Static Multicast Routes
Feature Overview:

- Static multicast routes give the flexibility to the user to program a specific path for multicast traffic from the source till the client without having to rely on the underlying protocols to build a multicast route.

- Entries are programmed in each of the Routing Nodes to build the Static Network similar to Unicast Static Routes.

- It allows the user to explicitly specify the incoming interface, source address, group address, and the set of downstream interfaces to replicate the multicast traffic. The entries that the user configures can be directly programmed in MFIB.

- Static Multicast Routes can be programmed as an S,G entry or a *, G entry. PIM and Static Multicast Route can coexist on the Same Routers.

- With a redistribute option, it can also interop with other L3 multicast protocols like PIM to connect a PIM domain with a Static Multicast domain.
Use Cases

- Used to connect Overlay Networks statically without the Need to program a complex protocol like PIM-SM at the Overlay
- A centralized Controller like a SD-WAN Gateway can program the Routes on the WAN Edge Routers to connect multiple Overlay Networks
- Can also be used to program protocols like SSDP, PTP etc that requires Multicast Protocols for Communication but actually do not have stringent timing requirements like IPTV streams
- Helps in preserving resources in the Network Node by optionally summarizing Multiple (S,G) entries to one *,G entry without the need to move to a different protocol like PIM-BIDI
Command Format

\[[\text{Incoming Interface, Source, Group}] \to \text{[Set of downstream interfaces]}\]

Incoming Interface is the L3 interface from where the traffic is received on the router.

Source is the source ip address of the streaming device. It can be * also, which indicates any source ip address.

Group is the multicast ip address of the group for which the traffic is streamed.

Downstream interface is an L3 interface on which a PIM join is received or to which the receivers are connected.
On an incoming interface I1, when there are multiple sources sending multicast traffic to a single group G, and if the outgoing interfaces are also the same, then instead of having individual mroutes for every interface I1, source, group combination, a single summarized (*, G) mroute entry on interface I1 is programmed which will help in saving hardware resources. There are 2 types:

- **Implicit Summarization** – The network administrator configures multiple static mroutes with same group address, same incoming and outgoing interfaces but different source addresses. These routes are implicitly summarized into a single (*, G) mroute entry.
  
  - Example: If there are two mroutes (I1,S1,G) -> I2 and (I1,S2,G) -> I2 they will be summarized into a single mroute (I1,*,G) -> I2

- **Explicit Summarization** – The network administrator explicitly configures a summarized (*, G) static mroute without specifying the source ip.
Interop With L3 Multicast Protocols

• Static multicast routes are configured on routers R3 and R4 whereas PIM protocol builds the multicast routes on routers R1 and R2. R3 acts as a gateway where the static multicast routes terminate.

• On R3, where the static multicast routes terminate, a redistribute command is configured to inform PIM about the static mroute.
When redistribute is enabled on R3, PIM will start sending Joins upstream towards R2 for all the configured static mroutes. These joins could be either (*,G) or S,G joins based on the type of mroute configured (*,G or a S,G mroute).

Since R1, R2 routers run PIM, the RP will be aware of the source based on PIM registration. When it gets join on iface1, it starts forwarding the data. R2 routes this data to the rest of the static network.
For a same group address, it is possible to have both summarized and non-summarized multicast routes as follows.

Entry 1: (I1, *, G) -> I2  
Entry 2 : (I1, S1, G) -> I3

In this case, (S, G) entries are given precedence over (*, G) entry. If a matching (S, G) entry is not found, then a summarized (*, G) entry for that group (if present) will be selected for forwarding.

Here S1,G traffic on I1 will always match Entry 2 and other Sources streaming to G on I1 will match Entry 1
Thank You