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YANG Model for OSPFv3 Extended LSAs

Abstract

This document defines a YANG data model augmenting the IETF OSPF YANG model to provide support for OSPFv3 Link State Advertisement (LSA) Extensibility as defined in RFC 8362. OSPFv3 Extended LSAs provide extensible TLV-based LSAs for the base LSA types defined in RFC 5340.

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Table of Contents

- [1. Overview](#)
- [1.1. Requirements Language](#)
- [2. Tree Diagrams](#)
- [3. OSPFv3 Extended LSAs](#)
- [4. OSPFv3 Extended LSA Yang Module](#)
- [5. Security Considerations](#)
- [6. IANA Considerations](#)
- [7. Acknowledgements](#)
- [8. Normative References](#)
- [9. Informative References](#)
- [Appendix A. Configuration Example](#)
- [Authors' Addresses](#)

1. Overview

YANG [[RFC7950](#)] is a data definition language used to define the contents of a conceptual data store that allows networked devices to be managed using NETCONF [[RFC6241](#)]. YANG is proving relevant beyond its initial confines, as bindings to other interfaces (e.g., ReST) and encodings other than XML (e.g., JSON) are being defined. Furthermore, YANG data models can be used as the basis for implementation of other interfaces, such as CLI and programmatic APIs.

This document defines a YANG data model augmenting the IETF OSPF YANG model [[RFC9129](#)], which itself augments [[RFC8349](#)], to provide support for configuration and operational state for OSPFv3 Extended LSAs as defined in [[RFC8362](#)].

The YANG modules in this document conform to the Network Management Datastore Architecture (NMDA) [[RFC8342](#)].

1.1. Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in BCP 14 [[RFC2119](#)] [[RFC8174](#)] when, and only when, they appear in all capitals, as shown here.

2. Tree Diagrams

This document uses the graphical representation of data models defined in [[RFC8340](#)].

3. OSPFv3 Extended LSAs

This document defines a model for the OSPFv3 Extended LSA feature. It is an augmentation of the OSPF base model provided support for OSPFv3 Link State Advertisement (LSA) Extensibility [[RFC8362](#)]. OSPFv3 Extended LSAs provide extensible TLV-based LSAs for the base LSA types defined in [[RFC5340](#)].

The OSPFv3 Extended LSA YANG module requires support for the OSPF base model [[RFC9129](#)] which defines basic OSPF configuration and state. The OSPF YANG model augments the ietf-routing YANG model defined in [[RFC8349](#)]. The augmentations defined in the ietf-ospfv3-extended-lsa YANG model will provide global configuration, area configuration, and addition of OSPFv3 Extended LSAs to the Link State Database (LSDB) operational state.

```

module: ietf-ospfv3-extended-lsa
  augment /rt:routing/rt:control-plane-protocols
    /rt:control-plane-protocol/ospf:ospf:
    +-rw extended-lsa-support?  boolean
  augment /rt:routing/rt:control-plane-protocols
    /rt:control-plane-protocol/ospf:ospf/ospf:areas/ospf:area:
    +-rw extended-lsa-support?  boolean
  augment /rt:routing/rt:control-plane-protocols
    /rt:control-plane-protocol/ospf:ospf/ospf:areas/ospf:area
    /ospf:interfaces/ospf:interface/ospf:database
    /ospf:link-scope-lsa-type/ospf:link-scope-lsas
    /ospf:link-scope-lsa/ospf:version/ospf:ospfv3
    /ospf:ospfv3/ospf:body:
    +-ro e-link
      +-ro rtr-priority?  uint8
      +-ro lsa-options
      | +-ro lsa-options*  identityref
      +-ro e-link-tlvs* []
        +-ro unknown-tlv
          | +-ro type?      uint16
          | +-ro length?    uint16
          | +-ro value?     yang:hex-string
        +-ro intra-prefix-tlv
          | +-ro metric?      rt-types:uint24
          | +-ro prefix?      inet:ip-prefix
          | +-ro prefix-options
          | | +-ro prefix-options*  identityref
          | +-ro sub-tlvs* []
          |   +-ro unknown-sub-tlv
          |     +-ro type?      uint16
          |     +-ro length?    uint16
          |     +-ro value?     yang:hex-string
        +-ro ipv6-link-local-tlv
          | +-ro link-local-address?  inet:ipv6-address
          | +-ro sub-tlvs* []
          |   +-ro unknown-sub-tlv
          |     +-ro type?      uint16
          |     +-ro length?    uint16
          |     +-ro value?     yang:hex-string
        +-ro ipv4-link-local-tlv
          +-ro link-local-address?  inet:ipv4-address
          +-ro sub-tlvs* []
          +-ro unknown-sub-tlv
            +-ro type?      uint16
            +-ro length?    uint16
            +-ro value?     yang:hex-string
  augment /rt:routing/rt:control-plane-protocols
    /rt:control-plane-protocol/ospf:ospf/ospf:areas/ospf:area
    /ospf:database/ospf:area-scope-lsa-type

```

```

    /ospf:area-scope-lsas/ospf:area-scope-lsa
    /ospf:version/ospf:ospfv3/ospf:ospfv3/ospf:body:
+--ro e-router
| +--ro router-bits
| | +--ro rtr-lsa-bits*  identityref
| +--ro lsa-options
| | +--ro lsa-options*  identityref
| +--ro e-router-tlvs* []
|   +--ro unknown-tlv
|     | +--ro type?      uint16
|     | +--ro length?   uint16
|     | +--ro value?    yang:hex-string
|   +--ro link-tlv
|     +--ro interface-id?      uint32
|     +--ro neighbor-interface-id?  uint32
|     +--ro neighbor-router-id?    rt-types:router-id
|     +--ro type?                ospf:router-link-type
|     +--ro metric?              uint16
|     +--ro sub-tlvs* []
|       +--ro unknown-sub-tlv
|         +--ro type?      uint16
|         +--ro length?   uint16
|         +--ro value?    yang:hex-string
+--ro e-network
| +--ro lsa-options
| | +--ro lsa-options*  identityref
| +--ro e-network-tlvs* []
|   +--ro unknown-tlv
|     | +--ro type?      uint16
|     | +--ro length?   uint16
|     | +--ro value?    yang:hex-string
|   +--ro attached-router-tlv
|     +--ro adjacent-neighbor-router-id*  rt-types:router-id
+--ro e-nssa
| +--ro e-external-tlvs* []
|   +--ro unknown-tlv
|     | +--ro type?      uint16
|     | +--ro length?   uint16
|     | +--ro value?    yang:hex-string
|   +--ro external-prefix-tlv
|     +--ro flags
|       | +--ro ospfv3-e-external-prefix-bits*  identityref
|     +--ro metric?          rt-types:uint24
|     +--ro prefix?          inet:ip-prefix
|     +--ro prefix-options
|       | +--ro prefix-options*  identityref
|     +--ro sub-tlvs* []
|       +--ro ipv6-fw-addr-sub-tlv
|         | +--ro forwarding-address?  inet:ipv6-address

```

```

|         +--ro ipv4-fwd-addr-sub-tlv
|         | +--ro forwarding-address?  inet:ipv4-address
|         +--ro route-tag-sub-tlv
|         | +--ro route-tag?  uint32
|         +--ro unknown-sub-tlv
|             +--ro type?      uint16
|             +--ro length?    uint16
|             +--ro value?     yang:hex-string
+--ro e-inter-area-prefix
| +--ro e-inter-prefix-tlvs* []
|   +--ro unknown-tlv
|     | +--ro type?      uint16
|     | +--ro length?    uint16
|     | +--ro value?     yang:hex-string
|   +--ro inter-prefix-tlv
|     +--ro metric?      rt-types:uint24
|     +--ro prefix?      inet:ip-prefix
|     +--ro prefix-options
|       | +--ro prefix-options*  identityref
|     +--ro sub-tlvs* []
|       +--ro unknown-sub-tlv
|         +--ro type?      uint16
|         +--ro length?    uint16
|         +--ro value?     yang:hex-string
+--ro e-inter-area-router
| +--ro e-inter-router-tlvs* []
|   +--ro unknown-tlv
|     | +--ro type?      uint16
|     | +--ro length?    uint16
|     | +--ro value?     yang:hex-string
|   +--ro inter-router-tlv
|     +--ro lsa-options
|       | +--ro lsa-options*  identityref
|     +--ro metric?          rt-types:uint24
|     +--ro destination-router-id?  rt-types:router-id
|     +--ro sub-tlvs* []
|       +--ro unknown-sub-tlv
|         +--ro type?      uint16
|         +--ro length?    uint16
|         +--ro value?     yang:hex-string
+--ro e-intra-area-prefix
  +--ro referenced-ls-type?      uint16
  +--ro referenced-link-state-id?  uint32
  +--ro referenced-adv-router?    rt-types:router-id
  +--ro e-intra-prefix-tlvs* []
    +--ro unknown-tlv
      | +--ro type?      uint16
      | +--ro length?    uint16
      | +--ro value?     yang:hex-string

```

```

+--ro intra-prefix-tlv
  +--ro metric?          rt-types:uint24
  +--ro prefix?          inet:ip-prefix
  +--ro prefix-options
  | +--ro prefix-options*  identityref
  +--ro sub-tlvs* []
    +--ro unknown-sub-tlv
      +--ro type?         uint16
      +--ro length?       uint16
      +--ro value?        yang:hex-string
augment /rt:routing/rt:control-plane-protocols
  /rt:control-plane-protocol/ospf:ospf/ospf:database
  /ospf:as-scope-lsa-type/ospf:as-scope-lsas
  /ospf:as-scope-lsa/ospf:version/ospf:ospfv3
  /ospf:ospfv3/ospf:body:
+--ro e-as-external
  +--ro e-external-tlvs* []
  +--ro unknown-tlv
  | +--ro type?          uint16
  | +--ro length?       uint16
  | +--ro value?        yang:hex-string
+--ro external-prefix-tlv
  +--ro flags
  | +--ro ospfv3-e-external-prefix-bits*  identityref
  +--ro metric?          rt-types:uint24
  +--ro prefix?          inet:ip-prefix
  +--ro prefix-options
  | +--ro prefix-options*  identityref
  +--ro sub-tlvs* []
    +--ro ipv6-fwd-addr-sub-tlv
    | +--ro forwarding-address?  inet:ipv6-address
    +--ro ipv4-fwd-addr-sub-tlv
    | +--ro forwarding-address?  inet:ipv4-address
    +--ro route-tag-sub-tlv
    | +--ro route-tag?          uint32
    +--ro unknown-sub-tlv
      +--ro type?         uint16
      +--ro length?       uint16
      +--ro value?        yang:hex-string

```

4. OSPFv3 Extended LSA Yang Module

The following RFCs and drafts are not referenced in the document text but are referenced in the `ietf-ospfv3-extended-lsa.yang` module: [[RFC6991](#)], [[RFC8294](#)].

```

<CODE BEGINS> file "ietf-ospfv3-extended-lsa@2023-11-29.yang"
module ietf-ospfv3-extended-lsa {
  yang-version 1.1;
  namespace "urn:ietf:params:xml:ns:yang:ietf-ospfv3-extended-lsa";
  prefix ospfv3-e-lsa;

  import ietf-routing-types {
    prefix rt-types;
    reference
      "RFC 8294: Common YANG Data Types for the Routing Area";
  }
  import ietf-inet-types {
    prefix inet;
    reference
      "RFC 6991: Common YANG Data Types";
  }
  import ietf-routing {
    prefix rt;
    reference
      "RFC 8349: A YANG Data Model for Routing
      Management (NMDA Version)";
  }
  import ietf-ospf {
    prefix ospf;
    reference
      "RFC 9129: A YANG Data Model for OSPF Protocol";
  }

  organization
    "IETF LSR - Link State Routing Working Group";
  contact
    "WG Web: <https://datatracker.ietf.org/wg/lsr/>
    WG List: <mailto:lsr@ietf.org>

    Author: Acee Lindem
            <mailto:acee.ietf@gmail.com>
    Author: Sharmila Palani
            <mailto:sharmila.palani@microsoft.com>
    Author: Yingzhen Qu
            <mailto:yingzhen.qu@futurewei.com>";

  description
    "This YANG module defines the configuration
    and operational state for OSPFv3 Extended LSAs, which is
    common across all of the vendor implementations. The
    semantics and encodings for OSPFv3 Extended LSAs are
    described in RFC 8362.

    This YANG model conforms to the Network Management
    Datastore Architecture (NMDA) as described in RFC 8342.

```


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This version of this YANG module is part of RFC XXXX (<https://www.rfc-editor.org/info/rfcXXXX>); see the RFC itself for full legal notices.

The key words 'MUST', 'MUST NOT', 'REQUIRED', 'SHALL', 'SHALL NOT', 'SHOULD', 'SHOULD NOT', 'RECOMMENDED', 'NOT RECOMMENDED', 'MAY', and 'OPTIONAL' in this document are to be interpreted as described in BCP 14 (RFC 2119) (RFC 8174) when, and only when, they appear in all capitals, as shown here.";

reference

"RFC XXXX - YANG Model for OSPFv3 Extended LSAs";

revision 2023-11-29 {

description

"Initial revision.";

reference

"RFC XXXX: YANG Data Model for OSPFv3 Extended LSAs.";

}

/*

* OSPFv3 Extend LSA Type Identities

*/

identity ospfv3-e-router-lsa {

base ospf:ospfv3-lsa-type;

description

"OSPFv3 Extended Router LSA - Type 0xA021";

reference

"RFC 8362: OSPFv3 Link State Advertisement (LSA) Extensibility, Section 4.1";

}

identity ospfv3-e-network-lsa {

base ospf:ospfv3-lsa-type;

description

"OSPFv3 Extended Network LSA - Type 0xA022";

reference

"RFC 8362: OSPFv3 Link State Advertisement (LSA) Extensibility, Section 4.2";

```

}

identity ospfv3-e-summary-lsa-type {
    base ospf:ospfv3-lsa-type;
    description
        "OSPFv3 Extended Summary LSA types";
    reference
        "RFC 8362: OSPFv3 Link State Advertisement (LSA)
        Extensibility, Section 4.3 and Section 4.4";
}

identity ospfv3-e-inter-area-prefix-lsa {
    base ospfv3-e-summary-lsa-type;
    description
        "OSPFv3 Extended Inter-area Prefix LSA - Type 0xA023";
    reference
        "RFC 8362: OSPFv3 Link State Advertisement (LSA)
        Extensibility, Section 4.3";
}

identity ospfv3-e-inter-area-router-lsa {
    base ospfv3-e-summary-lsa-type;
    description
        "OSPFv3 Extended Inter-area Router LSA - Type 0xA024";
    reference
        "RFC 8362: OSPFv3 Link State Advertisement (LSA)
        Extensibility, Section 4.4";
}

identity ospfv3-e-external-lsa-type {
    base ospf:ospfv3-lsa-type;
    description
        "OSPFv3 Extended External LSA types";
    reference
        "RFC 8362: OSPFv3 Link State Advertisement (LSA)
        Extensibility, Section 4.5 and Section 4.6";
}

identity ospfv3-e-as-external-lsa {
    base ospfv3-e-external-lsa-type;
    description
        "OSPFv3 Extended AS-External LSA - Type 0xC025";
    reference
        "RFC 8362: OSPFv3 Link State Advertisement (LSA)
        Extensibility, Section 4.5";
}

identity ospfv3-e-nssa-lsa {
    base ospfv3-e-external-lsa-type;

```

```

description
  "OSPFv3 Extended Not-So-Stubby-Area (NSSA) LSA -
  Type 0xA027";
reference
  "RFC 8362: OSPFv3 Link State Advertisement (LSA)
  Extensibility, Section 4.6";
}

identity ospfv3-e-link-lsa {
  base ospf:ospfv3-lsa-type;
  description
    "OSPFv3 Extended Link LSA - Type 0x8028";
  reference
    "RFC 8362: OSPFv3 Link State Advertisement (LSA)
    Extensibility, Section 4.7";
}

identity ospfv3-e-intra-area-prefix-lsa {
  base ospf:ospfv3-lsa-type;
  description
    "OSPFv3 Extended Intra-area Prefix LSA - Type 0xA029";
  reference
    "RFC 8362: OSPFv3 Link State Advertisement (LSA)
    Extensibility, Section 4.8";
}

identity ospfv3-e-prefix-option {
  description
    "Base identity for OSPFv3 Prefix Options.";
  reference
    "RFC 8362: OSPFv3 Link State Advertisement (LSA)
    Extensibility, Section 3.1";
}

identity nu-bit {
  base ospfv3-e-prefix-option;
  description
    "When set, the prefix should be excluded
    from IPv6 unicast calculations.";
  reference
    "RFC 8362: OSPFv3 Link State Advertisement (LSA)
    Extensibility, Section 3.1";
}

identity la-bit {
  base ospfv3-e-prefix-option;
  description
    "When set, the prefix is actually an IPv6 interface
    address of the Advertising Router.";
}

```

```

reference
  "RFC 8362: OSPFv3 Link State Advertisement (LSA)
  Extensibility, Section 3.1";
}

identity p-bit {
  base ospfv3-e-prefix-option;
  description
    "When set, the NSSA area prefix should be
    translated to an AS External LSA and advertised
    by the translating NSSA Border Router.";
  reference
    "RFC 8362: OSPFv3 Link State Advertisement (LSA)
    Extensibility, Section 3.1";
}

identity dn-bit {
  base ospfv3-e-prefix-option;
  description
    "When set, the inter-area-prefix LSA or
    AS-external LSA prefix has been advertised as an
    L3VPN prefix.";
  reference
    "RFC 8362: OSPFv3 Link State Advertisement (LSA)
    Extensibility, Section 3.1";
}

identity n-bit {
  base ospfv3-e-prefix-option;
  description
    "When set, the prefix is a host address that identifies
    the advertising router.";
  reference
    "RFC 8362: OSPFv3 Link State Advertisement (LSA)
    Extensibility, Section 3.1";
}

identity ospfv3-e-external-prefix-option {
  description
    "Base identity for OSPFv3 External Prefix Options.";
  reference
    "RFC 8362: OSPFv3 Link State Advertisement (LSA)
    Extensibility, Section 3.6";
}

identity e-bit {
  base ospfv3-e-external-prefix-option;
  description
    "When set, the metric specified is a Type 2

```

```

        external metric.";
reference
    "RFC 8362: OSPFv3 Link State Advertisement (LSA)
    Extensibility, Section 3.6";
}

grouping unknown-sub-tlv {
    description
        "Unknown TLV grouping";
    container unknown-sub-tlv {
        uses ospf:tlv;
        description
            "Unknown External TLV Sub-TLV";
    }
reference
    "RFC 8362: OSPFv3 Link State Advertisement (LSA)
    Extensibility, Section 6.3";
}

grouping ospfv3-lsa-prefix {
    description
        "OSPFv3 LSA prefix";
    leaf prefix {
        type inet:ip-prefix;
        description
            "LSA Prefix";
    }
    container prefix-options {
        leaf-list prefix-options {
            type identityref {
                base ospfv3-e-prefix-option;
            }
            description
                "OSPFv3 prefix option flag list. This list will
                contain the identities for the OSPFv3 options
                that are set for the OSPFv3 prefix.";
        }
        description
            "Prefix options.";
reference
    "RFC 8362: OSPFv3 Link State Advertisement (LSA)
    Extensibility, Section 3.1";
}
reference
    "RFC 8362: OSPFv3 Link State Advertisement (LSA)
    Extensibility, Section 3";
}

grouping external-prefix-tlv {

```

```

container external-prefix-tlv {
  description
    "External Prefix LSA TLV";
  container flags {
    leaf-list ospfv3-e-external-prefix-bits {
      type identityref {
        base ospfv3-e-external-prefix-option;
      }
      description
        "OSPFv3 external-prefix TLV bits list.";
    }
    description
      "External Prefix Flags";
  }
  leaf metric {
    type rt-types:uint24;
    description
      "External Prefix Metric";
  }
  uses ospfv3-lsa-prefix;
  list sub-tlvs {
    description
      "External Prefix TLV Sub-TLVs";
    container ipv6-fwd-addr-sub-tlv {
      description
        "IPv6 Forwarding address Sub-TLV for E-AS-External and
        E-NSSA LSAs for the IPv6 address family.";
      leaf forwarding-address {
        type inet:ipv6-address;
        description
          "IPv6 Forwarding Address";
      }
      reference
        "RFC 8362: OSPFv3 Link State Advertisement (LSA)
        Extensibility, Section 3.10";
    }
    container ipv4-fwd-addr-sub-tlv {
      description
        "IPv4 Forwarding address Sub-TLV for E-AS-External and
        E-NSSA LSAs for the IPv4 address family.";
      leaf forwarding-address {
        type inet:ipv4-address;
        description
          "IPv4 Forwarding Address";
      }
      reference
        "RFC 8362: OSPFv3 Link State Advertisement (LSA)
        Extensibility, Section 3.11";
    }
  }
}

```

```

    container route-tag-sub-tlv {
      description
        "Route Tag Sub-TLV";
      leaf route-tag {
        type uint32;
        description
          "Route Tag";
      }
      reference
        "RFC 8362: OSPFv3 Link State Advertisement (LSA)
        Extensibility, Section 3.12";
    }
    uses unknown-sub-tlv;
  }
}
description
  "External Prefix TLV Grouping";
reference
  "RFC 8362: OSPFv3 Link State Advertisement (LSA)
  Extensibility, Section 3.6";
}

```

```

grouping intra-area-prefix-tlv {
  container intra-prefix-tlv {
    description
      "Intra-Area Prefix LSA TLV";
    leaf metric {
      type rt-types:uint24;
      description
        "Intra-Area Prefix Metric";
    }
    uses ospfv3-lsa-prefix;
    list sub-tlvs {
      description
        "Intra-Area Prefix TLV Sub-TLVs";
      uses unknown-sub-tlv;
    }
  }
}
description
  "Intra-Area Prefix TLV Grouping";
reference
  "RFC 8362: OSPFv3 Link State Advertisement (LSA)
  Extensibility, Section 3.7";
}

```

```

grouping ipv6-link-local-tlv {
  container ipv6-link-local-tlv {
    description
      "IPv6 Link-Local LSA TLV";
  }
}

```

```

    leaf link-local-address {
        type inet:ipv6-address;
        description
            "IPv6 Link Local address";
    }
    list sub-tlvs {
        description
            "IPv6 Link Local TLV Sub-TLVs";
        uses unknown-sub-tlv;
    }
}
description
    "IPv6 Link-Local TLV Grouping";
reference
    "RFC 8362: OSPFv3 Link State Advertisement (LSA)
    Extensibility, Section 3.8";
}

grouping ipv4-link-local-tlv {
    container ipv4-link-local-tlv {
        description
            "IPv4 Link-Local LSA TLV";
        leaf link-local-address {
            type inet:ipv4-address;
            description
                "IPv4 Link Local address";
        }
        list sub-tlvs {
            description
                "IPv4 Link Local TLV Sub-TLVs";
            uses unknown-sub-tlv;
        }
    }
}
description
    "IPv4 Link-Local TLV Grouping";
reference
    "RFC 8362: OSPFv3 Link State Advertisement (LSA)
    Extensibility, Section 3.9";
}

/* Configuration */

augment "/rt:routing/rt:control-plane-protocols"
    + "/rt:control-plane-protocol/ospf:ospf" {
    when "../rt:type = 'ospf:ospfv3'" {
        description
            "This augments the OSPFv3 routing protocol when used.";
    }
}
description

```



```

    "This augments the OSPFv3 protocol instance-level configuration
    with Extended LSA support.";
leaf extended-lsa-support {
    type boolean;
    default "false";
    description
        "Enable OSPFv3 Extended LSA Support for the OSPFv3
        domain";
    reference
        "RFC 8362 - OSPFv3 Link State Advertisement (LSA)
        Extensibility, Appendix B - Area Configuration Support";
}
}

augment "/rt:routing/rt:control-plane-protocols/"
    + "rt:control-plane-protocol/ospf:ospf/ospf:"
    + "areas/ospf:area" {
when "../.../rt:type = 'ospf:ospfv3'" {
    description
        "This augments the OSPFv3 protocol area-level configuration
        when used.";
}
description
    "This augments the OSPFv3 protocol area-level
    configuration with Extended LSA support.";
leaf extended-lsa-support {
    type boolean;
    must "derived-from(../ospf:area-type,'stub-nssa-area') or "
        + "(current() = 'true') or "
        + "(../.../extended-lsa-support = 'false')" {
    description
        "For regular areas, i.e., areas where AS-scoped LSAs
        are flooded, disabling AreaExtendedLSASupport at the
        area level is prohibited when ExtendedLSASupport is
        enabled at the instance level. AS-External LSAs
        are flooded into all OSPFv3 regular areas (i.e., not
        a stub or an NSSA area) and disabling support at the
        area level is not possible.";
}
description
    "Enable OSPFv3 Extended LSA Support for the OSPFv3
    area. If not specified, Extended LSA support status
    is inherited from the instance level configuration.";
reference
    "RFC 8362: OSPFv3 Link State Advertisement (LSA)
    Extensibility, Appendix B - Area Configuration Support";
}
}
}

```

```

/*
 * Link State Database (LSDB) Augmentations
 */

augment "/rt:routing/"
  + "rt:control-plane-protocols/rt:control-plane-protocol/"
  + "ospf:ospf/ospf:areas/ospf:area/"
  + "ospf:interfaces/ospf:interface/ospf:database/"
  + "ospf:link-scope-lsa-type/ospf:link-scope-lsas/"
  + "ospf:link-scope-lsa/ospf:version/ospf:ospfv3/"
  + "ospf:ospfv3/ospf:body" {
when "../../../../../../../../../../../../../../../"
  + "rt:type = 'ospf:ospfv3'" {
  description
    "This augmentation is only valid for OSPFv3.";
}
description
  "This augmentation adds OSPFv3 Link-Scoped Extended LSAs
  to the operational state for an interface Link State
  Database (LSDB).";
container e-link {
  when "../../../ospf:header/ospf:type = "
    + "'ospfv3-e-lsa:ospfv3-e-link-lsa'" {
  description
    "Only applies to Extended Link LSAs.";
}
  description
    "E-Link LSA";
  reference
    "RFC 8362: OSPFv3 Link State Advertisement (LSA)
    Extensibility, Section 4.7";
  leaf rtr-priority {
    type uint8;
    description
      "Router Priority for the interface.";
  }
}
uses ospf:ospfv3-lsa-options;
list e-link-tlvs {
  description
    "E-Link LSA TLVs";
  container unknown-tlv {
    uses ospf:tlv;
    description
      "Unknown E-Link TLV";
  }
  uses intra-area-prefix-tlv;
  uses ipv6-link-local-tlv;
  uses ipv4-link-local-tlv;
}

```

```

}
}

augment "/rt:routing/"
  + "rt:control-plane-protocols/rt:control-plane-protocol/"
  + "ospf:ospf/ospf:areas/ospf:area/ospf:database/"
  + "ospf:area-scope-lsa-type/ospf:area-scope-lsas/"
  + "ospf:area-scope-lsa/ospf:version/ospf:ospfv3/"
  + "ospf:ospfv3/ospf:body" {
when "../../../../../../../../../../../"
  + "rt:type = 'ospf:ospfv3'" {
  description
    "This augmentation is only valid for OSPFv3.";
}
description
  "This augmentation adds OSPFv3 Area-Scoped Extended LSAs
  to the operational state for an area Link State
  Database (LSDB).";
reference
  "RFC 8362: OSPFv3 Link State Advertisement (LSA)
  Extensibility, Section 4";
container e-router {
  when "../../../ospf:header/ospf:type = "
    + "'ospfv3-e-lsa:ospfv3-e-router-lsa'" {
  description
    "Only valid for OSPFv3 Extended-Router LSAs";
}
description
  "OSPFv3 Extended Router LSA";
reference
  "RFC 8362: OSPFv3 Link State Advertisement (LSA)
  Extensibility, Section 4.1";
uses ospf:ospf-router-lsa-bits;
uses ospf:ospfv3-lsa-options;
list e-router-tlvs {
  description
    "E-Router LSA TLVs";
  container unknown-tlv {
    uses ospf:tlv;
    description
      "Unknown E-Router TLV";
  }
  container link-tlv {
    description
      "E-Router LSA TLV";
    leaf interface-id {
      type uint32;
      description
        "Interface ID for link";
    }
  }
}

```

```

    }
    leaf neighbor-interface-id {
        type uint32;
        description
            "Neighbor's Interface ID for link";
    }
    leaf neighbor-router-id {
        type rt-types:router-id;
        description
            "Neighbor's Router ID for link";
    }
    leaf type {
        type ospf:router-link-type;
        description
            "Link type: 1 - Point-to-Point Link
                2 - Transit Network Link
                3 - Stub Network Link Link
                4 - Virtual Link";
    }
    leaf metric {
        type uint16;
        description
            "Link Metric";
    }
    list sub-tlvs {
        description
            "Link TLV Sub-TLVs";
        uses unknown-sub-tlv;
    }
}
}
}
container e-network {
    when "../..../ospf:header/ospf:type = "
        + "'ospfv3-e-lsa:ospfv3-e-network-lsa'" {
        description
            "Only applies to E-Network LSAs.";
    }
    description
        "Extended Network LSA";
    reference
        "RFC 8362: OSPFv3 Link State Advertisement (LSA)
            Extensibility, Section 4.2";
    uses ospf:ospfv3-lsa-options;
    list e-network-tlvs {
        description
            "E-Network LSA TLVs";
        container unknown-tlv {
            uses ospf:tlv;
        }
    }
}

```

```

        description
            "Unknown E-Network TLV";
    }
    container attached-router-tlv {
        description
            "Attached Router TLV";
        leaf-list adjacent-neighbor-router-id {
            type rt-types:router-id;
            description
                "Adjacent Neighbor's Router ID";
        }
    }
}
}
}
container e-nssa {
    when "../..//ospf:header/ospf:type = "
        + "'ospfv3-e-lsa:ospfv3-e-nssa-lsa'" {
        description
            "Only applies to E-NSSA LSAs.";
    }
    list e-external-tlvs {
        description
            "E-NSSA LSA TLVs";
        container unknown-tlv {
            uses ospf:tlv;
            description
                "Unknown E-External TLV";
        }
        uses external-prefix-tlv;
    }
    description
        "E-NSSA LSA.";
    reference
        "RFC 8362: OSPFv3 Link State Advertisement (LSA)
        Extensibility, Section 4.6";
}
container e-inter-area-prefix {
    when "../..//ospf:header/ospf:type = "
        + "'ospfv3-e-lsa:ospfv3-e-inter-area-prefix-lsa'" {
        description
            "Only applies to E-Inter-Area-Prefix LSAs.";
    }
    description
        "Extended Inter-Area Prefix LSA";
    reference
        "RFC 8362: OSPFv3 Link State Advertisement (LSA)
        Extensibility, Section 4.3";
    list e-inter-prefix-tlvs {
        description

```

```

    "E-Inter-Area-Prefix LSA TLVs";
  container unknown-tlv {
    uses ospf:tlv;
    description
      "Unknown E-Inter-Area-Prefix TLV";
  }
  container inter-prefix-tlv {
    description
      "Unknown E-Inter-Area-Prefix LSA TLV";
    leaf metric {
      type rt-types:uint24;
      description
        "Inter-Area Prefix Metric";
    }
    uses ospfv3-lsa-prefix;
    list sub-tlvs {
      description
        "Inter-Area Prefix TLV Sub-TLVs";
      uses unknown-sub-tlv;
    }
  }
}
}
}
}
container e-inter-area-router {
  when "../ospf:header/ospf:type = "
    + "'ospfv3-e-lsa:ospfv3-e-inter-area-router-lsa'" {
    description
      "Only applies to E-Inter-Area-Router LSAs.";
  }
  description
    "Extended Inter-Area Router LSA";
  reference
    "RFC 8362: OSPFv3 Link State Advertisement (LSA)
    Extensibility, Section 4.4";
  list e-inter-router-tlvs {
    description
      "E-Inter-Area-Router LSA TLVs";
    container unknown-tlv {
      uses ospf:tlv;
      description
        "Unknown E-Inter-Area-Router TLV";
    }
  }
  container inter-router-tlv {
    description
      "Unknown E-Inter-Area-Router LSA TLV";
    uses ospf:ospfv3-lsa-options;
    leaf metric {
      type rt-types:uint24;
      description

```

```

        "Inter-Area Router Metric";
    }
    leaf destination-router-id {
        type rt-types:router-id;
        description
            "Destination Router ID";
    }
    list sub-tlvs {
        description
            "Inter-Area Router TLV Sub-TLVs";
        uses unknown-sub-tlv;
    }
}
}
}
container e-intra-area-prefix {
    when "../..//ospf:header/ospf:type = "
        + "'ospfv3-e-lsa:ospfv3-e-intra-area-prefix-lsa'" {
        description
            "Only applies to E-Intra-Area-Prefix LSAs.";
    }
    description
        "E-Intra-Area-Prefix LSA";
    reference
        "RFC 8362: OSPFv3 Link State Advertisement (LSA)
        Extensibility, Section 4.8";
    leaf referenced-ls-type {
        type uint16;
        description
            "Referenced Link State type";
    }
    leaf referenced-link-state-id {
        type uint32;
        description
            "Referenced Link State ID";
    }
    leaf referenced-adv-router {
        type rt-types:router-id;
        description
            "Referenced Advertising Router";
    }
    list e-intra-prefix-tlvs {
        description
            "E-Intra-Area-Prefix LSA TLVs";
        container unknown-tlv {
            uses ospf:tlv;
            description
                "Unknown E-Intra-Area-Prefix TLV";
        }
    }
}

```

```

        uses intra-area-prefix-tlv;
    }
}
}

augment "/rt:routing/"
+ "rt:control-plane-protocols/rt:control-plane-protocol/"
+ "ospf:ospf/ospf:database/"
+ "ospf:as-scope-lsa-type/ospf:as-scope-lsas/"
+ "ospf:as-scope-lsa/ospf:version/ospf:ospfv3/"
+ "ospf:ospfv3/ospf:body" {
when "../../../../../../../"
+ "rt:type = 'ospf:ospfv3'" {
description
    "This augmentation is only valid for OSPFv3.";
}
description
    "This augmentation adds OSPFv3 AS-Scoped Extended LSAs
to the operational state for an AS instance-level Link
State Database (LSDB).";
container e-as-external {
when "../../../ospf:header/ospf:type = "
+ "'ospfv3-e-lsa:ospfv3-e-as-external-lsa'" {
description
    "Only applies to E-AS-external LSAs.";
}
list e-external-tlvs {
description
    "E-External LSA TLVs";
container unknown-tlv {
uses ospf:tlv;
description
    "Unknown E-External TLV";
}
uses external-prefix-tlv;
}
description
    "E-AS-External LSA.";
reference
    "RFC 8362: OSPFv3 Link State Advertisement (LSA)
Extensibility, Section 4.5";
}
}
}
}
<CODE ENDS>

```


5. Security Considerations

The YANG modules specified in this document define a schema for data that is designed to be accessed via network management protocols such as NETCONF [[RFC6241](#)] or RESTCONF [[RFC8040](#)]. The lowest NETCONF layer is the secure transport layer, and the mandatory-to-implement secure transport is Secure Shell (SSH) [[RFC6242](#)]. The lowest RESTCONF layer is HTTPS, and the mandatory-to-implement secure transport is TLS [[RFC8446](#)].

The NETCONF access control model [[RFC8341](#)] provides the means to restrict access for particular NETCONF or RESTCONF users to a pre-configured subset of all available NETCONF or RESTCONF protocol operations and content.

There are a number of data nodes defined in `ietf-ospfv3-extended-lsa.yang` module that are writable/creatable/deletable (i.e., `config true`, which is the default). These data nodes may be considered sensitive or vulnerable in some network environments. Write operations (e.g., `edit-config`) to these data nodes without proper protection can have a negative effect on network operations. There are the subtrees and data nodes and their sensitivity/vulnerability:

```
/ospf:ospf/extended-lsa-support
/ospf:ospf/ospf:areas/ospf:area/extended-lsa-support - For OSPFv3
Extended LSAs, the ability to disable OSPFv3 Extended LSA support
result in a denial of service.
```

Some of the readable data nodes in the `ietf-ospfv3-extended-lsa.yang` module may be considered sensitive or vulnerable in some network environments. It is thus important to control read access (e.g., via `get`, `get-config`, or notification) to these data nodes. The exposure of the Link State Database (LSDB) will expose the detailed topology of the network and information beyond the scope of OSPF router. This may be undesirable since both due to the fact that exposure may facilitate other attacks. Additionally, network operators may consider their topologies to be sensitive confidential data.

6. IANA Considerations

This document registers a URI in the IETF XML registry [[RFC3688](#)]. Following the format in [[RFC3688](#)], the following registration is requested to be made:

```
URI: urn:ietf:params:xml:ns:yang:ietf-ospfv3-extended-lsa
Registrant Contact: The IESG.
XML: N/A, the requested URI is an XML namespace.
```

This document registers a YANG module in the YANG Module Names registry [[RFC6020](#)].

name: ietf-ospfv3-extended-lsa
namespace: urn:ietf:params:xml:ns:yang:ietf-ospfv3-extended-lsa
prefix: ospfv3-e-lsa
reference: RFC XXXX

7. Acknowledgements

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Appendix A. Configuration Example

The following is an XML example using the YANG model for OSPFv3 Extended LSAs.

Note: '\\' line wrapping per [[RFC8792](#)].

```
<?xml version='1.0' encoding='UTF-8'?>
<routing xmlns="urn:ietf:params:xml:ns:yang:ietf-routing">
  <router-id>192.0.2.1</router-id>
  <control-plane-protocols>
    <control-plane-protocol>
      <type xmlns:ospf="urn:ietf:params:xml:ns:yang:ietf-ospf">\
ospf:ospfv3</type>
      <name>"OSPFv3"</name>
      <ospf xmlns="urn:ietf:params:xml:ns:yang:ietf-ospf">
        <extended-lsa-support xmlns="urn:ietf:params:xml:ns:yang:\
ietf-ospfv3-extended-lsa">true</extended-lsa-support>
      </ospf>
    </control-plane-protocol>
  </control-plane-protocols>
</routing>
```

The following is the same example using JSON format.

```
{
  "routing": {
    "router-id": "192.0.2.1",
    "control-plane-protocols": {
      "control-plane-protocol": {
        "type": "ospf:ospfv3",
        "name": "\"OSPFv3\"",
        "ospf": {
          "extended-lsa-support": true
        }
      }
    }
  }
}
```

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