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July 7, 2019

YANG Data Model for Preferred Path Routing draft-qct-lsr-ppr-yang-02

Abstract

This document defines YANG data modules for preferred path routing ([[I-D.chunduri-lsr-isis-preferred-path-routing](#)], [[I-D.chunduri-lsr-ospf-preferred-path-routing](#)]) configuration and operation. The YANG modules are intended to be used on network elements to manage the configurations and operations of preferred path routing.

Requirements Language

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 [[RFC2119](#)].

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ppr-yang

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[1.](#) Introduction

This document defines YANG data modules ([\[RFC6020\]](#), [\[RFC7950\]](#)) for preferred path routing configuration and operation.

There are three YANG modules defined in this document. Module `ietf-ppr.yang` defined the protocol independent part of configuration and operations. Two IGP modules are defined as `ietf-isis-ppr.yang` and `ietf-ospf-ppr.yang`.

[1.1.](#) Tree diagram

Tree diagrams used in this document follow the notation defined in [\[I-D.ietf-netmod-yang-tree-diagrams\]](#).

[2.](#) PPR YANG Module

This YANG module defines protocol independent part of configuration

and operation of preferred path routing (PPR) as defined in ([[I-D.chunduri-lsr-isis-preferred-path-routing](#)]).

```
module: ietf-ppr
  augment /rt:routing:
```

```
+--rw preferred-path-routing
  +--rw preferred-path-lists* [name]
    +--rw name string
    +--rw preferred-path-mps* [ppr-id]
      | +--rw ppr-prefix? inet:ip-prefix
      | +--rw ppr-id uint32
      | +--rw algo? uint8
      | +--rw ppr-pde* [pde-id]
      | | +--rw pde-id uint32
      | | +--rw pde-id-type? ppr-pde-id-type
      | | +--rw loose? boolean
      | | +--rw pde-type? ppr-pde-type
      | +--rw attributes
      | | +--rw count-packets? boolean
      | | +--rw count-bytes? boolean
      | | +--rw ppr-metric? uint32
    +--rw preferred-path-ipv4* [ppr-id]
      | +--rw ppr-prefix? inet:ipv4-prefix
      | +--rw ppr-id inet:ipv4-prefix
      | +--rw algo? uint8
      | +--rw ppr-pde* [pde-id]
      | | +--rw pde-id inet:ipv4-address
      | | +--rw pde-id-type? ppr-pde-id-type
      | | +--rw loose? boolean
      | | +--rw pde-type? ppr-pde-type
      | +--rw attributes
      | | +--rw count-packets? boolean
      | | +--rw count-bytes? boolean
      | | +--rw ppr-metric? uint32
    +--rw preferred-path-ipv6* [ppr-id]
      | +--rw ppr-id inet:ipv6-prefix
      | +--rw algo? uint8
      | +--rw ppr-prefix? inet:ipv6-prefix
      | +--rw ppr-pde* [pde-id]
      | | +--rw pde-id inet:ipv6-prefix
      | | +--rw pde-id-type? ppr-pde-id-type
```

```

| | +--rw loose?          boolean
| | +--rw pde-type?       ppr-pde-type
| +--rw attributes
|   +--rw count-packets?  boolean
|   +--rw count-bytes?    boolean
|   +--rw ppr-metric?     uint32
+--rw preferred-path-srv6* [ppr-id]
  +--rw ppr-id             inet:ipv6-prefix
  +--rw algo?              uint8
  +--rw ppr-pde* [pde-id]
  | +--rw pde-id           inet:ipv6-address
  +--rw pde-id-type?       ppr-pde-id-type

```

```

+--rw loose?          boolean
+--rw pde-type?       ppr-pde-type
+--rw attributes
  +--rw count-packets?  boolean
  +--rw count-bytes?    boolean
  +--rw ppr-metric?     uint32

```

```

<CODE BEGINS> file "ietf-ppr@2019-07-07.yang"
module ietf-ppr {
  yang-version 1.1;
  namespace "urn:ietf:params:xml:ns:yang:ietf-ppr";

  prefix ppr;

  import ietf-inet-types {
    prefix inet;
  }

  import ietf-routing {
    prefix rt;
  }

  organization
    "IETF LSR - Link State Routing Working Group";

  contact
    "WG Web:  <http://datatracker.ietf.org/group/lsr/>
    WG List:  <mailto:lsr@ietf.org>

```

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<mailto:uma.chunduri@futurewei.com>;

description

"This Yang module defines the configuration and operational state for Preferred Path Routing common to all vendor implementations.

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

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(<http://trustee.ietf.org/license-info>).

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

reference "RFC XXXX";

revision 2019-07-07 {
 description
 "Initial revision.";
 reference
 "RFC XXXX: A YANG Data Model for PPR.";
}

typedef ppr-pde-type {
 type enumeration {
 enum topological {
 value "1";
 description "Topological PPR PDE.";
 }
 enum non-topological {

```

        value "2";
        description "Non-Topological PPR PED.";
    }
}
description
    "PPR PDE type.";
}

typedef ppr-pde-id-type {
    type enumeration {
        enum sidlabel {
            value "1";
            description
                "PPR ID in mpls label format.";
        }
        enum prefix-sid {
            value "2";
            description
                "SR-MPLS prefix SID.";
        }
        enum adj-sid {
            value "3";
            description
                "SR-MPLS adjacency SID.";
        }
        enum ipv4-node {

```

```

        value "4";
        description
            "IPv4 node address.";
    }
    enum ipv4-p2p {
        value "5";
        description
            "IPv5 P2P interface address.";
    }
    enum ipv4-lan {
        value "6";
        description
            "IPv4 Lan interface address.";
    }
    enum ipv6-node {

```

```

        value "7";
        description
            "IPv6 node address.";
    }
    enum ipv6-p2p {
        value "8";
        description
            "IPv6 P2P interface address.";
    }
    enum ipv6-lan {
        value "9";
        description
            "IPv6 LAN interface address.";
    }
    enum srv6-node-sid {
        value "10";
        description
            "PDE ID in SRv6 node SID format.";
    }
    enum srv6-adj-sid {
        value "11";
        description
            "PDE ID in SRv6 node SID format.";
    }
}
description "Type of PPR ID.";
}

/* Groupings*/
grouping ppr-attributes {
    leaf count-packets {
        type boolean;
        description

```

```

        "create a counter to count number of packets
        forwarded on this PPR-ID on each node in the
        path description.";
    }
    leaf count-bytes {
        type boolean;
        description
            "create a conter to count number of bytes.";
    }

```

```

    }
    leaf ppr-metric {
        type uint32;
        description
            "Metric of the path presented by the PPR-ID.";
    }
    description
        "Groupings for PPR attributes.";
}

grouping pde-attributes {
    leaf pde-id-type {
        type ppr-pde-id-type;
        description
            "PDE forwarding identifier type.";
    }
    leaf loose {
        type boolean;
        default "true";
        description
            "If set, the next topological PDE is loose.";
    }
    leaf pde-type {
        type ppr-pde-type;
        description "PPR PDE type.";
    }
    description
        "Groupings for PDE attributes.";
}

augment "/rt:routing" {
    description
        "This module augments routing-instate configuration
        with preferred path routing.";
    container preferred-path-routing {
        description
            "preferred path routing configuration.";

        list preferred-path-lists {
            key "name";

```



```

    "Preferred path lists.";

    leaf name {
        type string;
        description "PPR path list ID.";
    }

    list preferred-path-mpls {
        key "ppr-id";
        description
            "List of preferred path using MPLS data plane.";
        leaf ppr-prefix {
            type inet:ip-prefix;
            description
                "PPR Prefix representing the destination of the path.";
        }
        leaf ppr-id {
            type uint32;
            description
                "PPR ID, A 20 bit label or 32 bit SID.";
        }
        leaf algo {
            type uint8;
            description
                "SPF algorithm.";
        }
        list ppr-pde {
            key "pde-id";
            leaf pde-id {
                type uint32;
                description
                    "PDE identifier.";
            }
            uses pde-attributes;
            description
                "List of PPR Path Description Element (PDE).";
        }
        container attributes {
            uses ppr-attributes;
            description "PPR attributes.";
        }
    }

    list preferred-path-ipv4 {
        key "ppr-id";
        description
            "List of preferred path using IPv4 data plane.";
    }

```

```
leaf ppr-prefix {
  type inet:ipv4-prefix;
  description
    "PPR Prefix representing the destination of the path.";
}
leaf ppr-id {
  type inet:ipv4-prefix;
  description
    "PPR ID, IPv4 address format.";
}
leaf algo {
  type uint8;
  description
    "SPF algorithm.";
}
list ppr-pde {
  key "pde-id";
  leaf pde-id {
    type inet:ipv4-address;
    description
      "PDE identifier.";
  }
  uses pde-attributes;
  description
    "List of PPR Path Description Element (PDE).";
}
container attributes {
  uses ppr-attributes;
  description "PPR attributes.";
}
}

list preferred-path-ipv6 {
  key "ppr-id";
  description
    "List of preferred path using IPv6 data plane.";
  leaf ppr-id {
    type inet:ipv6-prefix;
    description
      "PPR ID, IPv6 address format.";
  }
  leaf algo {
    type uint8;
    description
      "SPF algorithm.";
  }
}
```

```
leaf ppr-prefix {  
    type inet:ipv6-prefix;
```

```
    description  
        "The prefix at the tail-end of the advertised PPR.";  
}  
  
list ppr-pde {  
    key "pde-id";  
    leaf pde-id {  
        type inet:ipv6-prefix;  
        description  
            "PDE identifier.";  
    }  
    uses pde-attributes;  
    description  
        "List of PPR Path Description Element (PDE).";  
}  
    container attributes {  
        uses ppr-attributes;  
        description "PPR attributes.";  
    }  
}  
  
list preferred-path-srv6 {  
    key "ppr-id";  
    description  
        "List of preferred path using SRv6 data plane.";  
    leaf ppr-id {  
        type inet:ipv6-prefix;  
        description  
            "PPR ID, SRv6 SID format.";  
    }  
    leaf algo {  
        type uint8;  
        description  
            "SPF algorithm.";  
    }  
    list ppr-pde {  
        key "pde-id";  
        leaf pde-id {  
            type inet:ipv6-address;
```

```

        description
            "PDE identifier.";
    }
    description
        "List of PPR Path Description Element (PDE).";
    }
    uses pde-attributes;
    container attributes {
        uses ppr-attributes;
    }

```

```

        description "PPR attributes.";
    }

}

}

}

}
}
}
<CODE ENDS>

```

3. ISIS PPR YANG Module

This YANG module defines ISIS configuration and operation of preferred path routing (PPR) as defined in ([[I-D.chunduri-lsr-isis-preferred-path-routing](#)]). It augments base ISIS module defined in [[I-D.ietf-isis-yang-isis-cfg](#)].

```

module: ietf-isis-ppr
  augment /rt:routing/rt:control-plane-protocols
    /rt:control-plane-protocol/isis:isis:
      +--rw ppr
        +--rw ppr-enable* [name]
          +--rw enable?    boolean
          +--rw name       -> /rt:routing/ppr:preferred-path-routing
                           /preferred-path-lists/name
      augment /rt:routing/rt:control-plane-protocols
        /rt:control-plane-protocol/isis:isis/isis:database
        /isis:levels/isis:lsp:
      +--ro ppr-tlvs
        +--ro ppr-tlv*

```

```

+--ro flags?                bits
+--ro fragment-id?          uint8
+--ro mt-id?                 uint16
+--ro algorithm?             uint8
+--ro ppr-prefix-sub-tlv
|   +--ro prefix-len?        uint8
|   +--ro mask-len?          uint8
|   +--ro isis-prefix?        inet:ip-address
|   +--ro ppr-prefix-sub-sub-tlvs
|       +--ro unknown-tlv*
|           +--ro type?      uint8
|           +--ro length?    uint8
|           +--ro value?     yang:hex-string
+--ro ppr-id-sub-tlv
|   +--ro ppr-id-type?        enumeration
|   +--ro ppr-id-len?         uint8

```

```

|   +--ro ppr-id-mask-len?    uint8
|   +--ro (ppr-id)?
|       +--:(mpls-id)
|           |   +--ro mpls-id?        uint32
|       +--:(ipv4-id)
|           |   +--ro ipv4-id?         inet:ipv4-prefix
|       +--:(srv6-ipv6-id)
|           |   +--ro srv6-ipv6-id?    inet:ipv6-prefix
+--ro ppr-pde-sub-tlvs*
|   +--ro pde-type?            enumeration
|   +--ro ppr-pde-flags?        bits
|   +--ro pde-id-type?          ppr:ppr-pde-id-type
|   +--ro pde-id-len?           uint8
|   +--ro (pde-id)?
|       |   +--:(mpls-id)
|       |       |   +--ro mpls-id?        uint32
|       |       +--:(ipv4-id)
|       |           |   +--ro ipv4-id?         inet:ipv4-prefix
|       |       +--:(srv6-ipv6-id)
|       |           |   +--ro srv6-ipv6-id?    inet:ipv6-prefix
|   +--ro sub-tlv-length?        uint8
|   +--ro ppr-pde-sub-sub-tlvs
|       +--ro unknown-tlv*
|           +--ro type?      uint8
|           +--ro length?    uint8

```

```

|         +---ro value?      yang:hex-string
+---ro ppr-attribute-sub-tlv
|   +---ro traffic-accounting-sub-tlv
|   |   +---ro type?      uint8
|   +---ro traffic-statis-sub-tlv
|   |   +---ro type?      uint8
+---ro ipv4-routerid-sub-tlv
|   +---ro type?          uint8
|   +---ro length?        uint8
|   +---ro value?         inet:ipv4-address
+---ro ipv6-routerid-sub-tlv
|   +---ro type?          uint8
|   +---ro length?        uint8
|   +---ro value?         inet:ipv6-address
+---ro ppr-metric-sub-tlv
|   +---ro type?          uint8
|   +---ro length?        uint8
|   +---ro value?         uint32

```

```

<CODE BEGINS> file "ietf-isis-ppr@2019-07-07.yang"
module ietf-isis-ppr {
  yang-version 1.1;
  namespace "urn:ietf:params:xml:ns:yang:ietf-isis-ppr";

```

```

prefix isis-ppr;

import ietf-inet-types {
  prefix inet;
}

import ietf-yang-types {
  prefix "yang";
}

import ietf-routing {
  prefix rt;
}

import ietf-isis {
  prefix "isis";
}

```

```

import ietf-ppr {
    prefix "ppr";
}

organization
    "IETF LSR - Link State Routing Working Group";

contact
    "WG Web:  <http://datatracker.ietf.org/group/lsr/>
    WG List:  <mailto:lsr@ietf.org>

    Author:   Yingzhen Qu
              <mailto:yingzhen.qu@futurewei.com>
              Uma Chunduri
              <mailto:uma.chunduri@futurewei.com>";

description
    "This Yang module defines the configuration and operational
    state for Preferred Path Routing common to all vendor
    implementations.

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

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```

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 (<http://trustee.ietf.org/license-info>).

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 see the RFC itself for full legal notices.";

```
reference "RFC XXXX";
```

```
revision 2019-07-07 {
    description
```

```

    "Initial revision.";
reference
    "RFC XXXX: A YANG Data Model for ISIS PPR.";
}

/* Groupings */
grouping tlv {
    description
        "TLV";
    leaf type {
        type uint8;
        description "TLV type.";
    }
    leaf length {
        type uint8;
        description "TLV length (octets).";
    }
    leaf value {
        type yang:hex-string;
        description "TLV value.";
    }
}

grouping general-tlvs {
    description
        "Unknown TLVs grouping - Used for unknown TLVs or
        unknown sub-TLVs.";

    list unknown-tlv {
        description "General TLV.";
        uses tlv;
    }
}

grouping ppr-prefix-sub-tlv {
    description "ISIS destination prefix.";
}

```

```

container ppr-prefix-sub-tlv {
    leaf prefix-len {
        type uint8;
        description "The length of the profix in bytes.";
    }
}

```



```

    }
    leaf mask-len {
        type uint8;
        description "The length of the prefix in bits.";
    }
    leaf isis-prefix {
        type inet:ip-address;
        description "FEC Prefix.";
    }
    container ppr-prefix-sub-sub-tlvs {
        uses general-tlvs;
        description "PPR Prefix sub sub-tlvs.";
    }
    description
        "PPR Prefix sub-tlv.";
}
}

grouping ppr-id-sub-tlv {
    description
        "PPR ID: the actual data plane identifier in the packet header.";

    container ppr-id-sub-tlv {
        leaf ppr-id-type {
            type enumeration {
                enum mpls {
                    value 1;
                    description
                        "PPR ID in mpls label format.";
                }
                enum ipv4 {
                    value 2;
                    description
                        "PPR ID in IPv4 address format.";
                }
                enum ipv6 {
                    value 3;
                    description
                        "PPR ID in ipv6 address format.";
                }
                enum srv6 {
                    value 4;
                    description
                        "PPR ID in SRv6 SID format.";
                }
            }
        }
    }
}

```

```
    }
  }
  description "Type of PPR ID.";
}
leaf ppr-id-len {
  type uint8;
  description
    "Length of the PPR ID.";
}
leaf ppr-id-mask-len {
  type uint8;
  description "The length of the prefix in bits.";
}
choice ppr-id {
  leaf mpls-id {
    type uint32;
    description "MPLS Label format.";
  }
  leaf ipv4-id {
    type inet:ipv4-prefix;
    description "IPv4 format.";
  }
  leaf srv6-ipv6-id {
    type inet:ipv6-prefix;
    description "SRv6 or IPv6 format.";
  }
}
description "Preferred Path ID.";
}
description "PPR ID sub tlv.";
}

}

grouping ppr-pde-sub-tlv {
  description
    "This sub-tlv represents the PPR Path Description Element (PDE).";

  list ppr-pde-sub-tlvs {
    description "PPR PDE sub tlvs.";
    leaf pde-type {
      type enumeration {
        enum topological {
          value 1;
          description
            "Topological PDE.";
        }
        enum non-topological {
```

value 2;

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```
        description
            "Non-topological PDE.";
    }
}
description "Type of PDE.";
}
leaf ppr-pde-flags {
    type bits {
        bit L {
            position 0;
            description
                "If set, the PPR path is a Loose-PPR.";
        }
        bit N {
            position 1;
            description
                "If set, the PDE is topological and this PDE represents
                the node PPR-prfix";
        }
        bit E {
            position 2;
            description
                "Egress Bit. By default this bit MUST be unset.";
        }
    }
    description "Flags.";
}
leaf pde-id-type {
    type ppr:ppr-pde-id-type;
    description "Type of PPR PDE ID.";
}
leaf pde-id-len {
    type uint8;
    description
        "Length of the PDE ID.";
}
choice pde-id {
    leaf mpls-id {
        type uint32;
        description "MPLS Label format.";
```

```

}
leaf ipv4-id {
    type inet:ipv4-prefix;
    description "IPv4 format.";
}
leaf srv6-ipv6-id {
    type inet:ipv6-prefix;
    description "SRv6 or IPv6 format.";
}

```

```

    }
    description "Preferred Path ID.";
}
leaf sub-tlv-length{
    type uint8;
    description
        "Length of all sub-TLVs followed.";
}
container ppr-pde-sub-sub-tlvs {
    uses general-tlvs;
    description "PPR PDE sub sub-tlvs.";
}
}
}

grouping ppr-attribute-sub-tlv {
    description "Grouping for PPR attribute sub-tlvs.";

    container ppr-attribute-sub-tlv {
        description "PPR attribute sub-tlv.";

        container traffic-accounting-sub-tlv {
            description
                "packet traffic acccounting sub-tlv. Specifies to create
                a counter to count number of packets forwarded to this
                PPR-ID on each node in the path description.";
            leaf type {
                type uint8;
                default 1;
                description "Type 1 sub-tlv.";
            }
        }
    }
}
container traffic-statis-sub-tlv {

```

```

description
  "Specifies to create a counter to count number of bytes
  forwarded on this PPR-ID specified in the network header
  (e.g. IPv4, IPv6) on each node in the path description.";
leaf type {
  type uint8;
  default 2;
  description "Traffic statistics in bytes sub-tlv.";
}
}
container ipv4-routerid-sub-tlv {
  description "PPR-prefix originating node's IPv4 router ID.";
  leaf type {
    type uint8;
    default 3;
  }
}

```

```

  description "PPR-prefix originating node's IPv4 router ID.";
}
leaf length {
  type uint8;
  default 4;
  description "Length is 4 bytes.";
}
leaf value {
  type inet:ipv4-address;
  description "IPv4 router ID.";
}
}
container ipv6-routerid-sub-tlv {
  description "PPR-prefix originating node's IPv6 router ID.";
  leaf type {
    type uint8;
    default 4;
    description "PPR-prefix originating node's IPv6 router ID.";
  }
  leaf length {
    type uint8;
    default 16;
    description "Length is 16 bytes.";
  }
  leaf value {
    type inet:ipv6-address;
  }
}

```

```

        description "IPv6 router ID.";
    }
}
container ppr-metric-sub-tlv {
    description
        "The metric of this path represented through the PPR-ID.";
    leaf type {
        type uint8;
        default 5;
        description "Metric sub-tlv.";
    }
    leaf length {
        type uint8;
        default 4;
        description "4 bytes.";
    }
    leaf value {
        type uint32;
        description "Metric of the PPR-ID.";
    }
}
}
}

```

```

}

grouping ppr-tlvs {
    description "PPR TLV encodings.";

    container ppr-tlvs {
        description "List of PPR TLVs.";
        list ppr-tlv {
            description "List of PPR TLVs.";
            leaf flags {
                type bits {
                    bit F {
                        position 0;
                        description
                            "If set, the PPR TLV must be flooded across
                             the entire routing domain.";
                    }
                    bit D {
                        position 1;
                    }
                }
            }
        }
    }
}

```

```

        description
            "If set, the PPR TLV is leaked from ISIS level-2
            to level-1.";
    }
    bit A {
        position 2;
        description
            "If set, it is to signal that the prefixes and PPR IDs
            advertised in this TLV are directly connected to
            their originators.";
    }
    bit U {
        position 3;
        description
            "U bit MUST be set if a path has only one fragment or
            if it is the last Fragment of the path.";
    }
    }
    description "Flags.";
}
leaf fragment-id {
    type uint8 {
        range "0 .. 127";
    }
    description
        "Identifier of the fragment.";
}
leaf mt-id {
    type uint16 {

```

```

        range "0 .. 4095";
    }
    description
        "This leaf defines the identifier
        of a topology as in RFC 5120.";
    }
    leaf algorithm {
        type uint8;
        description
            "The SPF algorithm.";
    }
    }
    uses ppr-prefix-sub-tlv;

```

```

        uses ppr-id-sub-tlv;
        uses ppr-pde-sub-tlv;
        uses ppr-attribute-sub-tlv;
    }
}
}

/* Configuration */
augment "/rt:routing/rt:control-plane-protocols"
    + "/rt:control-plane-protocol/isis:isis" {
    when "../rt:type = 'isis:isis'" {
        description
            "This augments the ISIS routing protocol when used.";
    }
    description
        "This augments the ISIS protocol configuration
        with preferred path routing.";

    container ppr {
        description
            "ISIS PPR.";
        leaf enable {
            type boolean;
            default false;
            description
                "Enable PPR.";
        }
        list ppr-advertise {
            key "name";
            leaf name {
                type leafref {
                    path "/rt:routing/ppr:preferred-path-routing/"
                        + "ppr:preferred-path-lists/ppr:name";
                }
            }
            description

```

```

        "PPR path list name.";
    }
    description
        "Enable PPR path advertisement.";
}

```



```

    }
}

/* Database */
augment "/rt:routing/"
  + "rt:control-plane-protocols/rt:control-plane-protocol"
  + "/isis:isis/isis:database/isis:levels/isis:lsp" {
    when "/rt:routing/rt:control-plane-protocols/" +
      "rt:control-plane-protocol/rt:type = 'isis:isis'" {
      description
        "This augment ISIS routing protocol when used";
    }
    description
      "This augments ISIS protocol LSDB.";
    uses ppr-tlvs;
  }
}
<CODE ENDS>

```

4. OSPF PPR YANG Module

This YANG module defines OSPF configuration and operation of preferred path routing (PPR) as defined in ([[I-D.chunduri-lsr-ospf-preferred-path-routing](#)]). It augments the base OSPF module defined in [[I-D.ietf-ospf-yang](#)]. Both OSPFv2 and OSPFv3 are included.

```

module: ietf-ospf-ppr
  augment /rt:routing/rt:control-plane-protocols
    /rt:control-plane-protocol/ospf:ospf:
      +--rw ppr
        +--rw ppr-enable* [name]
          +--rw enable?    boolean
          +--rw name       -> /rt:routing/ppr:preferred-path-routing
                           /preferred-path-lists/name
      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:ospfv2/ospf:ospfv2
        /ospf:body/ospf:opaque/ospf:extended-prefix-tlvs
        /ospf:extended-prefix-tlv:

```

```

+--ro ppr-tlvs
  +--ro ppr-tlv*
    +--ro flags?                bits
    +--ro af?                   iana-rt-types:address-family
    +--ro ppr-prefix-sub-tlv
      | +--ro mt-id?             uint8
      | +--ro prefix-len?       uint8
      | +--ro mask-len?         uint8
      | +--ro ospf-prefix?      inet:ip-address
      | +--ro ppr-prefix-sub-sub-tlvs
      |   +--ro unknown-tlvs
      |     +--ro unknown-tlv*
      |       +--ro type?       uint16
      |       +--ro length?     uint16
      |       +--ro value?      yang:hex-string
    +--ro ppr-id-sub-tlv
      | +--ro ppr-id-type?       enumeration
      | +--ro ppr-id-len?        uint8
      | +--ro ppr-id-mask-len?   uint8
      | +--ro ppr-id-algo?       uint8
      | +--ro (ppr-id)?
      |   +--:(mpls-id)
      |     | +--ro mpls-id?      uint32
      |     +--:(ipv4-id)
      |       | +--ro ipv4-id?    inet:ipv4-prefix
      |       +--:(srv6-ipv6-id)
      |         +--ro srv6-ipv6-id? inet:ipv6-prefix
    +--ro ppr-pde-sub-tlvs*
      | +--ro pde-type?          enumeration
      | +--ro ppr-pde-flags?     bits
      | +--ro pde-id-type?       ppr:ppr-pde-id-type
      | +--ro pde-id-len?        uint8
      | +--ro (pde-id)?
      |   +--:(mpls-id)
      |     | +--ro mpls-id?      uint32
      |     +--:(ipv4-id)
      |       | +--ro ipv4-id?    inet:ipv4-prefix
      |       +--:(srv6-ipv6-id)
      |         +--ro srv6-ipv6-id? inet:ipv6-prefix
      +--ro ppr-pde-sub-sub-tlvs
        +--ro unknown-tlvs
          +--ro unknown-tlv*
            +--ro type?         uint16
            +--ro length?       uint16
            +--ro value?        yang:hex-string
    +--ro ppr-attribute-sub-tlv
      +--ro traffic-accounting-sub-tlv
        | +--ro type?          uint8

```

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```

    +---ro traffic-statis-sub-tlv
    | +---ro type?      uint8
    +---ro ipv4-routerid-sub-tlv
    | +---ro type?      uint8
    | +---ro length?    uint8
    | +---ro value?     inet:ipv4-address
    +---ro ipv6-routerid-sub-tlv
    | +---ro type?      uint8
    | +---ro length?    uint8
    | +---ro value?     inet:ipv6-address
    +---ro ppr-metric-sub-tlv
        +---ro type?      uint8
        +---ro length?    uint8
        +---ro value?     uint32
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:ospfv2/ospf:ospfv2
    /ospf:body/ospf:opaque/ospf:extended-prefix-tlvs
    /ospf:extended-prefix-tlv:
+---ro ppr-tlvs
+---ro ppr-tlv*
    +---ro flags?          bits
    +---ro af?             iana-rt-types:address-family
+---ro ppr-prefix-sub-tlv
    | +---ro mt-id?          uint8
    | +---ro prefix-len?     uint8
    | +---ro mask-len?       uint8
    | +---ro ospf-prefix?    inet:ip-address
    | +---ro ppr-prefix-sub-sub-tlvs
    |     +---ro unknown-tlvs
    |     +---ro unknown-tlv*
    |         +---ro type?    uint16
    |         +---ro length?  uint16
    |         +---ro value?   yang:hex-string
+---ro ppr-id-sub-tlv
    | +---ro ppr-id-type?    enumeration
    | +---ro ppr-id-len?     uint8
    | +---ro ppr-id-mask-len? uint8
    | +---ro ppr-id-algo?    uint8
    | +---ro (ppr-id)?
    |     +---:(mpls-id)

```

```

|         | +--ro mpls-id?          uint32
|         +--:(ipv4-id)
|         | +--ro ipv4-id?         inet:ipv4-prefix
|         +--:(srv6-ipv6-id)
|         +--ro srv6-ipv6-id?      inet:ipv6-prefix
+--ro ppr-pde-sub-tlvs*

```

```

| +--ro pde-type?          enumeration
| +--ro ppr-pde-flags?     bits
| +--ro pde-id-type?       ppr:ppr-pde-id-type
| +--ro pde-id-len?        uint8
| +--ro (pde-id)?
| | +--:(mpls-id)
| | | +--ro mpls-id?       uint32
| | +--:(ipv4-id)
| | | +--ro ipv4-id?       inet:ipv4-prefix
| | +--:(srv6-ipv6-id)
| | +--ro srv6-ipv6-id?    inet:ipv6-prefix
+--ro ppr-pde-sub-sub-tlvs
|   +--ro unknown-tlvs
|   | +--ro unknown-tlv*
|   | | +--ro type?        uint16
|   | | +--ro length?      uint16
|   | | +--ro value?       yang:hex-string
+--ro ppr-attribute-sub-tlv
|   +--ro traffic-accounting-sub-tlv
|   | +--ro type?          uint8
+--ro traffic-statis-sub-tlv
|   +--ro type?            uint8
+--ro ipv4-routerid-sub-tlv
|   +--ro type?            uint8
|   +--ro length?          uint8
|   +--ro value?           inet:ipv4-address
+--ro ipv6-routerid-sub-tlv
|   +--ro type?            uint8
|   +--ro length?          uint8
|   +--ro value?           inet:ipv6-address
+--ro ppr-metric-sub-tlv
|   +--ro type?            uint8
|   +--ro length?          uint8
|   +--ro value?           uint32

```

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:ospfv2/ospf:ospfv2/ospf:body/ospf:opaque
    /ospf:extended-prefix-tlvs/ospf:extended-prefix-tlv:
+--ro ppr-tlvs
  +--ro ppr-tlv*
    +--ro flags?          bits
    +--ro af?             iana-rt-types:address-family
    +--ro ppr-prefix-sub-tlv
      | +--ro mt-id?      uint8
      | +--ro prefix-len? uint8
      | +--ro mask-len?   uint8
      | +--ro ospf-prefix? inet:ip-address

```

```

    | +--ro ppr-prefix-sub-sub-tlvs
    |   +--ro unknown-tlvs
    |     +--ro unknown-tlv*
    |       +--ro type?    uint16
    |       +--ro length?  uint16
    |       +--ro value?   yang:hex-string
+--ro ppr-id-sub-tlv
  | +--ro ppr-id-type?    enumeration
  | +--ro ppr-id-len?     uint8
  | +--ro ppr-id-mask-len? uint8
  | +--ro ppr-id-algo?    uint8
  | +--ro (ppr-id)?
  |   +--:(mpls-id)
  |     | +--ro mpls-id?      uint32
  |     +--:(ipv4-id)
  |       | +--ro ipv4-id?    inet:ipv4-prefix
  |       +--:(srv6-ipv6-id)
  |         +--ro srv6-ipv6-id? inet:ipv6-prefix
+--ro ppr-pde-sub-tlvs*
  | +--ro pde-type?      enumeration
  | +--ro ppr-pde-flags? bits
  | +--ro pde-id-type?   ppr:ppr-pde-id-type
  | +--ro pde-id-len?    uint8
  | +--ro (pde-id)?
  |   | +--:(mpls-id)
  |   | | +--ro mpls-id?      uint32
  |   | +--:(ipv4-id)
  |   | | +--ro ipv4-id?     inet:ipv4-prefix

```

```

| | +--:(srv6-ipv6-id)
| |   +--ro srv6-ipv6-id?                inet:ipv6-prefix
| +--ro ppr-pde-sub-sub-tlvs
|   +--ro unknown-tlvs
|     +--ro unknown-tlv*
|       +--ro type?      uint16
|       +--ro length?    uint16
|       +--ro value?     yang:hex-string
+--ro ppr-attribute-sub-tlv
  +--ro traffic-accounting-sub-tlv
  | +--ro type?      uint8
  +--ro traffic-statis-sub-tlv
  | +--ro type?      uint8
  +--ro ipv4-routerid-sub-tlv
  | +--ro type?      uint8
  | +--ro length?    uint8
  | +--ro value?     inet:ipv4-address
  +--ro ipv6-routerid-sub-tlv
  | +--ro type?      uint8
  | +--ro length?    uint8

```

```

| +--ro value?      inet:ipv6-address
+--ro ppr-metric-sub-tlv
  +--ro type?      uint8
  +--ro length?    uint8
  +--ro value?     uint32
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/ospf:inter-area-prefix:
+--ro ppr-tlvs
  +--ro ppr-tlv*
  +--ro flags?      bits
  +--ro af?          iana-rt-types:address-family
+--ro ppr-prefix-sub-tlv
  | +--ro mt-id?      uint8
  | +--ro prefix-len? uint8
  | +--ro mask-len?   uint8
  | +--ro ospf-prefix? inet:ip-address
  | +--ro ppr-prefix-sub-sub-tlvs

```

```

|         +---ro unknown-tlvs
|         +---ro unknown-tlv*
|             +---ro type?      uint16
|             +---ro length?    uint16
|             +---ro value?     yang:hex-string
+---ro ppr-id-sub-tlv
|   +---ro ppr-id-type?          enumeration
|   +---ro ppr-id-len?           uint8
|   +---ro ppr-id-mask-len?      uint8
|   +---ro ppr-id-algo?          uint8
|   +---ro (ppr-id)?
|       +---:(mpls-id)
|       |   +---ro mpls-id?      uint32
|       +---:(ipv4-id)
|       |   +---ro ipv4-id?      inet:ipv4-prefix
|       +---:(srv6-ipv6-id)
|       |   +---ro srv6-ipv6-id? inet:ipv6-prefix
+---ro ppr-pde-sub-tlvs*
|   +---ro pde-type?              enumeration
|   +---ro ppr-pde-flags?         bits
|   +---ro pde-id-type?           ppr:ppr-pde-id-type
|   +---ro pde-id-len?            uint8
|   +---ro (pde-id)?
|       |   +---:(mpls-id)
|       |   |   +---ro mpls-id?      uint32
|       |   +---:(ipv4-id)
|       |   |   +---ro ipv4-id?      inet:ipv4-prefix

```

```

|   |   +---:(srv6-ipv6-id)
|   |   |   +---ro srv6-ipv6-id?      inet:ipv6-prefix
+---ro ppr-pde-sub-sub-tlvs
|   +---ro unknown-tlvs
|   +---ro unknown-tlv*
|       +---ro type?      uint16
|       +---ro length?    uint16
|       +---ro value?     yang:hex-string
+---ro ppr-attribute-sub-tlv
|   +---ro traffic-accounting-sub-tlv
|   |   +---ro type?      uint8
+---ro traffic-statis-sub-tlv
|   +---ro type?      uint8
+---ro ipv4-routerid-sub-tlv

```

```

|   +---ro type?      uint8
|   +---ro length?    uint8
|   +---ro value?     inet:ipv4-address
+---ro ipv6-routerid-sub-tlv
|   +---ro type?      uint8
|   +---ro length?    uint8
|   +---ro value?     inet:ipv6-address
+---ro ppr-metric-sub-tlv
|   +---ro type?      uint8
|   +---ro length?    uint8
|   +---ro value?     uint32
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/ospf:inter-area-prefix:
+---ro ppr-tlvs
+---ro ppr-tlv*
|   +---ro flags?          bits
|   +---ro af?             iana-rt-types:address-family
+---ro ppr-prefix-sub-tlv
|   +---ro mt-id?          uint8
|   +---ro prefix-len?     uint8
|   +---ro mask-len?       uint8
|   +---ro ospf-prefix?    inet:ip-address
|   +---ro ppr-prefix-sub-sub-tlvs
|       +---ro unknown-tlvs
|           +---ro unknown-tlv*
|               +---ro type?      uint16
|               +---ro length?    uint16
|               +---ro value?     yang:hex-string
+---ro ppr-id-sub-tlv
|   +---ro ppr-id-type?    enumeration
|   +---ro ppr-id-len?     uint8

```

```

|   +---ro ppr-id-mask-len?  uint8
|   +---ro ppr-id-algo?     uint8
|   +---ro (ppr-id)?
|       +---:(mpls-id)
|           |   +---ro mpls-id?          uint32
|       +---:(ipv4-id)
|           |   +---ro ipv4-id?          inet:ipv4-prefix

```



```

|         +---:(srv6-ipv6-id)
|         +---ro srv6-ipv6-id?          inet:ipv6-prefix
+---ro ppr-pde-sub-tlvs*
|   +---ro pde-type?                    enumeration
|   +---ro ppr-pde-flags?                bits
|   +---ro pde-id-type?                  ppr:ppr-pde-id-type
|   +---ro pde-id-len?                   uint8
|   +---ro (pde-id)?
|   |   +---:(mpls-id)
|   |   |   +---ro mpls-id?              uint32
|   |   +---:(ipv4-id)
|   |   |   +---ro ipv4-id?              inet:ipv4-prefix
|   |   +---:(srv6-ipv6-id)
|   |   |   +---ro srv6-ipv6-id?          inet:ipv6-prefix
+---ro ppr-pde-sub-sub-tlvs
|   +---ro unknown-tlvs
|   |   +---ro unknown-tlv*
|   |   |   +---ro type?                 uint16
|   |   |   +---ro length?               uint16
|   |   |   +---ro value?                yang:hex-string
+---ro ppr-attribute-sub-tlv
|   +---ro traffic-accounting-sub-tlv
|   |   +---ro type?                     uint8
+---ro traffic-statis-sub-tlv
|   +---ro type?                         uint8
+---ro ipv4-routerid-sub-tlv
|   +---ro type?                         uint8
|   +---ro length?                       uint8
|   +---ro value?                        inet:ipv4-address
+---ro ipv6-routerid-sub-tlv
|   +---ro type?                         uint8
|   +---ro length?                       uint8
|   +---ro value?                        inet:ipv6-address
+---ro ppr-metric-sub-tlv
|   +---ro type?                         uint8
|   +---ro length?                       uint8
|   +---ro value?                        uint32
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

```

```

    /ospf:inter-area-prefix:
+--ro ppr-tlvs
  +--ro ppr-tlv*
    +--ro flags?                bits
    +--ro af?                   iana-rt-types:address-family
    +--ro ppr-prefix-sub-tlv
      | +--ro mt-id?             uint8
      | +--ro prefix-len?       uint8
      | +--ro mask-len?         uint8
      | +--ro ospf-prefix?      inet:ip-address
      | +--ro ppr-prefix-sub-sub-tlvs
      |   +--ro unknown-tlvs
      |     +--ro unknown-tlv*
      |       +--ro type?       uint16
      |       +--ro length?     uint16
      |       +--ro value?      yang:hex-string
    +--ro ppr-id-sub-tlv
      | +--ro ppr-id-type?      enumeration
      | +--ro ppr-id-len?       uint8
      | +--ro ppr-id-mask-len?  uint8
      | +--ro ppr-id-algo?      uint8
      | +--ro (ppr-id)?
      |   +--:(mpls-id)
      |     | +--ro mpls-id?     uint32
      |     +--:(ipv4-id)
      |       | +--ro ipv4-id?   inet:ipv4-prefix
      |       +--:(srv6-ipv6-id)
      |         +--ro srv6-ipv6-id? inet:ipv6-prefix
    +--ro ppr-pde-sub-tlvs*
      | +--ro pde-type?         enumeration
      | +--ro ppr-pde-flags?    bits
      | +--ro pde-id-type?      ppr:ppr-pde-id-type
      | +--ro pde-id-len?       uint8
      | +--ro (pde-id)?
      |   +--:(mpls-id)
      |     | +--ro mpls-id?     uint32
      |     +--:(ipv4-id)
      |       | +--ro ipv4-id?   inet:ipv4-prefix
      |       +--:(srv6-ipv6-id)
      |         +--ro srv6-ipv6-id? inet:ipv6-prefix
      +--ro ppr-pde-sub-sub-tlvs
        +--ro unknown-tlvs
          +--ro unknown-tlv*
            +--ro type?         uint16
            +--ro length?       uint16
            +--ro value?        yang:hex-string
    +--ro ppr-attribute-sub-tlv
      +--ro traffic-accounting-sub-tlv

```

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```

    | +--ro type?      uint8
+--ro traffic-statis-sub-tlv
    | +--ro type?      uint8
+--ro ipv4-routerid-sub-tlv
    | +--ro type?      uint8
    | +--ro length?    uint8
    | +--ro value?     inet:ipv4-address
+--ro ipv6-routerid-sub-tlv
    | +--ro type?      uint8
    | +--ro length?    uint8
    | +--ro value?     inet:ipv6-address
+--ro ppr-metric-sub-tlv
    +--ro type?        uint8
    +--ro length?      uint8
    +--ro value?       uint32
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/ospf:intra-area-prefix:
+--ro ppr-tlvs
+--ro ppr-tlv*
+--ro flags?          bits
+--ro af?             iana-rt-types:address-family
+--ro ppr-prefix-sub-tlv
    | +--ro mt-id?          uint8
    | +--ro prefix-len?     uint8
    | +--ro mask-len?       uint8
    | +--ro ospf-prefix?    inet:ip-address
    | +--ro ppr-prefix-sub-sub-tlvs
    |   +--ro unknown-tlvs
    |     +--ro unknown-tlv*
    |       +--ro type?     uint16
    |       +--ro length?   uint16
    |       +--ro value?    yang:hex-string
+--ro ppr-id-sub-tlv
    | +--ro ppr-id-type?    enumeration
    | +--ro ppr-id-len?     uint8
    | +--ro ppr-id-mask-len? uint8
    | +--ro ppr-id-algo?    uint8
    | +--ro (ppr-id)?
    |   +--:(mpls-id)

```

```

|   |   +--ro mpls-id?          uint32
|   +--:(ipv4-id)
|   |   +--ro ipv4-id?          inet:ipv4-prefix
|   +--:(srv6-ipv6-id)
|       +--ro srv6-ipv6-id?      inet:ipv6-prefix

```

```

+--ro ppr-pde-sub-tlvs*
|   +--ro pde-type?              enumeration
|   +--ro ppr-pde-flags?         bits
|   +--ro pde-id-type?           ppr:ppr-pde-id-type
|   +--ro pde-id-len?            uint8
|   +--ro (pde-id)?
|       |   +--:(mpls-id)
|       |   |   +--ro mpls-id?          uint32
|       |   +--:(ipv4-id)
|       |   |   +--ro ipv4-id?          inet:ipv4-prefix
|       |   +--:(srv6-ipv6-id)
|       |       +--ro srv6-ipv6-id?      inet:ipv6-prefix
|   +--ro ppr-pde-sub-sub-tlvs
|       +--ro unknown-tlvs
|           +--ro unknown-tlv*
|               +--ro type?          uint16
|               +--ro length?        uint16
|               +--ro value?         yang:hex-string
+--ro ppr-attribute-sub-tlv
|   +--ro traffic-accounting-sub-tlv
|       |   +--ro type?          uint8
|   +--ro traffic-statis-sub-tlv
|       |   +--ro type?          uint8
|   +--ro ipv4-routerid-sub-tlv
|       |   +--ro type?          uint8
|       |   +--ro length?        uint8
|       |   +--ro value?         inet:ipv4-address
|   +--ro ipv6-routerid-sub-tlv
|       |   +--ro type?          uint8
|       |   +--ro length?        uint8
|       |   +--ro value?         inet:ipv6-address
|   +--ro ppr-metric-sub-tlv
|       +--ro type?          uint8
|       +--ro length?        uint8
|       +--ro value?         uint32

```

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/ospf:intra-area-prefix:
+--ro ppr-tlvs
  +--ro ppr-tlv*
    +--ro flags?          bits
    +--ro af?             iana-rt-types:address-family
    +--ro ppr-prefix-sub-tlv
      | +--ro mt-id?      uint8
      | +--ro prefix-len? uint8
      | +--ro mask-len?   uint8

```

```

    | +--ro ospf-prefix?          inet:ip-address
    | +--ro ppr-prefix-sub-sub-tlvs
    |   +--ro unknown-tlvs
    |     +--ro unknown-tlv*
    |       +--ro type?          uint16
    |       +--ro length?        uint16
    |       +--ro value?         yang:hex-string
+--ro ppr-id-sub-tlv
  | +--ro ppr-id-type?          enumeration
  | +--ro ppr-id-len?           uint8
  | +--ro ppr-id-mask-len?      uint8
  | +--ro ppr-id-algo?          uint8
  | +--ro (ppr-id)?
  |   +--:(mpls-id)
  |     | +--ro mpls-id?        uint32
  |     +--:(ipv4-id)
  |       | +--ro ipv4-id?      inet:ipv4-prefix
  |       +--:(srv6-ipv6-id)
  |         +--ro srv6-ipv6-id? inet:ipv6-prefix
+--ro ppr-pde-sub-tlvs*
  | +--ro pde-type?             enumeration
  | +--ro ppr-pde-flags?        bits
  | +--ro pde-id-type?          ppr:ppr-pde-id-type
  | +--ro pde-id-len?           uint8
  | +--ro (pde-id)?
  |   | +--:(mpls-id)
  |   | | +--ro mpls-id?        uint32
  |   | +--:(ipv4-id)
  |   | | +--ro ipv4-id?        inet:ipv4-prefix

```

```

| | +--:(srv6-ipv6-id)
| |   +--ro srv6-ipv6-id?                inet:ipv6-prefix
| +--ro ppr-pde-sub-sub-tlvs
|   +--ro unknown-tlvs
|     +--ro unknown-tlv*
|       +--ro type?      uint16
|       +--ro length?    uint16
|       +--ro value?     yang:hex-string
+--ro ppr-attribute-sub-tlv
  +--ro traffic-accounting-sub-tlv
  | +--ro type?      uint8
  +--ro traffic-statis-sub-tlv
  | +--ro type?      uint8
  +--ro ipv4-routerid-sub-tlv
  | +--ro type?      uint8
  | +--ro length?    uint8
  | +--ro value?     inet:ipv4-address
  +--ro ipv6-routerid-sub-tlv
  | +--ro type?      uint8

```

```

| +--ro length?      uint8
| +--ro value?       inet:ipv6-address
+--ro ppr-metric-sub-tlv
  +--ro type?        uint8
  +--ro length?      uint8
  +--ro value?       uint32
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
  /ospf:intra-area-prefix:
+--ro ppr-tlvs
  +--ro ppr-tlv*
  +--ro flags?        bits
  +--ro af?           iana-rt-types:address-family
  +--ro ppr-prefix-sub-tlv
  | +--ro mt-id?      uint8
  | +--ro prefix-len? uint8
  | +--ro mask-len?   uint8
  | +--ro ospf-prefix? inet:ip-address
  | +--ro ppr-prefix-sub-sub-tlvs
  |   +--ro unknown-tlvs

```

```

|         +---ro unknown-tlv*
|         +---ro type?      uint16
|         +---ro length?    uint16
|         +---ro value?     yang:hex-string
+---ro ppr-id-sub-tlv
|   +---ro ppr-id-type?      enumeration
|   +---ro ppr-id-len?       uint8
|   +---ro ppr-id-mask-len?  uint8
|   +---ro ppr-id-algo?      uint8
|   +---ro (ppr-id)?
|     +---:(mpls-id)
|       | +---ro mpls-id?          uint32
|       +---:(ipv4-id)
|         | +---ro ipv4-id?        inet:ipv4-prefix
|       +---:(srv6-ipv6-id)
|         +---ro srv6-ipv6-id?     inet:ipv6-prefix
+---ro ppr-pde-sub-tlvs*
|   +---ro pde-type?          enumeration
|   +---ro ppr-pde-flags?     bits
|   +---ro pde-id-type?       ppr:ppr-pde-id-type
|   +---ro pde-id-len?        uint8
|   +---ro (pde-id)?
|     | +---:(mpls-id)
|     | | +---ro mpls-id?          uint32
|     | +---:(ipv4-id)
|     | | +---ro ipv4-id?          inet:ipv4-prefix

```

```

|   | +---:(srv6-ipv6-id)
|   | | +---ro srv6-ipv6-id?          inet:ipv6-prefix
+---ro ppr-pde-sub-sub-tlvs
|   +---ro unknown-tlvs
|   +---ro unknown-tlv*
|     +---ro type?      uint16
|     +---ro length?    uint16
|     +---ro value?     yang:hex-string
+---ro ppr-attribute-sub-tlv
|   +---ro traffic-accounting-sub-tlv
|     | +---ro type?    uint8
+---ro traffic-statis-sub-tlv
|   +---ro type?    uint8
+---ro ipv4-routerid-sub-tlv
|   +---ro type?    uint8

```

```

    | +--ro length?    uint8
    | +--ro value?     inet:ipv4-address
+--ro ipv6-routerid-sub-tlv
    | +--ro type?      uint8
    | +--ro length?    uint8
    | +--ro value?     inet:ipv6-address
+--ro ppr-metric-sub-tlv
    +--ro type?        uint8
    +--ro length?      uint8
    +--ro value?       uint32
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/ospf:as-external:
+--ro ppr-tlvs
  +--ro ppr-tlv*
    +--ro flags?              bits
    +--ro af?                  iana-rt-types:address-family
  +--ro ppr-prefix-sub-tlv
    | +--ro mt-id?              uint8
    | +--ro prefix-len?         uint8
    | +--ro mask-len?           uint8
    | +--ro ospf-prefix?        inet:ip-address
    | +--ro ppr-prefix-sub-sub-tlvs
    |   +--ro unknown-tlvs
    |     +--ro unknown-tlv*
    |       +--ro type?         uint16
    |       +--ro length?       uint16
    |       +--ro value?        yang:hex-string
  +--ro ppr-id-sub-tlv
    | +--ro ppr-id-type?        enumeration

```

```

    | +--ro ppr-id-len?          uint8
    | +--ro ppr-id-mask-len?    uint8
    | +--ro ppr-id-algo?        uint8
    | +--ro (ppr-id)?
    |   +--:(mpls-id)
    |     | +--ro mpls-id?          uint32
    |     +--:(ipv4-id)
    |       | +--ro ipv4-id?        inet:ipv4-prefix

```



```

|         +---:(srv6-ipv6-id)
|         +---ro srv6-ipv6-id?          inet:ipv6-prefix
+---ro ppr-pde-sub-tlvs*
|   +---ro pde-type?                    enumeration
|   +---ro ppr-pde-flags?                bits
|   +---ro pde-id-type?                  ppr:ppr-pde-id-type
|   +---ro pde-id-len?                   uint8
|   +---ro (pde-id)?
|   |   +---:(mpls-id)
|   |   |   +---ro mpls-id?              uint32
|   |   +---:(ipv4-id)
|   |   |   +---ro ipv4-id?              inet:ipv4-prefix
|   |   +---:(srv6-ipv6-id)
|   |   |   +---ro srv6-ipv6-id?          inet:ipv6-prefix
+---ro ppr-pde-sub-sub-tlvs
|   +---ro unknown-tlvs
|   |   +---ro unknown-tlv*
|   |   |   +---ro type?                 uint16
|   |   |   +---ro length?               uint16
|   |   |   +---ro value?                yang:hex-string
+---ro ppr-attribute-sub-tlv
|   +---ro traffic-accounting-sub-tlv
|   |   +---ro type?                     uint8
+---ro traffic-statis-sub-tlv
|   +---ro type?                         uint8
+---ro ipv4-routerid-sub-tlv
|   +---ro type?                         uint8
|   +---ro length?                       uint8
|   +---ro value?                        inet:ipv4-address
+---ro ipv6-routerid-sub-tlv
|   +---ro type?                         uint8
|   +---ro length?                       uint8
|   +---ro value?                        inet:ipv6-address
+---ro ppr-metric-sub-tlv
|   +---ro type?                         uint8
|   +---ro length?                       uint8
|   +---ro value?                        uint32
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:body/ospf:as-external:
+--ro ppr-tlvs
  +--ro ppr-tlv*
    +--ro flags?                bits
    +--ro af?                   iana-rt-types:address-family
    +--ro ppr-prefix-sub-tlv
      | +--ro mt-id?             uint8
      | +--ro prefix-len?       uint8
      | +--ro mask-len?        uint8
      | +--ro ospf-prefix?      inet:ip-address
      | +--ro ppr-prefix-sub-sub-tlvs
      |   +--ro unknown-tlvs
      |     +--ro unknown-tlv*
      |       +--ro type?      uint16
      |       +--ro length?    uint16
      |       +--ro value?     yang:hex-string
    +--ro ppr-id-sub-tlv
      | +--ro ppr-id-type?      enumeration
      | +--ro ppr-id-len?       uint8
      | +--ro ppr-id-mask-len?  uint8
      | +--ro ppr-id-algo?      uint8
      | +--ro (ppr-id)?
      |   +--:(mpls-id)
      |     | +--ro mpls-id?    uint32
      |     +--:(ipv4-id)
      |       | +--ro ipv4-id?  inet:ipv4-prefix
      |       +--:(srv6-ipv6-id)
      |         +--ro srv6-ipv6-id?  inet:ipv6-prefix
    +--ro ppr-pde-sub-tlvs*
      | +--ro pde-type?         enumeration
      | +--ro ppr-pde-flags?    bits
      | +--ro pde-id-type?      ppr:ppr-pde-id-type
      | +--ro pde-id-len?       uint8
      | +--ro (pde-id)?
      |   +--:(mpls-id)
      |     | +--ro mpls-id?    uint32
      |     +--:(ipv4-id)
      |       | +--ro ipv4-id?  inet:ipv4-prefix
      |       +--:(srv6-ipv6-id)
      |         +--ro srv6-ipv6-id?  inet:ipv6-prefix
      +--ro ppr-pde-sub-sub-tlvs
        +--ro unknown-tlvs
          +--ro unknown-tlv*
            +--ro type?      uint16
            +--ro length?    uint16
            +--ro value?     yang:hex-string
    +--ro ppr-attribute-sub-tlv

```

```

    +---ro traffic-accounting-sub-tlv
    | +---ro type?    uint8
    +---ro traffic-statis-sub-tlv
    | +---ro type?    uint8
    +---ro ipv4-routerid-sub-tlv
    | +---ro type?      uint8
    | +---ro length?    uint8
    | +---ro value?     inet:ipv4-address
    +---ro ipv6-routerid-sub-tlv
    | +---ro type?      uint8
    | +---ro length?    uint8
    | +---ro value?     inet:ipv6-address
    +---ro ppr-metric-sub-tlv
        +---ro type?      uint8
        +---ro length?    uint8
        +---ro value?     uint32
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
/ospf:as-external:
+---ro ppr-tlvs
+---ro ppr-tlv*
+---ro flags?                bits
+---ro af?                   iana-rt-types:address-family
+---ro ppr-prefix-sub-tlv
| +---ro mt-id?                uint8
| +---ro prefix-len?           uint8
| +---ro mask-len?             uint8
| +---ro ospf-prefix?          inet:ip-address
| +---ro ppr-prefix-sub-sub-tlvs
|   +---ro unknown-tlvs
|     +---ro unknown-tlv*
|       +---ro type?           uint16
|       +---ro length?         uint16
|       +---ro value?          yang:hex-string
+---ro ppr-id-sub-tlv
| +---ro ppr-id-type?          enumeration
| +---ro ppr-id-len?           uint8
| +---ro ppr-id-mask-len?      uint8
| +---ro ppr-id-algo?          uint8
| +---ro (ppr-id)?
|   +---:(mpls-id)
|     | +---ro mpls-id?          uint32
|   +---:(ipv4-id)
|     | +---ro ipv4-id?          inet:ipv4-prefix

```

```

|       +---:(srv6-ipv6-id)
|       +---ro srv6-ipv6-id?          inet:ipv6-prefix

```

```

+---ro ppr-pde-sub-tlvs*
|   +---ro pde-type?          enumeration
|   +---ro ppr-pde-flags?     bits
|   +---ro pde-id-type?       ppr:ppr-pde-id-type
|   +---ro pde-id-len?        uint8
|   +---ro (pde-id)?
|   |   +---:(mpls-id)
|   |   |   +---ro mpls-id?          uint32
|   |   +---:(ipv4-id)
|   |   |   +---ro ipv4-id?          inet:ipv4-prefix
|   |   +---:(srv6-ipv6-id)
|   |   |   +---ro srv6-ipv6-id?     inet:ipv6-prefix
|   +---ro ppr-pde-sub-sub-tlvs
|   |   +---ro unknown-tlvs
|   |   |   +---ro unknown-tlv*
|   |   |   |   +---ro type?        uint16
|   |   |   |   +---ro length?     uint16
|   |   |   |   +---ro value?      yang:hex-string
+---ro ppr-attribute-sub-tlv
|   +---ro traffic-accounting-sub-tlv
|   |   +---ro type?        uint8
+---ro traffic-statis-sub-tlv
|   +---ro type?        uint8
+---ro ipv4-routerid-sub-tlv
|   +---ro type?        uint8
|   +---ro length?      uint8
|   +---ro value?       inet:ipv4-address
+---ro ipv6-routerid-sub-tlv
|   +---ro type?        uint8
|   +---ro length?      uint8
|   +---ro value?       inet:ipv6-address
+---ro ppr-metric-sub-tlv
|   +---ro type?        uint8
|   +---ro length?      uint8
|   +---ro value?       uint32
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/ospf:nssa:
+---ro ppr-tlvs
  +---ro ppr-tlv*
    +---ro flags?                bits
    +---ro af?                   iana-rt-types:address-family
    +---ro ppr-prefix-sub-tlv
      | +---ro mt-id?             uint8
      | +---ro prefix-len?       uint8

```

```

      | +---ro mask-len?          uint8
      | +---ro ospf-prefix?       inet:ip-address
      | +---ro ppr-prefix-sub-sub-tlvs
      |   +---ro unknown-tlvs
      |     +---ro unknown-tlv*
      |       +---ro type?        uint16
      |       +---ro length?      uint16
      |       +---ro value?       yang:hex-string
+---ro ppr-id-sub-tlv
  | +---ro ppr-id-type?          enumeration
  | +---ro ppr-id-len?          uint8
  | +---ro ppr-id-mask-len?     uint8
  | +---ro ppr-id-algo?         uint8
  | +---ro (ppr-id)?
  |   +---:(mpls-id)
  |     | +---ro mpls-id?        uint32
  |     +---:(ipv4-id)
  |       | +---ro ipv4-id?      inet:ipv4-prefix
  |       +---:(srv6-ipv6-id)
  |         +---ro srv6-ipv6-id? inet:ipv6-prefix
+---ro ppr-pde-sub-tlvs*
  | +---ro pde-type?            enumeration
  | +---ro ppr-pde-flags?       bits
  | +---ro pde-id-type?         ppr:ppr-pde-id-type
  | +---ro pde-id-len?          uint8
  | +---ro (pde-id)?
  |   | +---:(mpls-id)
  |   |   | +---ro mpls-id?      uint32
  |   |   +---:(ipv4-id)
  |   |     | +---ro ipv4-id?    inet:ipv4-prefix
  |   |     +---:(srv6-ipv6-id)
  |   |       +---ro srv6-ipv6-id? inet:ipv6-prefix

```

```

|   +---ro ppr-pde-sub-sub-tlvs
|       +---ro unknown-tlvs
|           +---ro unknown-tlv*
|               +---ro type?      uint16
|               +---ro length?    uint16
|               +---ro value?     yang:hex-string
+---ro ppr-attribute-sub-tlv
    +---ro traffic-accounting-sub-tlv
    |   +---ro type?      uint8
+---ro traffic-statis-sub-tlv
    |   +---ro type?      uint8
+---ro ipv4-routerid-sub-tlv
    |   +---ro type?      uint8
    |   +---ro length?    uint8
    |   +---ro value?     inet:ipv4-address
+---ro ipv6-routerid-sub-tlv

```

```

|   +---ro type?      uint8
|   +---ro length?    uint8
|   +---ro value?     inet:ipv6-address
+---ro ppr-metric-sub-tlv
    +---ro type?      uint8
    +---ro length?    uint8
    +---ro value?     uint32
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/ospf:nssa:
+---ro ppr-tlvs
    +---ro ppr-tlv*
        +---ro flags?          bits
        +---ro af?             iana-rt-types:address-family
+---ro ppr-prefix-sub-tlv
    |   +---ro mt-id?          uint8
    |   +---ro prefix-len?     uint8
    |   +---ro mask-len?       uint8
    |   +---ro ospf-prefix?    inet:ip-address
    |   +---ro ppr-prefix-sub-sub-tlvs
    |       +---ro unknown-tlvs
    |           +---ro unknown-tlv*
    |               +---ro type?      uint16

```

```

|           +--ro length?      uint16
|           +--ro value?      yang:hex-string
+--ro ppr-id-sub-tlv
|   +--ro ppr-id-type?        enumeration
|   +--ro ppr-id-len?         uint8
|   +--ro ppr-id-mask-len?    uint8
|   +--ro ppr-id-algo?        uint8
|   +--ro (ppr-id)?
|       +--:(mpls-id)
|           | +--ro mpls-id?          uint32
|           +--:(ipv4-id)
|               | +--ro ipv4-id?      inet:ipv4-prefix
|               +--:(srv6-ipv6-id)
|                   +--ro srv6-ipv6-id?  inet:ipv6-prefix
+--ro ppr-pde-sub-tlvs*
|   +--ro pde-type?            enumeration
|   +--ro ppr-pde-flags?       bits
|   +--ro pde-id-type?         ppr:ppr-pde-id-type
|   +--ro pde-id-len?          uint8
|   +--ro (pde-id)?
|       | +--:(mpls-id)
|       | | +--ro mpls-id?          uint32
|       | +--:(ipv4-id)

```

```

|   |   | +--ro ipv4-id?          inet:ipv4-prefix
|   |   +--:(srv6-ipv6-id)
|   |       +--ro srv6-ipv6-id?    inet:ipv6-prefix
+--ro ppr-pde-sub-sub-tlvs
|   +--ro unknown-tlvs
|       +--ro unknown-tlv*
|           +--ro type?          uint16
|           +--ro length?        uint16
|           +--ro value?        yang:hex-string
+--ro ppr-attribute-sub-tlv
|   +--ro traffic-accounting-sub-tlv
|       | +--ro type?          uint8
+--ro traffic-statis-sub-tlv
|   +--ro type?          uint8
+--ro ipv4-routerid-sub-tlv
|   +--ro type?          uint8
|   +--ro length?        uint8
|   +--ro value?         inet:ipv4-address

```

```

    +---ro ipv6-routerid-sub-tlv
    |   +---ro type?      uint8
    |   +---ro length?    uint8
    |   +---ro value?     inet:ipv6-address
    +---ro ppr-metric-sub-tlv
        +---ro type?      uint8
        +---ro length?    uint8
        +---ro value?     uint32
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/ospf:nssa:
+---ro ppr-tlvs
+---ro ppr-tlv*
+---ro flags?                bits
+---ro af?                   iana-rt-types:address-family
+---ro ppr-prefix-sub-tlv
    |   +---ro mt-id?                uint8
    |   +---ro prefix-len?           uint8
    |   +---ro mask-len?             uint8
    |   +---ro ospf-prefix?          inet:ip-address
    |   +---ro ppr-prefix-sub-sub-tlvs
    |       +---ro unknown-tlvs
    |           +---ro unknown-tlv*
    |               +---ro type?      uint16
    |               +---ro length?    uint16
    |               +---ro value?     yang:hex-string
+---ro ppr-id-sub-tlv
    |   +---ro ppr-id-type?          enumeration
    |   +---ro ppr-id-len?           uint8

```

```

    |   +---ro ppr-id-mask-len?      uint8
    |   +---ro ppr-id-algo?          uint8
    |   +---ro (ppr-id)?
    |       +---:(mpls-id)
    |           |   +---ro mpls-id?          uint32
    |       +---:(ipv4-id)
    |           |   +---ro ipv4-id?          inet:ipv4-prefix
    |       +---:(srv6-ipv6-id)
    |           +---ro srv6-ipv6-id?        inet:ipv6-prefix
+---ro ppr-pde-sub-tlvs*
    |   +---ro pde-type?             enumeration

```



```

| +--ro ppr-pde-flags?          bits
| +--ro pde-id-type?           ppr:ppr-pde-id-type
| +--ro pde-id-len?            uint8
| +--ro (pde-id)?
| | +--:(mpls-id)
| | | +--ro mpls-id?           uint32
| | +--:(ipv4-id)
| | | +--ro ipv4-id?           inet:ipv4-prefix
| | +--:(srv6-ipv6-id)
| | | +--ro srv6-ipv6-id?       inet:ipv6-prefix
| +--ro ppr-pde-sub-sub-tlvs
| | +--ro unknown-tlvs
| | | +--ro unknown-tlv*
| | | | +--ro type?            uint16
| | | | +--ro length?          uint16
| | | | +--ro value?           yang:hex-string
+--ro ppr-attribute-sub-tlv
| +--ro traffic-accounting-sub-tlv
| | +--ro type?                uint8
+--ro traffic-statis-sub-tlv
| +--ro type?                  uint8
+--ro ipv4-routerid-sub-tlv
| +--ro type?                  uint8
| +--ro length?                uint8
| +--ro value?                  inet:ipv4-address
+--ro ipv6-routerid-sub-tlv
| +--ro type?                  uint8
| +--ro length?                uint8
| +--ro value?                  inet:ipv6-address
+--ro ppr-metric-sub-tlv
| +--ro type?                  uint8
| +--ro length?                uint8
| +--ro value?                  uint32

```

```

<CODE BEGINS> file "ietf-ospf-ppr@2019-07-07.yang"
module ietf-ospf-ppr {

```

```

yang-version 1.1;
namespace "urn:ietf:params:xml:ns:yang:ietf-ospf-ppr";

prefix ospf-ppr;

```

```

import ietf-inet-types {
    prefix inet;
}

import iana-routing-types {
    prefix "iana-rt-types";
    reference "RFC 8291 - Common YANG Data Types for the
        Routing Area";
}

import ietf-routing {
    prefix rt;
}

import ietf-ospf {
    prefix "ospf";
}

import ietf-ppr {
    prefix "ppr";
}

organization
    "IETF LSR - Link State Routing Working Group";

contact
    "WG Web:    <http://datatracker.ietf.org/group/lsr/>
    WG List:    <mailto:lsr@ietf.org>

    Author:     Yingzhen Qu
                <mailto:yingzhen.qu@futurewei.com>
                Uma Chunduri
                <mailto:uma.chunduri@futurewei.com>";

description
    "This Yang module defines the configuration and operational
    state for Preferred Path Routing common to all vendor
    implementations.

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

    Copyright (c) 2019 IETF Trust and the persons identified as
    authors of the code. All rights reserved."

```

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

reference "RFC XXXX";

```
revision 2019-07-07 {  
  description  
    "Initial revision.";  
  reference  
    "RFC XXXX: A YANG Data Model for OSPFv2 and OSPFv3 PPR.";  
}
```

```
grouping ppr-prefix-sub-tlv {  
  description "Grouping for OSPF prefix sub-tlv.";
```

```
  container ppr-prefix-sub-tlv {  
    leaf mt-id {  
      type uint8 {  
        range "0 .. 255";  
      }  
      description  
        "This leaf defines the identifier  
        of a topology.";  
    }  
    leaf prefix-len {  
      type uint8;  
      description "The length of the prefix in bytes.";  
    }  
    leaf mask-len {  
      type uint8;  
      description "The length of the prefix in bits.";  
    }  
    leaf ospf-prefix {  
      type inet:ip-address;  
      description "OSPF Prefix.";  
    }  
    container ppr-prefix-sub-sub-tlvs {  
      uses ospf:unknown-tlvs;  
      description
```

"PPR-Prefix sub-tlvs.";

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```
    }
    description
      "OSPF PPR prefix sub-tlv.";
  }
}

grouping ppr-id-sub-tlv {
  description
    "PPR ID: the actual data plane identifier in the packet header.";

  container ppr-id-sub-tlv {
    description "PPR ID sub tlv.";
    leaf ppr-id-type {
      type enumeration {
        enum mpls {
          value 1;
          description
            "PPR ID in mpls label format.";
        }
        enum ipv4 {
          value 2;
          description
            "PPR ID in IPv4 address format.";
        }
        enum ipv6 {
          value 3;
          description
            "PPR ID in ipv6 address format.";
        }
        enum srv6 {
          value 4;
          description
            "PPR ID in SRv6 SID format.";
        }
      }
    }
    description "Type of PPR ID.";
  }
  leaf ppr-id-len {
    type uint8;
    description
```

```

        "Length of the PPR ID.";
    }
    leaf ppr-id-mask-len {
        type uint8;
        description "The length of the profix in bits.";
    }
    leaf ppr-id-algo {
        type uint8;

```

```

        description "The SPF algorithm.";
    }
    choice ppr-id {
        leaf mpls-id {
            type uint32;
            description "MPLS Label format.";
        }
        leaf ipv4-id {
            type inet:ipv4-prefix;
            description "IPv4 format.";
        }
        leaf srv6-ipv6-id {
            type inet:ipv6-prefix;
            description "SRv6 or IPv6 format.";
        }
        description "Preferred Path ID.";
    }
}

}

grouping ppr-pde-sub-tlv {
    description
        "This sub-tlv represents the PPR Path Description
        Element (PDE).";

    list ppr-pde-sub-tlvs {
        description "PPR PDE sub tlvs.";
        leaf pde-type {
            type enumeration {
                enum topological {
                    value 1;
                    description

```

```

        "Topological PDE.";
    }
    enum non-topological {
        value 2;
        description
            "Non-topological PDE.";
    }
}
description "PDE type.";
}
leaf ppr-pde-flags {
    type bits {
        bit L {
            position 0;
            description

```

```

        "If set, the PPR path is a Loose-PPR.";
    }
    bit D {
        position 1;
        description
            "If set, the PDE is topological and this PDE represents
            the node PPR-prfix";
    }
    bit E {
        position 2;
        description
            "Egress Bit. By default this bit MUST be unset.";
    }
}
description "Flags.";
}
leaf pde-id-type {
    type ppr:ppr-pde-id-type;
    description "Type of PDE ID.";
}
leaf pde-id-len {
    type uint8;
    description
        "Length of the PDE ID.";
}
choice pde-id {

```

```

    leaf mpls-id {
        type uint32;
        description "MPLS Label format.";
    }
    leaf ipv4-id {
        type inet:ipv4-prefix;
        description "IPv4 format.";
    }
    leaf srv6-ipv6-id {
        type inet:ipv6-prefix;
        description "SRv6 or IPv6 format.";
    }
    description "Preferred Path ID.";
}
container ppr-pde-sub-sub-tlvs {
    uses ospf:unknown-tlvs;
    description "PPR PDE sub sub-tlv.";
}
}
}

grouping ppr-attribute-sub-tlv {

```

```

description "Grouping for PPR attribute sub-tlvs.";

container ppr-attribute-sub-tlv {
    description "PPR attribute sub-tlv.";

    container traffic-accounting-sub-tlv {
        description
            "packet traffic acccounting sub-tlv. Specifies to create
            a counter to count number of packets forwarded to this
            PPR-ID on each node in the path description.";
        leaf type {
            type uint8;
            default 1;
            description "Type 1 sub-tlv.";
        }
    }
}

container traffic-statis-sub-tlv {
    description
        "Specifies to create a counter to count number of bytes

```

```

        forwarded on this PPR-ID specified in the network header
        (e.g. IPv4, IPv6) on each node in the path description.";
    leaf type {
        type uint8;
        default 2;
        description "Traffic statistics in bytes sub-tlv.";
    }
}
container ipv4-routerid-sub-tlv {
    description "PPR-prefix originating node's IPv4 router ID.";
    leaf type {
        type uint8;
        default 3;
        description "PPR-prefix originating node's IPv4 router ID.";
    }
    leaf length {
        type uint8;
        default 4;
        description "TLV length is 4.";
    }
    leaf value {
        type inet:ipv4-address;
        description "IPv4 router ID.";
    }
}
container ipv6-routerid-sub-tlv {
    description "PPR-prefix originating node's IPv6 router ID.";
    leaf type {
        type uint8;

```

```

        default 4;
        description "PPR-prefix originating node's IPv6 router ID.";
    }
    leaf length {
        type uint8;
        default 16;
        description "TLV length is 16.";
    }
    leaf value {
        type inet:ipv6-address;
        description "IPv6 router ID.";
    }
}

```



```

    }
    container ppr-metric-sub-tlv {
      description
        "The metric of this path represented through the PPR-ID.";
      leaf type {
        type uint8;
        default 5;
        description "Metric sub-tlv.";
      }
      leaf length {
        type uint8;
        default 4;
        description "4 bytes.";
      }
      leaf value {
        type uint32;
        description "Metric of the PPR-ID.";
      }
    }
  }
}

grouping ppr-tlvs {
  description "PPR TLV in extended prefix opaque LSAs.";

  container ppr-tlvs {
    description "List of PPR TLVs.";
    list ppr-tlv {
      description "OSPF PPR TLV.";
      leaf flags {
        type bits {
          bit IA {
            position 0;
            description
              "Inter-Area flag.";
          }
        }
      }
    }
  }
}

```

```

    bit A {
      position 1;
      description
        "If set, it is to signal that the prefixes and PPR
         IDs advertised in this TLV are directly connected

```

```

        to their originators.";
    }
}
description "Flags.";
}
leaf af {
    type iana-rt-types:address-family;
    description
        "Address family of the OSPF instance.";
}

uses ppr-prefix-sub-tlv;
uses ppr-id-sub-tlv;
uses ppr-pde-sub-tlv;
uses ppr-attribute-sub-tlv;
}

}

}

/* Configuration */
augment "/rt:routing/rt:control-plane-protocols"
    + "/rt:control-plane-protocol/ospf:ospf" {
    when "../rt:type = 'ospf:ospfv2' or "
        + "../rt:type = 'ospf:ospfv3'" {
        description
            "This augments the OSPF routing protocol when used.";
    }
    description
        "This augments the OSPF protocol configuration
        with preferred path routing.";

    container ppr {
        description
            "OSPF PPR.";
        list ppr-enable {
            key "name";
            leaf enable {
                type boolean;
                description
                    "Enable PPR.";
            }
        }
    }
}

```

```

    leaf name {
      type leafref {
        path "/rt:routing/ppr:preferred-path-routing/"
          + "ppr:preferred-path-lists/ppr:name";
      }
      description
        "PPR path list name.";
    }
  }
  description
    "Enable PPR.";
}
}

/* Database */
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:ospfv2/"
  + "ospf:ospfv2/ospf:body/ospf:opaque/"
  + "ospf:extended-prefix-tlvs/ospf:extended-prefix-tlv" {
when "../../../../../../../../../../../../../../../"
  + "rt:type = 'ospf:ospfv2'" {
  description
    "This augmentation is only valid for OSPFv2.";
}
  description
    "PPR specific TLVs for OSPFv2 type 9 opaque LSA.";
  uses ppr-tlvs;
}

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:ospfv2/"
  + "ospf:ospfv2/ospf:body/ospf:opaque/"
  + "ospf:extended-prefix-tlvs/ospf:extended-prefix-tlv" {
when "../../../../../../../../../../../"
  + "rt:type = 'ospf:ospfv2'" {
  description
    "This augmentation is only valid for OSPFv2.";
}
  description
    "PPR specific TLVs for OSPFv2 type 10 opaque LSA.";
}

```

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```
    uses ppr-tlvs;
}

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:ospfv2/"
+ "ospf:ospfv2/ospf:body/ospf:opaque/"
+ "ospf:extended-prefix-tlvs/ospf:extended-prefix-tlv" {
when "../.../.../.../.../.../.../.../.../.../..."
+ "rt:type = 'ospf:ospfv2'" {
description
    "This augmentation is only valid for OSPFv2.";
}
description
    "PPR specific TLVs for OSPFv2 type 11 opaque LSA.";
uses ppr-tlvs;
}

/* OSPFv3 inter-area-prefix-lsa */
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/ospf:inter-area-prefix" {
when "../.../.../.../.../.../.../.../.../.../..."
+ "rt:type = 'ospf:ospfv3'" {
description
    "This augmentation is only valid for OSPFv3.";
}

description
    "SR specific TLVs for OSPFv3 link scope Inter-Area-Prefix-LSA.";
uses ppr-tlvs;
}

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/ospf:inter-area-prefix" {
when "../.../.../.../.../.../.../.../.../..."
    + "rt:type = 'ospf:ospfv3'" {

```

```

    description
        "This augmentation is only valid for OSPFv3.";
    }
    description
        "SR specific TLVs for OSPFv3 area scope Inter-Area-Prefix-LSA.";
    uses ppr-tlvs;
}

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/ospf:inter-area-prefix" {
when "../.../.../.../.../.../.../.../..."
    + "rt:type = 'ospf:ospfv3'" {
    description
        "This augmentation is only valid for OSPFv3.";
    }
    description
        "SR specific TLVs for OSPFv3 as scope Inter-Area-Prefix-LSA.";
    uses ppr-tlvs;
}

/* OSPFv3 intra-area-prefix-lsa */
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/ospf:intra-area-prefix" {
when "../.../.../.../.../.../.../.../.../..."
    + "rt:type = 'ospf:ospfv3'" {
    description

```

```

        "This augmentation is only valid for OSPFv3.";
    }

    description
        "SR specific TLVs for OSPFv3 link scope Intra-Area-Prefix-LSA.";
    uses ppr-tlvs;
}

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/ospf:intra-area-prefix" {
    when "../../../../../../../../../../../"
        + "rt:type = 'ospf:ospfv3'" {
        description
            "This augmentation is only valid for OSPFv3.";
    }
    description
        "SR specific TLVs for OSPFv3 area scope Inter-Area-Prefix-LSA.";
    uses ppr-tlvs;
}

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/ospf:intra-area-prefix" {
    when "../../../../../../../../../../../"
        + "rt:type = 'ospf:ospfv3'" {
        description
            "This augmentation is only valid for OSPFv3.";
    }
    description
        "SR specific TLVs for OSPFv3 as scope Intra-Area-Prefix-LSA.";
    uses ppr-tlvs;
}

```

```

/* OSPFv3 external-lsa */
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/ospf:as-external" {
when "../.../.../.../.../.../.../.../.../.../.../..."
  + "rt:type = 'ospf:ospfv3'" {
  description
    "This augmentation is only valid for OSPFv3.";
}

description
  "SR specific TLVs for OSPFv3 link scope AS-External-LSA.";
uses ppr-tlvs;
}

```

```

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/ospf:as-external" {
when "../.../.../.../.../.../.../.../.../.../..."
  + "rt:type = 'ospf:ospfv3'" {
  description
    "This augmentation is only valid for OSPFv3.";
}
description
  "SR specific TLVs for OSPFv3 area scope AS-External-LSA.";
uses ppr-tlvs;
}

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/ospf:as-external" {
when "../.../.../.../.../.../.../.../..."
        + "rt:type = 'ospf:ospfv3'" {
description
    "This augmentation is only valid for OSPFv3.";
}
description
    "SR specific TLVs for OSPFv3 as scope AS-External-LSA.";
uses ppr-tlvs;
}

/* OSPFv3 Type-7 NSSA */
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/ospf:nssa" {
when "../.../.../.../.../.../.../.../.../.../.../..."
    + "rt:type = 'ospf:ospfv3'" {
description
    "This augmentation is only valid for OSPFv3.";
}
}

```

```

description
    "SR specific TLVs for OSPFv3 link scope Type-7-LSA.";
uses ppr-tlvs;
}

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/ospf:nssa" {
when "../.../.../.../.../.../.../.../.../.../..."
    + "rt:type = 'ospf:ospfv3'" {
}
}

```


[6.](#) Acknowledgements

TBD.

[7.](#) IANA Considerations

TBD.

[8.](#) References

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