



FUELING THE CONVERGENCE OF BROADCAST  
AND IP NETWORKS FOR COST-EFFECTIVELY  
DELIVERING VIDEO

## XILINX BROADCAST PLATFORMS: ENGINEERING INNOVATION FOR ANYTIME, ANYWHERE VIDEO

### » Broadcast Industry Challenges

- Savvy consumer audiences, with high expectations for viewing experiences
- System bottlenecks, with bandwidth and reliability limiting the ability to process content faster
- Pressures to lower costs and power budgets, while supporting higher-resolution and 3D video
- Constantly changing standards and interface technologies
- Convergence of broadcasting and communications infrastructure

### » Xilinx Platforms

- Accelerating innovation, with the power and agility of programmable devices
- Speeding time to market, with productivity-enhancing development kits
- Fueling convergence of broadcast and operator networks, with leading bandwidth and support for 10Gbps LAN (10 Gigabit Ethernet AVB) and WAN (SMPTE2022) standards
- Partnering with industry leaders to drive world-class end-to-end broadcasting
- Fostering highly differentiated designs and enabling algorithm optimization with kits that include broadly applicable IP and reference designs
- Driving down power consumption and costs, with process technology (28nm) and increased integration

Audiences have experienced large screens, Blu-ray Disc, and Digital Cinema—and they now demand constantly increasing video resolutions and stunning viewing experiences. As a result, content providers are calling on broadcast equipment and infrastructure designers to enable acquisition, processing, delivery, and consumption of massive quantities of the best quality video. Competition also puts pressure on these designers to shorten solution development cycles, lower costs, and reduce power consumption.

The industry-leading Xilinx portfolio of field-programmable gate arrays (FPGAs) brings high-speed digital signal processing (DSP) and integrated networking functions to throughput-sensitive designs such as EdgeQAM line cards. To lower development costs, Xilinx also offers comprehensive Targeted Design Platforms, which speed adoption of emerging technologies such as 3D, Digital Cinema 4K2K, and Super HiVision. Xilinx platforms bring maximum value to the end-to-end broadcasting landscape, with a broad choice of programmable devices, a world-class Alliance Member program and IP library, superior value, breakthrough power efficiency, and 10Gbps leadership (10G-SDI, Video over 10GbE). Xilinx Targeted Design Platforms minimize the efforts for application foundations, and allow more time to be focused on product performance, differentiation, and optimizing video algorithms that ultimately entice audiences.

### Accelerating the Integration of Faster Video Network Interfaces

The demand for anytime, anywhere access to video content is driving the convergence of broadcasting and communications networks. Broadcast equipment architects and networking vendors need extremely efficient ways to build in video-over-IP interfaces and transport capabilities. Xilinx's industry-leading 10Gbps broadcast solutions give them the capabilities they need to cost-effectively meet these demands. Designers can take advantage of IP cores, reference designs, tools, and hardware that address the latest interface standards and achieve the quality of service needed to transport high-quality video, multiple streams of video, and live 3D streams.

The latest Xilinx innovations include new and enhanced IP cores for the Broadcast Real-Time Video Targeted Design Platform. Aimed specifically at speeding time to market, the Xilinx platform helps designers simultaneously drive up the quality of video, overcome the challenges of processing and moving uncompressed HD, 3D, and 4K video streams, and lower costs with minimized bill of materials (BOM).

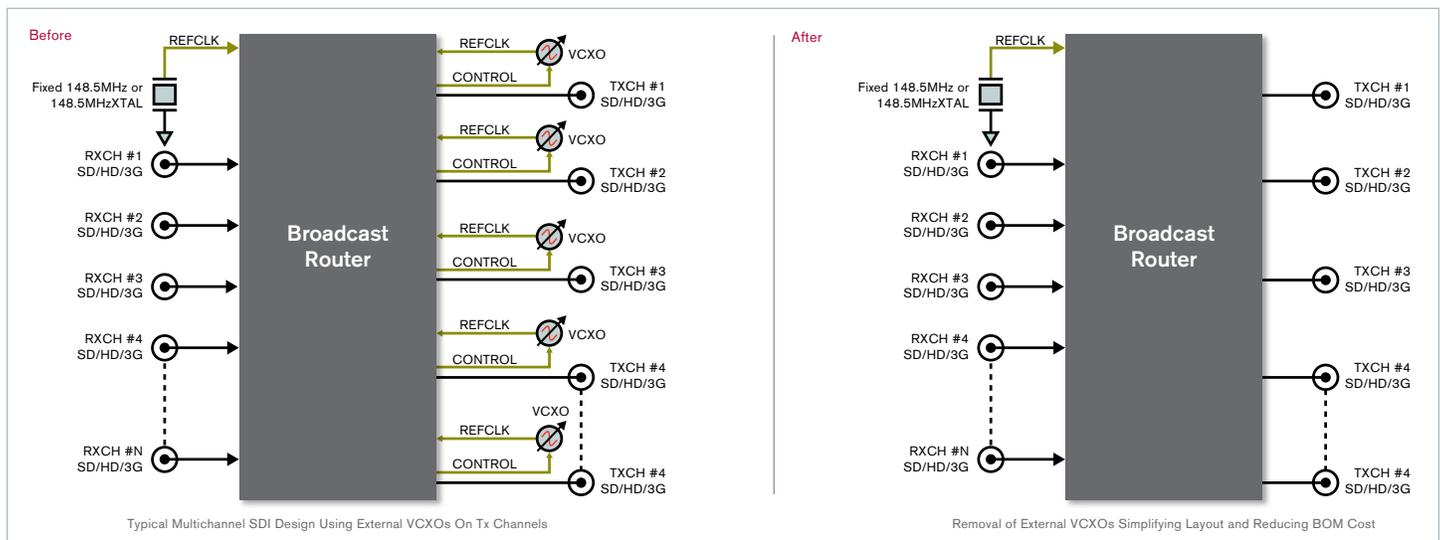
## Increasing Productivity and Lowering Costs

Standards and market offerings change continuously, and designers need to stay on the leading edge. The flexibility of Xilinx Broadcast Targeted Design Platforms and the better out-of-box support with Xilinx Broadcast Connectivity Kits bring products and enhancements to market much faster than ASIC and ASSP alternatives. Besides letting designers do more in less time, Xilinx devices can cost-effectively drive real-time video processing into today's broadcasting solutions. Xilinx-pioneered 28nm process technology is further reducing costs and cutting power consumption in half compared to previous generations.

Xilinx Broadcast Connectivity Kits give designers a comprehensive development environment tailored for emerging broadcast connectivity standards. With versions for both Virtex®-6 and Spartan®-6 FPGAs, the kits support Triple-rate SDI (SD/HD/3G-SDI) and AES/EBU Audio, as well as providing a foundation for SMPTE2022 video over IP, 10Gbps Ethernet AVB, HDMI®, DisplayPort®, DVI, and V-by-One® HS standards. Designers can accelerate the evaluation of these interfaces, and integrate multiple interfaces into a flexible, single-chip design that drives down the cost of switchers, encoders, cameras, displays, and other broadcast applications.

Using novel techniques to control the phase interpolator inside Virtex-6 and 7 series FPGA transceivers, Xilinx now offers the ability to remove multiple voltage controlled oscillators (VCXOs) from SDI designs. By removing \$15-\$20 USD worth of VCXOs per output video channel, as well as simplifying board layout, equipment manufacturers can benefit from significant BOM savings, particularly in large channel count designs such as routers and switchers. This technique has lots of other benefits including low jitter, freedom to use all transmit SERDES at completely independent rates and without adding any extra power.

### BOM COST REDUCTION WITH EXTERNAL VCXO REMOVAL



## Raising Video Quality to New Levels

To maximize access to the latest FPGA advancements, Xilinx offers an expanded broadcast IP offering. Bundled video and image processing cores give designers an affordable optimized hardware implementation that enables breakthrough visual quality. The advanced cores and EDK-based tool suite provides more choices for achieving better results, including smooth diagonals and sharper video formats. The advanced IP shortens design cycles and helps lower overall system costs.

The Xilinx broadcasting platforms let designers develop complex video algorithms in the shortest time possible, with the most differentiation. Combining programmable Xilinx devices, market-specific IP, reference designs, and hardware boards fosters innovation and algorithm enhancements that ultimately deliver real-time capabilities at HD and higher resolutions such as Digital Cinema and 4K2K.

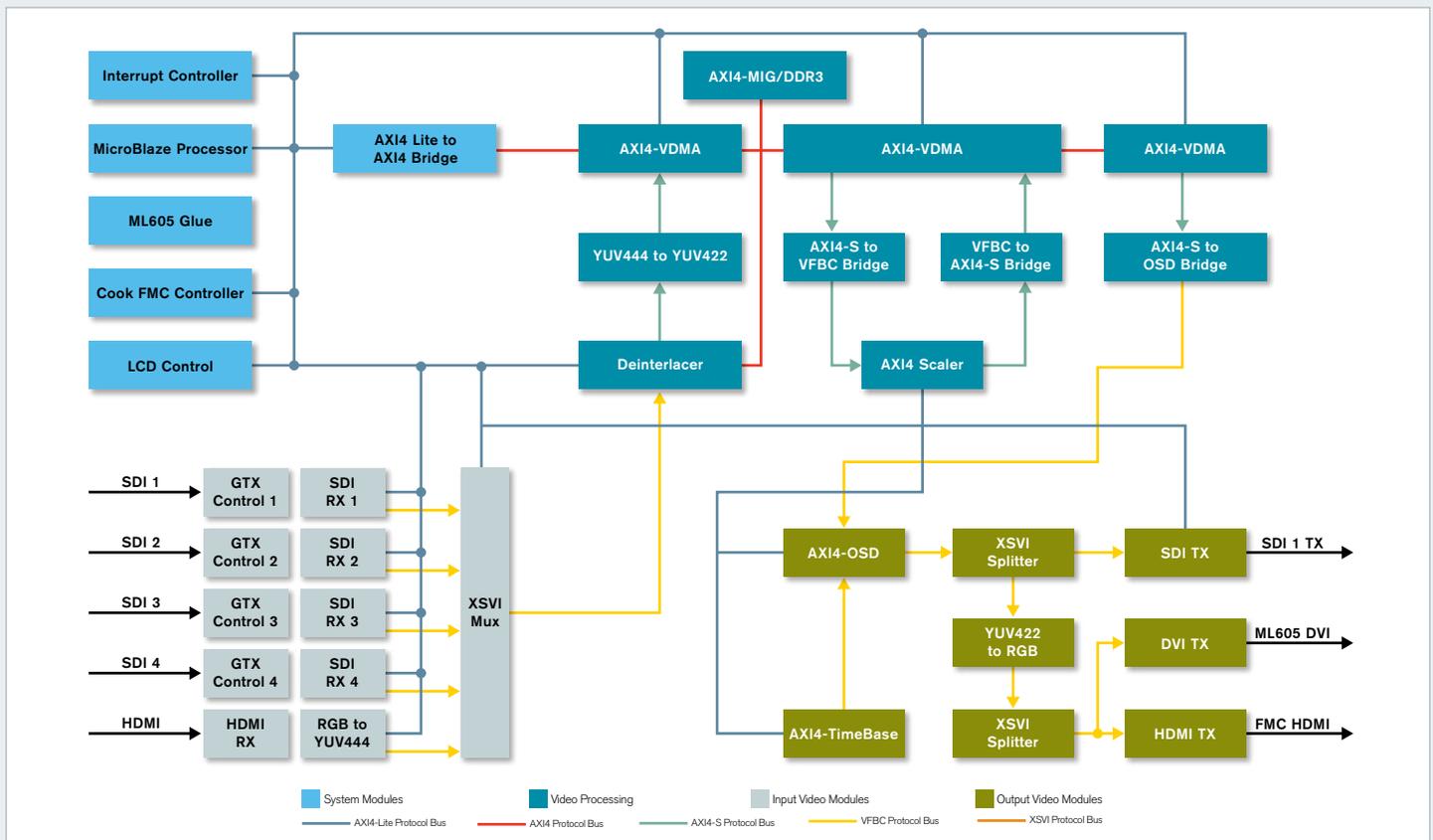
## Broadcast Real Time Video Engine Targeted Design Platform

The Xilinx Real Time Video Engine Targeted Design Platform enables designers to process video on a single chip. Built-in capabilities include:

- Scaler (Resizing video frames)
- De-interlacer (Converting interlaced to progressive video)
- Color Space Conversion (RGB to YCrCb and vice-versa)
- Chroma Resampler (Color compression, e.g. 4:2:2 to 4:2:0)
- 2D Noise Reduction (Spatial noise reduction)
- Motion Adaptive Noise Reduction (Temporal noise reduction)

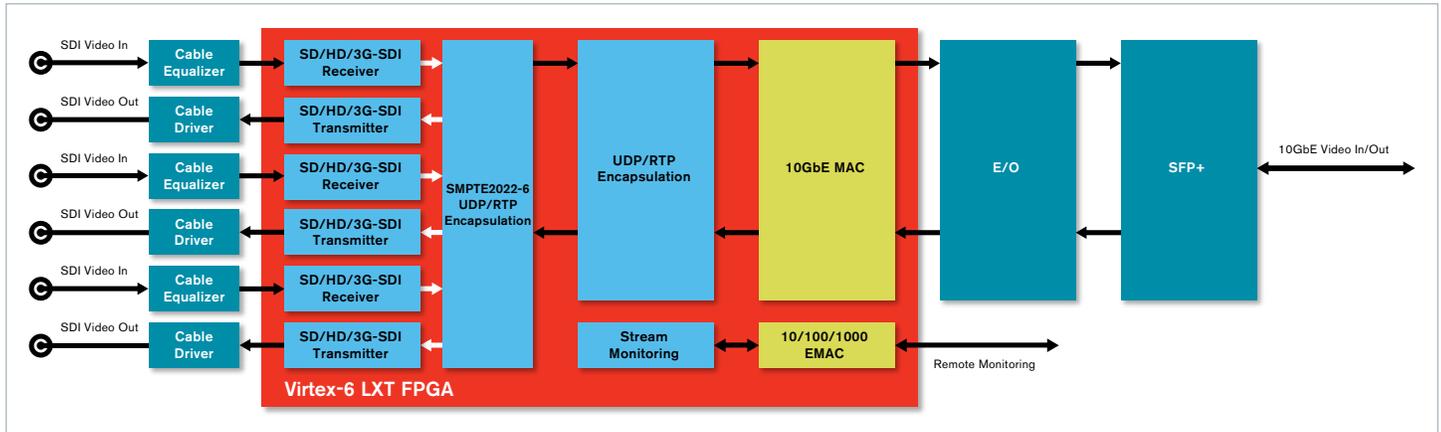
The platform facilitates solutions for any video application from cameras to switchers, storage servers to displays, and everything in between. Each video block within the Real Time Video Engine Targeted Design Platform has standardized interfaces, making it easy to add to, upgrade or mix and match video IP using the AMBA® AXI4 (Advanced eXtensible Interface 4). Today, existing and emerging standards supported by the Broadcast Real Time Video Engine Targeted Design Platform include 3D, 4K2K and Digital Cinema. The platform will also support up to 12-bit color depth.

## REAL-TIME VIDEO ENGINE REFERENCE DESIGN



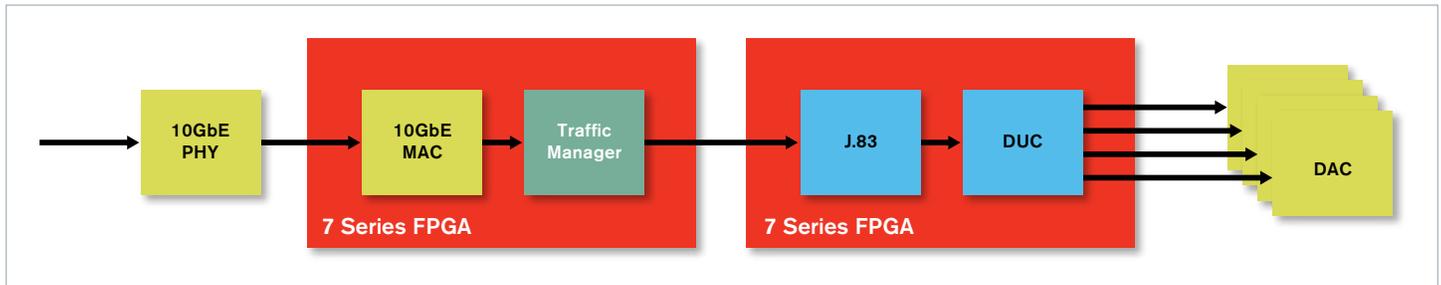
Applications

SMPT2022 VIDEO OVER IP BRIDGE



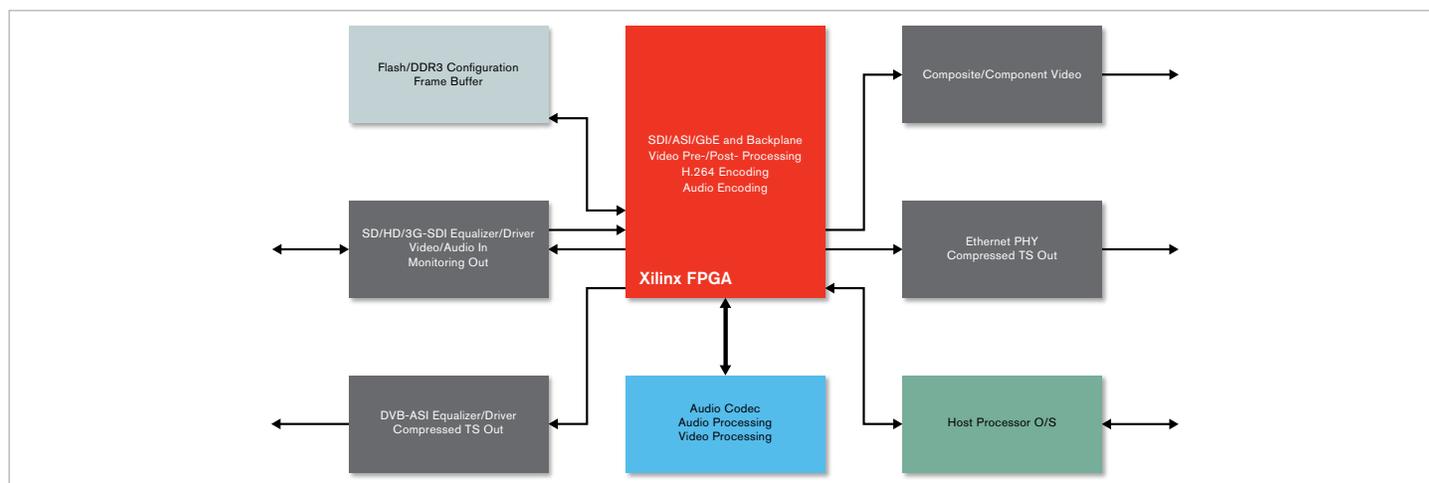
Broadcasters and MSOs are looking for ways to reduce CapEX and OPEX and the adoption of IP networks offers many ways to do reduce both. For instance, with the emergence of 10Gbps Ethernet, it is now possible to transmit multiple channels of uncompressed HD video over a single copper or fiber Ethernet link, instead of the more cumbersome and expensive SDI coaxial cables. This also enables the removal of redundant, duplicate studio set ups from outside broadcast by streaming back to centralized studio installations, and enables remote production teams to work instantly on video as it is captured. SMPT2022 is the major standard being rolled out to packetize the video, audio and data and provide forward error correction (FEC) so that QoS is maintained and systems interoperate with one another. By providing SMPT2022 LogiCORE™ IP, Xilinx is enabling the adoption of the standard, and the delivery of pristine video over Ethernet, so that manufacturers quicken time-to-market and can embrace the convergence between the broadcast, telecommunications and IT industries.

EDGEQAM



Xilinx FPGAs—with industry-leading DSP throughput and network processing capabilities—support the latest broadcast transmission use cases, architectures, and industry initiatives such as Converged Cable Access Platform (CCAP). Working with its partners, Xilinx is taking advantage of the flexibility of the evolving architectures to drive convergence of headend equipment. Xilinx programmable platforms and high-performance, low-power devices are contributing to the headend of the future, which can consolidate traditional Cable Modem Termination Shelf (CMTS) and EdgeQAM in a single network component. With single-chip throughput that breaks through the previous RF port limit of 160 channels, Xilinx FPGAs enable highly integrated headend solutions that will eliminate external RF combiners, and achieve an industry milestone by providing simultaneous upstream and downstream processing of the full broadcast spectrum.

BROADCAST DISTRIBUTION ENCODER



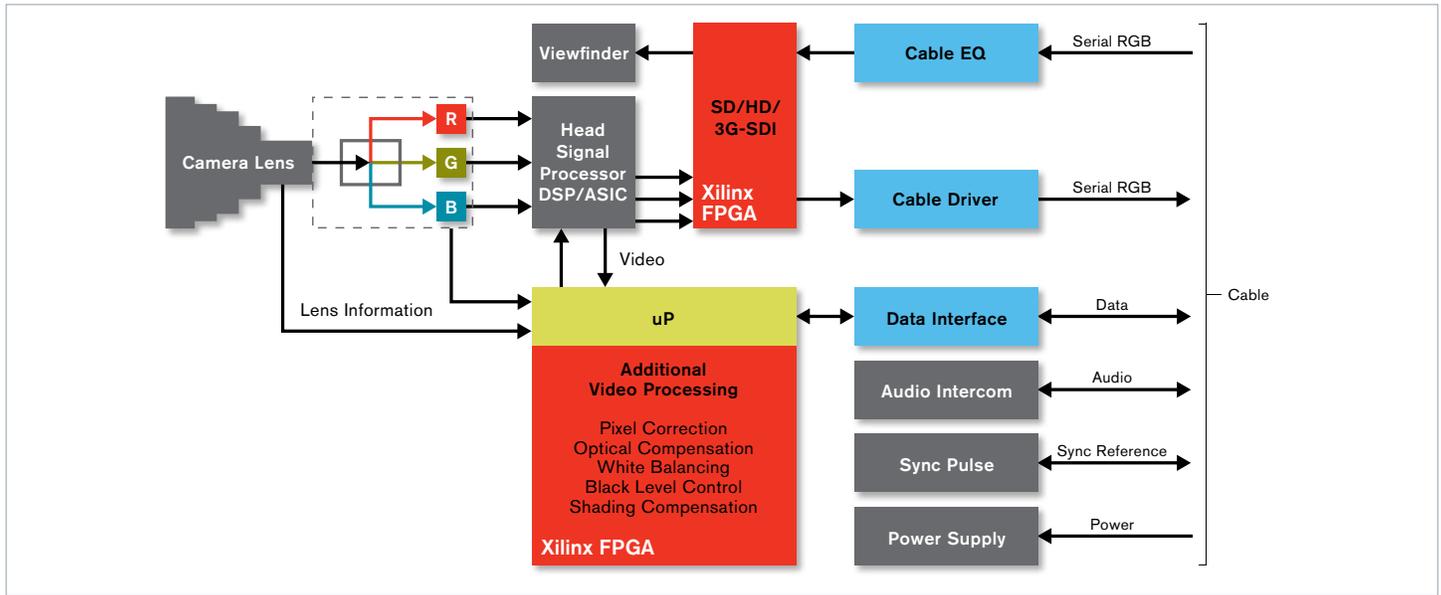
The bandwidth available on existing broadcast transmission networks, be it satellite, cable, terrestrial, IPTV or mobile is limited particularly when it comes to broadcasting HD content—broadcasters and content providers need to compress the video and audio being delivered. This means many trade-offs are needed between video quality, bandwidth, real-time performance, cost and power. For professional broadcast encoders, being able to provide the highest quality in the bandwidth available is paramount and so manufactures differentiate themselves by developing novel algorithms around the MPEG-2 and H.264/AVC compression standards. This ability to innovate (while maintaining real-time performance and reducing cost and power) requires the use of Xilinx FPGAs in encoder systems to add 'secret sauce' differentiators and ensure success in encoder evaluation shoot-outs. Xilinx partners also offer IP for H.264/AVC-I, JPEG2000 and Dolby codecs to speed integration and time-to-market.

XILINX TARGETED DESIGN PLATFORMS

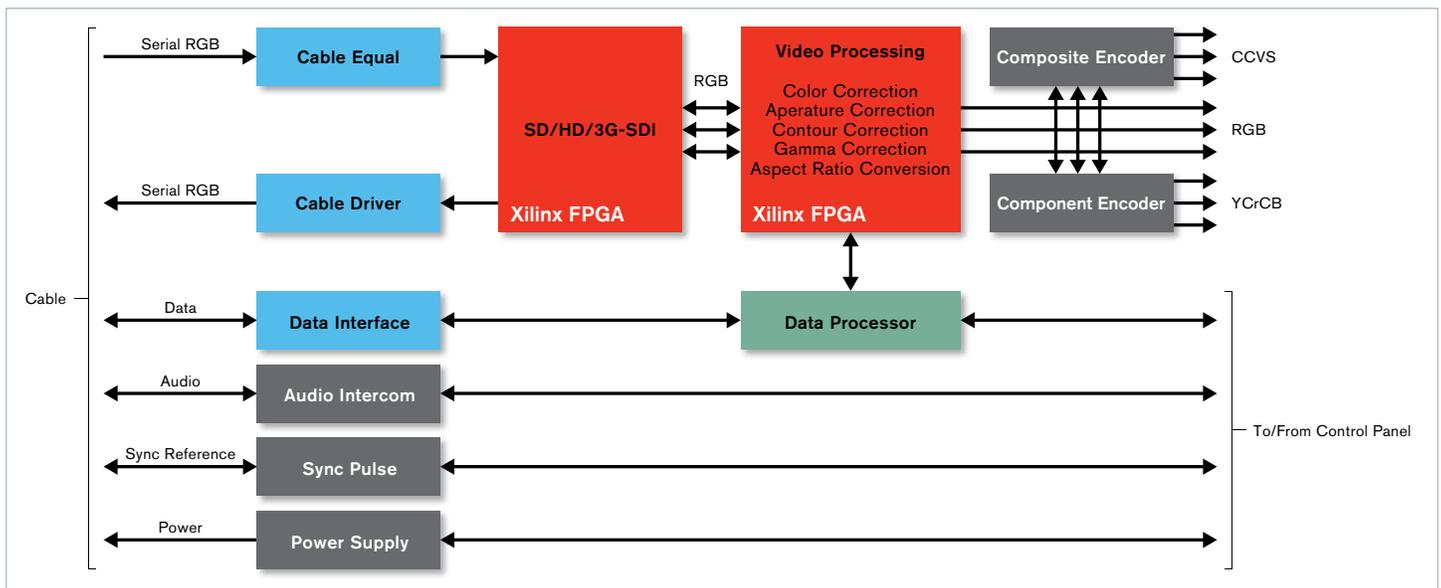
Xilinx Targeted Design Platforms speed time to market and free designers to focus on innovation and differentiation. The combination of FPGA devices, design tools, and IP into targeted reference designs that run on development or evaluation boards creates a robust development and run-time environment. The platforms help designers more quickly learn about FPGAs and leverage standard or modified tools and IP to accelerate development. Xilinx teams up with industry leaders to build customized variations of the Targeted Design Platform, each introducing common methodologies to benefit both hardware designers and software application developers.

| TYPE            | TARGETED APPLICATIONS  | PLATFORM COMPONENTS  |
|-----------------|--|--|
| Base            | Fundamental development and run-time capabilities  | <ul style="list-style-type: none"> <li>FPGA silicon</li> <li>ISE Design Suite design environment and appropriate third-party development tools</li> <li>Reference designs (e.g., memory interface and configuration designs)</li> <li>Evaluation or development boards</li> <li>Common IP (PCIe, GigE, Ethernet, etc.)</li> </ul>  |
| Domain-Specific | Digital Signal Processing (DSP)  | Base Targeted Design Platform, plus: <ul style="list-style-type: none"> <li>Higher-level design tools (MATLAB, Simulink, AutoESL)</li> <li>DSP IP, targeted reference designs, and DSP-specific FMC</li> </ul>   |
|                 | Connectivity   | Base Targeted Design Platform, plus: <ul style="list-style-type: none"> <li>Higher-level design tools (serial characterization tools)</li> <li>Connectivity IP (PCIe, XAUI, etc), targeted reference designs, and connectivity-specific FMC daughter cards</li> </ul>  |
|                 | Embedded Processors  | Base Targeted Design Platform, plus: <ul style="list-style-type: none"> <li>Higher-level design tools (EDK, Operating Systems, etc)</li> <li>Embedded IP, targeted reference designs, and embedded-specific FMC daughter cards</li> </ul>  |
| Market-Specific | Broadcast Routers, Production Switchers, EdgeQAM, Encoders, Cameras, Monitors and others | Elements from Base and Domain-Specific Platforms, plus: <ul style="list-style-type: none"> <li>Broadcast Connectivity IP (SDI, AES3, SMPTE2022, HDMI, DisplayPort)</li> <li>Video and Image Processing IP (Scaling, Deinterlacing, Chroma Resampling, Noise Reduction)</li> <li>Audio and Video Codecs (MPEG-2, H.264/AVC, JPEG2000, Dolby(R))</li> <li>Broadcast Transmission (DVB, ATSC, EdgeQAM)</li> </ul> |

STUDIO CAMERA UNIT

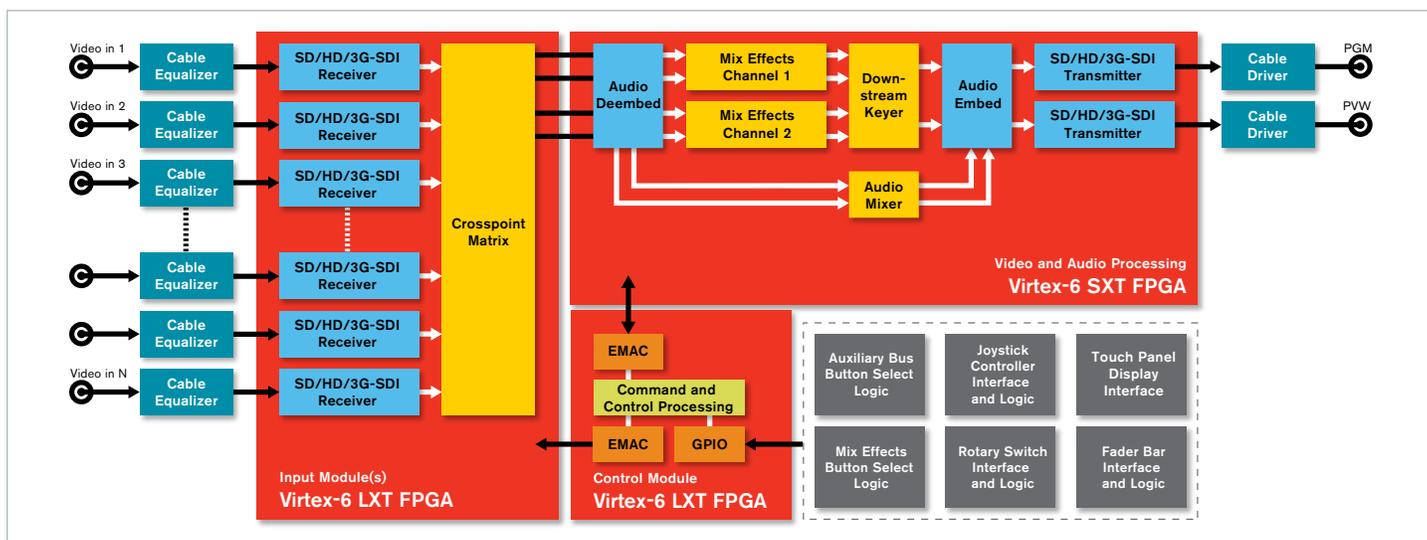


CAMERA CONTROL UNIT



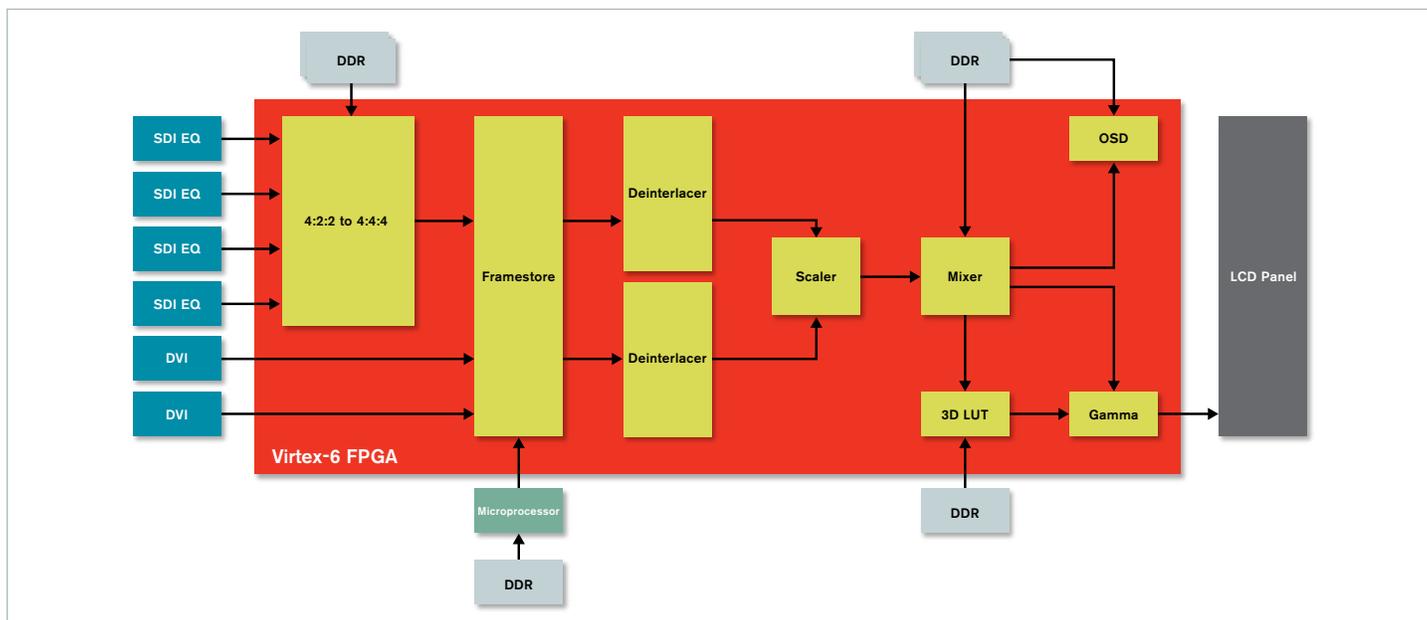
In studio cameras and professional camcorders, the main video and image processing elements are the most important part of the broadcast chain (data lost here ripples throughout the rest of the chain). FPGAs enable interfacing, optical correction, image improvements, compression and video processing—all while lowering overall cost and power with each generation. With Xilinx's new Zynq™-7000 family with embedded ARM® processors, the potential for innovation and integration is even higher. Designers can integrate many functions into one or two devices without having to spend a huge sum on fabrication, as opposed to ASIC-based designs.

PRODUCTION SWITCHER



Production switchers are at the heart of a live production and have a huge range of functions that need to be done in real-time and without sacrificing any video quality. Switchers take in many live camera feeds up to 1080p60 HD, various audio channels from intercoms to Dolby surround and combine them, often with nice visual effects for transitions, with inputs from clip stores, character generation and archival systems. All of this takes a tremendous amount of processing and a large number of interfaces. Xilinx FPGAs integrate multiple SD/HD/3G-SDI and AES/EBU interfaces (now including VCXO removal capabilities) with real-time multichannel HD video processing—while supporting modular and scalable switcher architectures through high speed backplane connectivity

PROFESSIONAL MONITOR



Professional monitors are ubiquitous in the industry and being able to display the video exactly as intended by the director or producer in various viewing environments is key. As such, these displays really push the video quality envelope in terms of HD, 3D and now 4K2K images. The monitor must be capable of receiving a variety of inputs, be it the interface standard (e.g. HDMI, DisplayPort, SDI) or video format (e.g. 1080p, 576i) and deinterlacing if necessary before scaling it to fit the available screen size without losing quality. The Xilinx Real Time Video Engine Targeted Design Platform is an ideal development platform for monitors as it includes the major video building blocks to implement the design while providing the ability to integrate customer differentiation and extra features. Uniquely FPGAs also enable the inclusion of calibration and waveform monitoring on the same device and Xilinx partners are on hand to provide these capabilities.

## Get Started Now!

Xilinx Broadcast Connectivity Kits make it easier than ever before for designers to develop a real-time video processing chain that supports multiple SD/HD/3D formats, frame rates, and resolutions. The kits' FPGA mezzanine card (FMC) connectors speed the evaluation and integration of SD/HD/3G-SDI, AES/EBU audio, DVI, HDMI, DisplayPort, 10GbE for video over IP, and other interfaces into real-time broadcast designs. Applications needing the highest video quality and highest bandwidth in digital cinema and Super Hi-Vision (or Ultra HDTV) systems can also be jump-started with the Xilinx kits.

### VIRTEX-6 FPGA BROADCAST CONNECTIVITY KIT



**Product Information:** [www.xilinx.com/v6bck](http://www.xilinx.com/v6bck)

**Product Number:** DK-V6-BCCN-G

### SPARTAN-6 FPGA BROADCAST CONNECTIVITY KIT



**Product Information:** [www.xilinx.com/s6bck](http://www.xilinx.com/s6bck)

**Product Number:** TB-6S-BCK-FND or TB-6S-BCK-PRO

## Take the NEXT STEP

For more information about Xilinx broadcast solutions, please visit [www.xilinx.com/broadcast](http://www.xilinx.com/broadcast)

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