

IGMP

Internet Group Management Protocol is used in multicast implementations between the end host and the local router. IGMP is used by hosts to report this multicast group memberships to their local router. These messages are not routed. There are three versions of IGMP that are defined below:

IGMPv1

Simple message types for communication between hosts and routers.

- **Membership Query:** Router checking to see if a host wants to join a group.
- **Membership Report:** Used by a host to join a multicast group.

IGMPv2

Allows for faster termination or leaving of multicast groups.

- **Membership Query:** Router checking to see if a host wants to join a group.
- **Version 2 Membership Query:** Sent to the group address with the multicast groups IPs. Sent by hosts to join and remain in the multicast group on the segment.
- **Version 2 Leave Group:** Sent by a host to indicate that it will leave the group. These are sent to 224.0.0.2, the router responds with a group specific query.
- **Version 1 Membership Group:** For backwards compatibility.

IGMPv3

Provides extensions to support SSM.

- **Membership Query:** Router checking to see if a host wants to join a group.
- **Version 3 Membership Report:** Same as Version 2 but is sent to 224.0.0.22
- **Version 2 Membership Report:** For backwards compatibility.
- **Version 2 Leave Report:** For backwards compatibility.
- **Version 1 Membership Report:** For backwards compatibility.

Dense Multicast

- Assumes that group members are densely distributed through the network, that all hosts want to receive multicast traffic, and that bandwidth is plentiful.
- Routers stop the flow of multicast traffic to parts of the network when there are no more group members.
- Dense multicast routing protocols flood traffic through out the network.
- Dense multicast routing protocols include DVMRP, MOSPF, and PIM-DM

Sparse Multicast

- Assumes group members are sparsely distributed throughout the network, that not all members want to receive traffic, and that bandwidth is limited.
- Method is to only send traffic when it is requested by routers or hosts.
- Multicast routing protocols include CBT and PIM-SM.

Multicast Trees

Multicast distribution trees control the path that multicast packets take to their destination.

Source Trees

- The tree roots from the source of the multicast group then expands throughout the network in spanning-tree style.
 - Also called shortest-path trees or SPTs as they create paths without having to go through a rendezvous point.
 - Drawback is that every router along the path must keep a list of all multicast groups in memory.
 - PIM-DM uses source based trees.
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Shared Trees

- The tree roots between the source and receivers.
 - The root is called the rendezvous point or RP. The tree is created from the RP in a spanning-tree fashion, without any loops.
 - Sources send multicast packets to the RP then the RP distributes the data to members of the multicast group.
 - Reduced memory requirements on the routers.
 - Packets might not take the best path at first.
 - The RP has high memory requirements.
 - PIM-SM uses shared trees.
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PIM

Protocol Independent Multicast or PIM has two flavors. SM and DM for sparse and dense mode respectively.

PIM-SM (RFC 7761)

- Assumes that no host wants to receive multicast traffic unless it is specifically requested.
 - Routers with receivers have to register with the RP.
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PIM-DR

- A designated router is selected in multiaccess segments running PIM. The DR is responsible for sending join, prune, and register messages to the RP.
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BIDIR-PIM (RFC 5015)

- Variant of PIM-SM that builds bidirectional shared trees connecting multicast sources and receivers.
 - Never builds a SPT and scales well because it does not need a source-specific tree
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SSM (RFC 3569)

- Source-specific multicast is a variant of PIM-SM that builds a tree rooted in only one source.
 - Only builds a SPT and foregoes RPs and sparse mode shared trees
 - SSM trees are built directly based on the receipt of group membership reports that request a given source.
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MSDP (RFC 3618)

- Multicast Source Discovery Protocol or MSDP is used to inter-connect multiple PIM-SM domains.
- Reduces the complexity of inter-connecting PIM-SM domains by allowing the PIM-SM domains to use an inter domain source tree.
- Each domain has its own RP that talks to each other.