






Unrivaled JPEG 2000 solutions

1080i 1080p UHDTV			2K 3D 4K 3D
Broadcast Profile			DCI Profile
Ultra low Latency			Lossless
High Quality			Multi Channel

Full set of configurations

- Multi-purpose
- Digital cinema DCI
- Broadcast multi-channel HD
- Ultra-high resolution 8K
- Sub-frame latency
- Multi-quality layered
- Mathematically lossless

Unique market expertise



Barco Silex offers a comprehensive range of high quality solutions for JPEG 2000 applications. Our JPEG2000 portfolio covers a full set of IP cores, reference designs, acceleration boards and design integration services.

The Barco Silex JPEG 2000 encoder and decoder IP cores achieve unequalled quality and high-speed performance and are available on the latest generation FPGA's as well as on legacy platforms.

These remarkably flexible IP cores deliver real-time encoding or decoding of high-resolution and multi-channel video streams such as **DCI 2K, 4K and 8K, HD 1080i and 1080p, UHDTV.**

The unique architecture of our JPEG 2000 cores provides the highest standards of quality, flexibility, performance, compactness and reliability.

Performance

- Real-time with multiple channels, high resolution and frame-rate.

Quality

- Support of untiled images for 1080p, 2K, 4K and 8K with multiple layers and first-rate picture quality.

Flexibility

- Support for the widest spectrum of JPEG 2000 options, configurable frame size and easy to integrate interface.
- Upgradable during lifetime to new performance requirements or to a new generation of FPGA technology and footprint.
- Optimized and tailored cores to any application.

Compactness

- Cost-effective, single FPGA solution.
- Best trade-off between features, performance and footprint.

Reliability

- Extensive market-adopted solution (live streaming and cinema theaters).

The Barco Silex JPEG 2000 cores surpass the requirements of demanding applications such as **acquisition, archiving, production, wireless video, contribution, digital cinema** and have been widely adopted by the industry.

Multi-purpose & flexible

The Barco Silex JPEG 2000 encoder and decoder cores are built on the flexible architecture of the BA110-FLEX encoder and BA109-FLEX decoder cores. These cores support the widest available spectrum of JPEG 2000 options available on the market.

Ultra-compact

The Barco Silex ultra-compact JPEG 2000 encoder and decoders are able to code untiled streams up to 1080p60 or 2K@48fps. They are easily integrated with video interfaces (HDMI, Ethernet ...) within the smallest FPGA devices.

- Local video distribution
- KVM
- Broadcast
- DCI



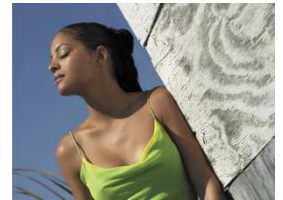
Multiple quality layers (MQL)

JPEG 2000 provides scalability in resolution and in quality. Progressive quality transmission enables to preview images with lower quality and to add quality layers afterwards. The Barco Silex Multi Quality Layers provides efficient code-streams which are progressive through up to 7+ layers.

- Document Imaging & Automation
- Remote Sensing
- Medical Information Systems



1.1% decoded – 0.030 bpp



13.0% decoded – 0.354 bpp

Digital cinema (DCI)

The Barco Silex DCI JPEG 2000 encoder and decoder cores are compliant with the DCI recommendation. They support high-performance coding of large DCI frame formats: 2K up to 120fps, 2K-3D up to 120fps/eye, 4K up to 60fps, 4K-3D up to 30fps/eye.



Ultra-high resolution (8K)

The Barco Silex ultra-high resolution JPEG 2000 encoder and decoder cores encode and decode image sizes up to 8K.

- UHDTV, 8K
- Future DCI
- Aerial & Geospatial Imagery

Sub-frame latency

The untiled subframe latency JPEG 2000 architecture of Barco Silex is unique and is integrated by camera manufacturers. Barco Silex provides tiled JPEG 2000 subframe latency encoders and decoders as well.

Broadcast multi-channel

The Barco Silex broadcast JPEG 2000 encoder and decoder cores are compliant with the Broadcast Profile. They are single FPGA solutions for high performance, simultaneous multi-channel 720p30/60, 1080i and 1080p30/60 JPEG 2000 coding.



Mathematically lossless

The Barco Silex mathematically lossless JPEG 2000 encoder and decoder cores encode and decode images with color depths up to 16 bits, while mathematically preserving the quality of the original image.



Technical features

Single-chip solution for multi-channel

- 720p30/60, 1080i, 1080p30/60, UHDTV
- 2K, 2K-3D, 4K, 4K-3D, 8K
- Custom frame sizes

Adjustable compressed bit rate

- Up to 8 Gbps, or lossless

Color spaces

- XYZ – RGB - YUV
- Optional ICT/RCT color transform

Color sub-sampling

- 4:4:4 - 4:2:2 - 4:2:0

Support a wide range of JPEG 2000 parameters

- Wavelet filters
 - 9/7 (lossy) and 5/3 (lossless)
 - 0 to 6 decomposition levels
- Full-frame processing (no tiling)
- Reduced latency (with tiling)
- Up to 16 bits per color sample
- Rate control with 3 selectable regulation modes
 - Quality control with quantization and weights
- Multiple quality layers

Optimized memory controller for high efficiency

Typical configurations



FLEX

		Spartan-6	Artix-7	Kintex-7	Kintex Ultrascale	Zynq
Compact HD 1080p at 30 fps	Decoder	75-1	75T-2	70T-1	035-1	7020-2
	Encoder	100-1	100T-2	70T-1	035-1	7020-2
DCI Stereoscopic 3D 2K at 60 fps	Decoder	-	75T-2	70T-1	035-1	7020-2
	Encoder	-	100T-2	160T-1	035-1	7020-2
UHD 4K at 60 fps	Decoder	-	-	160T-2	035-1	7035-2
	Encoder	-	-	160T-2	035-1	7035-2
Quad-channel HD 1080p at 30 fps	Decoder	-	200T-2	160T-1	035-1	7030-2
	Encoder	-	200T-2	160T-1	035-1	7030-2
High resolution 8K at 60 fps	Decoder	-	-	-	075-2	-
	Encoder	-	-	-	075-2	-
Lossless HD 1080p at 30 fps	Decoder	-	100T-2	70T-1	035-1	7030-2
	Encoder	-	100T-2	70T-1	035-1	7030-2
2K with MQL* at 60 fps	Decoder	-	100T-2	160T-1	035-1	7030-2
	Encoder	-	200T-2	160T-1	035-1	7030-2

Other configurations and FPGA available on request



FLEX

		Cyclone V**		Arria V**	Arria 10
		E	GX	GX	GX/SX
Compact HD 1080p at 30 fps	Decoder	A4	C4	A1	160
	Encoder	A5	C5	A1	160
DCI Stereoscopic 3D 2K at 60 fps	Decoder	A5	C5	A3	160
	Encoder	A7	C7	A3	160
UHD 4K at 60 fps	Decoder	-	-	B1	160
	Encoder	-	-	B1	160
Quad-channel HD 1080p at 30 fps	Decoder	A7	C7	A3	160
	Encoder	A7	C7	A3	160
High resolution 8K at 60 fps	Decoder	-	-	-	570
	Encoder	-	-	-	570
Lossless HD 1080p at 30 fps	Decoder	A5	C5	A1	160
	Encoder	A5	C5	A1	160
2K with MQL* at 60 fps	Decoder	A7	C7	A1	160
	Encoder	A7	C7	A3	160

Other configurations and FPGA available on request

* Multiple Quality Layers ** Equivalent SoC devices also supported

Electronic Design Services

- FPGA and ASIC
- Embedded Software
- Board/System



Video over IP reference design

- SD/HD/3G/4K, Gigabit Ethernet, 10GbE
- JPEG 2000 compressed or uncompressed
- MPEG-2 TS
- SMPTE2022-1,2,5,6 with FEC
- Xilinx 7 series FPGA's & Zynq SoC
- VSF interoperable profile for broadcast

Video Platforms

- Video in/out (SDI/HDMI/Display Port/ DVB ASI)
- Processing (rotation, scaling, interlacing, noise reduction, image dithering...)
- JPEG 2000 and VC-2 LD Compression
- Transport (SMPTE2022/Ethernet AVB/RTP)
- Streaming (1Gb/10Gb ...)
- High efficiency Memory Controllers
- PCIe DMA for Video applications

Video compression IP cores

- JPEG 2000
- VC-2 HQ
- JPEG
- MPEG-2

Security Platforms

- Key generation, Encryption & Authentication
- Secure Boot
- OpenSSL and Linux CryptoAPI support

Cryptography IP cores

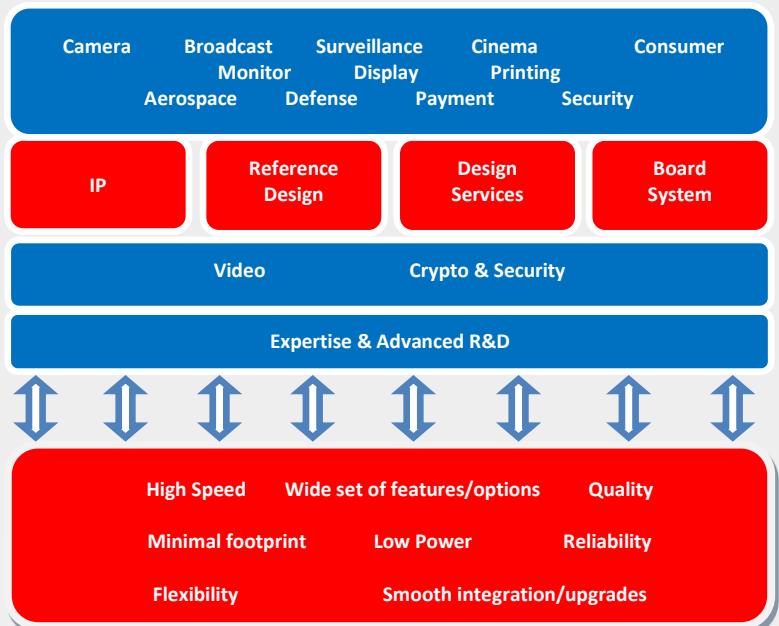
- AES multi-purpose (ECB, CTR, CBC/CMAC, OFB, CFB)
- AES CCM (wireless, IPsec...)
- AES GCM (MACsec, IPsec...)
- AES XTS (disc storage ...)
- Public Key engine (RSA, ECC, ...)
- HASH & 3-DES core
- TRNG, DRNG (NIST800-90 compliant)

Barco Silex provides image processing and security solutions as well as electronic design services (ASIC, FPGA, DSP, embedded software, Board).

Barco Silex can interact at different stages in the development cycle of your products: from providing IP cores, reference designs and platforms, support on part of your integrated design to the delivery of full turnkey projects.

The unique combination of Barco Silex's image processing expertise and top-notch **electronic design** skills enabled many customers to accelerate their video product developments with leading-edge and cost-effective solutions. We are recognized for our state-of-the-art expertise in complex and high-speed design, for our project management skills and for our reliable design methodology.

Barco Silex's **video platforms** and **reference designs** integrate a full-range of compression and networking modules. They benefit equipment OEM's who need to accelerate the development of video solutions that can adapt to changes in critical standards, specifications and protocols. Our Video-over-IP reference design integrates the latest video over IP capabilities (SDI, SMPTE2022, JPEG 2000, MPEG-2 TS, 1&10Gb Ethernet).



Barco Silex also provides **security platforms** and silicon-proven **security IP** cores (AES, Public Key, Hash...), which are valued by the market for their world leading ultra-high-speed performance and compact footprint. They have been integrated in products for applications such as digital cinema media block, video streaming, secure payment, communication, storage...