

# Testing Multicast Based Video Services with TeraVM



## OVERVIEW

TeraVM is used extensively to test the performance of video over IP services. TeraVM provides both video analysis and feature based functionality performance measurements.

## FEATURES

- ✓ Supports IGMP v1/v2/v3 and MLD v1/v2
- ✓ Emulate both multicast clients and/or servers
- ✓ Fully stateful clients that can join/leave live broadcast channels
- ✓ Channel change capacity testing
- ✓ Support for multiple video codec formats (MPEG-4, H.264, VC-1, etc)
- ✓ Configurable playout buffers that accurately emulate different viewing device types
- ✓ Video and audio quality analysis via mean opinion score (MOS)
- ✓ Integrated video quality violation notification
- ✓ Dynamic control of emulated multicast clients during live test runs
- ✓ Network load generation with a mix of voice, video, and data traffic flows

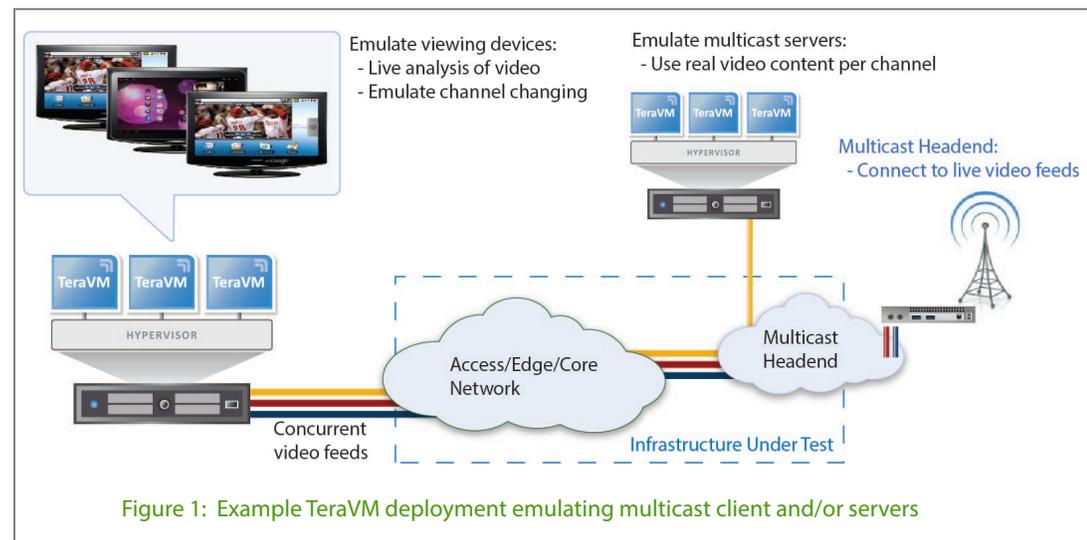


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Multicast enables service providers to deliver broadcast video over their IP network. However the challenge faced by many service providers is how to best manage the continued growth in video consumption while maintaining broadcast quality video. Quality of experience for video over IP is not just about video quality testing, but also includes testing the reliability of functions such as channel change. Network optimization for multicast video is a common solution for ensuring quality. However this raises the challenge of how to select the best optimization policy for the broadcast service under varying network load conditions.

TeraVM is the only IP video test and performance measurement solution that provides both endpoint emulation and video quality analysis with performance measurements on functionality such as channel change. A unique aspect of TeraVM is the ability to measure performance on a per flow or per user basis. This means that for video over IP, TeraVM provides live performance analysis on all available channels in parallel.

Per flow analysis on all available multicast channels is critical to ensuring that the network and policy configuration settings have minimal impact on subscriber viewing quality or usability. Using TeraVM's multicast channel emulation, service providers can also assess the impact that introducing new channels will have on existing services.



## Example Test Scenario - Service Scaling

When a service provider introduces new video channels the existing video service must be tested to make sure there is no negative impact on quality.

With TeraVM, the service provider can emulate multicast subscribers and rate the service delivery quality to establish a baseline. After introducing the new channels, TeraVM is once again used to measure or rate the delivery quality and this can be compared to the baseline measurement to determine if the new channels have had any negative impact on service delivery.

TeraVM is used extensively to test these type of scenarios:

- Per flow measurement on a per emulated subscriber or per channel basis
- Video quality analysis via mean opinion score (MOS) to identify video quality problems
- Timing analysis to emulate channel surfing to determine impact of latency
- Determine accuracy of network policies by using TeraVM load generation

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## Comprehensive Test Metrics

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 join/leave times
- ✓ Packet loss/latency
- ✓ Buffer Overrun/Underrun
- ✓ Video/Audio MOS scores
- ✓ Time to viewable content (first I-frame)
- ✓ Number of I/B/P frame impairments
- ✓ CODEC/GOP/PID identification

## Functionality Overview

TeraVM Multicast	Description
Stateful IGMP/MLD protocol	<ul style="list-style-type: none"><li>- Concurrent testing with IGMP v1/v2/v3 &amp; MLD v1/v2</li><li>- Support membership reports (solicited and unsolicited queries)</li><li>- Emulate multicast servers (broadcast real video streams)</li></ul>
Channel surfing	<ul style="list-style-type: none"><li>- Connect to both standard definition (SD) and high definition (HD) channels</li><li>- Configurable buffer sizes to emulate different viewing devices</li><li>- Implement channel surfing (joins/leaves) with defined viewing durations</li></ul>
Live video analysis	<ul style="list-style-type: none"><li>- Media performance of standard definition (SD) and high definition (HD) video streams</li><li>- No reference analysis for both video and audio streams (MOS)</li><li>- TR 101 290 standard measurements (decodability of elementary video streams)</li></ul>

## TeraVM Software Overview

### 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 & Double Tagging (Q-Q)
- ACL, 802.1p, DSCP

### REPLAY

- Replay large PCAP files
- Amplify and dynamically substitute data into PCAP files
- TCP, UDP and raw data playback

### VIDEO

- Multicast: IGMP v1/v2/v3 & MLD v1/v2
- Automatic Multicast Tunelling (AMT)
- Video on Demand (VoD)
- 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
- 802.1x EAP-MD5

### SECURITY ATTACK MITIGATION

- Spam / Viruses / DDOS

### VOICE

- VoIP: SIP & RTP (secure & unsecure)
- Dual Hosted UACs, SIP Trunking
- H.323
- Voice & Video quality metric (MOS)

### LTE/4G

- GTP tunnel support

### SLA

- TWAMP

### AUTOMATION

- CLI, Perl, TCL, XML, Java API



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