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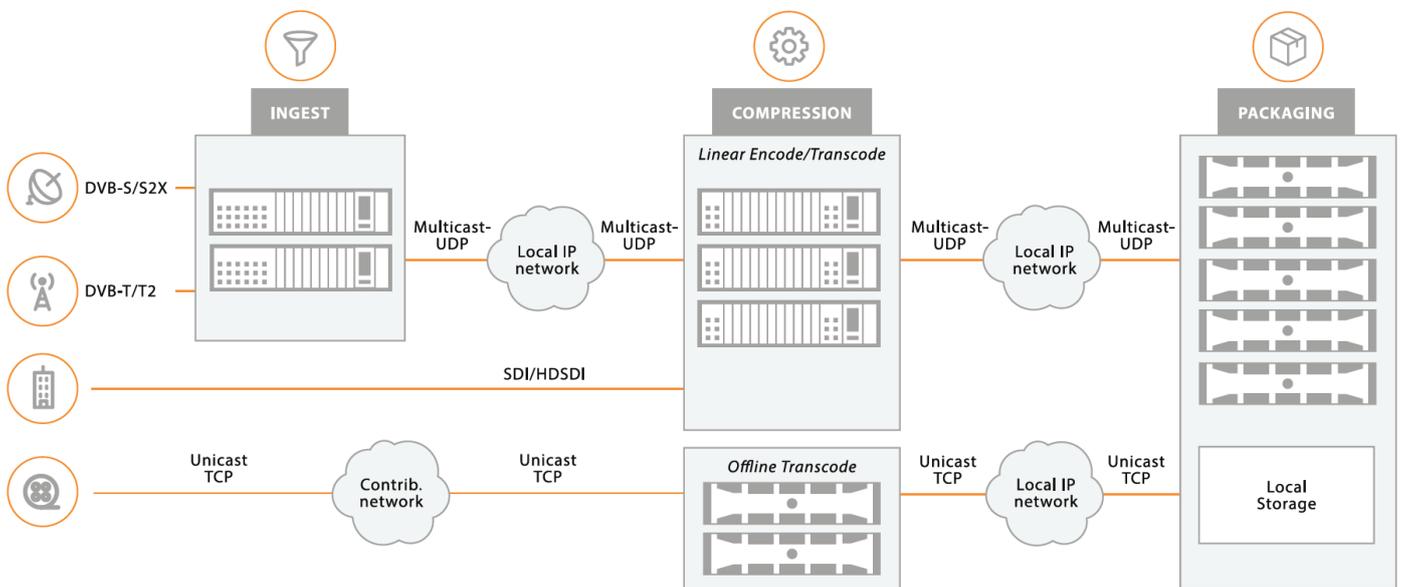
ADAPTIVE BITRATE SERVER

## THE APPEAR TV LINEAR PACKAGING SOLUTION FOR OTT

Traditional TV delivery is no longer enough for consumers. They expect access to content anywhere and on all devices. Over-the-top (OTT) delivery provides a solution by allowing content to be distributed over unmanaged IP networks to all kinds of devices. This type of delivery presents new challenges as unmanaged networks are not necessarily capable of predictably transmitting high quality video. Typical users on a shared network can do any task, from watching movies, video conferencing, reading mails, downloading files to playing games. Available bandwidth in shared network environments will therefore vary with time as it is driven by user behavior.

Adaptive bitrate (ABR) streaming solves this issue by adapting to changing network conditions dynamically. In essence, ABR provides variable video quality depending on available bandwidth. If bandwidth is reduced, video quality is reduced without the customer experiencing constant buffering issues and interrupted transmissions.

AppearTV offers an extensive portfolio of OTT solutions, with the ability to support hybrid broadcast delivery from the same equipment.



System overview of live delivery chain.



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## The ABR packaging server supports a variety of different deployment architectures.

### APPEAR TV'S EXTENSIVE PORTFOLIO OFFERS EVERYTHING NEEDED TO DELIVER OTT (AND HYBRID BROADCAST) TV

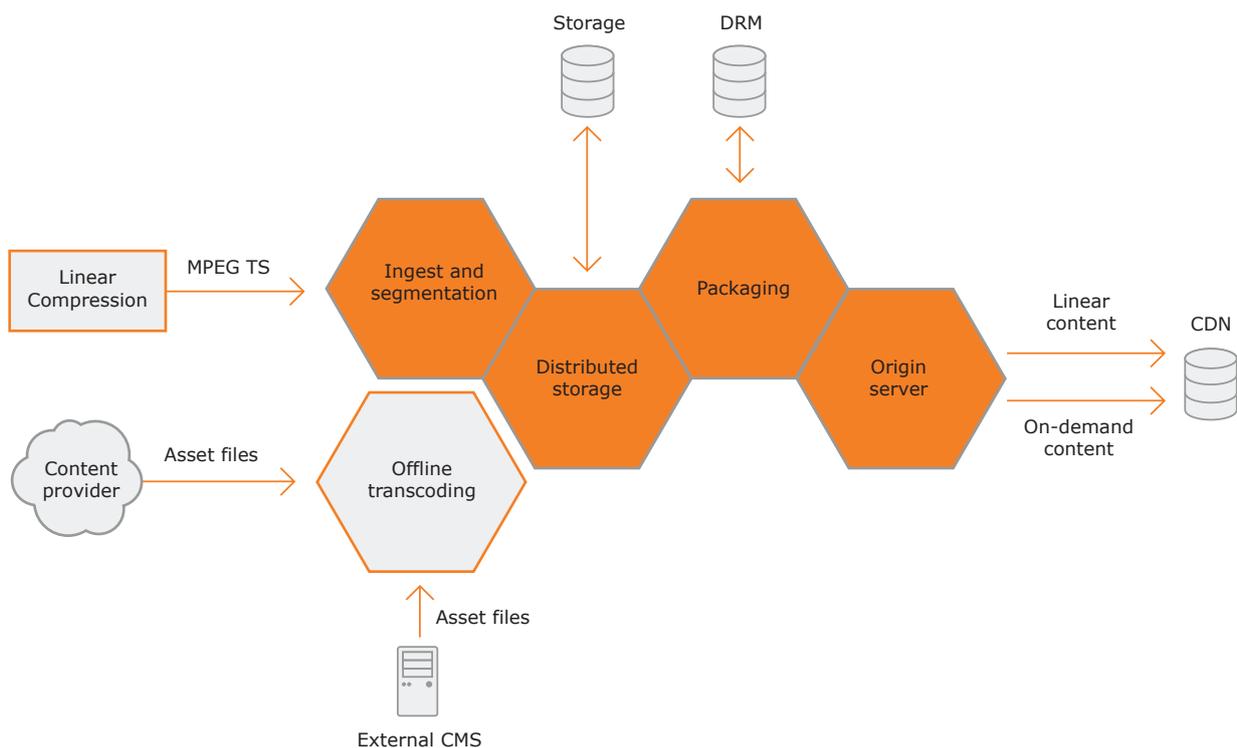
The OTT product portfolio can be divided into **content acquisition**, **compression** and **packaging**.

Appear TV implements the **content acquisition** (including input from multiple sources, descrambling, stream processing) and **linear compression** stages in our X Platform and XC Platform, fully modular hardware appliances. The X and XC delivers highly space and power efficient solutions offering full redundancy, the highest standards of performance and exceptionally high reliability. For a software-driven solution, Appear TV offers our software-based video compression, allowing for both live and file transcoding. For more information on content acquisition and compression, please refer to the X Platform, XC Platform and software-based video compression datasheets.

The Appear TV ABR system is a modular software solution providing a powerful video segmentation engine, high-performance storage solution, packager, DRM engine and origin server in one complete suite. The ABR system runs on industry standard off-the-shelf server hardware and can be customized to meet the operators' specific streaming requirements.

With its innovative architecture, our ABR Server allows for seamless growth and scalable redundancy – both through vertical brick-by-brick scaling and horizontal functional separation. It enables linear just-in-time packaging with features for start-over, catch-up, nPVR and VOD, and is designed with large scale OTT operations in mind.

The ABR **packaging** server supports a variety of different deployment architectures, including edge deployments without CDN support. It is encoding vendor agnostic and its strict standards compliance allows for easy integration with third-party encoders.

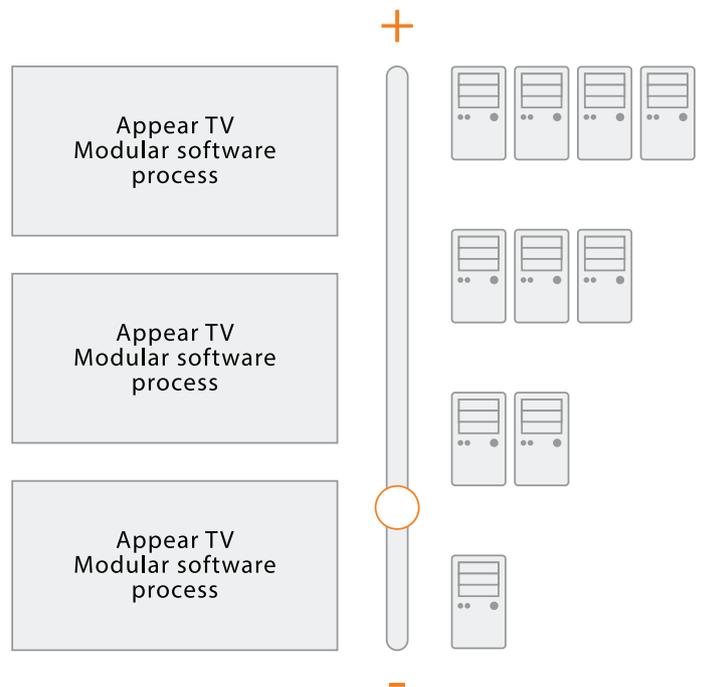


Components that make up the Appear TV delivery solution.

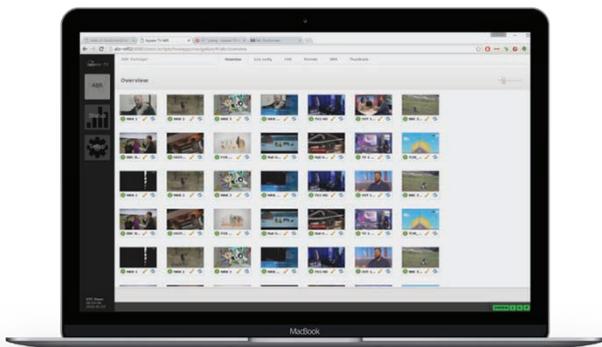
## LIVE, CATCH-UP AND ON-DEMAND

The modular software elements forming the ABR software suite are designed to work together and scale precisely as required. The ingest and segmentation module accepts DVB compliant MPEG transport streams for splicing into chunks of pre-determined duration around IDR or alternative markers. The chunked files are passed to the linear packaging stage, and can be stored internally or externally for catch-up, time-shift or Live-to-VOD. The linear packager module will adapt the generic chunks generated by the ingest and segmentation module to the requested output format (MPEG DASH, HLS, HSS and CMAF) on the fly, including applying DRM to protect the content.

The ABR software is integrated with all major DRM solutions. The packaged content is cached in the origin and distributed to users requesting the same content within the stored timeframe, thus eliminating the need for packaging the same content repeatedly within a set timeframe.



*The Appear TV solution scales to meet all needs.*



*Thumbnails gives accurate overview of system state.*

OTT delivery technology is constantly changing, and Appear TV is fully committed to follow changes in requirements. Our “new from the ground up”-approach provides a scalable solution that grow with streaming demand changes. OTT is the future of television, and through advertising or subscription models it is capable of delivering the most feature rich and monetized services in television today. The growing penetration of consumer devices with large-screen, high-resolution displays (including connected TV sets), the consumer preference to download content and the need to offer true broadcast grade services to all devices are driving a steep change in OTT opportunities and the technology required to deliver it successfully.

Investing in Appear TV compression and ABR solutions will place state of the art technology at the heart of your operations and will provide the ideal platform to secure your position in the next chapters of OTT.

## SEAMLESSLY SCALED OTT

The ABR system is flexible and easily scaled to remove bottlenecks. This is possible because Appear TV has implemented the packager using high performance clustering technology, using a common hardware pool to achieve system redundancy and scalability.

Ease of use always features as a key priority in Appear TV solutions, and the packager is no exception. Intuitive and clear interfaces with individual service monitoring to keep you informed of status makes it easy to operate.

# FUNCTIONALITY AT-A-GLANCE

## INGEST

The ABR system provides live ingest of multiscreen content through TSolP, with support for seamless input redundancy. In case of partial or complete input failure, ABR will attempt to replace missing video input with that of a lower bitrate or blank video. This prevents players from stopping in case of intermittent input issues. ABR processes SCTE35 markers and include the corresponding output in playlists and manifests to enable events like Dynamic Ad Insertion. Teletext subtitles are converted to WebVTT and TTML.

## STORAGE

Appear TV ABR server comes equipped with our own streaming optimized storage: Appear Media Storage (AMS). AMS is specifically designed to solve the challenges related to OTT video storage, and enables scalable and redundant storage on your ABR nodes. In addition to AMS, ABR can leverage third-party NFS and S3 storage solutions, and multiple interfaces can be set up to support tiering and archiving. ABR provides several tunable parameters to prevent overload and enable efficient use of third-party storage.

## PACKAGING

The just-in-time packaging delivers HLS, DASH, HSS and CMAF formats, and is capable of serving both live and on-demand content. By performing packaging on-the-fly, storage requirements are reduced, and existing content can be delivered in new and updated packaging formats as they become available. An unlimited amount of packaging endpoints can be created for the content, each with settings for 3GPP, HbbTV, SCTE35 and the like.

## DRM

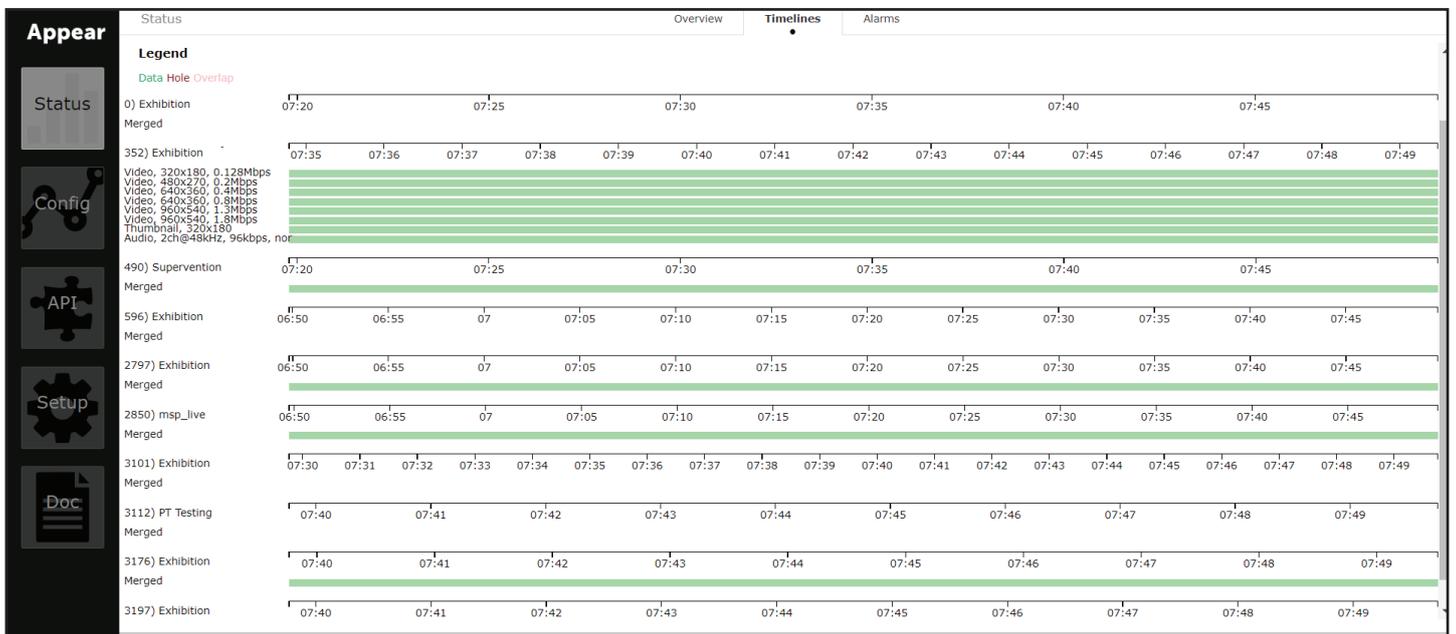
With support for Apple FairPlay, Google Widevine and Microsoft PlayReady encryption schemes, the ABR system provides native security on all platforms. And with support for common encryption multi-DRM, encryption overhead is reduced as a single encryption process is used to target different platforms with its native DRM. In combination with CMAF streaming format, a single media representation may also be used towards all platforms, cutting CDN costs substantially. The ABR servers use CBCS encryption for content at rest and Docker for process isolation.

## ORIGIN

With support for CDN whitelisting, blacklisting and authentication, as well as caching, the ABR Origin is an ideal source for your OTT deliveries.

## API

The ABR system API provides all the necessary interfaces for VOD ingestion, content management system integration and middleware interaction. Our flexible REST operations expose a complete model of the stored data, and are suitable for many different use-cases, including broadcasting, VOD delivery and production environments. The APIs are available over HTTPS with authentication.



Status view, ingest timelines







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