

# Testing HTTP Adaptive Bitrate (ABR) Video with TeraVM

TeraVM statefully emulates the leading HTTP adaptive bitrate streaming players: Adobe® (HDS), Apple® (HLS), Microsoft® (Smooth) and MPEG-DASH.

HTTP adaptive bitrate (ABR) players allow network users to consume video content customized to the screen resolution, frame size and frame rate of the device and/or the conditions of the network path when the video is streaming. This form of video distribution is often referred to as Over-The-Top (OTT) video. The ability of the HTTP adaptive streaming player to adapt to its conditions results in multiple video file formats of varying frame sizes and rates being sent from the origin server during a single video session. The challenge to testing ABR video services is the need to facilitate these change requests live during the test. The forced switch over helps determine the availability of each of the associated frame rate file formats under varying network load conditions.

TeraVM is the only virtualized test solution available that enables stateful emulation of all the leading ABR streaming players: Adobe® (HDS), Apple® (HLS), MPEG-DASH and Microsoft® (Smooth). Because TeraVM's emulated ABR streaming players are stateful they can request content from live 3rd party video servers and provide detailed performance measurements on a per emulated player basis.

## Features

- Emulate HDS, HLS, MPEG-DASH and Smooth adaptive bitrate streaming players
- Concurrent testing of all the leading HTTP adaptive bitrate streaming servers
- Parse served manifest files, request content for each available source
- Configurable playout buffer sizes
- Delay playout based on fragment or chunk rates
- Automatic up/down shift of video quality rates on demand
- Force video file switch overs
- Configure per emulated player quality rate cycle (up and down) lists
- Dynamic control of emulated players during live test runs

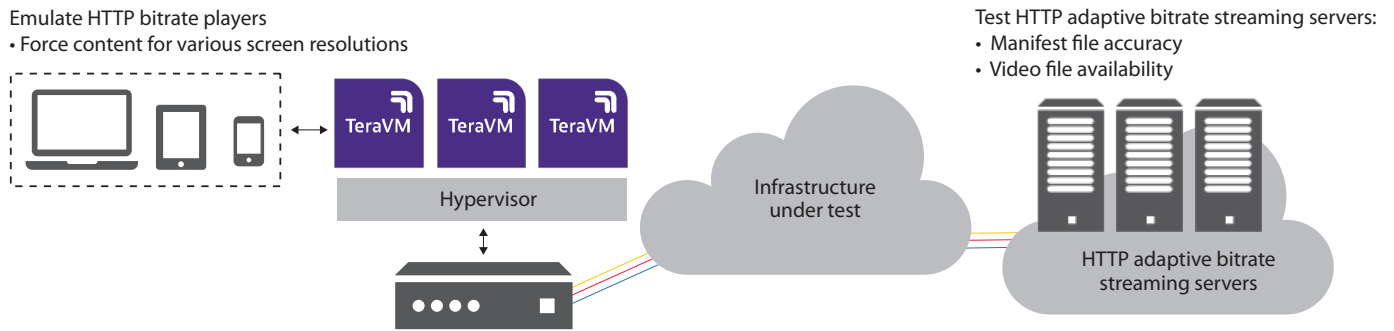


Figure 1: Example TeraVM deployment - testing adaptive bitrate streaming

TeraVM's ABR testing capabilities are used in a number of test scenarios including adaptive video streaming service reliability and robustness testing. TeraVM is also used by service providers to determine the impact that a large number of active streaming users has on regular traffic flows such as voice and data.

## Example Scenario

TeraVM is used to test HTTP adaptive bitrate streaming services by emulating the leading players. The per flow architecture of TeraVM enables unique content requests per player, ideal for scalability and robustness testing. In addition, TeraVM can be configured to force the source to adapt or switch over the video file based on quality parameters on an upward or downward basis.

TeraVM is an ideal solution to test and measure performance of the following HTTP adaptive streaming attributes:

- Accuracy of the manifest file (per video)
- Availability and accessibility of each and every one of the video file formats
- Response rates to video switch over requests
- Scalability of the service

## Functionality

TeraVM ABR Capabilities	Description
<b>Stateful Emulation</b>	Emulate HDS, HLS, MPEG-DASH and Smooth adaptive bitrate streaming players
	Interoperate with 3rd party video servers: request manifest file, request media per manifest file descriptors
	Emulate both the MPEG-DASH client and server
	Supports video switch over requests
<b>Analysis Per Player</b>	Analysis on a per emulated player basis
	MOS equivalent scoring for each of the ABR types
	Analysis of video: timing performance on each of the sources for each and every variant of the media file
<b>Player Functionality</b>	Adjustable playout buffer size and delays
	Dynamically force video quality switch over on an up or downward basis
	Unique user login details per player
<b>Scalability</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 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 video on demand. Below are a few example metrics:

- Retrieval times
- HTTP response codes
- Established Connections
- Availability of Manifest files
- Packet loss
- Buffer Overrun/Underrun

## Applications Supported

<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, MPEG-DASH)
	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 stack 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



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