Virtual Hub & Spoke with BGP EVPN

draft-keyupate-evpn-virtual-hub-00

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Motivation

- EVPN is becoming a pervasive technology for overlay networks in MSDCs & SPDCs
- EVPN route scale in DCs is typically achieved by
  - Leaf nodes learn and store local DC routes (MAC and IP addresses)
  - Any remote DC routes are stored on Gateway nodes
  - Leaf nodes are installed with default route pointing towards Gateway nodes

- Draft further optimizes route learning such that
  - Leaf nodes learn and store routes (MAC and IP addresses) for local sites only
  - Leaf nodes do not store routes advertised by other Leaf nodes residing in the same DC
Solution

- RFC7024 defines rules for Virtual Hub & Spoke for BGP L3VPNs
- Draft extends RFC7024 for EVPN address family
  - Rules for generating and processing of unknown MAC Route
  - Modifications to Aliasing, Split Horizon and Mass Withdraws
  - Forwarding considerations for Bridging mode and IRB mode
  - Rules for ARP Suppression
Solution – Rules for Unknown MAC Route

- Unknown MAC Route is equivalent to VPN-IP default route in RFC7024
- V-Hub exports Unknown MAC Route for a given EVI for set of its V-Spokes
  - RD makes route unique per V-Hub
- Rules to originate the Unknown MAC Route is same as VPN-IP default route in RFC7024
  - Unknown MAC Route is announced using MAC/IP advertisement route
- V-Spoke imports the route unless route-target mismatch happens
- Rules to import the Unknown MAC Route is same as VPN-IP default route in RFC7024
  - In absence of more specific EVPN-MAC route, unknown MAC Route is used in MAC-Table/ARP/ND Cache
  - Forces the traffic to be forwarded to V-HUB from a V-Spoke
Solution – Modifications to Aliasing, Split Horizon and Mass Withdrawals

- V-Spokes usually do NOT have EVPN MAC Routes from other V-Spokes
  - Ethernet A-D routes of V-Spokes are only announced to V-HUB.
  - V-Hub only announces Ethernet A-D per EVI route when it announces at least 1 or more specific MAC/IP route to a V-Spoke. Otherwise there is no point in propagating Ethernet A-D per EVI routes between spokes by default.
  - Same rule applies to Ethernet A-D per ES routes.
Solution – Forwarding Considerations

- **IP Forwarding**
  - Rules of RFC7024 apply for IP only forwarding

- **MAC only forwarding (Bridging Mode)**
  - MPLS label of Unknown MAC route identifies the MAC-VRF of V-Hub
  - V-Hub receiving data packets for such a label pops the label and performs a lookup in MAC-VRF to determine further disposition of the packet
  - Data packets for more specific routes are forwarded towards their nexthops

- **IRB**
  - If the host destination address of the packet is an IRB interface then V-Spoke does an IP lookup in MAC-VRF
    - If the IP address is not found then V-Spoke MAY forward the packet to V-HUB using Default VPN-IP Route
  - If the host destination address of the packet is a MAC address then V-Spoke does an MAC lookup in MAC-VRF
    - If the MAC address is not found then V-Spoke MAY forward the packet to V-HUB using unknown MAC Route
Solution – ARP Suppression

- RFC7432 defines procedures to terminate ARP/ND request, translate it into BGP updates and then use the information to generate ARP/ND responses (AKA ARP Suppression)

- ARP suppression needs to be performed by V-Hub and V-Spoke:
  - V-Spoke terminates gratuitous ARP/ND request, stores the source MAC/IP pair in ARP/ND Cache and announce it in EVPN SAFI to V-Hubs (if created for the first time)
  - V-Spoke responds to the received ARP/ND request if it find a match in its local ARP/ND cache. Otherwise the request is unicasted towards one of V-Hubs
  - V-Hub receives these routes from V-Spoke and stores it in its ARP/ND Cache table.
  - V-Hub responds to any received unicast ARP/ND requests. Optionally V-Hub MAY announce the matching route in EVPN SAFI as well (as a matter of policy)
Questions?