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**Topic**
Information Technology [1]

**Policy Number**
650-17

**Reviewed Date**
January 4, 2007

**Responsible Office**
- Office of the Senior Vice Chancellor, Finance and Administration [2]

**Purpose**

This policy addresses the need for a minimum standard to enable multicasting on the UCSF enterprise network. The components of this policy outline a set of multicasting protocols that will apply to all multicast-capable network devices in UCSF networks in which the infrastructures are ready for multicast traffic.

**Definitions**

Multicast

A bandwidth-efficient form of network communication involving the transmission of information to a subset of multiple recipients. Examples of applications involving one-to-many or many-to-many communications include: video/audio broadcasts, videoconferencing/collaboration, database replication, and software downloads.

Internet II

Internet2 is a partnership among academia, industry, and government that fostered today’s Internet. Internet2 is a not-for-profit consortium being led by over 200 universities working in partnership with industry and government to develop and deploy advanced network applications and technologies, accelerating the creation of tomorrow's Internet.

The Corporation for Education Network Initiatives in California (CENIC)

CENIC’s mission is to develop, deploy and operate leading-edge network-based services and to facilitate and coordinate their use for the research and education community to advance learning and innovation. CENIC’s Charter Associates – Stanford University, the University of California, the California State University, the California Institute of Technology, the California Community Colleges and the University of Southern California – articulated a common vision for the innovative use of communications technology to deliver the next generation of data
communications services.
CENIC also provides services to California K-12 schools in order to facilitate the education and research mission of its associates, to non-California higher education institutions, and to industry research organizations with which CENIC Associate researchers and educators are engaged.

Protocol Independent Multicast v2 (PIMv2)

Provides intra-domain multicast forwarding for all underlying unicast routing protocols
Independent from any underlying unicast protocol such as Open Shortest Path First (OSPF) or Border Gateway Protocol (BGP)
Supports explicit join (sparse mode), flood-and-prune (dense mode), or hybrid sparse-dense modes
Sparse Mode: relies upon an explicit joining method before attempting to send multicast data to receivers of a multicast group
Dense Mode: actively attempts to send multicast data to all potential receivers (flooding) and relies upon their self-pruning (removal from group) to achieve desired distribution

Internet Group Management Protocol (IGMP) Versions 1, 2, and 3

Protocol used by IPv4 hosts to communicate multicast group membership states to local multicast routers
Version 3 of IGMP adds source awareness to the protocol. This allows the inclusion or exclusion of sources. IGMPv3 is the basis for Source Specific Multicast (SSM)

Auto-RP

a mechanism where a PIM router learns the set of group-to-RP mappings required for PIM SM

Internet Group Management Protocol (IGMP) Snooping

A method by which a switch can constrain Multicast to only those ports that have requested the stream. Used in higher-end, hardware-enabled hardware

Policy

A. All UCSF campus networks that wish to receive and transmit multicasting traffic must comply with these policies through the implementation of multicast-enabled routers and switches.
B. UCSF shall use IGMP V2 as the standard protocol for the future network. IGMP is used to
dynamically register individual hosts in a multicast group on a particular local area network
(LAN). Routers use IGMP to query and update its group membership table.

C. IGMP snooping will be enabled on all layer 2 multicast-capable switches to eliminate the
impact of flooding multicast traffic.

D. UCSF shall deploy PIM sparse mode v2 as the routing protocol to provide support for
intradomain multicast forwarding and provide join capabilities of local receivers.

E. UCSF will use MBGP, an extension to BGP, to apply the multiple policy control knobs
familiar in BGP to specify the routing policy and thereby the forwarding policy for multicast.

F. Anycast RP will be utilized in UCSF’s multicast sparse mode network to provide fault
tolerance and load-sharing between Parnassus and Mission Bay campus.

G. The Multicast Source Discovery Protocol is used to communicate the availability of
multicast sources between Autonomous Systems

Responsibilities

Contact Responsible Office (see above) with any questions.

References

- Internet2 Multicast Working Group Web Site http://multicast.internet2.edu/ [3]
- Cisco IP Multicast Whitepaper
  (Registration with Cisco required.)
- Request for Comments on UCSF Multicasting Policy for Distribution of Video/Audio via
  the UCSF Intranet, Commodity Internet and Internet2 [5]
- UCSF Office of Academic and Administrative Information Systems Website [6]