OSPFv3 as a PE-CE Routing Protocol

http://www.ietf.org/internet-drafts/draft-pillay-esnault-moyer-ospfv3-pece-00.txt

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Agenda

- OSPFv2 as a PE-CE Protocol
- Differences between RFC 4577 and this I-D
  - New BGP Extended Community
  - Support for Multiple OSPFv3 Instances per VRF
- Next Steps
OSPFv2 as a PE-CE Protocol

- Specification detailed in RFC 4577 and RFC 4576

- Motivations include
  - Offloading BGP requirements (support, management) from customer sites
  - Path preference (backdoor path vs. VPN path) for multi-homed customer networks
  - Provide the MPLS-VPN service to customers without having to radically change their IGP network with the MPLS-VPN Backbone acting as a super-backbone
  - Keep the basic premises of OSPF the same:
    - Type-1 and Type-3 LSAs for internal information
    - Type-5 and Type-7 LSAs for external information

- Routing services offered
  - Inter-area routing connectivity between VPN sites
    - BGP Extended Community Attributes carry OSPFv2 specific information
    - Type 3/5/7 LSAs can be originated based on the contents of the extended communities
  - Intra-area routing connectivity between VPN sites (sham links)
    - A sham link creates a pt-pt intra-area link between VRFs
    - LSAs are flooded across the sham link

OSPFv3 as a PE-CE protocol has similar requirements as specified in RFC 4577. It has consistent behavior and format with OSPFv2 where applicable
Differences between RFC 4577 and this Draft

• New BGP extended community encodings for OSPFv3 Route Types
  • Intra-area-prefix LSA (0x2009) carries the prefixes which were previously carried by Type 1 and Type 2 LSAs in OSPFv2

• Multiple OSPFv3 protocol instances can be established over a single link. (rfc5340 section 2.4)
  • All instances defined on a link consequently belong to the same vrf.

• Assignment of Domain IDs on a per-VRF or a per-OSPFv3 instance basis
  • <Domain ID, Instance ID> tuple is used for demultiplexing

• Multiple OSPFv3 instances can be established across the sham link to support multiple intra-area connections across the same sham link
  • Instance ID within the OSPFv3 header is used to distinguish between multiple OSPFv3 instances
BGP OSPFv3 Route Extended Community

- Allocated from the IPv6 Address Specific BGP Extended Communities Attribute
  - *draft-rekhter-v6-ext-communities-02*

- Extended community allocation contains same fields as OSPFv2; however all fields are now packed into a single attribute
  - DomainID, RouterID, AreaID, and Options field formats remain identical to RFC 4577
  - Route Type field contains new LSA encodings

- Addition of an OSPF Instance ID field

```
+----------+  +----------+  +----------+  +----------+  +----------+  +----------+
|         |  |           |  |           |  |           |  |           |  |           |
|  0       |  |  1        |  |  2        |  |  3        |  |  4        |  |  5        |
|  0 1 2 3 |  |  4 5 6 7  |  |  8 9 0    |  |  1 2 3 4  |  |  5 6 7 8  |  |  9 0 1    |
|----------|  |-----------|  |-----------|  |-----------|  |-----------|  |-----------|
| UXUU     |  | OSPF Domain ID |  | OSPF Domain ID (Cont.) |  | OSPF Router ID |  | Area ID |  | Route Type |  | Options | OSPF InstanceID | UNUSID |
+----------+  +----------+  +----------+  +----------+  +----------+  +----------+  +----------+  +----------+  +----------+
```
Next Steps

- Find a home/working group that is interested in the document
  - Most likely L3VPN (home of rfc4577) in Minneapolis
  - Multiple address families support using instance-id

Comments welcome!
The OSPFv3 Instance ID values have been assigned as follows in draft-ietf-ospf-af-alt-06.txt:

- Instance ID # 0 - # 31: IPv6 unicast AF
- Instance ID # 32 - # 63: IPv6 multicast AF
- Instance ID # 64 - # 95: IPv4 unicast AF
- Instance ID # 96 - # 127: IPv4 multicast AF
- Instance ID # 128 - # 255: Unassigned

The Instance ID is used to de-multiplex the address family if multiple address families are supported.

The BGP v6 route attribute carries all the needed info for support of ipv4 AF.
Support for Multiple OSPFv3 Instances Per VRF

• Instance ID for Inter-area links between PEs
  • Instance(s) on PE-CE link are mapped to an Instance ID associated with the PE-PE link
  • Instance ID of the PE-PE link is encoded in the OSPFv3 Route Extended Community
  • \(<\text{Domain ID}, \text{Instance ID}, \text{Route Type}>\) is used to determine the Lsa Type for imported prefixes.

• Instance ID for Intra-area links between PEs
  • Sham link is established between two VRFs similar to rfc 4577
  • Multiple OSPFv3 instances may be established across this sham link
  • Each intra-area link is associated with an Instance ID within the OSPFv3 header as specified in RFC 5340