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IS-IS Prefix Attributes for Extended IP and IPv6 Reachability
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Abstract

This document introduces new sub-TLVs to support advertisement of IP and IPv6 prefix attribute flags and the source router ID of the router which originated a prefix advertisement.

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 [RFC 2119](#) [[RFC2119](#)].

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[1.](#) Introduction

IS-IS is a link state routing protocol defined in [[ISO10589](#)] and [[RFC1195](#)]. Extensions in support of advertising new forms of IP/IPv6 prefix reachability are defined in [[RFC5305](#)], [[RFC5308](#)], and [[RFC5120](#)].

There are existing use cases in which knowing additional attributes of a prefix is useful.

It is useful to know whether an advertised prefix is directly connected to the advertising router or not. In the case of [[SR](#)] knowing whether a prefix is directly connected or not determines what action should be taken as regards processing of labels associated with an incoming packet.

It is useful to know what addresses can be used as addresses of the node in support of services (e.g., Remote Loop Free Alternate (RLFA) endpoint).

Current formats of the Extended Reachability TLVs for both IP and IPv6 are fixed and do not allow the introduction of additional flags without backwards compatibility issues. Therefore a new sub-TLV is introduced which allows for the advertisement of attribute flags associated with prefix advertisements.

In cases where multiple node addresses are advertised by a given router it is also useful to be able to associate all of these addresses with a single Router-ID even when prefixes are advertised outside of the area in which they are originated. Therefore a new sub-TLV is introduced to advertise the router-id of the originator of a prefix advertisement.

2. New sub-TLVs for Extended Reachability TLVs

The following new sub-TLVs are introduced:

- o IPv4/IPv6 Extended Reachability Attributes
- o IPv4 Source Router ID
- o IPv6 Source Router ID

All sub-TLVs are applicable to TLVs 135, 235, 236, and/or 237.

2.1. IPv4/IPv6 Extended Reachability Attribute Flags

This sub-TLV supports the advertisement of additional flags associated with a given prefix advertisement. The behavior of each flag when a prefix advertisement is leaked from one level to another (upwards or downwards) is explicitly defined below.

All flags are applicable to TLVs 135, 235, 236, 237 unless otherwise stated.

Prefix Attribute Flags

Type: 4 (suggested - to be assigned by IANA)

Length: Number of octets to follow

Value

(Length * 8) bits.

```

 0 1 2 3 4 5 6 7...
+-+--+--+--+--+--+...
|X|R|N|          ...
+-+--+--+--+--+--+...
```

Bits are defined/sent starting with Bit #0 defined below. Additional bit definitions which may be defined in the future SHOULD be assigned in ascending bit order so as to minimize the number of bits which will need to be transmitted.

Undefined bits MUST be transmitted as 0 and MUST be ignored on receipt.

Bits which are NOT transmitted MUST be treated as if they are set to 0 on receipt.

X-Flag: External Prefix Flag (Bit 0)

Set if the prefix has been redistributed from another protocol. This includes the case where multiple virtual routers are supported and the source of the redistributed prefix is another IS-IS instance.

The flag MUST be preserved when leaked between levels.

In TLVs 236 and 237 this flag SHOULD always be sent as 0 and MUST be ignored on receipt. This is because there is an existing X flag defined in the fixed format of these TLVs as specified in [\[RFC5308\]](#) and [\[RFC5120\]](#).

R-Flag: Re-advertisement Flag (Bit 1)

Set when the prefix has been leaked from one level to another (upwards or downwards).

N-flag: Node Flag (Bit 2)

Set when the prefix identifies the advertising router i.e., the prefix is a host prefix advertising a globally reachable address typically associated with a loopback address.

The advertising router MAY choose to NOT set this flag even when the above conditions are met.

If the flag is set and the prefix length is NOT a host prefix (/32 for IPV4, /128 for IPv6) then the flag MUST be ignored.

The flag MUST be preserved when leaked between levels.

2.2. IPv4/IPv6 Source Router ID

When a reachability advertisement is leaked from one level to another, the source of the original advertisement is unknown. In cases where the advertisement is an identifier for the advertising router (e.g., N-flag set in the Extended Reachability Attribute sub-TLV as described in the previous section) it may be useful for other routers to know the source of the advertisement. The sub-TLVs defined below provide this information.

Note that the Router ID advertised is always the Router ID of the IS-IS instance which originated the advertisement. This would be true even if the prefix has been learned from another protocol (X-flag set as defined in [Section 2.1](#)).

IPv4 Source Router ID

Type: 11 (suggested - to be assigned by IANA)

Length: 4

Value: IPv4 Router ID of the source of the advertisement

Inclusion of this TLV is optional and MAY occur in TLVs 135, 235, 236, or 237. When included the value MUST be identical to the value advertised in Traffic Engineering router ID (TLV 134) defined in [[RFC5305](#)].

If present the sub-TLV MUST be included when the prefix advertisement is leaked to another level.

IPv6 Source Router ID

Type: 12 (suggested - to be assigned by IANA)

Length: 16

Value: IPv6 Router ID of the source of the advertisement

Inclusion of this TLV is optional and MAY occur in TLVs 135, 235, 236, or 237. When included the value MUST be identical to the value advertised in IPv6 TE Router ID (TLV 140) defined in [[RFC6119](#)].

If present the sub-TLV MUST be included when the prefix advertisement is leaked to another level.

2.3. Advertising Router IDs

[[RFC5305](#)] and [[RFC6119](#)] define the advertisement of router IDs for IPv4 and IPv6 respectively. Although both drafts discuss the use of router ID in the context of Traffic Engineering (TE), the advertisement of router IDs is explicitly allowed for purposes other

than TE. The use of router IDs to identify the source of a prefix advertisement as defined in the previous section is one such use case. Therefore, whenever the source router ID sub-TLVs defined in the previous section are used, the originating router SHOULD also advertise the corresponding address-family specific router ID TLV(s).

3. IANA Considerations

This document adds the following new sub-TLVs to the registry of sub-TLVs for TLVs 135, 235, 236, 237.

Value: 4 (suggested - to be assigned by IANA)

Name: Prefix Attribute Flags

Value: 11 (suggested - to be assigned by IANA)

Name: IPv4 Source Router ID

Value: 12 (suggested - to be assigned by IANA)

Name: IPv6 Source Router ID

This document also introduces a new registry for bit values in the Prefix Attribute Flags sub-TLV. Registration policy is Expert Review as defined in [[RFC5226](#)]. This registry is to be part of the IS-IS TLV Codepoints registry. The name of the registry is "Bit values for Prefix Attribute Flags sub-TLV". Defined values are:

Bit #	Name
-----	-----
0	External Prefix Flag (X-flag)
1	Re-advertisement Flag (R-flag)
2	Node Flag (N-flag)

4. Security Considerations

Security concerns for IS-IS are addressed in [[RFC5304](#)] and [[RFC5310](#)].

Advertisement of the additional information defined in this document introduces no new security concerns.

5. Contributors

The following people gave a substantial contribution to the content of this document and should be considered as co-authors:

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