

# Channel Sharing for ATSC Broadcasters

## SOLUTION BRIEF



As a result of the recent FCC incentive auction, many ATSC broadcasters have now entered into Channel Sharing Agreements (CSAs) that demand a new approach to utilizing the 19.4 Mbps spectrum. Meeting the requirements of these CSAs introduces a number of questions for sharees, among them: How do you maintain MPEG-2 video quality for multiple channels in just 6 MHz? What role can statistical multiplexing play? What's the best method for assuring you and your CSA partners each get your allotted bits?

Harmonic, the leader in video infrastructure delivery, offers a number of solutions tailored to the unique needs of channel sharers, all designed to address each of these challenges.

### Video Quality

When considering channel sharing, the most pressing concern is the desire to retain the highest possible video encoding quality. Performance is easily compromised, however, when addressing all aspects of the new ATSC business model. Harmonic Electra™ encoders are known for their high encoding quality, and our patented compression algorithms and technologies allow us to preserve that quality even in the most challenging of encoding environments. Each of our ATSC solutions offers high performance encoding and statistical multiplexing, designed to help you achieve the industry's best video quality while meeting the obligations of your CSA.

### Station Interconnection

In most cases, stations that will share a channel are not at the same location, so the video needs to be multiplexed into a single transport stream prior to reaching the transmitter. It is possible for each station to encode separately and then multiplex their streams together at the transmitter, but the resulting video quality will be severely compromised. To optimize performance, a statistical multiplex must extend across all channels, so any solution that fails to communicate between channels isn't really suitable.

It is also possible to encode at one station, decode at another, and then re-encode to build an efficient multiplex. The extra encode-decode step degrades the video quality of the second station, however. This approach may be workable, though, if high bitrates and MPEG-4 AVC encoding are used on the link. Harmonic's Electra X advanced media processors can accept both SDI and transport streams at the encoder, then encode the signal to either MPEG-2 or AVC, which eliminates the need for separate decoders — a feature that reduces costs and improves reliability.

## HIGHLIGHTS

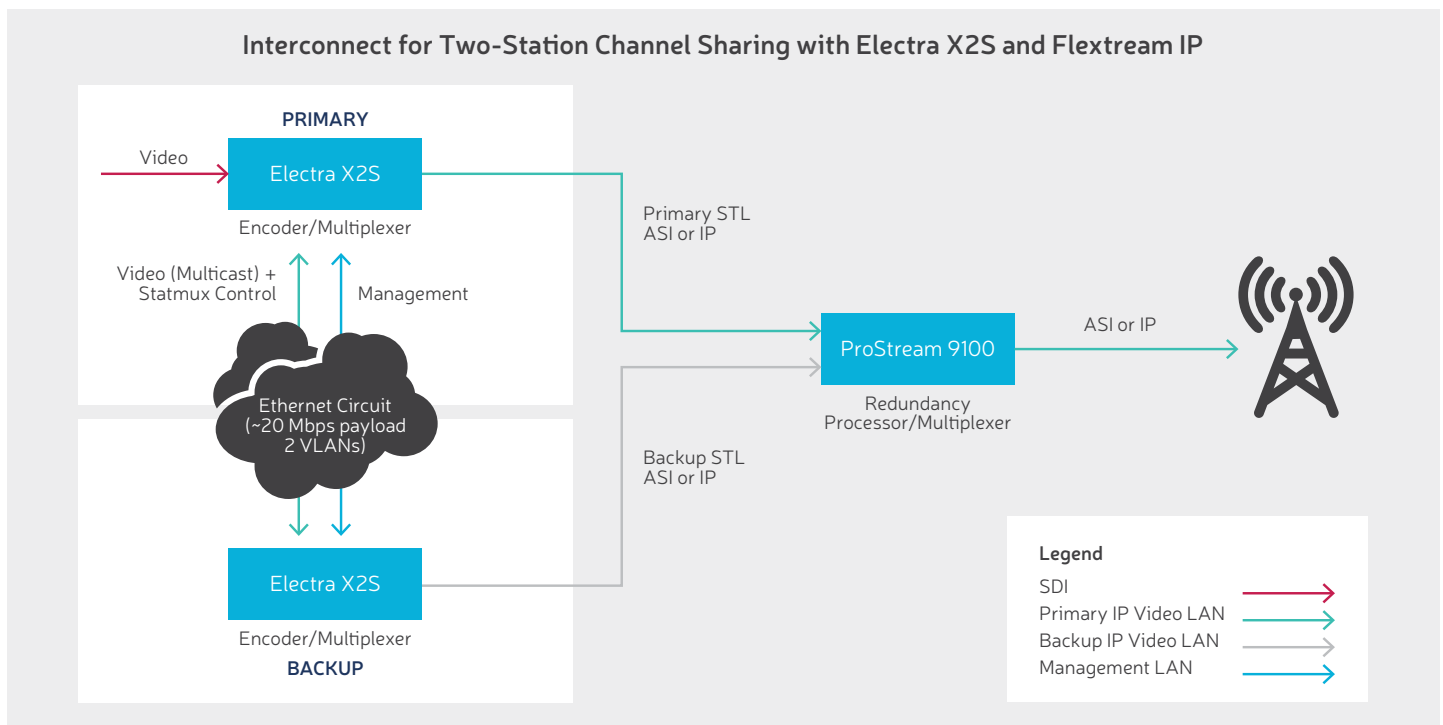
- Cost-effective solutions for ATSC channel sharing
- Maintain superior video quality
- Efficiently pack more MPEG-2 channels into 19.4 Mbps
- Create a statmux from geographically dispersed encoding feeds
- Ensure CSAs are honored
- Upgrade to HEVC via simple software license
- Robust, high availability solutions

## Distributed Statmuxing

For many broadcasters, the preferred method for maintaining video quality while optimizing bitrate efficiency is with Harmonic's Flexstream™ IP statistical multiplexing solution (formerly DiviTrackIP™). Available for the Electra X, Electra 9200 and ViBE EM4000 encoding platforms, Flexstream IP enables an MPEG-2 statmux to be built across multiple encoders, which may be located at great distances from each other. An Ethernet network between the encoders provides an exchange path for video and statmux information. Applicable for either LAN or distributed WAN environments, Flexstream IP can support up to 300 ms of WAN round-trip delay, auto-adjust to IP network variations, and form MPEG transport streams with up to 64 channels per pool.

## STL Redundancy

What happens if there is a major failure at the master station, or if its connection to the transmitter site or other station goes down? Flexstream IP offers a unique solution. If both stations have a studio-transmitter link (STL) to the transmitter site, full redundancy is possible. In case the primary STL fails, the other station's multiplexer and STL take over. It is also possible to protect against failure of the Ethernet. In the event of WAN failure, each encoder will assume it is the master and will run its own local pool. There is some degradation in video quality (because of dual pool operation), but both stations will remain on air until repairs can be made.



## The Business of Channel Sharing

Channel sharing depends on statistical multiplexing to provide optimized video quality, but the use of statistical multiplexing runs counter to the notion that each partner can receive a predictable percentage of the total bits. Solutions such as dual statmux pools or constant bitrate (CBR) encoding degrade video quality to the degree that they are unusable.

The business agreement between stations is complicated by statistical multiplexing. Neither party can achieve good quality without it, but this technology makes deterministic bitrates impossible. Some stations think that simply maximizing video quality for each partner is sufficient, but this approach offers no promise that there won't be disputes in the future. It is very difficult to allocate bitrates fairly if one station has a very different channel lineup or type of programming than the other.

## Flexstream Convergence

Flexstream Convergence is a unique new statmux technology for Electra X series encoders that provides deterministic bitrates while maintaining the high video quality of a fully agile statmux system. Convergence allows the user to assign a very long averaging period — up to days — for the system. Each channel is assigned an average bitrate; the Convergence algorithm takes care of the rest, guaranteeing precise long-term average bitrates. Short-term statmux functionality is preserved so each channel has optimal video quality. This powerful feature assures that CSA terms are met at the highest possible quality, thereby pleasing station attorneys as well as engineers.

In addition to CSAs, Flexstream Convergence has a role to play in network affiliation agreements. Some programmers want to include contract language guaranteeing “minimum” bitrates. In practice, if this language is interpreted literally, the multiplex will be forced into CBR or near-CBR operation, resulting in severe degradation of all channels. Convergence provides a mechanism that guarantees delivery of the required bitrates, and will provide better quality across all of the channels.

## Harmonic ATSC Encoding Systems

The following Harmonic products are used to build a highly efficient and cost-effective media processing solution for CSA participants.

### Electra X

Electra X is the latest generation Harmonic encoding platform. Leveraging the software-based Harmonic PURE Compression Engine™ encoding technology, Electra X is available as either a 1-RU appliance (Electra X2) or as a virtual machine (Electra XVM). Flexstream Convergence software is available on both systems for managing long-term bitrate averages. The future-proof Electra X encoding systems are offered with MPEG-2 encoding for ATSC 1.0, but upgrading to AVC, or HEVC for ATSC 3.0, is easily accomplished via software license.

### ProStream X

The Harmonic ProStream® X video stream processor and gateway leverages advances in IT infrastructure to provide best-in-class, high-performance stream processing for mission-critical broadcast delivery applications. The software-based platform integrates 10-Gbps throughput with a variety of advanced video processing applications, including multiplexing, splicing, blackout switching and scrambling, and pairs with the Electra X2 encoder to deliver a compact solution for distributing superior-quality IP and ASI video streams. A software-only version, ProStream XVM, is available for environments featuring the Electra XVM virtualized media processor.

### NMX

NMX Digital Service Manager™ is the definitive video network management solution for monitoring and managing Harmonic compressed digital video and audio systems. Available for both traditional hardware-based infrastructures and next-generation, virtualized environments, NMX offers a simple and intuitive interface for creating and modifying channel lineups, and for ensuring best-in-class redundancy schemes.

### Electra X2S

The new Electra X2S processor incorporates capabilities of the Electra X encoder, ProStream X multiplexer and NMX control system on a single 1-RU server. This high-performance platform can be utilized as a standalone appliance, or multiple units can be combined for redundancy, Flexstream IP statmuxing, or simultaneous ATSC 1.0/ATSC 3.0 transmission. The Electra X2S platform is available as part of a specially priced six-channel ATSC package. Expansion packages are available for simultaneous HEVC encoding, or for expanding the channel count for multiple stations or central casting.

### Electra 9200

The Electra 9200 encoder is Harmonic’s most cost-effective compression solution for smaller channel counts. This affordability, combined with superb video quality, make it the most popular Harmonic encoder ever. The addition of Flexstream IP and Iris make Electra 9200 a very efficient channel sharing solution, especially for stations that already own Electra 9200 encoders. The platform is currently offered in a variety of specially priced three- and four-channel ATSC packages.

### Iris

Harmonic’s Iris® advanced video analytics system provides video quality, global channel availability and source profiling measurements for hundreds of compressed channels, both in real time and historically for up to one year. Designed for use with the Electra 9200 encoder, Iris makes long-term documentation available for both video quality and bitrate allocation, information that is vital to assuring that CSA guidelines are maintained for bitrates and video quality.

### ViBE EM4000

The ViBE® EM4000 SD/HD encoder provides up to eight channels in a 1-RU appliance. The platform offers very high video encoding and statistical multiplexing performance and is well suited for all ATSC applications. Specially-priced six- and eight-channel packages make this an excellent choice for larger channel counts.

Harmonic offers a complete range of solutions for ATSC broadcasters entering into CSAs. Whether you’re an existing Electra encoder user or a broadcaster exploring new options for your business, a Harmonic solution will help you achieve and maintain superior video quality, optimize bitrate usage, and assure that you and your CSA partners honor the requirements of your agreement.