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OSPFv2 Anycast Property Advertisement

Abstract

An IP prefix may be configured as anycast and, as such, the same value can be advertised by multiple routers. It is useful for other routers to know that the advertisement is for an anycast prefix.

This document defines a new flag in the OSPFv2 Extended Prefix TLV Flags to advertise the anycast property. The document also specifies a companion YANG module for managing this function.

Status of This Memo

This is an Internet Standards Track document.

This document is a product of the Internet Engineering Task Force (IETF). It represents the consensus of the IETF community. It has received public review and has been approved for publication by the Internet Engineering Steering Group (IESG). Further information on Internet Standards is available in Section 2 of RFC 7841.

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1. Introduction

An IP prefix may be configured as anycast and, as such, the same value can be advertised by multiple routers. It is useful for other routers to know that the advertisement is for an anycast prefix.

[RFC7684] defines OSPFv2 Opaque Link State Advertisements (LSAs) based on Type-Length-Value (TLV) tuples that can be used to associate additional attributes with prefixes or links. The OSPFv2 Extended Prefix TLV that is contained in the OSPFv2 Extended Prefix Opaque LSA is used to advertise additional attributes associated with a prefix.

Extensions related to the anycast property of prefixes have been specified for IS-IS [RFC9352] and OSPFv3 [RFC9513], even though those documents are related to Segment Routing over IPv6, the anycast property applies to any IP prefix advertisement. This document defines a flag to advertise the anycast property for a prefix advertisement in OSPFv2 in the Flags field of the OSPFv2 Extended Prefix TLV Flags (Section 2.1 of [RFC7684]). The document also specifies a companion YANG module for managing this function.

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. OSPFv2 Anycast Property Advertisement

An IP prefix may be configured as anycast; it is useful for other routers to know that the advertisement is for an anycast prefix.

In the context of the flags defined in this document, the term "set" means the bit is set to 1; "clear" means the bit is set to 0.

A flag is introduced in the "OSPFv2 Extended Prefix TLV Flags" IANA registry (see [RFC7684]) to advertise the anycast property:

Value: 0x10

Description: Anycast Flag (AC-Flag)

The only meaning of the AC-Flag is that the prefix is intended to be advertised by multiple nodes.

When a prefix is configured as anycast, the AC-Flag MUST be set. Otherwise, this flag MUST be clear.

The AC-Flag and the N-flag (Section 2.1 of [RFC7684]) MUST NOT both be set. The reception of an advertisement with both the N-flag and AC-Flag set MUST be considered a configuration anomaly, and the N-flag MUST be ignored. Additionally, the detection of such a

conflicting advertisement SHOULD be logged as an operational error (subject to rate-limiting).

The AC-Flag MUST be preserved when the OSPFv2 Extended Prefix Opaque LSA is re-advertised into other areas.

The same prefix can be advertised by multiple routers, and, if at least one of them sets the AC-Flag in its advertisement, the prefix is considered to be anycast.

A prefix that is advertised by a single node and without an AC-Flag is considered to be a node-specific prefix.

Anycast prefixes SHOULD be consistently managed throughout the network. Since an AC-Flag set takes precedence in identifying the anycast property, stale configurations should be strictly monitored.

3. BGP-LS Advertisement

[RFC9085] defines the Prefix Attribute Flags TLV for Border Gateway Protocol - Link State (BGP-LS) that carries prefix attribute flags information. The Flags field of this TLV is interpreted according to OSPFv2 [RFC7684]. Thus, the Flags field of the BGP-LS Prefix Attribute Flags TLV also conveys the anycast property introduced by this document.

4. YANG Data Model

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 Network Configuration Protocol (NETCONF) [RFC6241] or RESTCONF [RFC8040].

This section defines a YANG data model that can be used to manage the usage of the OSPFv2 Anycast Property as defined in this document, which augments the OSPF YANG data model [RFC9129] and the YANG Data Model for Routing Management [RFC8349].

4.1. Tree for the YANG Data Model

This document uses the graphical representation of data models per [RFC8340].

The following shows the tree diagram of the module:

```
module: ietf-ospf-anycast-flag

  augment /rt:routing/rt:control-plane-protocols
    /rt:control-plane-protocol/ospf:ospf:areas/ospf:area
      /ospf:interfaces/ospf:interface:
        +--rw anycast-flag?    boolean
```

4.2. YANG Data Model for OSPFv2 Anycast Property Advertisement

The "ietf-ospf-anycast-flag" module defined in this document imports typedefs from [RFC8349] and [RFC9129].

```
<CODE BEGINS> file "ietf-ospf-anycast-flag@2026-05-19.yang"
module ietf-ospf-anycast-flag {
  yang-version 1.1;
  namespace "urn:ietf:params:xml:ns:yang:ietf-ospf-anycast-flag";
  prefix ospf-anycast-flag;

  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: YANG Data Model for the 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:     Ran Chen
               <mailto:chen.ran@zte.com.cn>
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               <mailto:zhao.detao@zte.com.cn>
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               <mailto:ppsenak@cisco.com>
  Author:     Ketan Talaulikar
               <mailto:ketant.ietf@gmail.com>
  Author:     Changwang Lin
               <mailto:linchangwang.04414@h3c.com>";

description
  "This YANG module adds the support of managing an OSPFv2
  prefix as anycast.

  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.

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  forth in Section 4.c of the IETF Trust's Legal Provisions
  Relating to IETF Documents
  (https://trustee.ietf.org/license-info).

  All revisions of IETF and IANA published modules can
  be found at the YANG Parameters registry group
  (https://www.iana.org/assignments/yang-parameters);

  This version of this YANG module is part of RFC 9983;
  see the RFC itself for full legal notices.";

revision 2026-05-19 {
  description
    "Initial version";
  reference
    "RFC 9983: OSPFv2 Anycast Property Advertisement";
}

identity ac-flag {
  base ospf:ospfv2-extended-prefix-flag;
  description
    "Indicates that the prefix is configured as anycast.";
}

```

```

augment "/rt:routing/rt:control-plane-protocols/"
  + "rt:control-plane-protocol/ospf:ospf/"
  + "ospf:areas/ospf:area/ospf:interfaces/ospf:interface" {
when "derived-from(/rt:routing/rt:control-plane-protocols/"
  + "rt:control-plane-protocol/rt:type, 'ospf:ospfv2')" {
  description
    "This augments the OSPFv2 interface.";
}
description
  "This augments OSPFv2 interface with anycast
  property advertisement.";
leaf anycast-flag {
  type boolean;
  must "not(../anycast-flag = 'true' and "
    + "/rt:routing/rt:control-plane-protocols/"
    + "rt:control-plane-protocol/ospf:ospf/"
    + "ospf:areas/ospf:area/ospf:interfaces/"
    + "ospf:interface/ospf:node-flag = 'true')" {
    error-message "The anycast-flag and the node-flag MUST "
      + "NOT both be set to 1 (true).";
  description
    "Ensures architectural consistency by preventing a prefix
    from being marked as both anycast and node-specific.";
  }
  default "false";
  description
    "Indicates that the prefix is an anycast address,
    if set to 1 (true).";
}
}
}
}
<CODE ENDS>

```

5. IANA Considerations

IANA has allocated and/or registered the following values in their respective registries.

5.1. OSPFv2 Extended Prefix TLV Flags Registry

IANA has allocated the following value in the "OSPFv2 Extended Prefix TLV Flags" registry:

0x10: AC-Flag (Anycast Flag)

5.2. OSPFv2 Anycast Flag YANG Module Registration

IANA has registered the following URI in the "ns" registry within the "IETF XML Registry" registry group (see [RFC3688]):

ID: yang:ietf-ospf-anycast-flag
 URI: urn:ietf:params:xml:ns:yang:ietf-ospf-anycast-flag
 Registrant Contact: The IESG
 XML: N/A; the requested URI is an XML namespace

IANA has registered the following YANG module in the "YANG Module Names" registry ([RFC6020]) within the "YANG Parameters" registry group.

Name: ietf-ospf-anycast-flag
 Maintained by IANA? N
 Namespace: urn:ietf:params:xml:ns:yang:ietf-ospf-anycast-flag
 Prefix: ospf-anycast-flag
 Reference: RFC 9983

6. Security Considerations

6.1. Protocol Security Considerations

Procedures and protocol extensions defined in this document do not affect the OSPFv2 security model. See the "Security Considerations" section of [RFC7684] for a discussion of OSPFv2 security.

The newly introduced AC-Flag, which MUST be either set or clear, introduces operational dependencies that impact the semantic validity of the advertised prefix. The correct semantic interpretation of the AC-Flag relies on both router implementation support for the flag and accurate operator configuration of the anycast route. Consequently, receivers MUST consider the possibility of misconfiguration or inconsistent implementation when relying on the AC-Flag for forwarding or security decisions.

6.2. YANG Security Considerations

This section is modeled after the template described in Section 3.7 of [RFC9907].

The "ietf-ospf-anycast-flag" YANG module defines a data model that is designed to be accessed via YANG-based management protocols, such as Network Configuration Protocol (NETCONF) [RFC6241] and RESTCONF [RFC8040]. These YANG-based management protocols (1) have to use a secure transport layer (e.g., SSH [RFC4252], TLS [RFC8446], and QUIC [RFC9000]) and (2) have to use mutual authentication.

The Network Configuration Access Control Model (NACM) [RFC8341] provides the means to restrict access for particular NETCONF or RESTCONF users to a preconfigured subset of all available NETCONF or RESTCONF protocol operations and content.

There is a data node defined in this YANG module that is writable/creatable/deletable (i.e., config true, which is the default). This data node can be considered sensitive or vulnerable in some network environments. Write operations (e.g., edit-config) and delete operations to this data node without proper protection or authentication can have a negative effect on network operations. Specifically, the following subtree and data node have particular sensitivities/vulnerabilities:

```
/ospf:ospf/ospf:areas/ospf:area/ospf:interfaces/ospf:interface/  
ospf-anycast-flag:anycast-flag
```

As specified in Section 2, the AC-Flag and the N-flag MUST NOT both be set to 1. This rule is enforced by a "must" constraint in the YANG module to prevent configuration anomalies. The handling of such anomalies is defined in Section 2. Modifications to this data node without proper protection could prevent interpreting the IPv4 prefix as anycast or node-specific.

The readable data node in this 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 this data node. Specifically, the following subtree and data node have particular sensitivities/vulnerabilities:

```
/ospf:ospf/ospf:areas/ospf:area/ospf:interfaces/ospf:interface/  
ospf-anycast-flag:anycast-flag
```

Unauthorized access to the data node of this subtree can disclose specific anycast property information for OSPF prefixes on a device.

There are no particularly sensitive RPC or action operations.

7. References

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