ATSC 3.0 Next-Generation TV for Programmers and TV Networks

Video Processing

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This solution brief explains how ATSC Broadcasters can swiftly migrate to ATSC 3.0 using Synamedia's Terrestrial Broadcast Solution.

Market Landscape

While the broadband industry has already shifted to delivering content at any time to any screen, broadcast television still relies on standards that were created in the early 2000s to support the analog to digital TV transition. The broadcast industry has therefore developed a new set of standards that brings together over-the-air (OTA) broadcast and broadband allowing them to deliver next generation TV.

Following the FCC's Broadcast Incentive Auction, in which broadcasters offered to voluntarily relinquish some or all of their spectrum usage rights, about 1000 TV channels will need to be moved.

The FCC also has stated that ATSC 3.0 deployments are voluntary and left to the market.

At the same time ATSC 1.0 signals will need to be simulcasted and hence require broadcasters to cooperate in each market by co-locating ATSC 1.0 services on a single transmitter.

Several broadcasters have signed agreements and made statements to work together in launching next-gen TV in 2020.

As the transition is voluntary, the FCC will not require ATSC 3.0 tuners to be included in new televisions, and there will not be a subsidy program for the distribution of ATSC 3.0-compatible equipment

At CES 2019, several manufacturers have been showing prototypes of ATSC 3.0 tuners and it appears that manufactures will introduce consumer TV products able to receive ATSC 3.0 in 2020.

Contents

Business Outcomes

ATSC 3.0 is a suite of new broadcast TV transmission standards that will be delivering higher-definition pictures, better audio as well as provide for interactivity, targeted advertising, advanced emergency alerting and other next-gen features.

The ATSC 3.0 standard gives broadcasters the potential to launch new and better services and generate new sources of revenue as business models evolve.

According to research conducted by BIA/Kelsey, "The Business Case for ATSC 3.0," a fairly bullish return on investment of 3 years for ATSC 3.0 is projected.

In that same report researchers also indicated that ATSC 3.0 will help increase advertising revenues through expanded viewership, better targeting of advertisements, improved viewership tracking accuracy, and expanded non-advertisement related revenue through the development of new IP-based broadcasting and non-broadcasting business models.
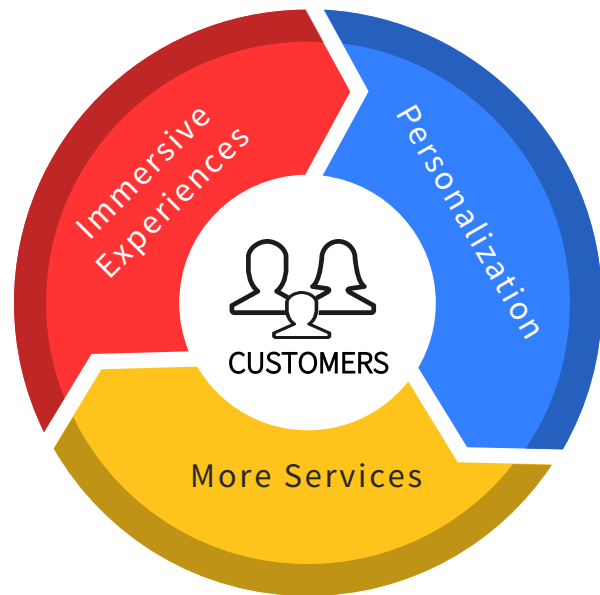
Immersive Experiences

Next Gen TV will not only allow broadcasters to transmit higher resolution video up to 8K, it expands quality of experience by including High Dynamic Range (HDR), Wide Color Gamut (WCG) and higher frame rates for a more immersive experience.

For coding, the video codec H.265 (High Efficiency Video Coding or HEVC) and audio codec Dolby AC-4 have been selected.

AC-4 is a highly efficient audio codec that supports object-based content, personalized content, and advanced metadata.

This enables broadcasters to deliver enhanced visual and aural quality experiences to virtually any screen.

Personalization and Interactivity

ATSC 3.0 standards include proven technologies used on the World-Wide-Web that allow viewers to enjoy interactive features and options they desire like voting and shopping, while advertisers reap the benefits of targeted advertisements as well as immediate and improved audience measurement accuracy.

More Services

At the transport level, ATSC 3.0 is an IP-based transmission where all streams are multicast.

A key advantage of this approach is that it allows scaling the number of viewers without a need to scale the infrastructure.

While no new spectrum is available for launching new ATSC 3.0 services, advances in audio-video coding as described above together with new robust modulation schemes where up to 57Mb/s can be delivered on a 6 MHz channel, enable Broadcasters to deliver more services and increase viewership.

Solution Description

Since no new spectrum is available to launch ATSC 3.0 channels, and ATSC 1.0 channels must be simulcast for several years, an important first step is to efficiently repackage ATSC 1.0 channels clearing spectrum to launch ATSC 3.0 services.

At a high level, Synamedia's software centric video processing solution, running on generic compute servers, on premises or in public cloud, enables broadcasters to efficiently encode and repackage existing ATSC 1.0 services while leveraging the same environment to create and launch next generation ATSC 3.0 OTA, mobile, and OTT services.

Repack of ATSC 1.0 Channels - Channel Sharing

Synamedia's Terrestrial Broadcast solution allows broadcasters to share post-reverse auction spectrum. Broadcasters can deliver the same user experience by levering increased MPEG-2 video coding efficiency and advanced statistical multiplexing algorithms.
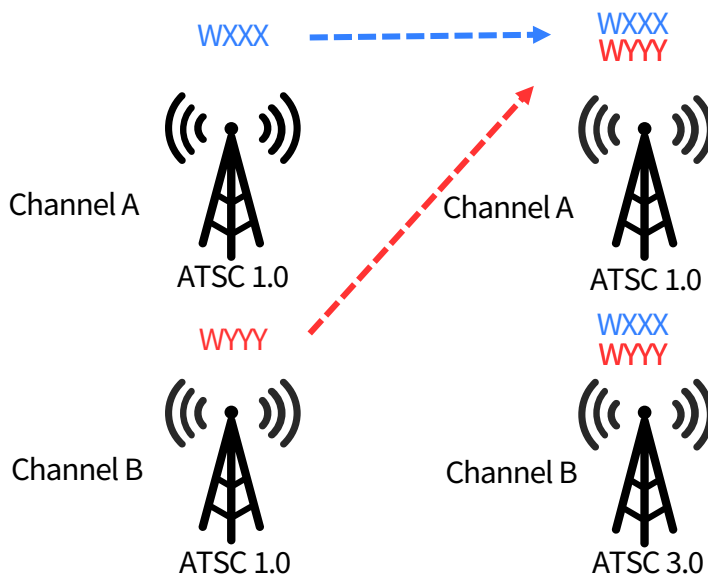

Figure 1   ATSC 1.0 Repack – Channel Sharing

Next Gen-TV with ATSC 3.0

Synamedia's converged software-centric solution allows broadcasters to quickly deploy channels using the new ATSC 3.0 family of standards. It also enables hybrid Broadcast OTA and broadband deployment models. (See figure, next page.)

Our Virtual DCM (vDCM) platform is a one-stop solution that provides MPEG-2, H.264 and HEVC encoding, transcoding in any resolution and for any screen, statistical multiplexing, splicing, DRM, packaging and advertisement insertion capabilities from a single software solution. The vDCM is an expanded version of its hardware predecessor, the Digital Content Manager (DCM), of which tens of thousands are in use every day around the world processing content for millions of viewers.
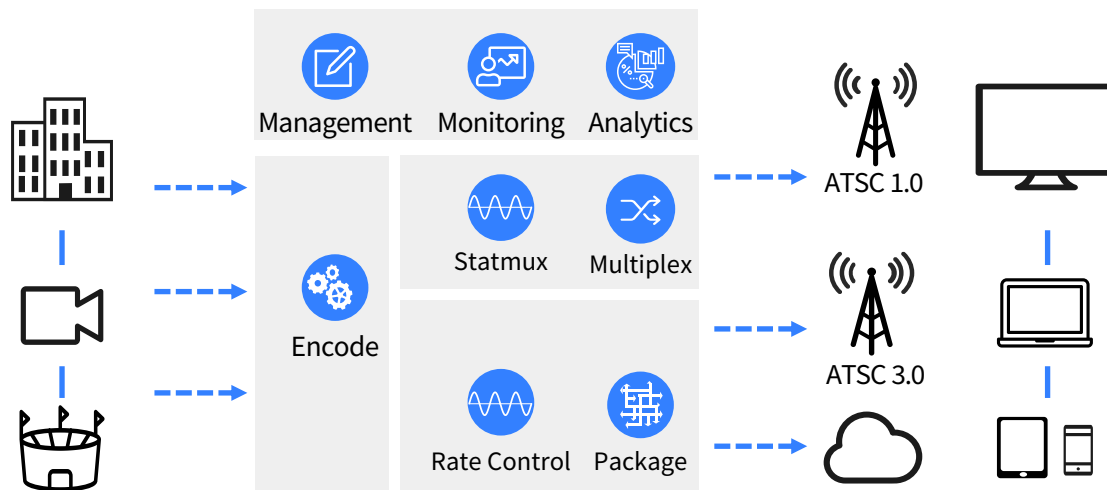
Figure 2   ATSC Solution Diagram

Key Capabilities

Converged platform

The vDCM represents a new generation of software-based video processing that runs on off-the-shelf servers and is built upon the foundations of the market-leading Digital Content Manager (DCM). It expands the well-known feature richness, picture quality, stability, and reliability of the widely deployed DCM platform in a flexible and configurable software package.

In addition to providing advanced video, audio, and metadata processing for live multi-format video delivery to any screen, it enables broadcasters to deliver best-in-class viewing experiences while meeting service requirements for premium picture quality, bandwidth efficiency, and multiscreen transcoding/encoding.

vDCM also supports DASH packaging, one of the media formats for transporting encoded video in ATSC 3.0.

Video Quality

The vDCM delivers outstanding encoding quality using market-leading MPEG-2, H.264 and High-Efficiency Video Codec (HEVC or H.265) technology developed by Synamedia.

Synamedia's Video Quality team is continuously improving our codec efficiency and quality

by adding new coding techniques, optimizing algorithms and enabling enhancements

by applying the latest techniques in machine learning to automate evaluation and discover new insights in large datasets with video quality scores over a wide range of test-cases.

As a result, our codecs provide excellent performance in bandwidth-constrained environments, and on-going improvements are easily implemented through software updates

Transcoding for DASH packaging and using vDCM's constant quality encoding based on Synamedia's unique Quality Metric (SVQ), called Smart rate Control (SRC), the DASH video segment average video bitrate is reduced by as much as 40-50%, without reduction in visual picture quality.

Rate Control for Linear Broadcast and Streaming

Synamedia's Unified Rate Control (URC) system is a state-of-the-art statistical multiplexing solution that is the result of nearly two decades of research. These algorithms make certain all channels in a stat mux pool are assigned the right amount of bandwidth frame by frame to deliver equal and great quality at every point in time.

These advanced URC algorithms have visibility over all encoding buffers, including mixed formats such as SD, HD, MPEG2, MPEG4, and HEVC, to optimize and equalize picture quality across all participating channels. The net result is an investment in unparalleled picture quality across all formats that benefits viewers.

Combining Statistical mux control with the above mentioned SRC, it is possible to control the total bandwidth at the output of the Broadcast Gateway to not exceed the capacity of the ATSC 3.0 channel.

The vDCM also includes a light-weight and real-time video quality monitoring metric that closely correlates with the human visual system. This unique capability allows broadcasters to confidently monitor the quality of every channel at any point in time on a real-time basis, and make adjustments to optimize content quality as needed.

Hybrid Delivery

Synamedia's Terrestrial Broadcast solution for ATSC supports the MPEG DASH delivery format for broadcast and broadband delivery of media and data in an integrated way. This approach allows to target different receiver types and deliver hybrid services to them from a single converged platform.

Reliability

Synamedia's vDCM is built upon the solid and proven foundation of the Digital Content Manager platform and is designed with quality and reliability as a key requirement.

Automated systems run thousands of test cases around the clock to verify the reliability, stability, code quality and performance of every vDCM update. vDCM is a high availability solution designed for the most critical and demanding applications

Utilizing our advanced features set that provides resiliency and redundancy on application, channel and stream level, Broadcasters can be confident to have a highly-available solution.

Monitoring, Management & Analytics

Synamedia's Video Service Manager (VSM) is a video processing management solution enveloping a powerful set of tools for configuring, monitoring and managing Synamedia's vDCM product suite and applications over unified or disparate geographic locations. For broadcasters, the VSM is an ideal solution to effectively manage ATSC 1.0 repacked channels originating from multiple locations while providing the same management capability and infrastructure for ATSC 3.0 distribution at a different location.

The VSM supports a diverse range of applications that allow operators and engineers with a service-oriented workflow management front end to operate and manage video signals for hybrid Broadcast/Broadband delivery in digital video processing headend applications.

Synamedia