SOLUTION BRIEF

Video Service Providers
Software-Based and Hardware-Accelerated Encoding and Transcoding

Enhanced Flexibility and Accelerated Time to Revenue for Video Providers

Video service providers use solutions from Harmonic, running on Intel® architecture, to meet the demands and challenges of an industry in transition. The combination of Harmonic and Intel building blocks prepares providers to deliver both legacy and newly emerging product offerings with a winning combination of quality, flexibility, and cost-effectiveness.

Harmonic, a global provider of high-performance solutions for the broadcast and media markets, takes advantage of Intel® architecture's capabilities to offer versatile solutions that meet industry challenges such as:

- **Shifting delivery models** from cable TV and IPTV to over-the-top content and multiscreen
- **Video density** for large portfolios that combine premium content and long-tail channels
- **Deployment flexibility** across bare metal, virtualized, containerized, and cloud infrastructure
- **Diverse business models**, including permanent or usage-based licensing as well as software-as-a-service delivery

Responding to changes in the way end users consume content is not only a challenge for video providers, but also an opportunity for competitive differentiation. Having the agility to fully embrace new business models such as over-the-top (OTT) content and multiscreen video delivery on all screens, from 4K televisions to mobile phones, is a core strategic imperative. At the same time, infrastructure must efficiently support both emerging demands and legacy operations.

Headquartered in San Jose, California, Harmonic provides a broad range of video infrastructure solutions that span production to delivery, as illustrated in Figure 1. Harmonic collaborates with Intel to deliver high-performance, scalable, and flexible hardware and software innovations.

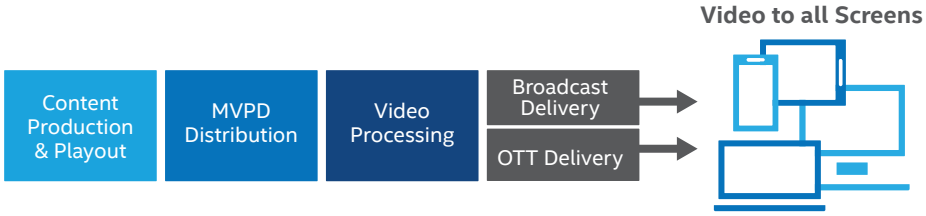

Figure 1. Harmonic's integrated solutions span production to delivery.

Harmonic Encoding Solutions, Enabled by Intel® Architecture

As Harmonic's hardware platform of choice, Intel® architecture provides a broad foundation that can be tailored to the needs of specific solutions. For example, the Intel® Xeon® processor E3 v5 family with Iris® Pro graphics offers high density, hardware-accelerated video processing in a platform that tightly integrates compute and graphics processing for on-premises systems as well as visual cloud implementations. The Intel® Xeon® processor E5 v4 family provides the compute resources needed to process large amounts of content in the most demanding formats, while meeting requirements for high output quality and a low data center footprint.

Two products from Harmonic's encoding and transcoding line leverage the advantages of hardware based on Intel architecture, as shown in Figure 2. The Electra™ XT Xtream™ transcoder ships as a 2U hardware appliance equipped with the Intel Xeon processor E3 v5 family, offering high-density, real-time transcoding. The Electra X advanced media processor is available as a 1U hardware appliance based on the Intel Xeon processor E5 v4 family or in various software-only forms, providing converged broadcast and multiscreen encoding, with outstanding video quality.

Harmonic Electra™ XT Xtream™ Transcoder

High-density solution for real-time transcoding

Hardware	Software
• Form factor: 2U appliance • Intel® Xeon® processor E3 v5 family with Iris® Pro graphics P580	• Advanced Harmonic transcoding algorithms • Optimized with Intel® Media Server Studio

Key Capabilities and Benefits

- **Density**: live transcoding, up to 270 channels per appliance
- **Scalability**: up to nine hot-swappable processing modules
- **Any-to-any format**: MPEG-2, MPEG-4 AVC, and HEVC

> More info:
harmonicinc.com/products/product-detail/electra-xt

Harmonic Electra X Advanced Media Processor

Fully converged platform for broadcast and over-the-top video delivery

Hardware	Software
• Form factor: 1U appliance, software-only, virtualized, or container • Intel® Xeon® processor E5 v4 family	• Harmonic PURE Compression Engine™ • EyeQ™ real-time video optimization

Key Capabilities and Benefits

- **Efficiency**: converged broadcast and multiscreen encoding
- **Simplicity**: central control of encoding, graphics, branding
- **Accelerated time to market**: rapid launch of new services

> More info:
harmonicinc.com/products/product-detail/electra-x2

Figure 2. Harmonic products for video providers using Intel® architecture.

High-Density Transcoding with the Intel® Xeon® Processor E3 v5 Family

Harmonic Electra XT offers high-density, hardware-accelerated transcoding with full support for various source and output formats. With the latest generation of Intel® platforms, video providers can support MPEG-2, MPEG-4 AVC, and HEVC codecs for both decoding and encoding.

This flexibility makes the Electra XT appliance an excellent basis for linear broadcasts on cable TV, IPTV, DTH, and DTTV, as well as multiscreen delivery platforms. It also provides a range of additional services, such as dynamic logo or text insertion, subtitle manipulation, statistical multiplexing, scrambling, and packaging for OTT delivery (for example, HLS, DASH, and Smooth Streaming).

Processing in the Electra XT appliance is handled by nine hot-swappable modules, each of which is based on a dual-socket platform equipped with the Intel Xeon processor E3 v5 family with Iris Pro graphics. This hardware is ideally suited to the needs of the Electra XT Xtream transcoder, providing up to 33 percent higher performance than its predecessor platform, at equivalent video quality.[1] Transcoding in hardware provides high efficiency that contributes substantially to the overall density offered by Electra XT. Architectural features of the hardware that accelerate transcoding workloads include the following:

- **Iris® Pro graphics P580** features 72 execution units that draw on 128 MB integrated, on-package eDRAM in addition to access to main system memory.
- **Intel® Quick Sync Video** is a set of fixed-function video processing resources that are integrated with the processor for accelerated throughput.
- **Tight, platform-wide integration** between graphics, I/O, and compute subsystems provides high performance and system density by reducing requirements for data movement.

Converged Broadcast and OTT Delivery with the Intel® Xeon® Processor E5 v4 Family

Harmonic Electra X advanced media processor provides real-time software encoding of SD, HD, and UHD media with broad deployment options that include bare-metal servers, virtual machines, or containers, either on- or off-premises. This offering can support customers as they move from hardware-only solutions to software-based approaches, as illustrated in Figure 3.

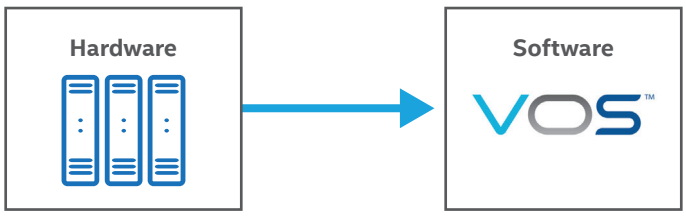

Figure 3. The Harmonic Electra™ X advanced media processor makes it easy to shift from hardware-only to software-based models.

Broadcast and pay-TV operators benefit from high compression quality, operational flexibility, and tight integration of capabilities in areas such as branding and graphics. Capabilities such as regional advertising and "double-box" screens that simultaneously display a live feed and advertising content enable flexible revenue opportunities. Media processing capabilities are governed by granular firmware licenses, allowing operators to pay only for the features they use, adding others as needed.

The Harmonic PURE Compression Engine™, which lies at the heart of Electra X media processing, is built explicitly to take advantage of the hardware foundation provided by the Intel Xeon processor E5 v4 family, whether running in an on-premises appliance, in the cloud, or using a software-as-a-service delivery model. The platform drives high solution density, with up to 22 cores, 55 MB last-level cache, and 3 TB DDR4 memory per socket. In addition, Electra X is currently undergoing optimizations to take advantage of the next-generation Intel® Xeon® Scalable processors.

Deployed in a cloud infrastructure, general-purpose servers based on the Intel Xeon processor E5 v4 family provide flexible support for additional workloads alongside the Electra X platform. When the encoder is deployed using virtual machines or containers, for example, it can easily share execution resources with software for audience analytics, ad insertion, and many other functions. In contrast to legacy single-purpose media-processing equipment, this shared functionality provides economies from resource flexibility as traffic levels ebb and flow.

Ongoing Collaboration to Advance the Video Industry

Joint work by Harmonic and Intel seamlessly complements the core competencies of both companies, creating a whole that is greater than the sum of its parts. Some key elements of the companies' shared vision are illustrated in Figure 4. Five years of collaboration has led to Intel® Xeon® processors being the hardware foundation for all Harmonic professional video solutions, of which the Electra X advanced media processor and Electra XT Xtream transcoder are just a small sample. That joint work has led to a high degree of CPU and GPU optimization for Intel architecture in Harmonic solutions.

For example, Harmonic has adopted the Intel® Media SDK as a cornerstone of its development of high-density transcoding solutions. This set of libraries, tools, and code samples streamlines the implementation of processor features such as hardware-accelerated video processing using Intel Quick Sync Video, adoption of new codecs, and optimization for new hardware features.

By driving up the performance and flexibility of Harmonic solutions, the Harmonic and Intel collaboration helps video providers simplify their infrastructure, reduce costs, and drive new services to expand their revenue-generation opportunities.

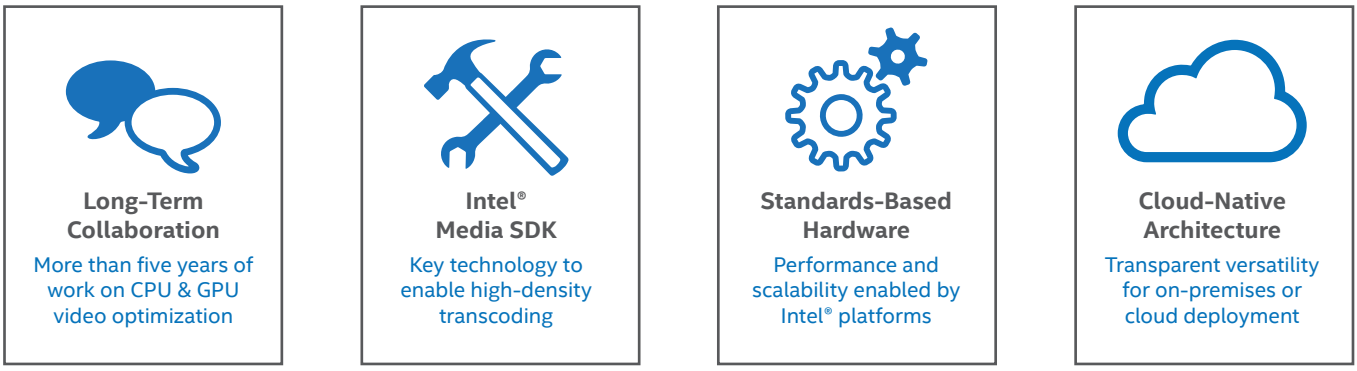

Figure 4. Harmonic and Intel have a shared development vision for the video industry.

Conclusion

Ongoing changes within the video industry are challenging traditional operators, with consumers increasingly expecting content to be viewable anytime, anywhere, on any device. At the same time, new entrants are vying for consumer attention, making the industry more competitive. In response, video operators need infrastructure that is flexible, allowing quick response to changing technologies and deployment on whatever platform they choose. Harmonic addresses these challenges with flexible, high-performance solutions that support a breadth of target segments, as shown in Figure 5.

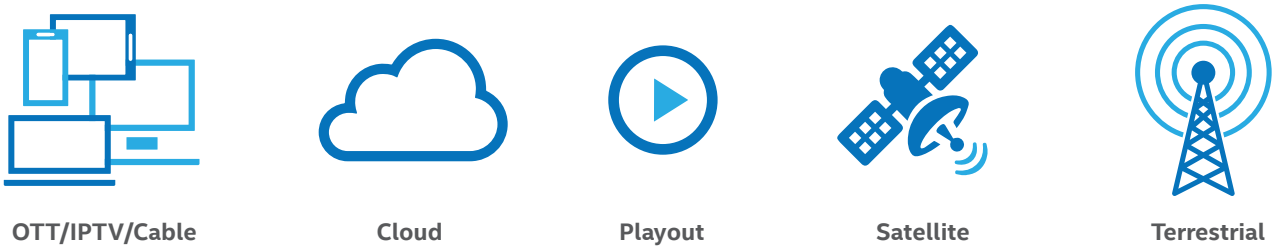

Figure 5. Harmonic supports a wide range of target segments.

The collaboration between Harmonic and Intel makes the software-based solutions that answer these challenges more viable. Electra X media processing, Electra XT Xtream transcoding, and other Harmonic solutions are highly optimized for Intel architecture. Harmonic also takes advantage of Intel contributions to the industry such as the Intel Media SDK and support for the latest Intel® processors, putting its products at the forefront of next-generation video delivery.

Solution provided by:

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Take the Next Step

Contact Harmonic: **www.harmonicinc.com/about/contact**

Learn About Intel® Xeon® Processors: **www.intel.com/xeon**

[1] Testing conducted by Harmonic. Predecessor configurations: Intel® Core™ i7-4860EQ processor GT3, Electra™ XT software version 2.00. Current performance configurations: Intel® Xeon® processor E3-1578L v5, Electra XT software version 2.50.

Software and workloads used in performance tests may have been optimized for performance only on Intel® microprocessors.

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