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      OSPF Routing Extension for Links with Variable Discrete Bandwidth
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Abstract

   A network may contain links with variable discrete bandwidth, e.g.,
   copper, radio, etc. The bandwidth of such links may change
   discretely in reaction to changing external environment.
   Availability is typically used for describing such links during
   network planning. This document introduces an optional ISCD
   Availability sub-TLV in OSPF routing protocol. This extension can be
   used for route computation in a network that contains links with
   variable discrete bandwidth.

Status of this Memo

This Internet-Draft will expire on August 19, 2016.

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Table of Contents

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

LSA   Link State Advertisement

1. Introduction

Some data communication technologies, e.g., microwave, and copper,
allow seamless change of maximum physical bandwidth through a set of
known discrete values. The parameter availability [G.827, F.1703,
P.530] is often used to describe the link capacity during network
planning. The availability is a time scale that the requested
bandwidth is ensured. 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. Since different service types may need different
availabilities guarantees, multiple <availability, bandwidth> pairs
may be required when signaling. The signaling extension for links
with discrete bandwidth is defined in [ASTE].

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 node(s).

To setup a label switching path (LSP), a 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. ISCD Availability sub-TLV

The Interface Switching Capacity Descriptor (ISCD) sub-TLV is
defined in Section 1.4 of [RFC 4203]. The ISCD Availability sub-TLV
is defined in this document as a sub-TLV of ISCD. The Switching
Capability specific information field of ISCD MAY include one or
more ISCD Availability sub-TLV(s). 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            |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |                      Availability level                      |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |               LSP Bandwidth at Availability level n          |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```
Type: 0x01, 16 bits;

Length: 16 bits;

 Availability level: 32 bits

    This field is a 32-bit IEEE floating point number which
    describes the decimal value of 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.

3.2. 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 node(s).

A node that 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

6. References

6.1. Normative References

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6.2. Informative References

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7. Acknowledgments

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