

Case Study

# Testing Video on Demand (VoD) Services with TeraVM

TeraVM™ is used extensively to test the performance of video on demand services. TeraVM provides both video analysis and functionality performance measurements for real time streaming protocol (RTSP).

Delivering video on demand services to thousands of homes with trick mode play features (rewind, fast forward and pause) requires extensive knowledge of the practical limitations of the network from content acquisition, to the last mile, to end user home networking. To overcome a number of networking related challenges service providers seek to use a distributed model in which the session control and media control servers are separate. The distributed model enables a greater number of media sessions and ultimately a highly scalable platform in which a session server coordinates the connection among the distributed media servers. The challenge faced by the service provider is to verify the reliability and accessibility of the video on demand service.

TeraVM enables network testing by emulating thousands of subscriber endpoints using stateful, real-time streaming protocol (RTSP). A key advantage of TeraVM is the ability to emulate multiple flows per endpoint, for example one flow to establish a session with the control server over RTSP, and another to establish a second session with the actual media server streaming the video/audio content. TeraVM's stateful emulation enables reliable, repeatable and scalable testing of distributed video on demand network architectures. With TeraVM one can verify subscriber viewing quality on a per movie basis.

## Features

- Support Real Time Streaming Protocol (RTSP)
- Emulate trick mode play features – rewind, pause, fast forward
- Support SIP and HTTP enabled RTSP sessions
- RTSP clients support redirect (300–399) responses from DESCRIBE requests
- 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
- Network load generation with a mix of voice, video, and data traffic flows



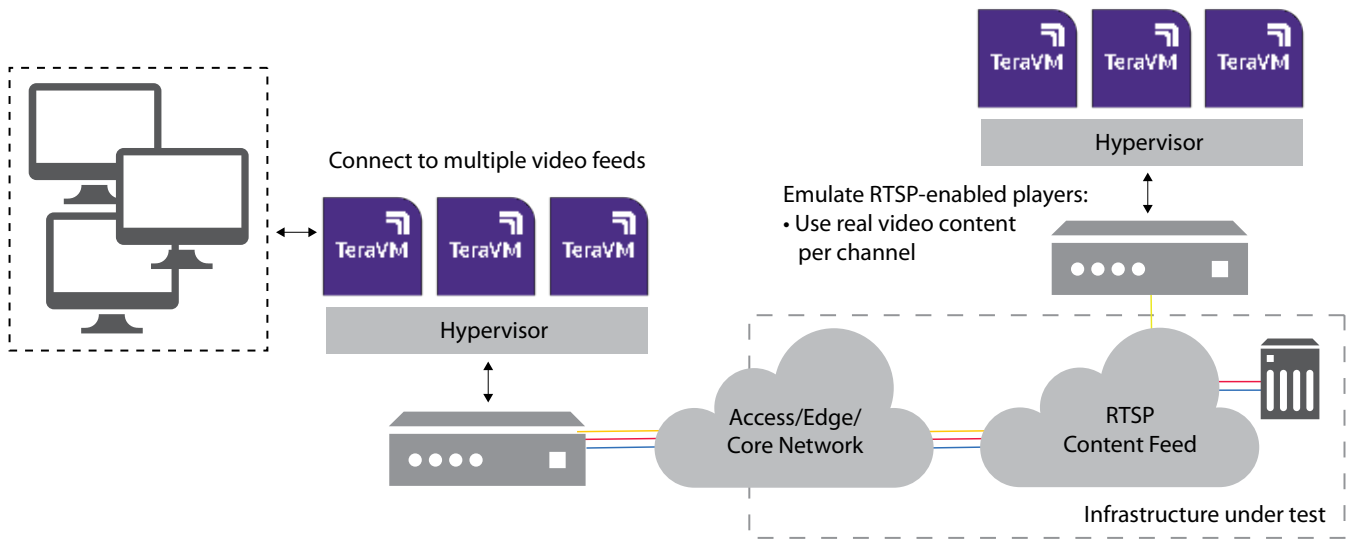


Figure 1: Example TeraVM deployment emulating video on demand clients and servers

## RTSP Client Emulation

TeraVM provides a fully stateful RTSP client, which can access live 3rd party servers. TeraVM offers the unique capability of following redirect responses from control servers, which redirect the subscriber to the true asset location on a separate server. Users of TeraVM can choose to follow the redirection or not, simply providing content availability. In the event of choosing to follow the redirect, each and every emulated RTSP client can be set to consume content for a configurable period of time.

## Media Quality

In the distributed model of remote content storage, location is an important aspect in defining overall subscriber quality. Using TeraVM it's possible to determine if location impedes actual video quality and determine if all video files are accessible.

## Subscriber Growth & Content Popularity

Service scalability and the ability of the session controller to manage all content requests (especially during periods of high demand) is critical. With TeraVM one can implement scaled test scenarios of thousands of subscriber requests and determine the resilience of the video service.

## Functionality

| TeraVM VoD                   | Description   |
|------------------------------|---|
| <b>Video Availability</b>    | • Establish RTSP sessions, feature test RTSP trick modes – pause, rewind and fast forward |
|                              | • Connect to individual movies to verify accessibility                                    |
|                              | • Test remote site caching policies   |
| <b>Video Quality</b>         | • Determine video/audio quality from remote endpoints on a per movie basis                |
|                              | • Configurable buffer sizes to emulate different viewing devices                          |
|                              | • Implement live scenarios of users losing connectivity and rejoining movies              |
| <b>Growing Video Catalog</b> | • As the video catalog grows, verify that the session controller's database is up to date |
|                              | • Verify that the session controller is keeping track of older content and locations      |
|                              | • Assess load balancing and efficient use of the media servers                            |

## 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 video on demand. Below are a few example metrics:

- Sessions established
- Sessions errored/failed
- Media throughput
- Time to viewable media
- RTSP packet counts
- Packet loss/latency
- Buffer overrun/underrun
- RTP jitter
- Video/audio MOS score

|                                   |  |
|-----------------------------------|--|
| <b>General</b>                    | Real-time isolation of problem flows                               |
| <b>Data</b>                       | TCP / UDP  |
|                                   | HTTP (headers, substitution, attachments)                          |
|                                   | SMTP / POP3 (incl. file attachments)                               |
|                                   | FTP (Passive/Active), P2P applications, DNS                        |
| <b>Address</b>                    | MAC, VxLAN   |
|                                   | DHCP, PPPoE (IPv4 & IPv6)  |
|                                   | Dual Stack (6RD, DS Lite)  |
| <b>Ethernet Switch</b>            | VLAN and Double VLAN Tagging (Q-Q)                                 |
|                                   | ACL, 802.1p, DSCP  |
| <b>Replay</b>                     | Replay large PCAP files - TCP, UDP and raw data playback           |
|                                   | Amplify and dynamically substitute data into PCAP files            |
| <b>Video</b>                      | 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   |
| <b>Secure VPN</b>                 | 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   |
| <b>Security Attack Mitigation</b> | Spam / Viruses / DDOS  |
| <b>Voice</b>                      | VoIP: SIP & RTP (secure & unsecure), H.323                         |
|                                   | Dual Hosted UACs, SIP Trunking                                     |
|                                   | Voice & Video quality metric (MOS)                                 |
| <b>LTE/4G</b>                     | GTP tunnel support   |
| <b>SLA</b>                        | TWAMP  |
| <b>Automation</b>                 | CLI, Perl, TCL, XML, Java API                                      |