Network Working Group
Internet Draft
Expiration Date: October 2003

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April 2003

Traffic Engineering Extensions to OSPF version 3

draft-ietf-ospf-ospfv3-traffic-00.txt

Status of this Memo

Abstract

This document describes extensions to the OSPF version 3 to support intra-area Traffic Engineering.

This document expands OSPFv2 traffic engineering to make both IPv4 and IPv6 network applicable. New sub-TLVs are defined to support IPv6 network. Use of these new sub-TLVs are not limited in OSPF version 3. They can be used in OSPF version 2.

1. Applicability

OSPFv3 has a very flexible mechanism in terms of adding new LS type.

Even the implementation does not know the LS types, the LSA is properly flooded by LS type field. This document adds a new LSA type Intra-Area-TE-LSA to OSPFv3.

For Traffic Engineering, this document refers [1] as a basement TLV definition documentation. New sub-TLVs are added to [1] to provide applicability to OSPFv3. Some TLVs need clarification of their usage and value to apply to OSPFv3. Newly added sub-TLVs can be used in [1] also.

Once [1] becomes applicable to OSPFv3, other mechanism such as [2] and [3] which use [1] can be applicable to OSPFv3.

2. Router Address TLV

In OSPFv3, Router Address TLV value should be a Router ID of the advertising router. [1] states Router Address TLV is "a stable IP address of the advertising router that is always reachable if there is any connectivity to it". In OSPFv3, Router ID is not a real IP address and is not reachable in IPv6 network. In OSPFv3 router identifier and IP address is completely separated. For eachability information, Router IPv6 Address TLV is used.

The Router Address TLV is type 1, and has a length of 4, and the value is the four octet OSPFv3 Router ID. It must appear in exactly one Traffic Engineering LSA originated by a router.

3. Router IPv6 Address TLV

A new TLV is introduced to carry reachable IPv6 address. This IPv6 address is always reachable address to resolve the router's reachability.

The Router IPv6 Address TLV is type 3, and has a length of 16. It must appear in exactly one Traffic Engineering LSA originated by a router.

4. Link TLV

The Link TLV describes a single link. It is constructed of a set of sub-TLVs. Except Link ID sub-TLV, all of other sub-TLVs defined in [1] can be applicable to OSPFv3. Link ID sub-TLV can't be used in OSPFv3 due to the protocol difference between OSPFv2 and OSPFv3.

Three new sub-TLVs are defined in this document: Neighbor ID, Local

Interface IPv6 address and Remote Interface IPv6 address.

17 - Neighbor ID (8 octets)
18 - Local Interface IPv6 Address (16N octets)
19 - Remote Interface IPv6 Address (16N octets)

4.1 Link ID

Link ID sub-TLV is used in OSPFv2 to identify the other end of the link. In OSPFv3, Neighbor ID should be used instead of Link ID. In OSPFv3, the Link ID sub-TLV should not be sent and ignored upon receipt.

4.2 Neighbor ID

In OSPFv2, Link ID is a unique key to identify the other end of the link. In OSPFv3, to identify the other end of the link, the combination of Neighbor Interface ID and Neighbor Router ID is needed. So new sub-TLV Neighbor ID is defined.

The Neighbor ID sub-TLV is TLV type 17, and is 8 octets in length. It contains 4 octet Neighbor Interface ID and 4 octet Neighbor Router ID. Neighbor Interface ID and Neighbor Router ID value is the same as described in [OSPFV3] A.4.3 Router-LSAs.

In OSPFv2, the Neighbor ID sub-TLV should not be sent and ignored upon receipt.

4.3 Local Interface IPv6 Address

The Local Interface IPv6 Address sub-TLV specifies the IPv6 address(es) of the interface corresponding to this link. If there are multiple local addresses on the link, they are all listed in this sub-TLV. Link-local address should not be included in this sub-TLV.

The Local Interface IPv6 Address sub-TLV is TLV type 18, and is 16N octets in length, where N is the number of local addresses.

4.4 Remote Interface IPv6 Address

The Remote Interface IPv6 Address sub-TLV specifies the IPv6 address(es) of the neighbor's interface corresponding to this link. This and the local address are used to discern multiple parallel links between systems. If the Link Type of the link is Multiaccess,

the Remote Interface IPv6 Address is set to ::. Link-local address should not be included in this sub-TLV.

The Remote Interface IPv6 Address sub-TLV is TLV type 19, and is 16N octets in length, where N is the number of neighbor addresses.

5. Intra-Area-TE-LSA

New LS type Intra-Area-TE-LSA is defined. LSA function code is 10. U bit is 1 to indicate that router should handle the LSA even if the router does not recognize the LSA's function code. Flooding scope is Area Scoping. So Intra-Area-TE-LSA's LS Type is 0xa00a.

LSA function code	LS Type	Description
10	0xa00a	Intra-Area-TE-LSA

Link State ID of Intra-Area-TE-LSA should be the Interface ID of the link.

6. Security Considerations

Security issues are not discussed in this memo.

7. Acknowledgements

Thanks to Vishwas Manral, Kireeti Kompella and Alex Zinin for their comments.

8. Reference

[1] Katz, D., Yeung, D., Kompella, K., "Traffic Engineering Extensions to OSPF", draft-katz-yeung-ospf-traffic-09.txt, work in progress.

[2] K. Kompella, Y. Rekhter, "OSPF Extensions in Support of Generalized MPLS", draft-ietf-ccamp-ospf-gmpls-extensions-09.txt, work in progress.

[3] F. L. Faucheur, J. Boyle, K. Kompella, W. Townsend, D. Skalecki, "Protocol extensions for support of Diff-Serv-aware MPLS Traffic Engineering", draft-ietf-tewg-diff-te-proto-02.txt, work in

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