX         InetAddressType { ipv6(2) }
DESCRIPTION
    "An implementation is only required to support IPv6
    address without zone index."

OBJECT         ospfv3NbrAddress
SYNTAX         InetAddress (SIZE (16))
DESCRIPTION
    "An implementation is only required to support IPv6
    address without zone index."

OBJECT         ospfv3VirtNbrAddressType
SYNTAX         InetAddressType { ipv6(2) }
DESCRIPTION
    "An implementation is only required to support IPv6
    address without zone index."

OBJECT         ospfv3VirtNbrAddress
SYNTAX         InetAddress (SIZE (16))
DESCRIPTION
    "An implementation is only required to support IPv6
    address without zone index."

 ::= { ospfv3Compliances 1 }

```

ospfv3ReadOnlyCompliance MODULE-COMPLIANCE

```

STATUS         current
DESCRIPTION
    "When this MIB module is implemented without
    support for read-create (i.e., in read-only
    mode), the implementation can claim read-only
    compliance. Such a device can then be monitored,
    but cannot be configured with this MIB."

```

```

MODULE -- this module
    MANDATORY-GROUPS {
        ospfv3BasicGroup,

```

```
    ospfv3AreaGroup,  
    ospfv3IfGroup,  
    ospfv3VirtIfGroup,  
    ospfv3NbrGroup,  
    ospfv3CfgNbrGroup,  
    ospfv3VirtNbrGroup,  
    ospfv3AreaAggregateGroup  
}
```

GROUP ospfv3AsLsdbGroup

DESCRIPTION

"This group is required for OSPFv3 systems that display their AS-scope link state database."

GROUP ospfv3AreaLsdbGroup

DESCRIPTION

"This group is required for OSPFv3 systems that display their Area-scope link state database."

GROUP ospfv3LinkLsdbGroup

DESCRIPTION

"This group is required for OSPFv3 systems that display their Link-scope link state database for non-virtual interfaces."

GROUP ospfv3VirtLinkLsdbGroup

DESCRIPTION

"This group is required for OSPFv3 systems that display their Link-scope link state database for virtual interfaces."

GROUP ospfv3HostGroup

DESCRIPTION

"This group is required for OSPFv3 systems that support attached hosts."

GROUP ospfv3NotificationObjectGroup

DESCRIPTION

"This group is required for OSPFv3 systems that support OSPFv3 notifications."

GROUP ospfv3NotificationGroup

DESCRIPTION

"This group is required for OSPFv3 systems that support OSPFv3 notifications."

OBJECT ospfv3RouterId

MIN-ACCESS read-only

DESCRIPTION
"Write access is not required."

OBJECT ospfv3AdminStatus
MIN-ACCESS read-only
DESCRIPTION
"Write access is not required."

OBJECT ospfv3ExtAreaLsdbLimit
MIN-ACCESS read-only
DESCRIPTION
"Write access is not required."

OBJECT ospfv3ExitOverflowInterval
MIN-ACCESS read-only
DESCRIPTION
"Write access is not required."

OBJECT ospfv3DemandExtensions
MIN-ACCESS read-only
DESCRIPTION
"Write access is not required."

OBJECT ospfv3ReferenceBandwidth
MIN-ACCESS read-only
DESCRIPTION
"Write access is not required."

OBJECT ospfv3RestartSupport
MIN-ACCESS read-only
DESCRIPTION
"Write access is not required."

OBJECT ospfv3RestartInterval
MIN-ACCESS read-only
DESCRIPTION
"Write access is not required."

OBJECT ospfv3RestartStrictLsaChecking
MIN-ACCESS read-only
DESCRIPTION
"Write access is not required."

OBJECT ospfv3NotificationEnable
MIN-ACCESS read-only
DESCRIPTION
"Write access is not required."

OBJECT ospfv3StubRouterAdvertisement
MIN-ACCESS read-only
DESCRIPTION
 "Write access is not required."

OBJECT ospfv3AreaImportAsExtern
MIN-ACCESS read-only
DESCRIPTION
 "Write access is not required."

OBJECT ospfv3AreaSummary
MIN-ACCESS read-only
DESCRIPTION
 "Write access is not required."

OBJECT ospfv3AreaRowStatus
MIN-ACCESS read-only
DESCRIPTION
 "Write access is not required."

OBJECT ospfv3AreaStubMetric
MIN-ACCESS read-only
DESCRIPTION
 "Write access is not required."

OBJECT ospfv3AreaNssaTranslatorRole
MIN-ACCESS read-only
DESCRIPTION
 "Write access is not required."

OBJECT ospfv3AreaNssaTranslatorStabInterval
MIN-ACCESS read-only
DESCRIPTION
 "Write access is not required."

OBJECT ospfv3AreaStubMetricType
MIN-ACCESS read-only
DESCRIPTION
 "Write access is not required."

OBJECT ospfv3AreaTEEnabled
MIN-ACCESS read-only
DESCRIPTION
 "Write access is not required."

OBJECT ospfv3HostMetric
MIN-ACCESS read-only
DESCRIPTION
 "Write access is not required."

OBJECT ospfv3HostRowStatus
MIN-ACCESS read-only
DESCRIPTION
 "Write access is not required."

OBJECT ospfv3HostAreaID
MIN-ACCESS read-only
DESCRIPTION
 "Write access is not required."

OBJECT ospfv3IfAreaId
MIN-ACCESS read-only
DESCRIPTION
 "Write access is not required."

OBJECT ospfv3IfType
MIN-ACCESS read-only
DESCRIPTION
 "Write access is not required."

OBJECT ospfv3IfAdminStatus
MIN-ACCESS read-only
DESCRIPTION
 "Write access is not required."

OBJECT ospfv3IfRtrPriority
MIN-ACCESS read-only
DESCRIPTION
 "Write access is not required."

OBJECT ospfv3IfTransitDelay
MIN-ACCESS read-only
DESCRIPTION
 "Write access is not required."

OBJECT ospfv3IfRetransInterval
MIN-ACCESS read-only
DESCRIPTION
 "Write access is not required."

OBJECT ospfv3IfHelloInterval
MIN-ACCESS read-only
DESCRIPTION
 "Write access is not required."

OBJECT ospfv3IfRtrDeadInterval
MIN-ACCESS read-only
DESCRIPTION
 "Write access is not required."

OBJECT ospfv3IfPollInterval
MIN-ACCESS read-only
DESCRIPTION
 "Write access is not required."

OBJECT ospfv3IfRowStatus
MIN-ACCESS read-only
DESCRIPTION
 "Write access is not required."

OBJECT ospfv3IfDemand
MIN-ACCESS read-only
DESCRIPTION
 "Write access is not required."

OBJECT ospfv3IfMetricValue
MIN-ACCESS read-only
DESCRIPTION
 "Write access is not required."

OBJECT ospfv3IfDemandNbrProbe
MIN-ACCESS read-only
DESCRIPTION
 "Write access is not required."

OBJECT ospfv3IfDemandNbrProbeRetransLimit
MIN-ACCESS read-only
DESCRIPTION
 "Write access is not required."

OBJECT ospfv3IfDemandNbrProbeInterval
MIN-ACCESS read-only
DESCRIPTION
 "Write access is not required."

OBJECT ospfv3IfTedisabled
MIN-ACCESS read-only
DESCRIPTION
 "Write access is not required."

OBJECT ospfv3IfLinkLSASuppression
MIN-ACCESS read-only
DESCRIPTION
 "Write access is not required."

OBJECT ospfv3VirtIfTransitDelay
MIN-ACCESS read-only
DESCRIPTION
 "Write access is not required."

OBJECT ospfv3VirtIfRetransInterval
MIN-ACCESS read-only
DESCRIPTION
 "Write access is not required."

OBJECT ospfv3VirtIfHelloInterval
MIN-ACCESS read-only
DESCRIPTION
 "Write access is not required."

OBJECT ospfv3VirtIfRtrDeadInterval
MIN-ACCESS read-only
DESCRIPTION
 "Write access is not required."

OBJECT ospfv3VirtIfRowStatus
MIN-ACCESS read-only
DESCRIPTION
 "Write access is not required."

OBJECT ospfv3CfgNbrPriority
MIN-ACCESS read-only
DESCRIPTION
 "Write access is not required."

OBJECT ospfv3CfgNbrRowStatus
MIN-ACCESS read-only
DESCRIPTION
 "Write access is not required."

```

OBJECT ospfv3AreaAggregateRowStatus
MIN-ACCESS read-only
DESCRIPTION
    "Write access is not required."

OBJECT ospfv3AreaAggregateEffect
MIN-ACCESS read-only
DESCRIPTION
    "Write access is not required."

OBJECT ospfv3AreaAggregateRouteTag
MIN-ACCESS read-only
DESCRIPTION
    "Write access is not required."
::= { ospfv3Compliances 2 }

-- units of conformance

ospfv3BasicGroup OBJECT-GROUP
    OBJECTS
        {
            ospfv3RouterId,
            ospfv3AdminStatus,
            ospfv3VersionNumber,
            ospfv3AreaBdrRtrStatus,
            ospfv3ASBdrRtrStatus,
            ospfv3AsScopeLsaCount,
            ospfv3AsScopeLsaCksumSum,
            ospfv3OriginateNewLsas,
            ospfv3RxNewLsas,
            ospfv3ExtLsaCount,
            ospfv3ExtAreaLsdbLimit,
            ospfv3ExitOverflowInterval,
            ospfv3DemandExtensions,
            ospfv3ReferenceBandwidth,
            ospfv3RestartSupport,
            ospfv3RestartInterval,
            ospfv3RestartStrictLsaChecking,
            ospfv3RestartStatus,
            ospfv3RestartAge,
            ospfv3RestartExitReason,
            ospfv3NotificationEnable,
            ospfv3StubRouterSupport,
            ospfv3StubRouterAdvertisement,
            ospfv3DiscontinuityTime,
            ospfv3RestartTime
        }
    STATUS
        current

```

DESCRIPTION

"These objects are used for managing/monitoring
OSPFv3 global parameters."

::= { ospfv3Groups 1 }

ospfv3AreaGroup OBJECT-GROUP

OBJECTS {
ospfv3AreaImportAsExtern,
ospfv3AreaSpfRuns,
ospfv3AreaBdrRtrCount,
ospfv3AreaAsBdrRtrCount,
ospfv3AreaScopeLsaCount,
ospfv3AreaScopeLsaChecksumSum,
ospfv3AreaSummary,
ospfv3AreaRowStatus,
ospfv3AreaStubMetric,
ospfv3AreaNssaTranslatorRole,
ospfv3AreaNssaTranslatorState,
ospfv3AreaNssaTranslatorStabInterval,
ospfv3AreaNssaTranslatorEvents,
ospfv3AreaStubMetricType,
ospfv3AreaTEEnabled
}

STATUS current

DESCRIPTION

"These objects are used for OSPFv3 systems
supporting areas."

::= { ospfv3Groups 2 }

ospfv3AsLsdbGroup OBJECT-GROUP

OBJECTS {
ospfv3AsLsdbSequence,
ospfv3AsLsdbAge,
ospfv3AsLsdbChecksum,
ospfv3AsLsdbAdvertisement,
ospfv3AsLsdbTypeKnown
}

STATUS current

DESCRIPTION

"These objects are used for OSPFv3 systems
that display their AS-scope link state database."

::= { ospfv3Groups 3 }

ospfv3AreaLsdbGroup OBJECT-GROUP

OBJECTS {
ospfv3AreaLsdbSequence,
ospfv3AreaLsdbAge,
ospfv3AreaLsdbChecksum,
}

```

        ospfv3AreaLsdbAdvertisement,
        ospfv3AreaLsdbTypeKnown
    }
    STATUS          current
    DESCRIPTION
        "These objects are used for OSPFv3 systems
        that display their Area-scope link state database."
    ::= { ospfv3Groups 4 }

ospfv3LinkLsdbGroup OBJECT-GROUP
    OBJECTS
        {
            ospfv3LinkLsdbSequence,
            ospfv3LinkLsdbAge,
            ospfv3LinkLsdbChecksum,
            ospfv3LinkLsdbAdvertisement,
            ospfv3LinkLsdbTypeKnown
        }
    STATUS          current
    DESCRIPTION
        "These objects are used for OSPFv3 systems
        that display their Link-scope link state database
        for non-virtual interfaces."
    ::= { ospfv3Groups 5 }

ospfv3HostGroup OBJECT-GROUP
    OBJECTS
        {
            ospfv3HostMetric,
            ospfv3HostRowStatus,
            ospfv3HostAreaID
        }
    STATUS          current
    DESCRIPTION
        "These objects are used for OSPFv3 systems
        that support attached hosts."
    ::= { ospfv3Groups 6 }

ospfv3IfGroup OBJECT-GROUP
    OBJECTS
        {
            ospfv3IfAreaId,
            ospfv3IfType,
            ospfv3IfAdminStatus,
            ospfv3IfRtrPriority,
            ospfv3IfTransitDelay,
            ospfv3IfRetransInterval,
            ospfv3IfHelloInterval,
            ospfv3IfRtrDeadInterval,
            ospfv3IfPollInterval,
            ospfv3IfState,

```



```

        ospfv3IfDesignatedRouter,
        ospfv3IfBackupDesignatedRouter,
        ospfv3IfEvents,
        ospfv3IfRowStatus,
        ospfv3IfDemand,
        ospfv3IfMetricValue,
        ospfv3IfLinkScopeLsaCount,
        ospfv3IfLinkLsaCksumSum,
        ospfv3IfDemandNbrProbe,
        ospfv3IfDemandNbrProbeRetransLimit,
        ospfv3IfDemandNbrProbeInterval,
        ospfv3IfTEDisabled,
        ospfv3IfLinkLSASuppression
    }
STATUS          current
DESCRIPTION
    "These interface objects are used for
    managing/monitoring OSPFv3 interfaces."
 ::= { ospfv3Groups 7 }

ospfv3VirtIfGroup OBJECT-GROUP
OBJECTS          {
    ospfv3VirtIfIndex,
    ospfv3VirtIfInstId,
    ospfv3VirtIfTransitDelay,
    ospfv3VirtIfRetransInterval,
    ospfv3VirtIfHelloInterval,
    ospfv3VirtIfRtrDeadInterval,
    ospfv3VirtIfState,
    ospfv3VirtIfEvents,
    ospfv3VirtIfRowStatus,
    ospfv3VirtIfLinkScopeLsaCount,
    ospfv3VirtIfLinkLsaCksumSum
}
STATUS          current
DESCRIPTION
    "These virtual interface objects are used for
    managing/monitoring OSPFv3 virtual interfaces."
 ::= { ospfv3Groups 8 }

ospfv3NbrGroup OBJECT-GROUP
OBJECTS          {
    ospfv3NbrAddressType,
    ospfv3NbrAddress,
    ospfv3NbrOptions,
    ospfv3NbrPriority,
    ospfv3NbrState,
    ospfv3NbrEvents,

```

```

        ospfv3NbrLsRetransQLen,
        ospfv3NbrHelloSuppressed,
        ospfv3NbrIfId,
        ospfv3NbrRestartHelperStatus,
        ospfv3NbrRestartHelperAge,
        ospfv3NbrRestartHelperExitReason
    }
    STATUS          current
    DESCRIPTION
        "These neighbor objects are used for
        managing/monitoring OSPFv3 neighbors."
    ::= { ospfv3Groups 9 }

ospfv3CfgNbrGroup OBJECT-GROUP
    OBJECTS
        {
            ospfv3CfgNbrPriority,
            ospfv3CfgNbrRowStatus
        }
    STATUS          current
    DESCRIPTION
        "These configured neighbor objects are used for
        managing/monitoring OSPFv3-configured neighbors."
    ::= { ospfv3Groups 10 }

ospfv3VirtNbrGroup OBJECT-GROUP
    OBJECTS
        {
            ospfv3VirtNbrIfIndex,
            ospfv3VirtNbrIfInstId,
            ospfv3VirtNbrAddressType,
            ospfv3VirtNbrAddress,
            ospfv3VirtNbrOptions,
            ospfv3VirtNbrState,
            ospfv3VirtNbrEvents,
            ospfv3VirtNbrLsRetransQLen,
            ospfv3VirtNbrHelloSuppressed,
            ospfv3VirtNbrIfId,
            ospfv3VirtNbrRestartHelperStatus,
            ospfv3VirtNbrRestartHelperAge,
            ospfv3VirtNbrRestartHelperExitReason
        }
    STATUS          current
    DESCRIPTION
        "These virtual neighbor objects are used for
        managing/monitoring OSPFv3 virtual neighbors."
    ::= { ospfv3Groups 11 }

```

```
ospfv3AreaAggregateGroup OBJECT-GROUP
    OBJECTS      {
        ospfv3AreaAggregateRowStatus,
        ospfv3AreaAggregateEffect,
        ospfv3AreaAggregateRouteTag
    }
    STATUS        current
    DESCRIPTION   "These area aggregate objects are required for
        aggregating OSPFv3 prefixes for summarization
        across areas."
    ::= { ospfv3Groups 12 }

ospfv3VirtLinkLsdbGroup OBJECT-GROUP
    OBJECTS      {
        ospfv3VirtLinkLsdbSequence,
        ospfv3VirtLinkLsdbAge,
        ospfv3VirtLinkLsdbChecksum,
        ospfv3VirtLinkLsdbAdvertisement,
        ospfv3VirtLinkLsdbTypeKnown
    }
    STATUS        current
    DESCRIPTION   "These objects are used for OSPFv3 systems
        that display their Link-scope link state database
        for virtual interfaces."
    ::= { ospfv3Groups 13 }

ospfv3NotificationObjectGroup OBJECT-GROUP
    OBJECTS      {
        ospfv3ConfigErrorType,
        ospfv3PacketType,
        ospfv3PacketSrc
    }
    STATUS        current
    DESCRIPTION   "These objects are used to record notification
        parameters."
    ::= { ospfv3Groups 14 }

ospfv3NotificationGroup NOTIFICATION-GROUP
    NOTIFICATIONS {
        ospfv3VirtIfStateChange,
        ospfv3NbrStateChange,
        ospfv3VirtNbrStateChange,
        ospfv3IfConfigError,
        ospfv3VirtIfConfigError,
        ospfv3IfRxBadPacket,
```

```

        ospfv3VirtIfRxBadPacket,
        ospfv3LsdbOverflow,
        ospfv3LsdbApproachingOverflow,
        ospfv3IfStateChange,
        ospfv3NssaTranslatorStatusChange,
        ospfv3RestartStatusChange,
        ospfv3NbrRestartHelperStatusChange,
        ospfv3VirtNbrRestartHelperStatusChange
    }
    STATUS          current
    DESCRIPTION
        "This group is used for OSPFv3 notifications."
    ::= { ospfv3Groups 15 }

```

END

6. Security Considerations

There are a number of management objects defined in this MIB module with 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. Improper manipulation of the objects represented by this MIB module may result in disruption of network connectivity by administratively disabling the entire OSPFv3 entity or individual interfaces, by deleting configured neighbors, by reducing the limit on External LSAs, by changing ASBR status, by manipulating route aggregation, by manipulating interface and route metrics, by changing Hello interval or dead interval, or by changing interface type. Remote monitoring can be defeated by disabling of SNMP notifications. Performance can be impacted by increasing the limit on External LSAs or changing DR/BDR (Designated Router / Backup Designated Router) priority.

Some of the readable objects in this MIB module (i.e., objects with a MAX-ACCESS other than not-accessible) may be considered sensitive or vulnerable in some network environments. It is thus important to control even GET and/or NOTIFY access to these objects and possibly to even encrypt the values of these objects when sending them over the network via SNMP. Unauthorized access to readable objects in this MIB module allows the discovery of the network topology and operating parameters, which can be used to target further attacks on the network or to gain a competitive business advantage.

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

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

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

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 -----
ospfv3MIB	{ mib-2 191 }

8. Acknowledgements

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9. References

9.1. Normative References

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.

[RFC2328] Moy, J., "OSPF Version 2", STD 54, RFC 2328, April 1998.

- [RFC2578] McCloghrie, K., Perkins, D., and J. Schoenwaelder, "Structure of Management Information Version 2 (SMIv2)", STD 58, [RFC 2578](#), April 1999.
- [RFC2579] McCloghrie, K., Perkins, D., and J. Schoenwaelder, "Textual Conventions for SMIv2", STD 58, [RFC 2579](#), April 1999.
- [RFC2580] McCloghrie, K., Perkins, D., and J. Schoenwaelder, "Conformance Statements for SMIv2", STD 58, [RFC 2580](#), April 1999.
- [RFC5340] Coltun, R., Ferguson, D., Moy, J., and A. Lindem, "OSPF for IPv6", [RFC 5340](#), July 2008.
- [RFC4293] Routhier, S., Ed., "Management Information Base for the Internet Protocol (IP)", [RFC 4293](#), April 2006.
- [RFC4750] Joyal, D., Ed., Galecki, P., Ed., Giacalone, S., Ed., Coltun, R., and F. Baker, "OSPF Version 2 Management Information Base", [RFC 4750](#), December 2006.

9.2. Informative References

- [RFC1224] Steinberg, L., "Techniques for managing asynchronously generated alerts", [RFC 1224](#), May 1991.
- [RFC2460] Deering, S. and R. Hinden, "Internet Protocol, Version 6 (IPv6) Specification", [RFC 2460](#), December 1998.
- [RFC3410] Case, J., Mundy, R., Partain, D., and B. Stewart, "Introduction and Applicability Statements for Internet-Standard Management Framework", [RFC 3410](#), December 2002.
- [RFC3411] Harrington, D., Presuhn, R., and B. Wijnen, "An Architecture for Describing Simple Network Management Protocol (SNMP) Management Frameworks", STD 62, [RFC 3411](#), December 2002.
- [RFC3413] Levi, D., Meyer, P., and B. Stewart, "Simple Network Management Protocol (SNMP) Applications", STD 62, [RFC 3413](#), December 2002.

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