Design Challenges for Digital Cinema

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November 4, 2015

BarcoSilex

Cinema in the past…

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Digital Cinema today….

Barco Alchemy series

Superior Image Processing
On-board media server
Integrated storage

4K
60 FPS

4K
3D

LASER

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35mm vs. Digital Value Chain

	PRODUCTION	POST-PRODUCTION	DUPLICATION	DISTRIBUTION	PROJECTION
OLD	Film Camera Negatives	Chemical filtering Duplicate neg	Film Lab Interpositive – Duplicate Neg	Courier Print copies	Filmplatter 35mm projector
NEW	Film - Digital CGI	Digital Intermediary (DI)	DCP – airline – rental - DVD	Satellite – Physical – Fiber Encryption - Compression	Server – Projector Decryption - Decompression

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Fully Integrated

Standard S2 Setup

Barco S3 Setup

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Fully Integrated – All what a cinema needs

16x AES
audio outputs

8x GPO
8x GPI

Multi projector
synchronization

2x Display Port
Up to 4K 60p, 4K 3D
full color

2x GETH
Fast remote ingest
Content streaming

Get Certificate
With Smartphone

HDMI 1.4a
4K & BluRay 3D

2x USB 3.0
Fast local ingest

3x 2.5in HDDs (1TB)
HW RAID 5
Higher capacity HDDs expected soon

2x 3G-SDI
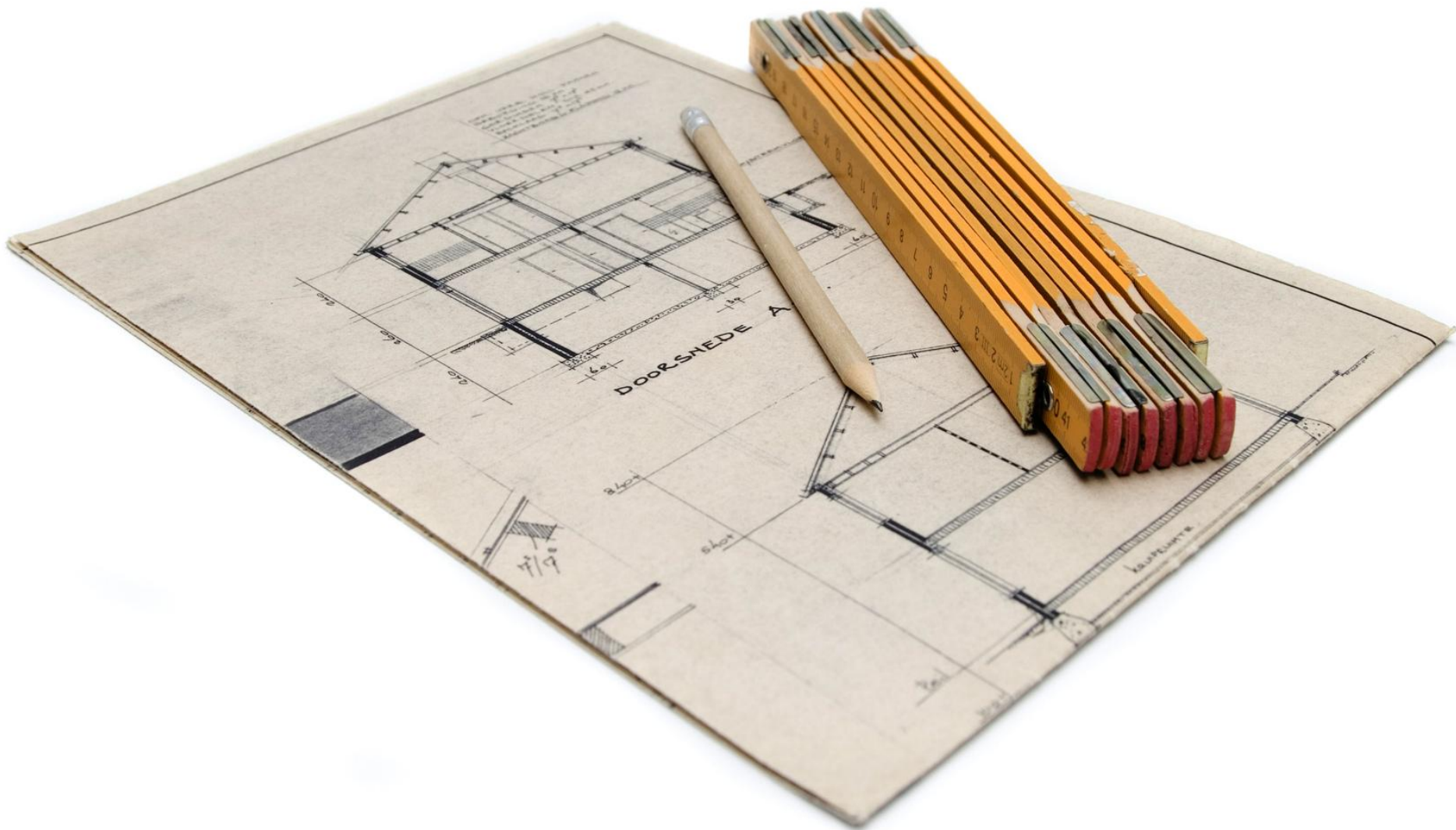Live Streaming

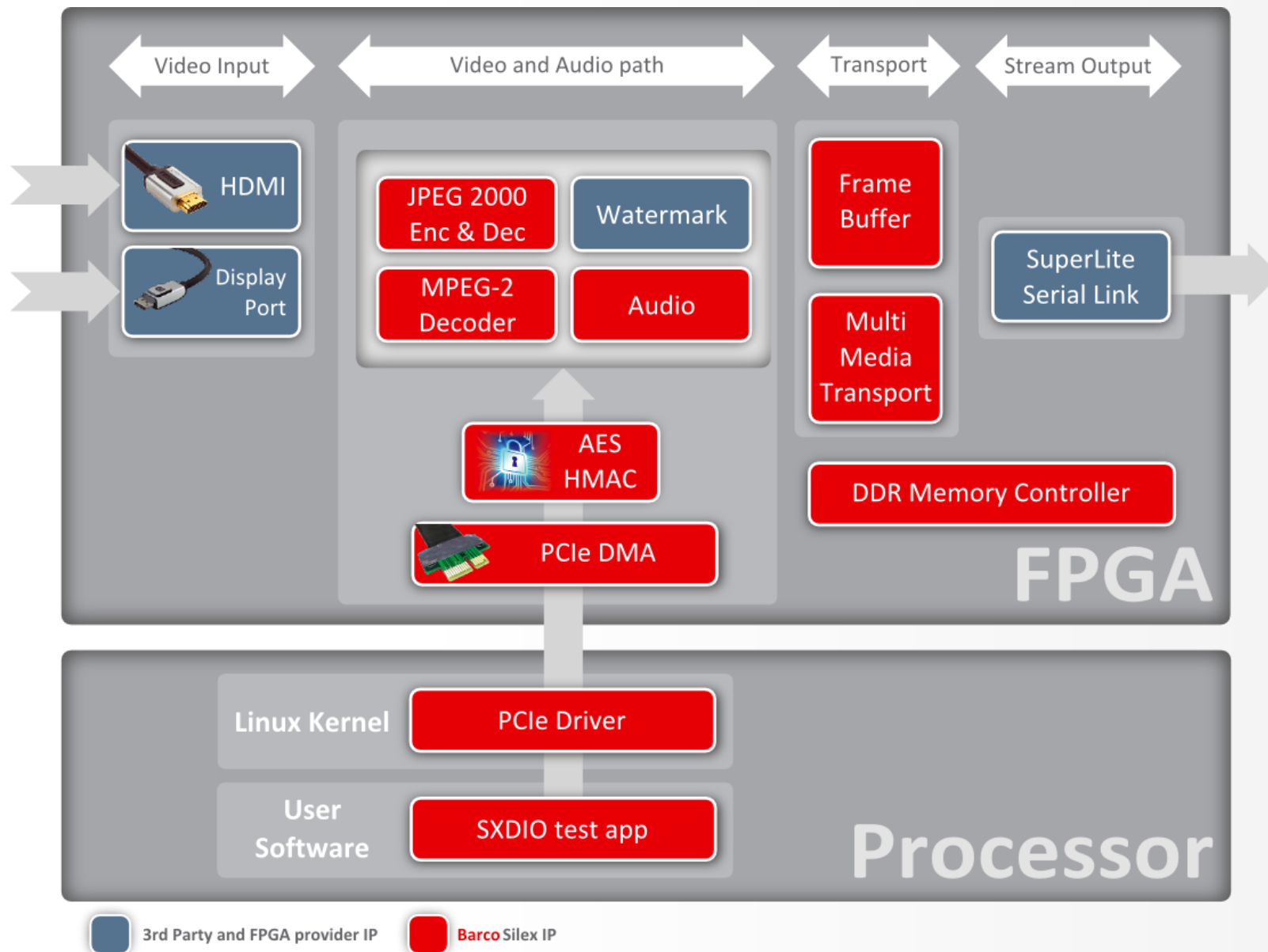BarcoSilex
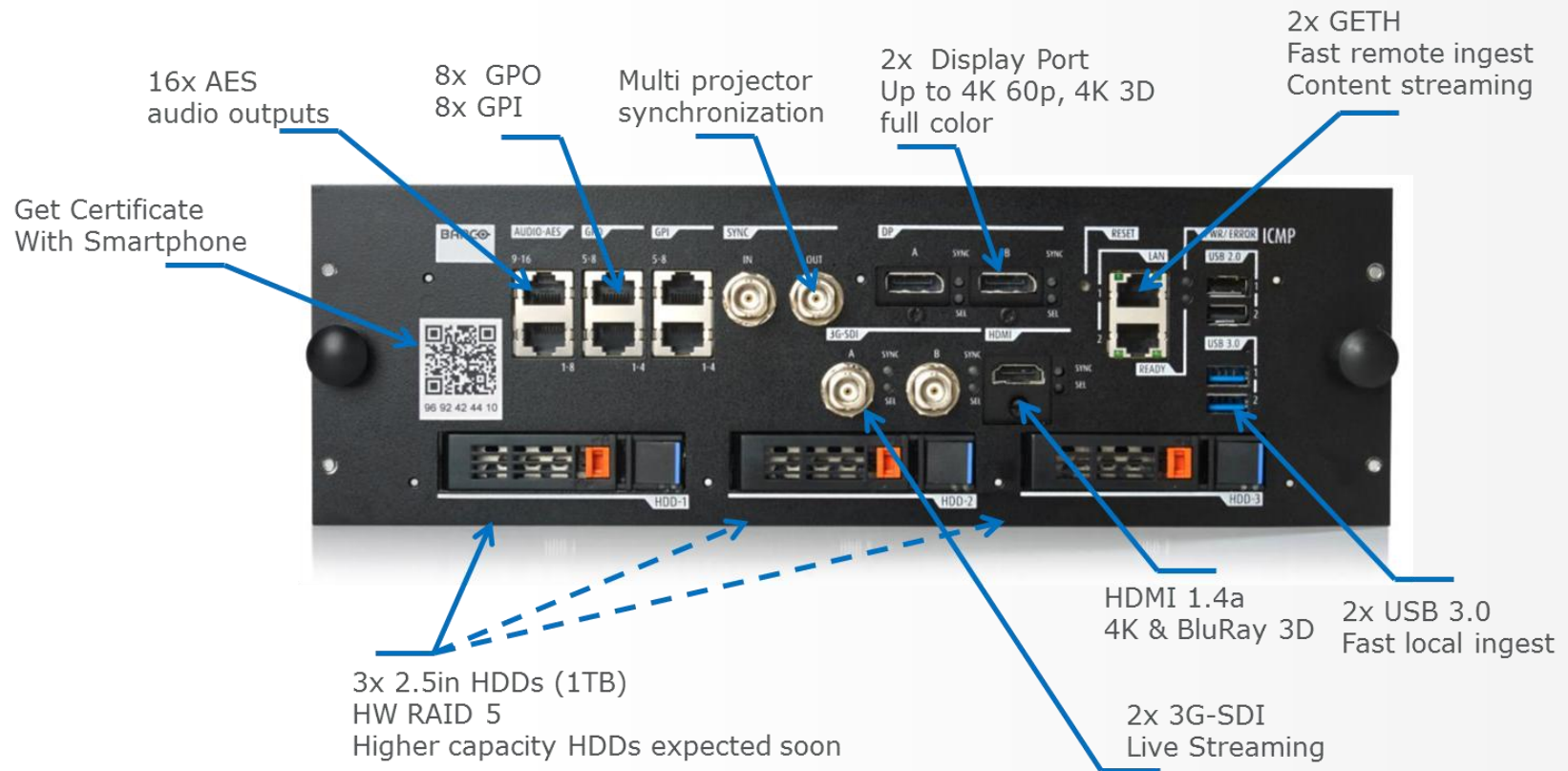
Fully Integrated

- **Barco Alchemy Inside**

- Superior image processing

- DCI playout

- High-Frame Rates

- Auro 11.1

- DCI Compliant 4K 3D & 60p HFR

- Alternative content in 4K 3D & 60p

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« How did you come up with this product so quickly ?»

James Gardiner – CineTechGeek – CinemaCon 2014

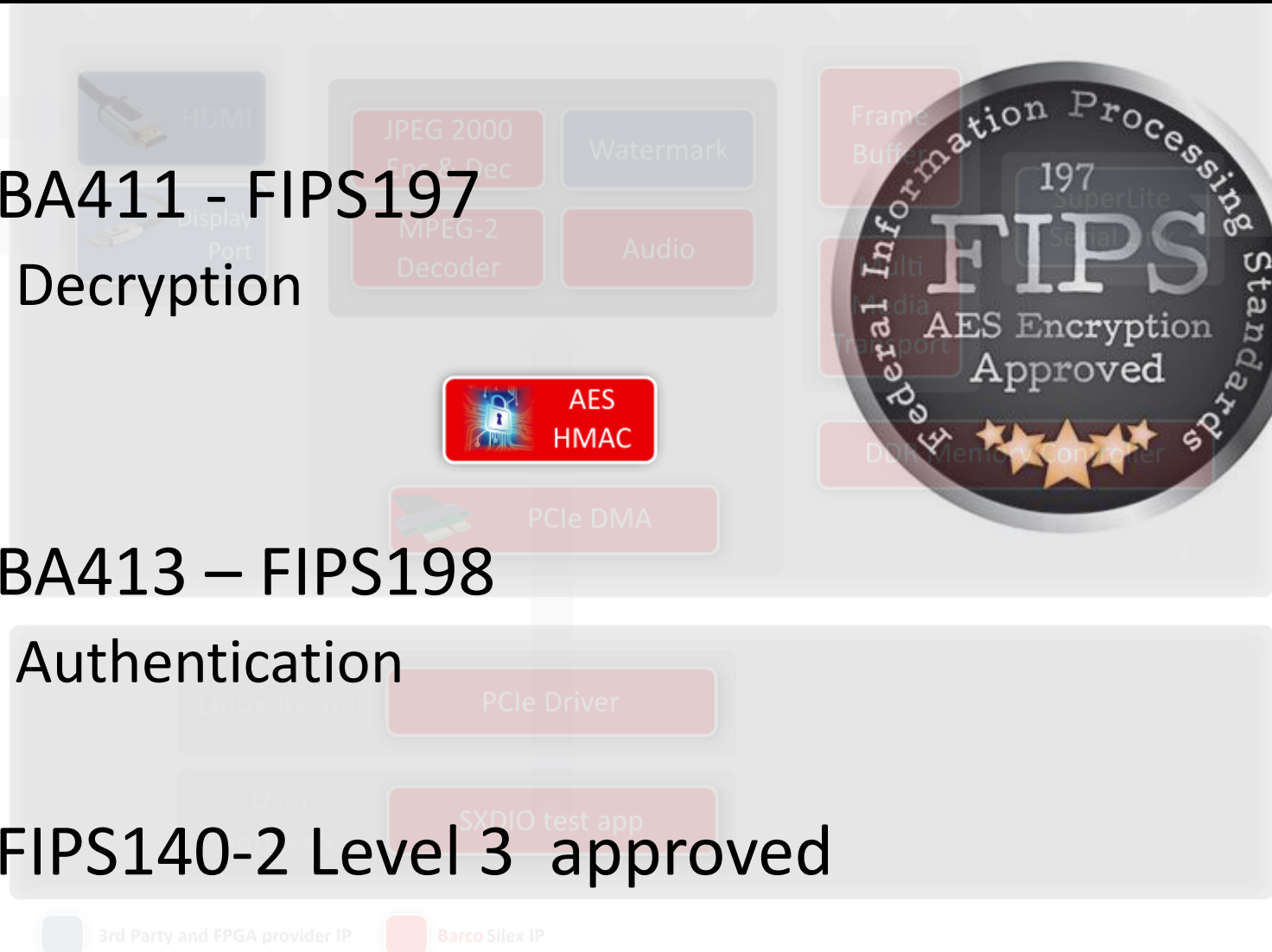- **> 4500 sales since launch (March 14)**
- **60 % of all Barco projectors**

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DOORSNEDE A

FPGA

Video Input · Video and Audio path · Transport · Stream Output

- HDMI
- Display Port
- JPEG 2000 Enc & Dec
- Watermark
- MPEG-2 Decoder
- Audio
- Frame Buffer
- Multi Media Transport
- SuperLite Serial Link
- AES HMAC
- PCIe DMA
- DDR Memory Controller

Processor

- Linux Kernel — PCIe Driver
- User Software — SXDIO test app

■ 3rd Party and FPGA provider IP   ■ **Barco** Silex IP

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DCI Digital Cinema Initiatives, LLC

- **BA411 - FIPS197**
  Decryption

  AES
  HMAC

- **BA413 – FIPS198**
  Authentication

- **FIPS140-2 Level 3 approved**

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DCI Digital Cinema Initiatives, LLC

JPEG 2000 Enc & Dec

Watermark

MPEG-2 Decoder

- Intra-Frame
- Quality
- Scalability

- Chinese market
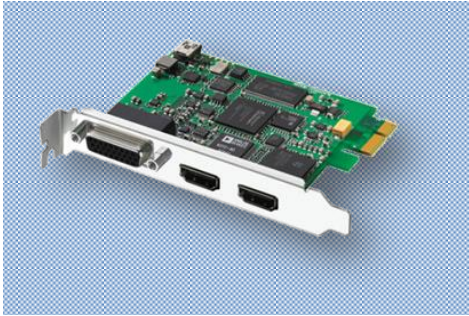- Commercials
- Legacy
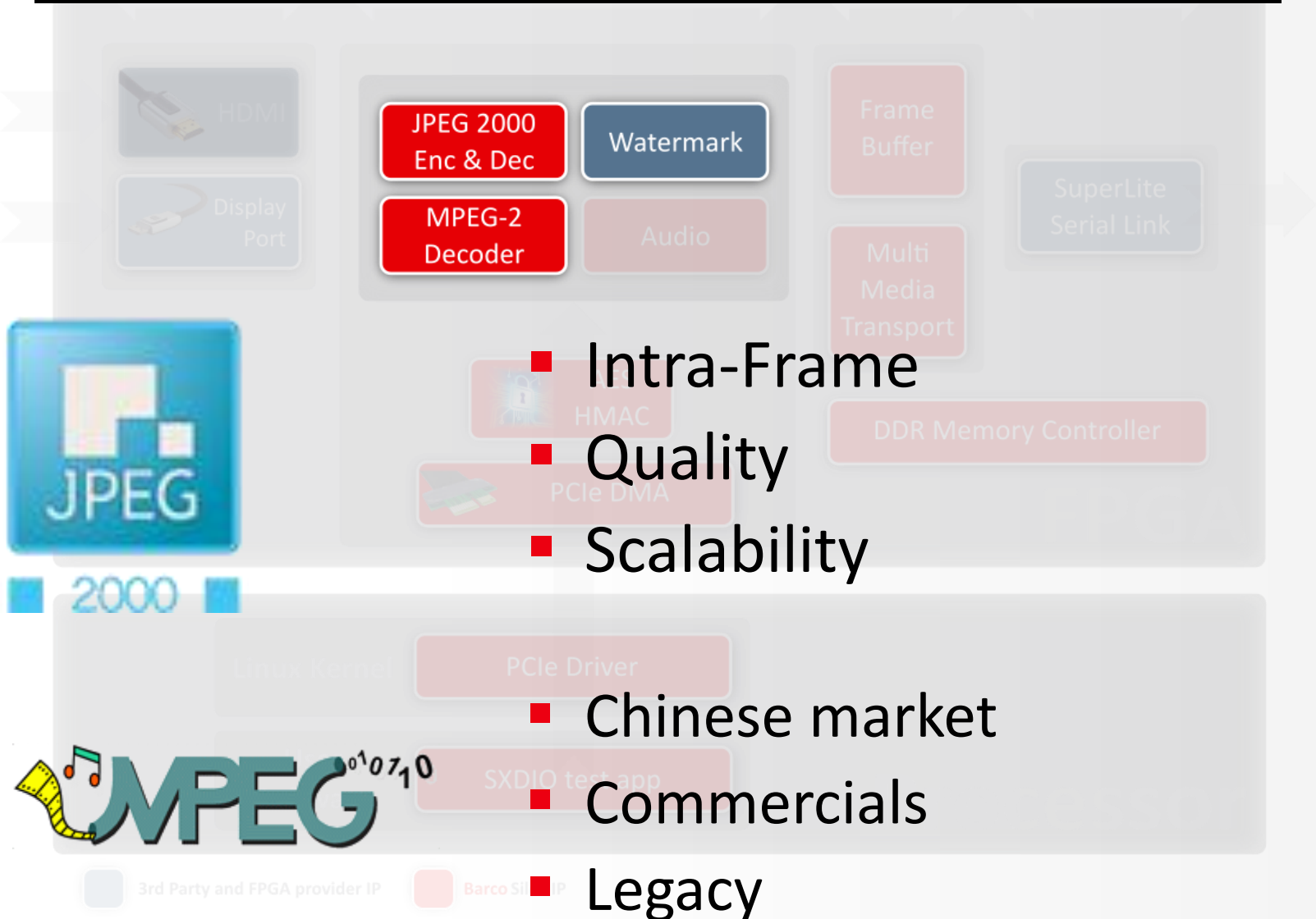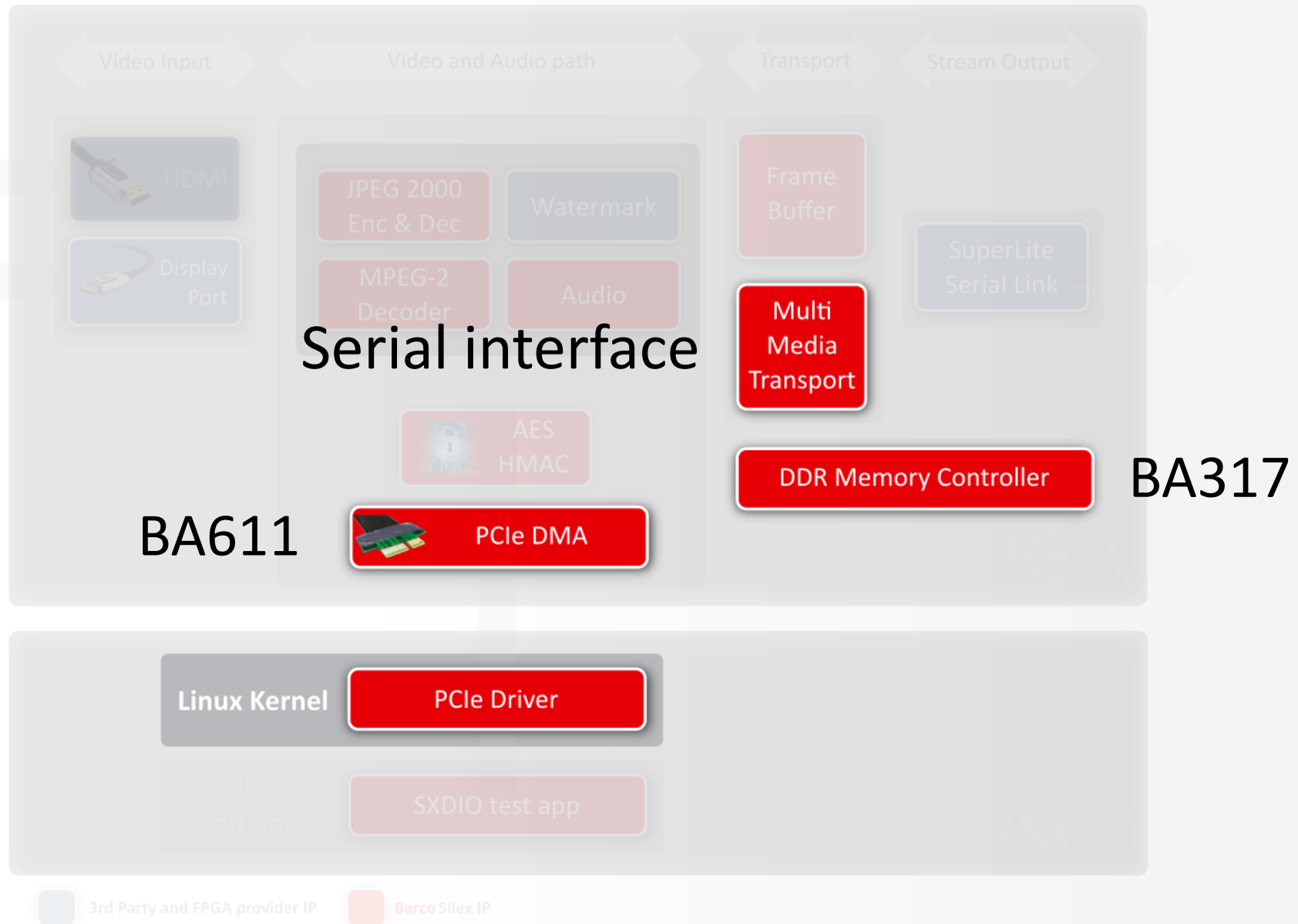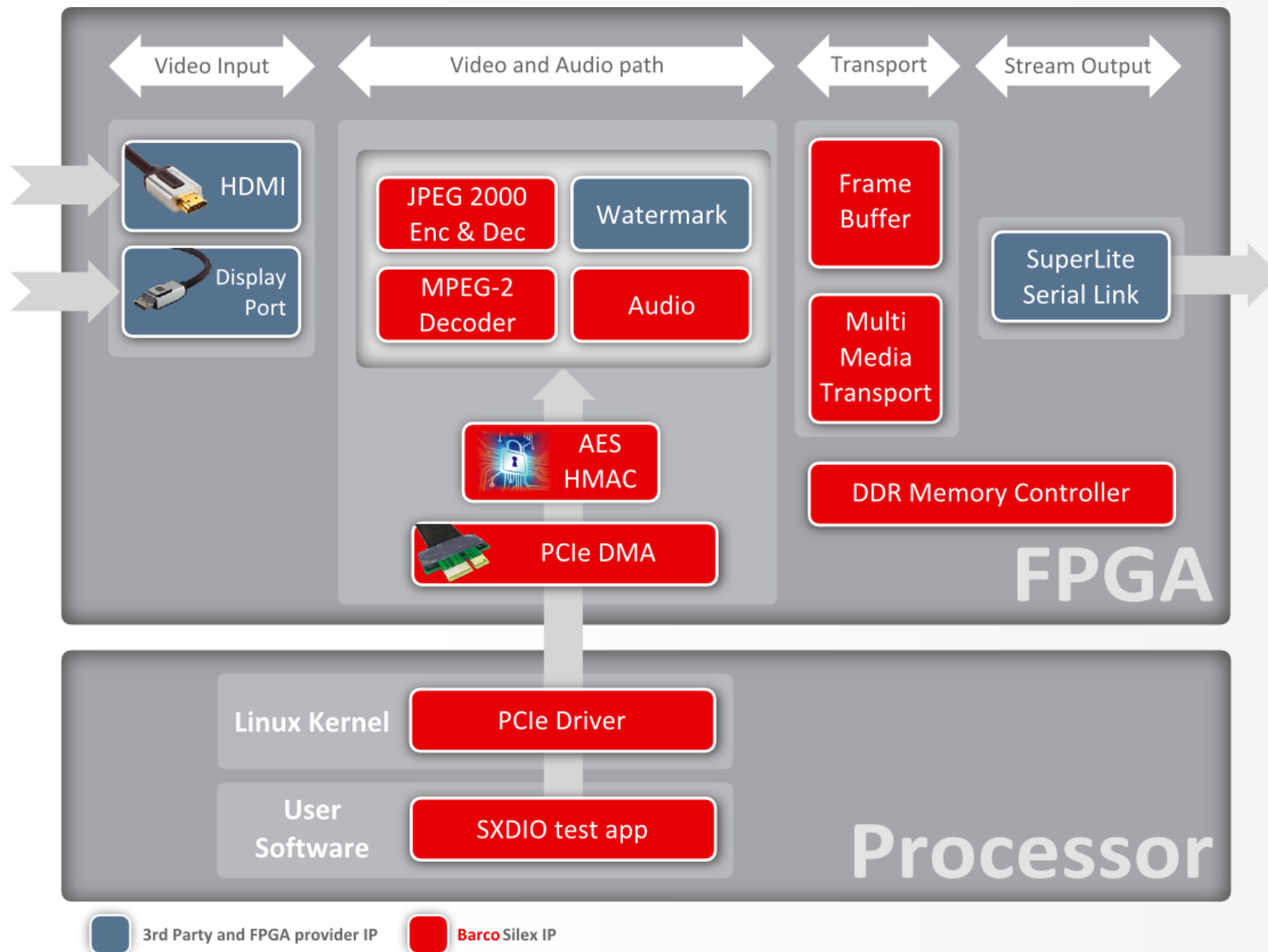
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- Escape
- High Frame Rate (HFR)
- High Dynamic Range (HDR)
- Object Based Audio

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Barco Silex: Services and Products

- Embedded Electronic design services (soft and hardware)
  - Highly integrated embedded systems development
  - High performance digital signal processing hardware design
    - **ASIC/SoC Design**
    - **Complex FPGA design on Xilinx and Altera**
    - **PCB level development and PCBA prototyping, production**

- Custom component solutions
  - "System on a Chip" (SoC) IC development service

- IPs or Intellectual Property blocks: Firmware for programming, defining custom chips (ASIC, FPGA)
  - Image compression (JPEG 2000, VC-2, JPEG, Mpeg2…)
  - Crypto & Security (AES, Public Key, …)
  - Memory Controllers
  - PCIe DMA

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