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        OSPF Routing Extension for Links with Variable Discrete Bandwidth
             draft-long-ccamp-ospf-availability-extension-03.txt

Abstract

   Packet switching network MAY contain links with variable discrete
   bandwidth, e.g., copper, radio, etc. The bandwidth of such link MAY
   change discretely in reaction to changing external environment.
   Availability is typically used for describing such links during
   network planning. This document describes an extension for OSPF
   routing for route computation in a Packet Switched Network (PSN)
   which contains links with variable discrete bandwidth by introducing
   an OPTIONAL Availability sub-TLV.

Status of this Memo

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Conventions used in this document

   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].

   The following acronyms are used in this draft:

   OSPF   Open Shortest Path First

   PSN   Packet Switched Network

   SNR   Signal-to-noise Ratio

   LSP   Label Switched Path

   ISCD   Interface Switching Capacity Descriptor

PE   Provider Edge

LSA   Link State Advertisement

1. Introduction

Some data communication technologies allow seamless change of
maximum physical bandwidth through a set of known discrete values.
For example, in mobile backhaul network, microwave links are very
popular for providing connection of last hops. In case of heavy rain,
to maintain the link connectivity, the microwave link MAY lower the
modulation level since demodulating lower modulation level need
lower signal-to-noise ratio (SNR). This is called adaptive
modulation technology [EN 302 217]. However, lower modulation level
also means lower link bandwidth. When link bandwidth reduced because
of modulation down-shifting, high priority traffic can be maintained,
while lower priority traffic is dropped. Similarly the cooper links
MAY change their effective link bandwidth due to external
interference.

The parameter availability [G.827, F.1703, P.530] is often used to
describe the link capacity during network planning. Assigning
different availability classes to different types of service over
such kind of links provides more efficient planning of link capacity.
To set up an LSP across these links, availability information is
required for the nodes to verify bandwidth satisfaction and make
bandwidth reservation. The availability information SHOULD be
inherited from the availability requirements of the services
expected to be carried on the LSP. For example, voice service
usually needs ''five nines'' availability, while non-real time
services MAY adequately perform at four or three nines availability.

For the route computation, the availability information SHOULD be
provided along with bandwidth resource information. In this document,
an extension on Interface Switching Capacity Descriptor (ISCD)
[RFC4202] for availability information is defined to support in
routing signaling. The extension reuses the reserved field in the
ISCD and also introduces an OPTIONAL Availability sub-TLV.

If there is a hop that cannot support the Availability sub-TLV, the
Availability sub-TLV SHOULD be ignored.

2. Overview

A node which has link(s) with variable bandwidth attached SHOULD
contain a <bandwidth, availability> information list in its OSPF TE
LSA messages. The list provides the information that how much

bandwidth a link can support for a specified availability. This
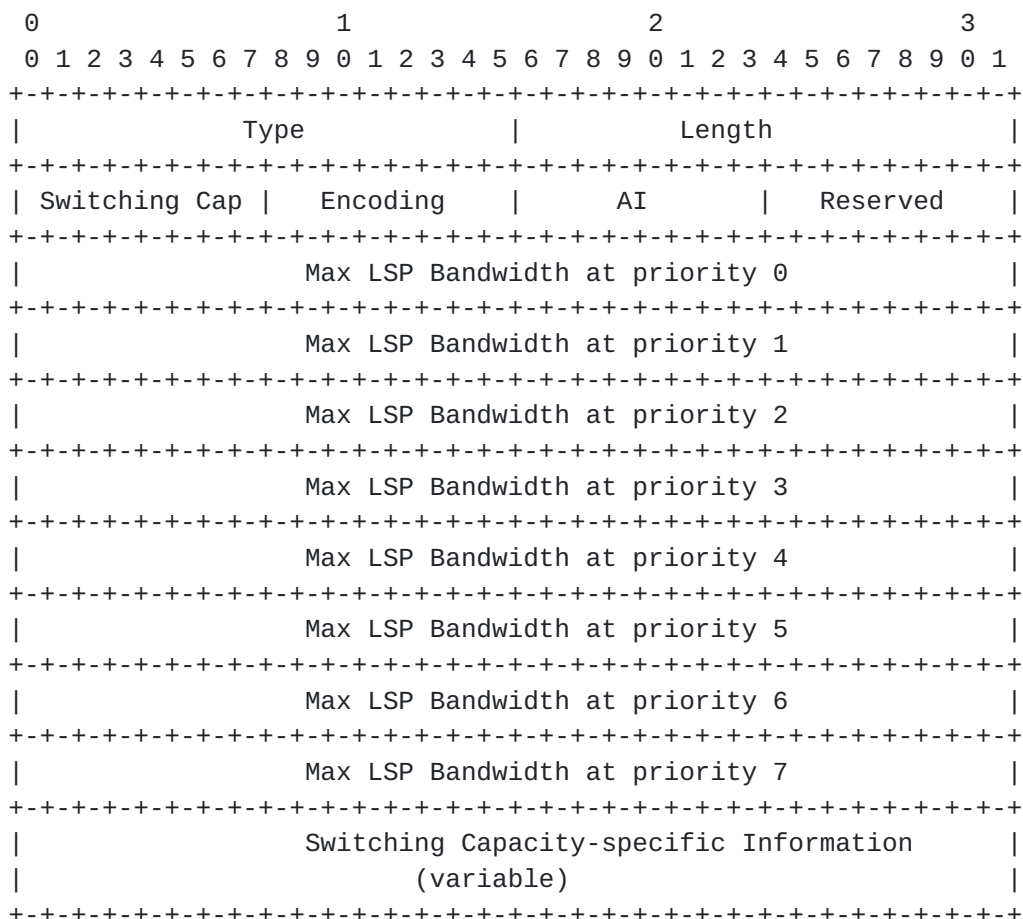information is used for path calculation by the PE node(s).

To setup an label switching path (LSP), a PE node MAY collect link
information which is spread in OSPF TE LSA messages by network nodes
to get know about the network topology, calculate out an LSP route
based on the network topology and send the calculated LSP route to
signaling to initiate a PATH/RESV message for setting up the LSP.

Availability information is required to carry in the signaling
message to better utilize the link bandwidth. The signaling
extension for availability can be found in [ASTE].

3. Extension to OSPF Routing Protocol

3.1. Interface Switching Capacity Descriptor

The Interface Switching Capacity Descriptor (ISCD) sub-TLV [RFC 4203]
has the following format:

```
    0                   1                   2                   3
    0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |             Type              |             Length            |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   | Switching Cap |   Encoding    |      AI       |   Reserved    |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |                 Max LSP Bandwidth at priority 0               |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |                 Max LSP Bandwidth at priority 1               |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |                 Max LSP Bandwidth at priority 2               |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |                 Max LSP Bandwidth at priority 3               |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |                 Max LSP Bandwidth at priority 4               |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |                 Max LSP Bandwidth at priority 5               |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |                 Max LSP Bandwidth at priority 6               |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |                 Max LSP Bandwidth at priority 7               |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |                 Switching Capacity-specific Information       |
   |                        (variable)                            |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

A new AI field is defined in this document.

AI: ISCD Availability sub-TLV index, 8 bits

This new field is the index of Availability sub-TLV for this
ISCD sub-TLV.

[3.2](#). ISCD Availability sub-TLV

The ISCD Availability sub-TLV has the following format:

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|              Type             |              Length           |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|     Index     |                  Reserved                     |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                      Availability level                       |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                LSP Bandwidth at Availability level n          |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

Type: 0x01, 16 bits;

Length: 16 bits;

Index: 8 bits

This field is the index of this Availability sub-TLV,
referred by the AI field of the ISCD sub-TLV.

Availability level: 32 bits

This field is a 32-bit IEEE floating point number which
describes the availability guarantee of the switching
capacity in the ISCD object which has the AI value equal to
Index of this sub-TLV. The value MUST be less than 1.

LSP Bandwidth at Availability level n: 32 bits

This field is a 32-bit IEEE floating point number which
describes the LSP Bandwidth at a certain Availability level
which was described in the Availability field.

3.3. Signaling Process

A node which has link(s) with variable bandwidth attached SHOULD
contain one or more ISCD Availability sub-TLVs in its OSPF TE LSA
messages. Each ISCD Availability sub-TLV provides the information
about how much bandwidth a link can support for a specified
availability. This information SHOULD be used for path calculation
by the PE node(s).

A node who doesn't support ISCD Availability sub-TLV SHOULD ignore
ISCD Availability sub-TLV.

4. Security Considerations

This document does not introduce new security considerations to the
existing OSPF protocol.

5. IANA Considerations

This document introduces an Availability sub-TLV of the ISCD sub-TLV
of the TE Link TLV in the TE Opaque LSA for OSPF v2. This document
proposes a suggested value for the Availability sub-TLV; it is
recommended that the suggested value be granted by IANA. Initial
values are as follows:

Type	Length	Format	Description
0	-	Reserved	Reserved value
0x01	8	see Section 3.2	Availability sub-TLV

6. References

6.1. Normative References

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6.2. Informative References

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7. Acknowledgments

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