IP Multicast

To fully realize the benefits of multimedia-capable desktop systems, network designers must begin to build their enterprise infrastructures to support standards-based IP Multicast applications. IP multicasting is the most efficient approach to delivering high-quality audio, video, and data simultaneously to many desktops. Using today's technology, companies can deliver streaming audio and video feeds to desktop systems within corporate campuses and over wide area links that consume a minimal amount of network bandwidth.

Voice and video over IP can be delivered to a few desktops in a shared LAN environment. But effectively supporting IP Multicast traffic on all desktops in a campus environment requires a fully switched network infrastructure. IP Multicast applications run optimally in a fully switched environment and require switching to every desktop if all end stations participate in voice or video broadcasts. Furthermore, network architects need to standardize on switches that provide intelligent multicast control to minimize the amount of network traffic generated by audio and video streams.

IP multicasting is designed to flow over a spanning tree, in which IP routers forward traffic to a downstream router only if an end station below the router has requested that specific multicast traffic session. Subsequently, routers forward IP multicast streams only to switches that have attached desktop systems that receive the multicast session. This approach ensures that only a single copy of the multicast data is sent downstream.

Since the edge devices (switches) are responsible for managing the multicast data streams to their destination points, most of the traffic processing burden is placed on the switches. It is therefore important that network designers standardize on switches that support IP multicasting.

There are currently two ways to support IP multicasting service on a network infrastructure. First, companies should standardize on a Layer 3 switch (LAN router) at the core of the network that supports the standard IP Multicast routing protocols Distance Vector Multicast Routing Protocol (DVMRP) and Multicast Open Shortest Path First

(MOSPF), as well as the membership protocol Internet Group Management Protocol (IGMP). These Layer 3 switches can then automatically manage the admission and control of IP Multicast applications and users.

Second, companies must address the network edge. Here, companies often use a pure Layer 2 switch. To properly support IP Multicast traffic, the Layer 2 switch must support either IGMP snooping or GARP Multicast Registration Protocol (GMRP). If the Layer 2 switch supports IGMP, it monitors the IGMP traffic between itself and the upstream Layer 3 device and dynamically sets up filters accordingly. The other approach used by Layer 2 switches is GMRP, a new standard. GMRP allows the switch and the end station to communicate directly, ensuring that traffic reaches only the stations that require it. GMRP allows Layer 2 switches to intelligently manage IP Multicast traffic for efficient delivery to end stations. It helps avoid oversaturating the last link and minimizes unnecessary CPU thrashing.

When evaluating switching solutions to support IP multicasting within an enterprise infrastructure, it is important to select switches that support IP Multicast snooping. When a workstation subscribes to a multicast session (or tree), it sends an IGMP message notifying the nearest router that it wants to be added to the broadcast session. An intelligent switch monitors network traffic for IGMP packets and allows multicast traffic only to the ports that have subscribed to a multicast stream. This process is called IGMP snooping. Operating system vendors such as Microsoft now include IGMP support in their TCP/IP protocol stacks to support the efficient handling of multicast traffic.

Abbreviations and Acronyms

CPU
central processing unit

DVMRP
Distance Vector Multicast Routing Protocol

GARP

Generic Attribute Registration Protocol

GMRP

GARP Multicast Registration Protocol

IGMP

Internet Group Management Protocol

IP

Internet Protocol

MOSPF

Multicast Open Shortest Path First

TCP/IP

Transmission Control Protocol/Internet Protocol

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