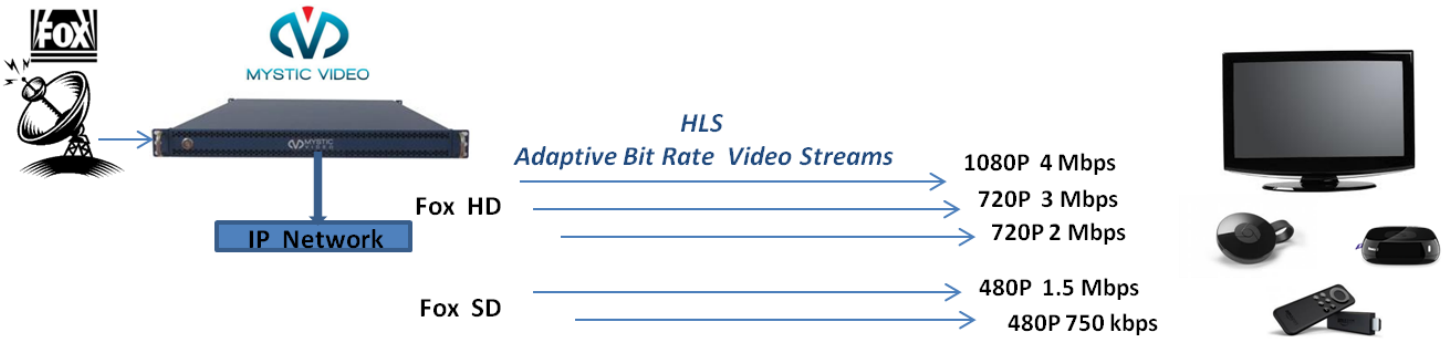
White Paper - MPVD's
Building a Live Video Streaming Service

This paper explains at a functional level the piece parts needed by MPVD's to deploy a successful adaptive bit rate live streaming video service.

MPVD's are turning to **Adaptive bitrate (ABR) streaming** technologies based on **HTTP** to deliver new video services to their broadband customers which previously could only be provided on dedicated networks such as cable QAM and IPTV multicast. This allows many MPVD's to reach a much larger percentage of their customers base with video services. It is currently popular for MPVD's to create smaller, lower cost program packages, usually consisting of off air local channel programming, geared toward keeping the growing segment of internet savvy customers called "cord cutters".

The technology is designed to work efficiently over large distributed HTTP networks such as the Internet. It works by detecting a user's bandwidth in real time and adjusting the quality of a video stream accordingly. The player client switches between streaming the different encodings depending on available resources. It provides customers with the best-possible experience, as it adapts to any changes in each user's network and playback conditions.

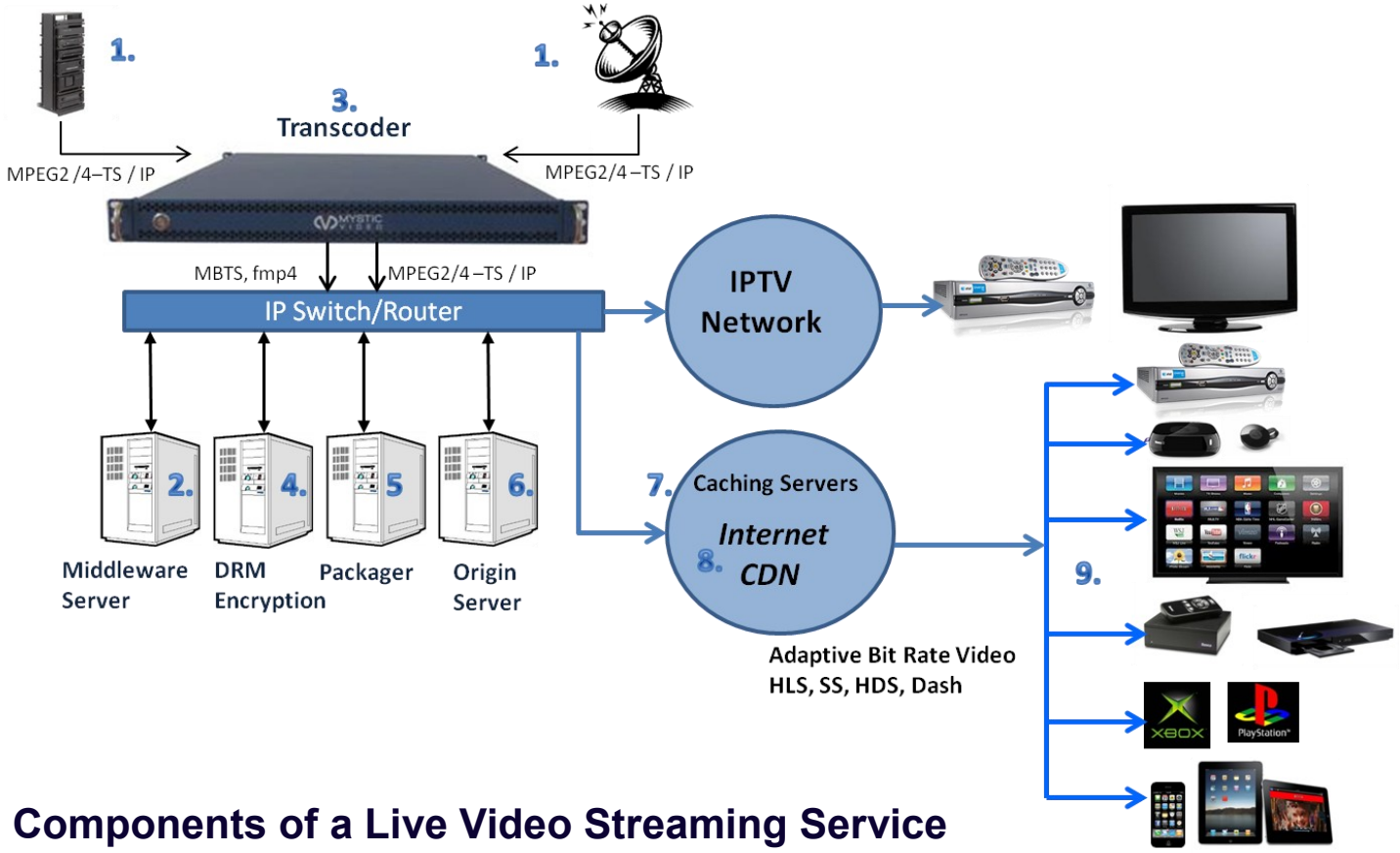
Example - Off Air Live Channel ABR Streaming Video service to MPVD's broadband customers through a HLS capable Set Top Box



HTTP Adaptive bitrate technology requires additional encoding and video processing components versus the traditional MPVD video plant. Let's take a look necessary piece parts in the following pages in more detail.

About Mystic Video

The Mystic team is a group of veteran broadcast industry leaders whose previous products power many major Broadcast Operators' systems. Mystic's experience in digital video coding, transformation, and real-time system design produces equipment with the highest video quality, transcoding performance, and 24/7 operation. The new Mystic Transcoder architecture surpasses old ASIC and software transcoders and future-proofs all IP delivery needs.

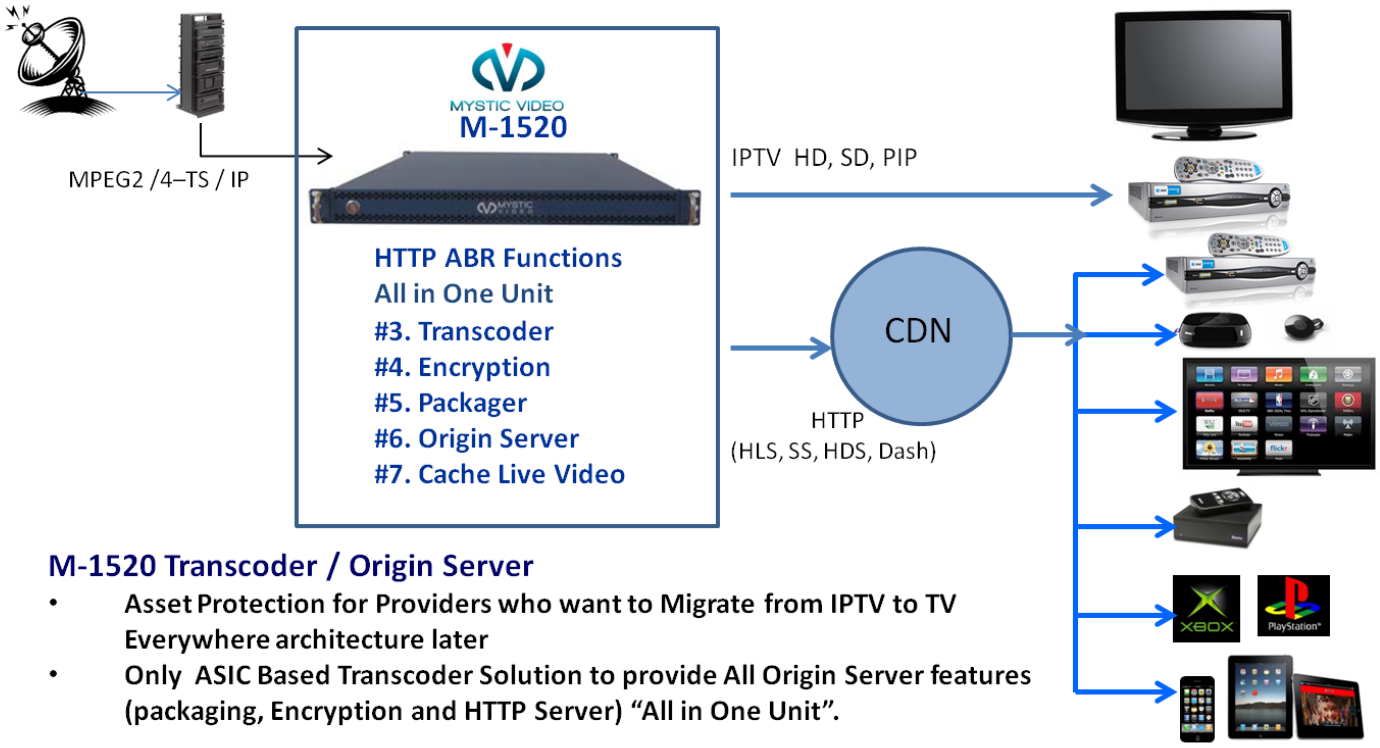


Components of a Live Video Streaming Service

1. **Live Video Feeds –** Programmer video feeds either from off air or from national feeds off satellite
2. **Middleware** – A software server that authenticates all users and provides a user channel guide to the client's video player.
3. **Video Encoder/Transcoder -** Encodes video using H.264 video codec and AAC audio codec, compresses video further, into one or multiple adaptive bit rates and resolutions. The transcoder ensures all IDRs are aligned for all the bitrates for a given channel group. This enables seamless switching between different bit rates by the video players.
4. **Encryptor –** Optionally, receives encryption keys from Digital Rights Management (DRM) systems and encrypts the live video using AES(128) encryption algorithm.
5. **Segmentor Packager –** Breaks down video streams into several small MPEG2-TS files (video chunks) of varying bit rates and duration. It packages them into HLS, Smooth Streaming, HDS or MPEG DASH containers. It also creates text-based manifest files that are used later by the video players to tune to and switch seamlessly between each of the encoded streams.
6. **HTTP Origin Server** - Video files are uploaded to an HTTP server for access by clients through the CDN. The transport stream chunks are continuously added and the manifest files continually updated with the locations of alternative bit rate streams. The HTTP Server responds to requests (via HTTP Gets) for video from CDN reverse proxy caching servers on clients behalf.
7. **HTTP Caching Servers** – They are the key components making up the Content Distribution Network (CDN). These servers receive the initial HTTP request for video from a client. It then either handles the request itself (if it has a fresh cached copy of the requested video) or passes the request off to the Origin Server to fulfill. Additional servers and/or GigE capacity may need to be added as the number of simultaneous subscribers scale higher.
8. **Internet** – IP Network starting from the video head end to the end customer's home. Usually a private broadband providers network but can also operate if desired over the open internet.
9. **HTTP Video Player –** This can be an HTTP supported set top box, or a web browser with a supported HTTP video player software on any consumers device (smart phone, tablet, PC, Internet enable TV's).

Mystic Video is helping MPVD's deploy live streaming video services with a full range of standards based cost effective Transcoding and Origin Server solutions

Mystic Video
Live ABR Streaming
Transcoder/Origin Server Solution



M-1520 Transcoder / Origin Server

- **Asset Protection for Providers who want to Migrate from IPTV to TV Everywhere architecture later**
- **Only ASIC Based Transcoder Solution to provide All Origin Server features (packaging, Encryption and HTTP Server) "All in One Unit".**

Using the Mystic M-1520, MPVD's can achieve the best video quality using specialized video asic's for compression and transcoding processing for ABR HTTP video streaming applications as well for use in IPTV multicast application.

In addition, the M-1520 comes with Intel based processors inside which deliver a full functioning HTTP packager, encryptor and Origin Server software needed to deliver ABR HTTP live streaming video.