Cisco Media Broadcaster

Cisco Media Broadcaster provides service providers a cost-effective and scalable solution for streaming HTTP adaptive bit rate live video to the in-home primary screen using network IP multicast.

The IP video growth challenge

Demand for online video continues to grow dramatically across connected devices. The Cisco Visual Network Index™ forecasts that by 2021 there will be 27 billion connected video devices, with 82 percent of IP traffic being video. Live video will increase 15-fold to 13 percent of video traffic, and ultra-HD IP video is forecasted to reach 21 percent of all video traffic.

The market trends presents some major challenges for video service providers:

- The shift to mobile Adaptive Bit Rate (ABR) clients requires service providers to operate two parallel delivery systems and headends: MPEG2TS for the legacy set-top boxes and IP ABR for mobile devices. This duplication has significant CapEx and OpEx cost implications.
- Streaming ABR using unicast requires a separate session for each viewer. This delivery method cannot scale to the forecasted load of live video, especially for popular live events such as the Superbowl or the World Cup Finals as well as sensational news events with burst viewership.
- Because of the nature of unicast streaming, the increase in video traffic volume will require significant infrastructure investment at the edge of the network to absorb the load.

Cisco Media Broadcaster solution overview

The Cisco® Media Broadcaster solution provides service providers a next-generation solution for streaming HTTP ABR video to the in-home primary screen using network router IP multicast to achieve broadcast-efficient distribution. It integrates with the existing ABR delivery system without a need for any modifications to the video headend components (for example, encoder, packager, content delivery network [CDN]) or to the ABR clients. The solution ingests unicast video from the origin server, converts it into multicast data, and distributes it all the way to the home router or set-top box, where it is converted back to unicast video. The solution is implemented to be fully transparent to both the ABR client and the ABR headend.

Because the solution is independent of the existing video delivery infrastructure, it can be integrated with any existing video headend or CDN provider. The solution is highly available and scalable and can support millions of viewers at once.
The solution offers:

- **Efficient live ABR video distribution** to stream to millions of homes with one IP multicast session
- **Cost reduction**, which enables convergence to all ABR headend and all ABR clients
- **Transparent deployment** with no change to the ABR video headend infrastructure, CDN, and ABR players
- **Reliable transmission** with Forward Error Correction (FEC) unicast retransmit
- **Optimized network capacity utilization** for significant reduction of CDN resources compared to unicast ABR

**Cisco Media Broadcaster advantages**

The Cisco Media Broadcaster solution’s primary design goals are to achieve:

- **Transparency to existing ABR media players**: does not require modifications of the ABR media player
- **Transparency to existing ABR headend**: does not require any modifications of encoder, packager, or CDN
- **Transparent switching** between unicast and multicast live video streaming in Customer Premises Equipment (CPE)
- **Centralized or distributed deployments of MC-sender**, depending on the service provider network
- **Transparent error repair** for packet loss, employing both in-band FEC and unicast retransmit fallback
- **Support for IPv4, IPv6, IGMPv3, and IGMPv4** to be compatible with existing multicast standards and networks
- **Flexible CPE strategy**: ability to integrate the MC-receiver client into an STB or HGW
- **Rapid channel change** using unicast client buffer filling from CDN or MC-receiver cache

**Why choose Cisco Media Broadcaster**

- Cisco is a world leader in switching, routing, and service provider video and for more than 10 years has been providing CDN and IPTV technology to meet video service provider needs for video delivery of MPEG2TS and HTTP ABR. The Cisco Visual Quality Enhancement (VQE) solution for multicast MPEG2TS provides rapid channel change and error repair. Building on this heritage and experience, Cisco is now introducing a new multicast ABR solution. Working with Cisco means you benefit from a strategic partner that provides in-depth experience and expertise, ongoing research and development, and a comprehensive product platform. We understand your needs and have solutions to meet them.

- **We offer**:
  - **Flexible architectures**: Our comprehensive product platforms can easily expand as new services are needed. Organizations worldwide rely on Cisco to meet their broadband and video communication needs.
  - **Open specifications**: The Cisco Media Broadcaster solution is based on open reference design and best practices, which are applicable to both cable and telecommunications networks.
Solution architecture

Cisco Media Broadcaster is based on a reference architecture for a multicast ABR video distribution solution released to the in community 2015–2016.

Figure 1 illustrates the solution architecture and main components.

Figure 1. Solution architecture and main components

The solution consists of three main components:

- **The multicast ABR sender (MC-sender):** The MC-sender is application software running on a Linux operating system (bare metal, virtualized, or containerized) in the service provider’s headend. The primary functions of the MC-sender are:
  - Acquire a live ABR stream from the CDN or origin server using unicast HTTP/TCP requests
  - Encapsulate the video data and FEC for multicast distribution
  - Transmit the data packets to the multicast address group
  - Rate pace the multicast video distribution rate
  - Optionally QoS mark (DSCP) the multicast data

- **The multicast ABR receiver (MC-receiver):** The MC-receiver can be integrated into the STB or HGW as application software running in a CPE middleware operating system. The primary functions of the MC-receiver are:
  - Stream HTTP/TCP unicast video to HTTP ABR media player
  - Implement a proxy cache toward the HTTP media player
  - Acquire (ingest) ABR video using multicast or unicast, with transparent switching, and fill proxy cache
  - Cache reliable fragmented HTTP video (HLS and DASH supported, HSS roadmap for end 2017)
- Packet error repair using combination of FEC in band when possible and fall back to unicast request retransmission from CDN
- Stream to in-home multiple media player clients a common stream or multiple unique streams

- **The multicast ABR controller (MC-controller):** The MC-controller is application software running on a Linux operating system (bare metal, virtualized, or containerized) in the service provider headend. The primary functions of the MC-controller are:
  - Distribute configuration information to the MC-sender and MC-receivers
  - Receive stream status messages from MC-receivers containing channel viewing and streaming statistics
  - Message the MC-sender which URI (streams) to distribute on which multicast address. This is referred to as a “channel map”
  - Message the MC-receiver which streams to join and the associated multicast address (channel map)
  - Provide policy-based or popularity-based configuration of streams to multicast. Policy-based is typically to “pin up” streams to always multicast, and popularity-based is for switching streams on or off based on concurrent viewer threshold crossing
  - Export data to Cisco Media Broadcaster element management system

**Cisco Open Media Distribution Director** is a Cisco centralized element management system for provisioning, monitoring, and analyzing the Cisco Media Broadcaster solution. The OMD Director is a common EMS for both Cisco’s unicast CDN (Cisco Media Streamer) and new Cisco Media Broadcaster solution. When Cisco’s CDN is also deployed with the Cisco Media Broadcaster solution, a common OMD Director instance is used to provision, monitor, and analyze both unicast and multicast distribution. OMD Director can be deployed for Media Broadcaster only as well.

**Product specifications**

Table 1 outlines the main feature of Cisco Media Broadcaster.

**Table 1.** Cisco Media Broadcaster features

<table>
<thead>
<tr>
<th>Description</th>
<th>Specification</th>
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<tbody>
<tr>
<td>Ingest content type</td>
<td>• MPEG-DASH: SCTE 214 compliant (H.264, MPEG2 segments)</td>
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<td></td>
<td>• Apple HLS (roadmap)</td>
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<td>Transparent to ABR headend, CDN, and</td>
<td>• Does not require modification of encoding, packaging, origin server, CDN,</td>
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<td>ABR media players</td>
<td>or clients in order to multicast standard ABR segments</td>
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<td></td>
<td>• Use your existing CDN or combine with Cisco Open Media Distribution CDN for complete Cisco solution</td>
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<td>Supports most ABR and DRM formats</td>
<td>• Apple HTTP Live Stream (HLS)</td>
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<td></td>
<td>• MPEG Dynamic Adaptive Streaming over HTTP (DASH ISO-BMFF)</td>
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<tr>
<td></td>
<td>• MPEG1, MPEG2, MPEG4/H264/H265</td>
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<td></td>
<td>• DRM independent</td>
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<tr>
<td>Compatible with TSTV and trick modes</td>
<td>• Does not interfere with existing CDVR solutions and supports client pause, FF, RWD functions (with unicast CDN support for TSTV)</td>
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<tr>
<td>Transparent unicast to multicast</td>
<td>• Transparently switch between unicast and multicast video stream ingest</td>
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<tr>
<td>switching</td>
<td>• FEC (Reed Solomon) for in-band FEC repair in STB or HGW</td>
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<td></td>
<td>• Fallback to unicast HTTP retransmit from CDN</td>
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<td>Reliable video with error correction</td>
<td>• Supports DSCP marking of multicast streams for network QoS enforcement</td>
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<tr>
<td>QoS marking</td>
<td>• Multicast receiver (embedded client) can be deployed in home gateway or set-top box for flexible deployment options</td>
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<tr>
<td>Description</td>
<td>Specification</td>
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<tr>
<td>Network standards</td>
<td>• Supports IPv4, IPv6, IGM2, IGMP3, PIM-SM, PIM-SSM</td>
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</table>
| Content distribution policies | • Supports both policy-based and popularity-based stream distribution  
• Policy-based preconfigures streams to multicast, typically most popular  
• Popularity-based dynamically switches on/off multicast streams, based on viewership popularity |
| Security | • Cisco Media Broadcaster supports existing DRM  
• HTTPS messaging between application servers  
• Secure OMD Director GUI |
| Hardware support | • Application servers run on Linux OS on x86 COTS servers  
• High-performance Cisco UCS® C220 server with performance SLAs |

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