Case Study

Testing IP Multicast with TeraVM

TeraVM statefully emulates both IPv4 and/or IPv6 multicast enabled clients, providing detailed analysis of the reliability and robustness of multicast services and delivery networks.

IP Multicast data transmission offers greater efficiencies and resource savings when it comes to delivering data on a regular basis to a group of users. Multicast enables the use of a single server to reliably deliver a common datagram to many endpoints on the network.

TeraVM is a virtualized IP test solution used to test and determine the performance limitations of multicast services and multicast enabled networks. Users of TeraVM can concurrently emulate and test with IPv4 - IGMP and/or IPv6 - MLD multicast clients connecting to a third party multicast service and/or an emulated multicast server. A key benefit of using TeraVM is the per flow architecture enabling emulation of unique multicast clients connecting to any number of multicast group addresses. Per flow analysis provides users of TeraVM with real time performance data for each emulated endpoint connected to a multicast group. TeraVM enables users to quickly identify and isolate problem group addresses ensuring service reliability.

Robustness of Enterprise IP Multicast Services

TeraVM is used by enterprise to determine how robust and scalable IP multicast services are.

Features

- Supports IPv4 – IGMP version 1,2,3
- Supports IPv6 – MLD version 1,2
- Emulate server hosts sending multicast datagrams to designated group address(s)
- Emulate user endpoints joining groups, to receive datagrams
- Dynamically Join and Leave Groups
- Configurable join duration times different viewing device types
- Network load generation with traffic flows of video, voice and data

TeraVM enables the flexibility to test a wide range of multicast use cases:

- Multimedia: video conferences and collaborative computing
- Datacasting: information distribution e.g. ticker based data
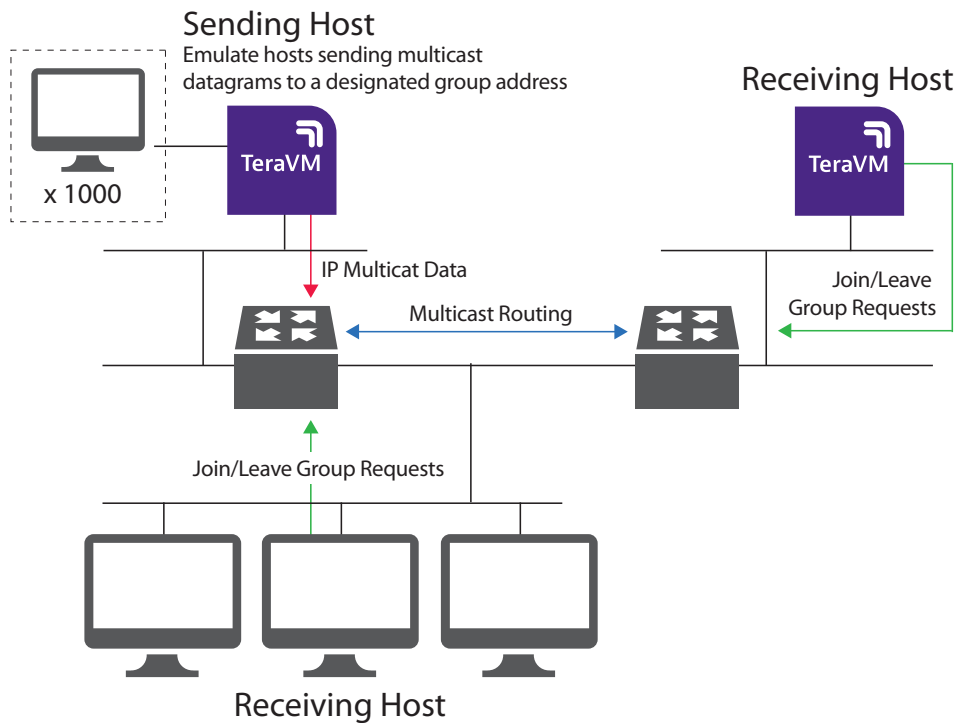- File Distribution: enterprise data publication

Figure 1: TeraVM emulating multicast client and/or servers

TeraVM provides detailed performance analysis of the multicast service through real activity of join and leave requests to any number of multicast groups. Using TeraVM's dedicated multicast performance metrics determine the reliability of the service, sample report metrics include:

- Reporting overhead: bandwidth associated with membership reports
- Bandwidth loss: the number of packets still arriving after the leave request submitted

Functionality

Use Case	Description
Stateful IGMP/MLD	Concurrent testing with IGMP v1, v2, v3 andMLD v1, v2·
	Support membership reports (solicited and unsolicited queries)
	Emulate multicast servers
Join/Leave Groups	Create profiles of Join/Leave requests
	Define duration of join for group membership
	Dynamically leave a group
Multicast group address analysis	Real time performance analysis with per second granularity for each group address joined
	Identify problem multicast groups, event notification per individual multicast address, for example, excessive join time

Comprehensive Test Capability

TeraVM provides the industry's most comprehensive test suite with over 3,000 unique metrics; ranging from application performance to protocol tunneling down to simple port enabled testing with throughput and latency metrics. A user defined threshold can be set on any of these metrics to easily pinpoint and isolate problem flows.

TeraVM is enabled with a unique set of metrics for multicast. Below are a few example metrics:

- Throughput
- Multicast joins initiated/completed
- Multicast leaves initiated/completed
- Multicast join (Mean/Max) times
- Multicast leave (Mean/Max) times
- Packet loss/latency
- Out of Sequence packets
- Client In Packets After Leave
- RTP/vide/audio relevant metrics

Applications Supported

General	Real-time isolation of problem flows
Data	TCP / UDP
	HTTP (headers, substitution, attachments)
	SMTP / POP3 (incl. file attachments)
	FTP (Passive/Active), P2P applications, DNS
Address	MAC, VxLAN
	DHCP, PPPoE (IPv4 & IPv6)
	Dual Stack (6RD, DS Lite)
Ethernet Switch	VLAN and Double VLAN Tagging (Q-Q)
	ACL, 802.1p, DSCP
Replay	Replay large PCAP files - TCP, UDP and raw data playback
	Amplify and dynamically substitute data into PCAP files
Video	Multicast: IGMP v1/v2/v3 & MLD v1/v2
	Automatic Multicast Tunelling (AMT)
	Video on Demand (RTSP)
	Adaptive Bit Rate Video (HLS, HDS, Smooth)
	Video conferencing
Secure VPN	SSL/TLS/DTLS, IPsec (IKE v1/v2)
	Cisco AnyConnect SSL VPN Client, Cisco AnyConnect IPsec VPN Client
	Juniper Pulse, Juniper Network Connect
	802.1x EAP-MD5
Security Attack Mitigation	Spam / Viruses / DDOS
Voice	VoIP: SIP & RTP (secure & unsecure), H.323
	Dual Hosted UACs, SIP Trunking
	Voice & Video quality metric (MOS)
LTE/4G	GTP tunnel support
SLA	TWAMP
Automation	CLI, Perl, TCL, XML, Java API

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