XDF XILINX DEVELOPER FORUM

AI Power FPGA Based Video Transcoding For Real Time Application

Presented By

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Title CEO
Date 2018.10.16

XILINX

Agenda

1. Video Market Outlook
2. Aupera FPGA Based Solution
3. Aupera Development Framework

Video Market Outlook

Video Is Everywhere

245 million

Surveillance Cameras

$40 billion

Video-on-demand market

344 million

Live broadcasting viewers

82%

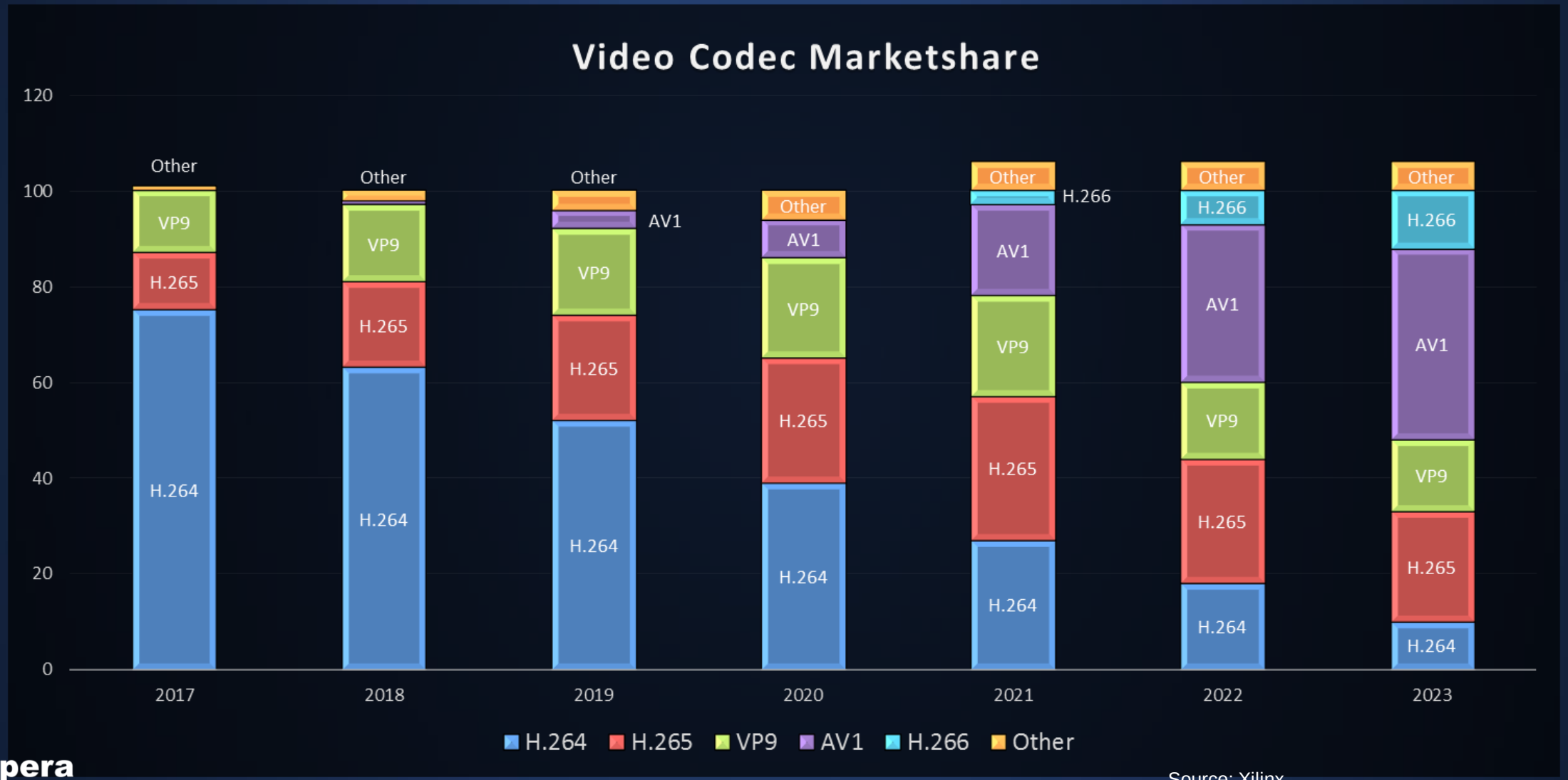
Internet traffic will be video by 2021

80%

Of data centre will be video data

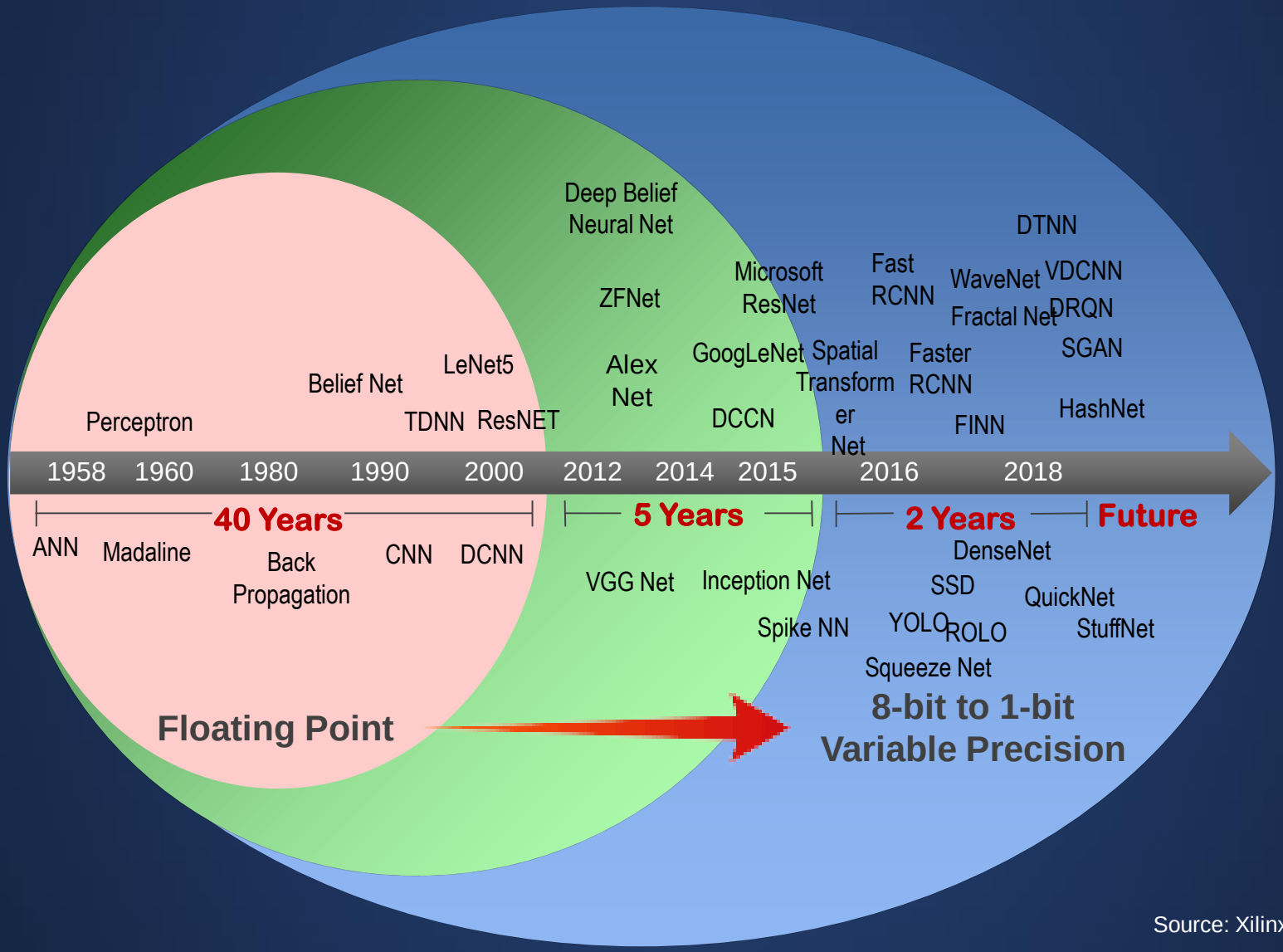
Sources: Cisco, IDC, IFSEC, IBM reports

Increasing Computing Complexity



Source: Xilinx

Fast Changing Networks



Source: Xilinx

Video Challenges & Aupera Solution

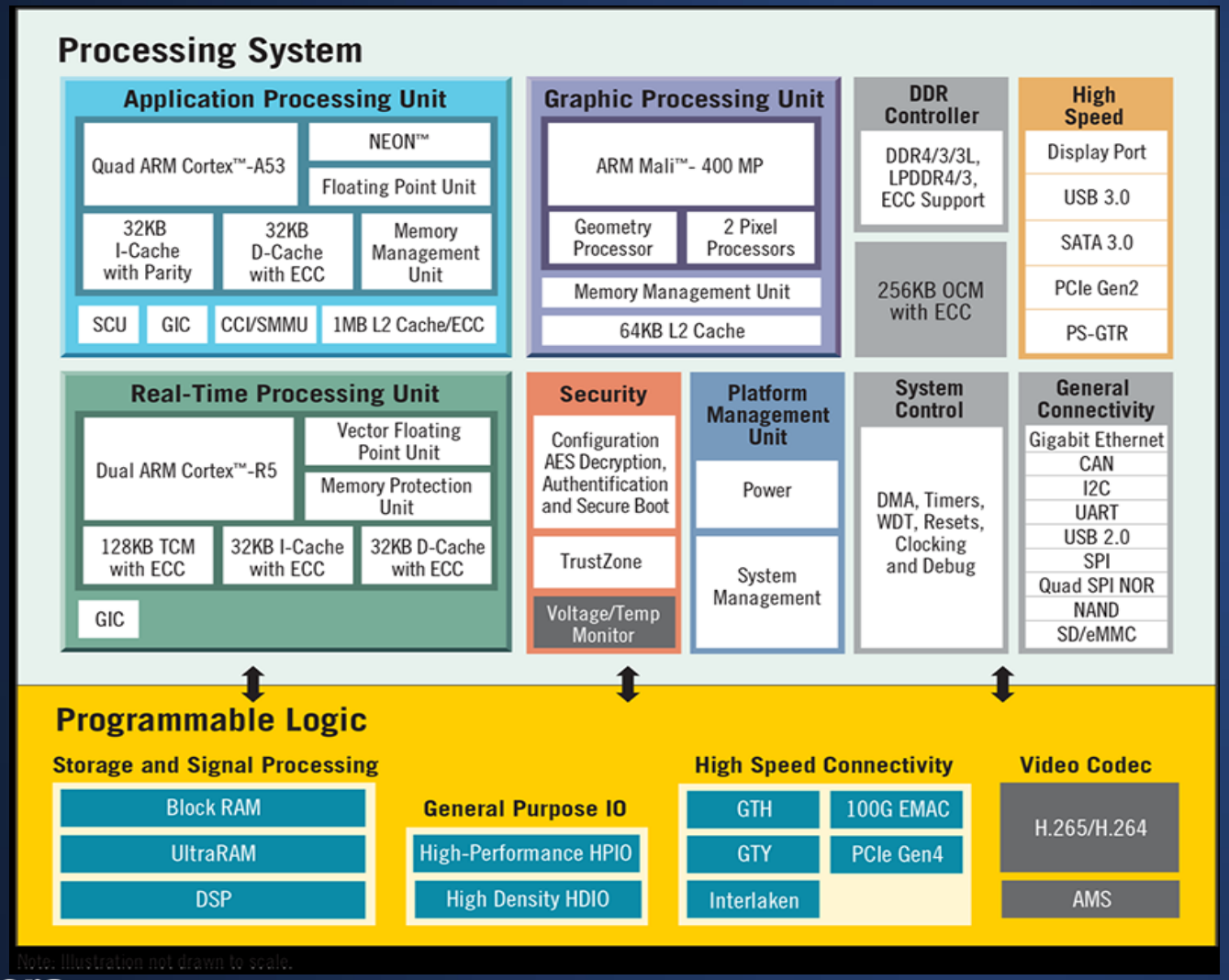
Video Processing Challenges

- Bandwidth cost
- Computing complexity
- Energy cost
- Video content real time analytics
- Variety of consumers end devices

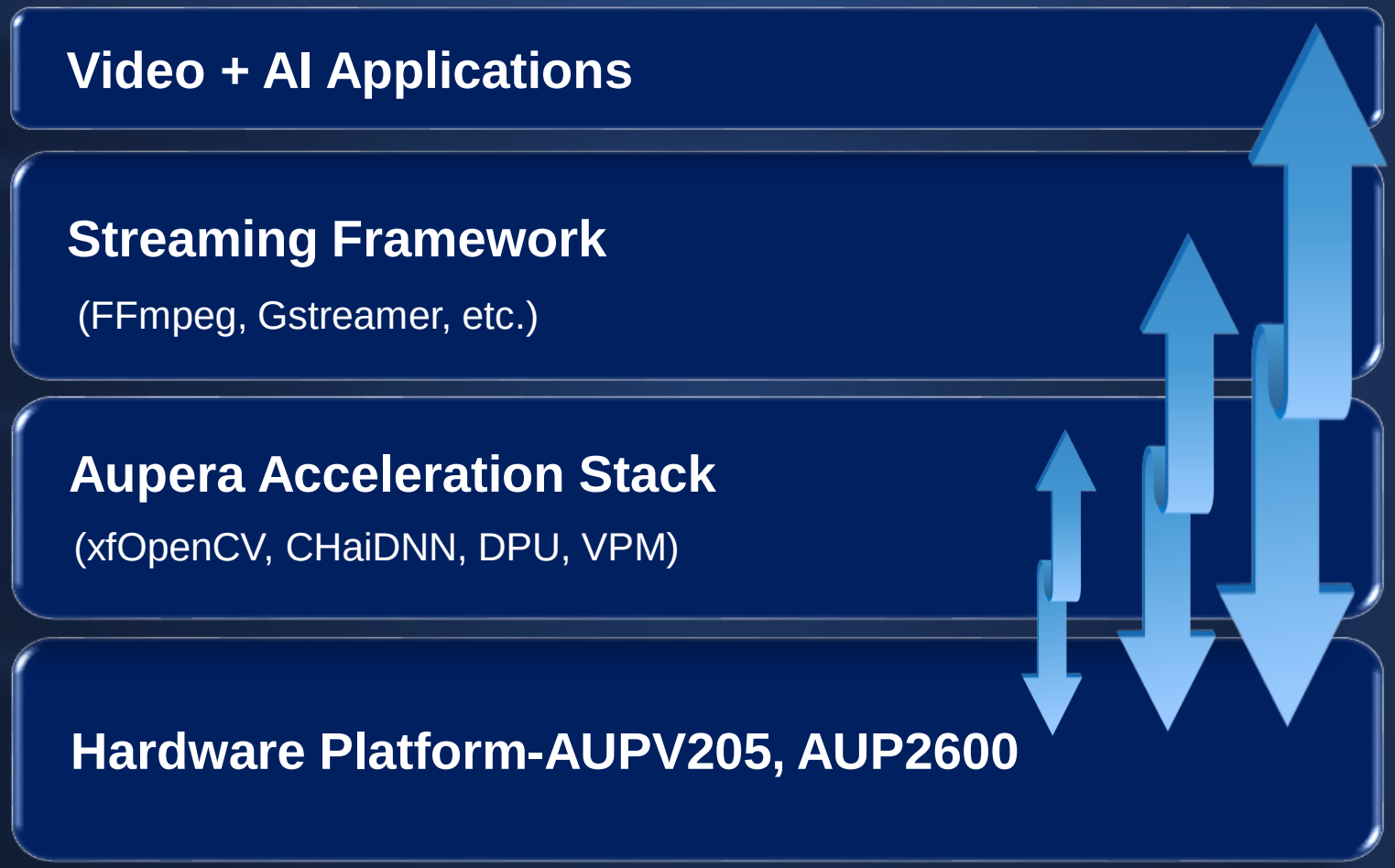
- Vertical System Optimization:
  - Algorithm → FPGA → HW → SW
- FPGA based high density video transcoding
  - 380 channel 1080p30 in 3U chassis
- FPGA built-in CV/ML engine
  - Real time object detection and classification
- 90% energy saving with FPGA + Arm

Aupera
Making Video Alive

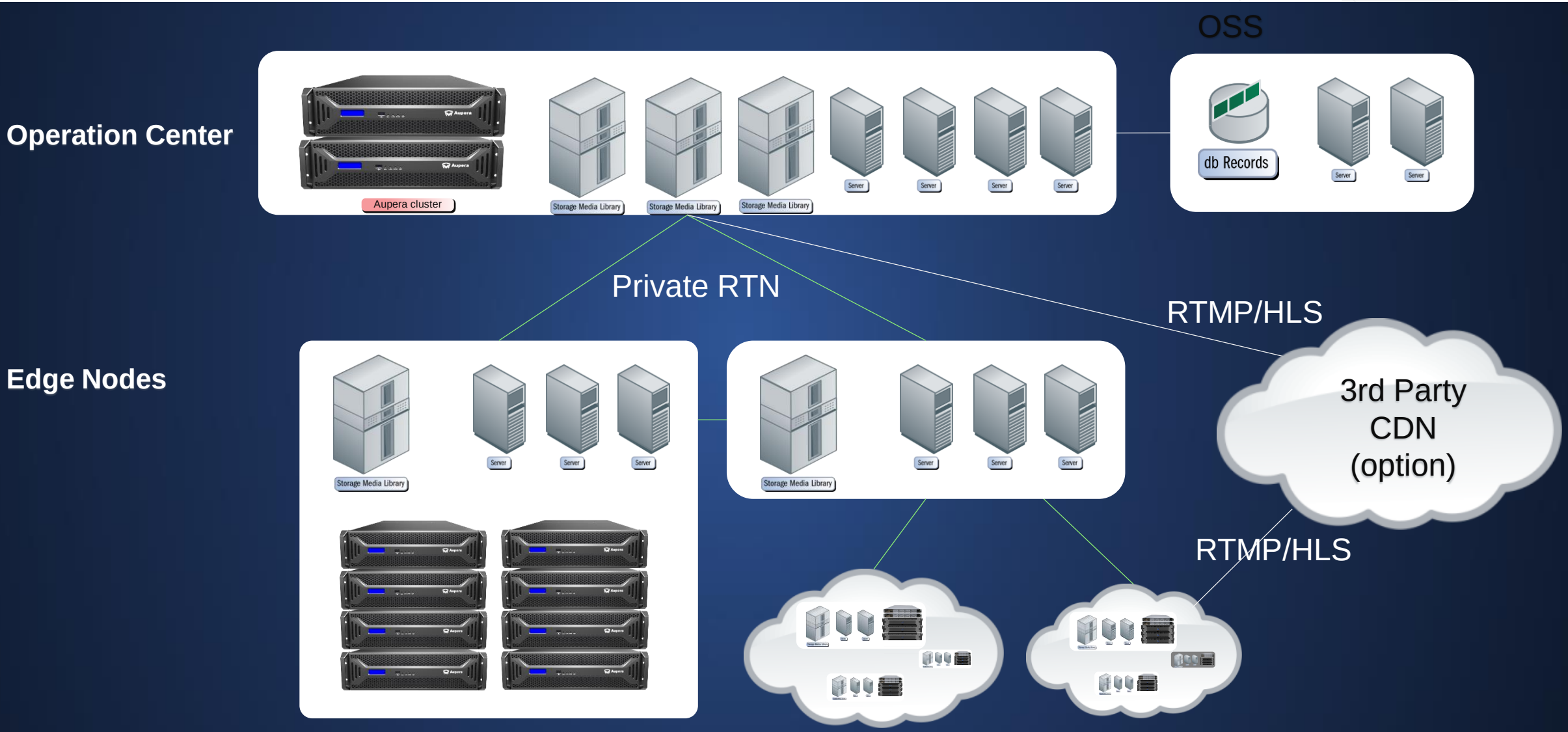
Xilinx MPSoC Architecture



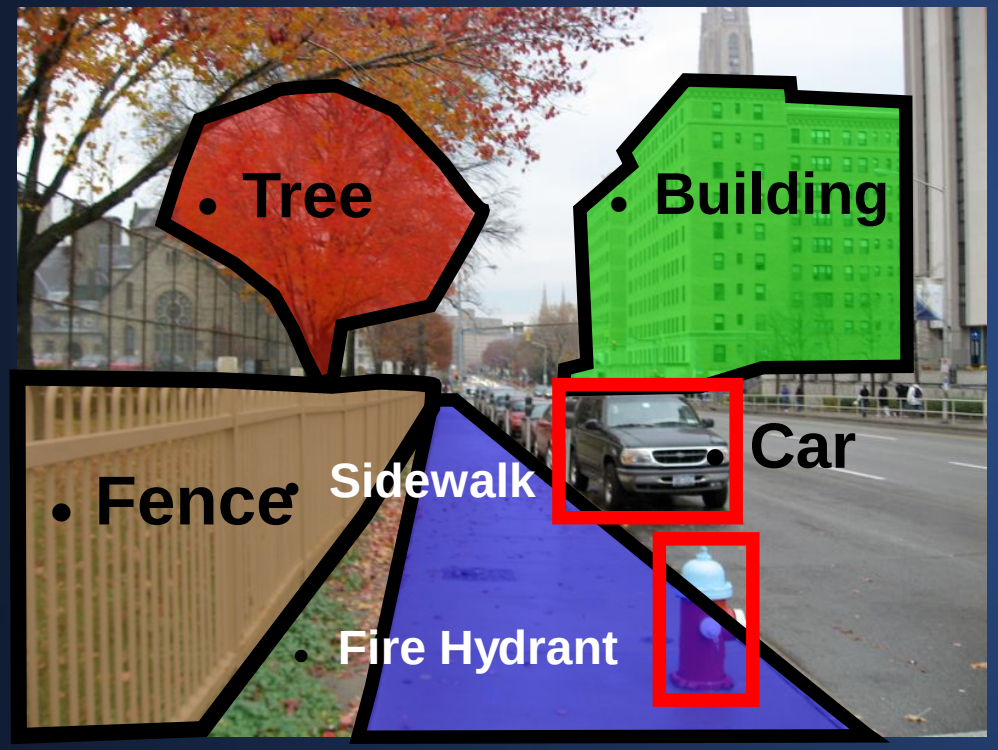
Aupera Architecture



Video Transcoding Application

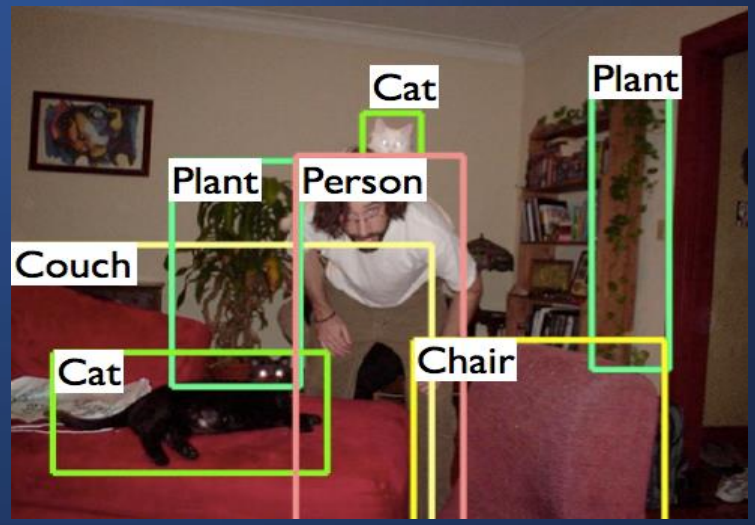


Video + AI Applications



Scene Understanding

Pedestrian Segmentation

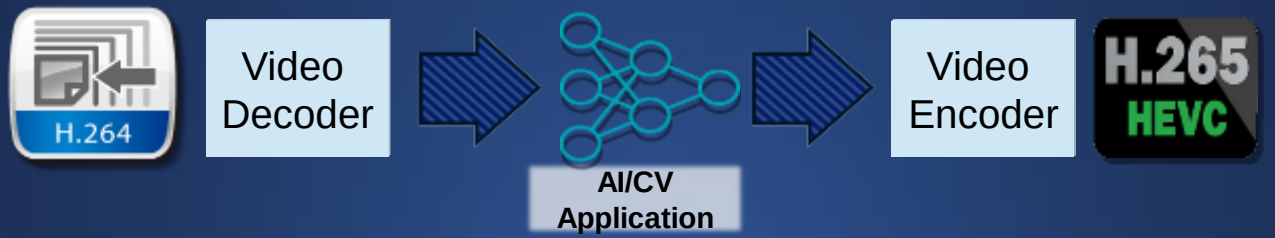


Object Classification and Detection

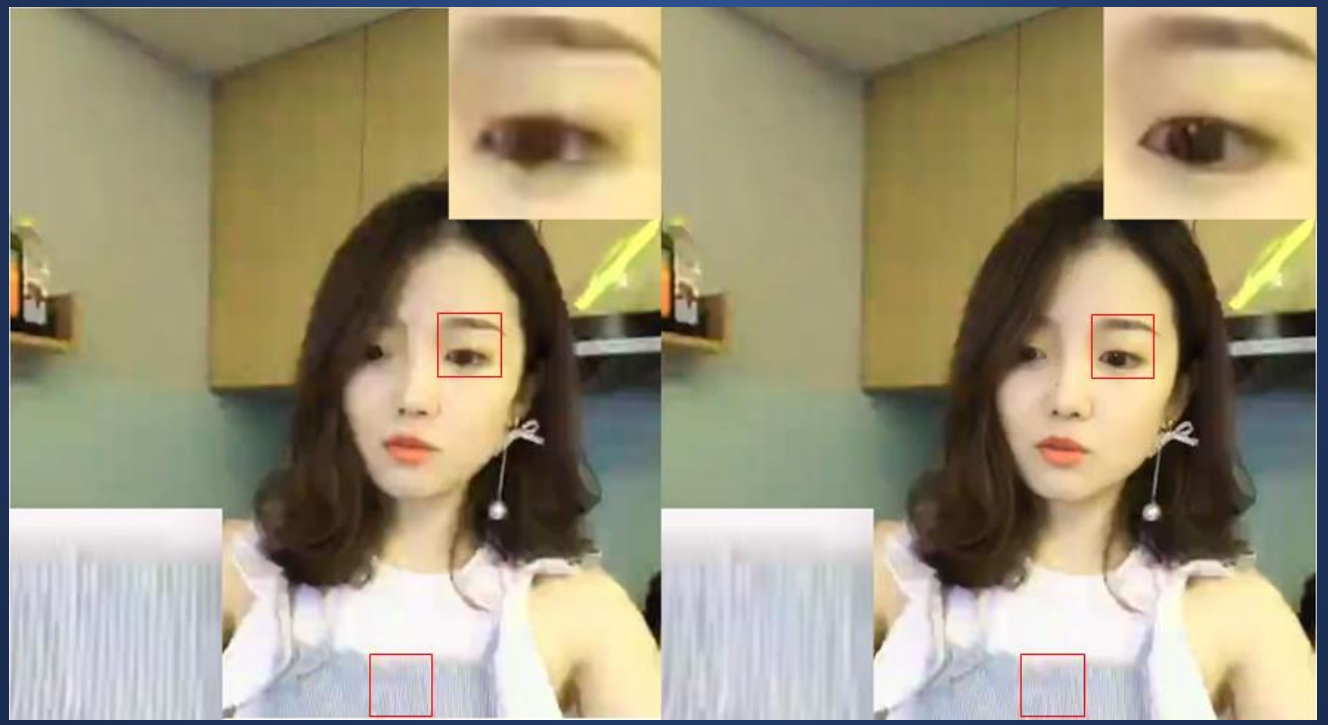
ROI Enhanced Video

$while true; do gst-launch-1.0 filesrc location=/gstreamer/data/live-004.mp4 ! qtdemux ! h264parse ! omxh264dec ! auperadetector ! queue ! omxh265enc gop-length=30 periodicity-idr=30 control-rate=1 target-bitrate=120 quant-i-frames=40 qp-mode=0 ! h265parse ! queue ! rtph265pay ! udpsink host=10.53.170.117 port=50000 max-lateness=-1 qos-dscp=60 async=false max-bitrate=500000000; done

Gstreamer plugin

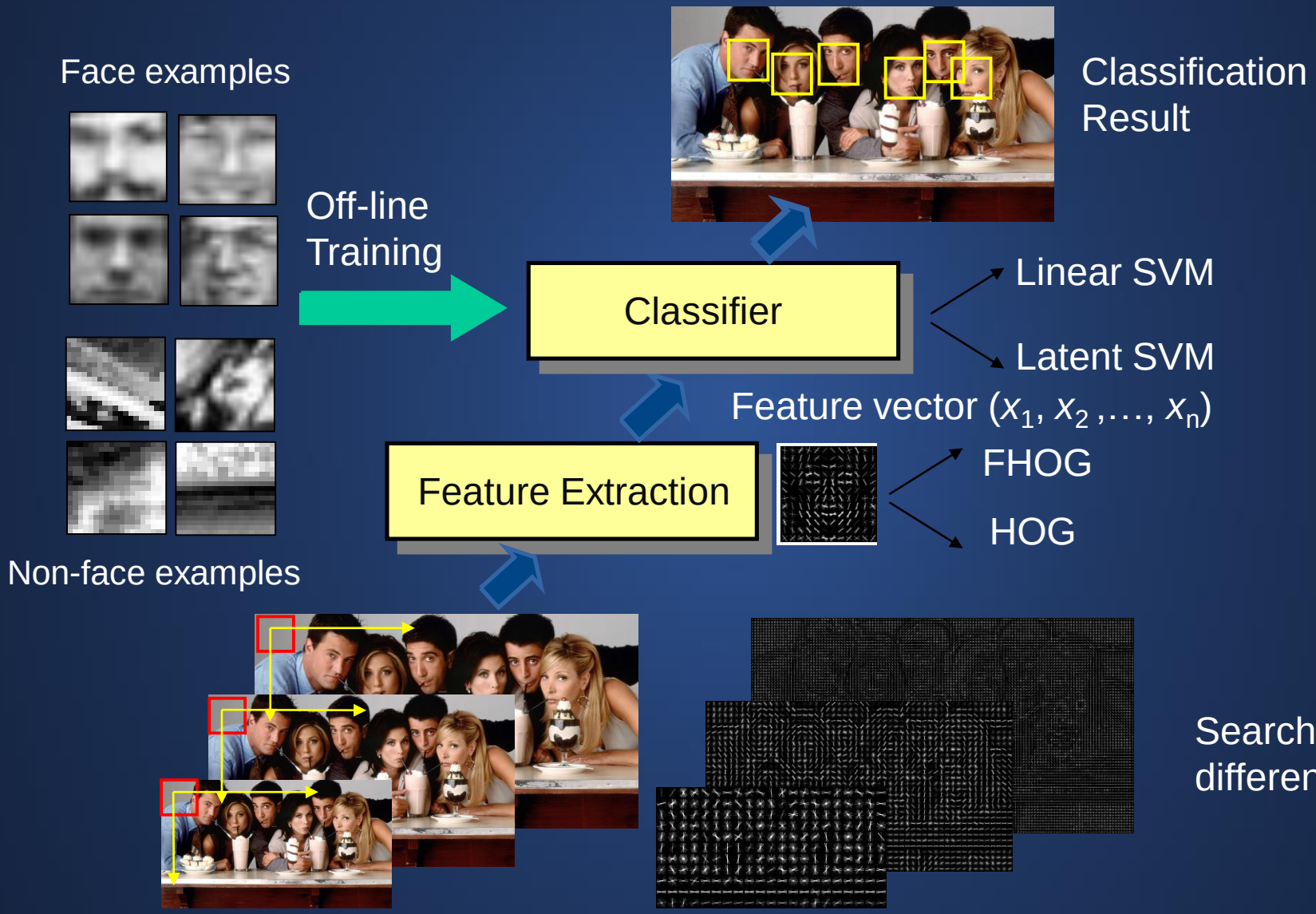


120Kbps



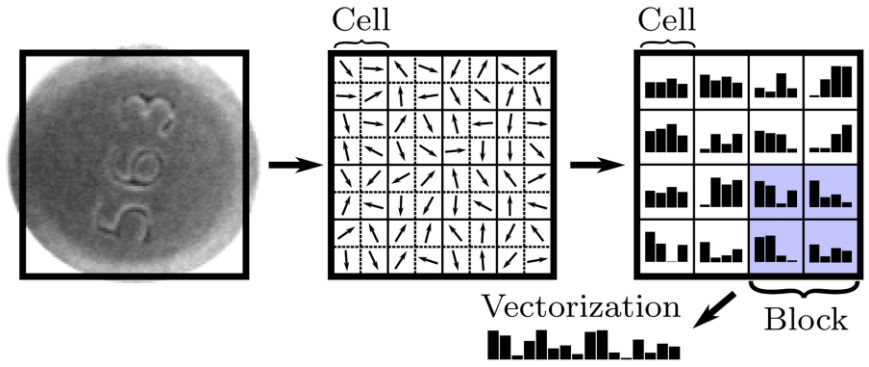
ROI Optimized 120Kbps

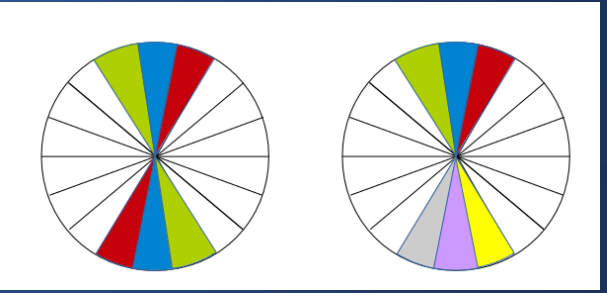
Object Detection



FHOG

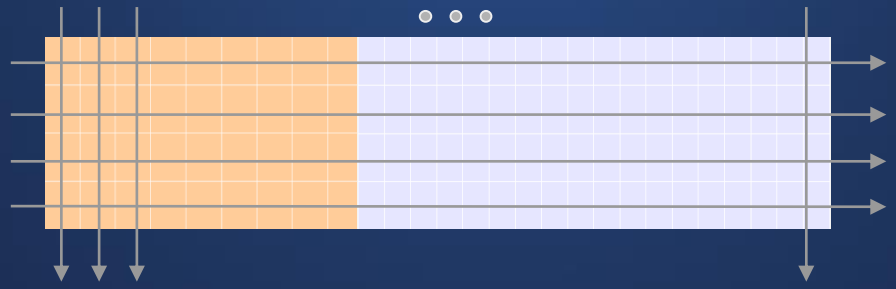
- Spatial case of histogram of oriented gradients
- Reduces feature size with no loss of information
  - 36 dimensional regular HOG → 31 dimensional FHOG
  - 9 orientations→ Contrast insensitive features
  - 18 orientations→ Contrast sensitive features





9 orientations
Contrast-Insensitive

18 orientations
Contrast-Sensitive



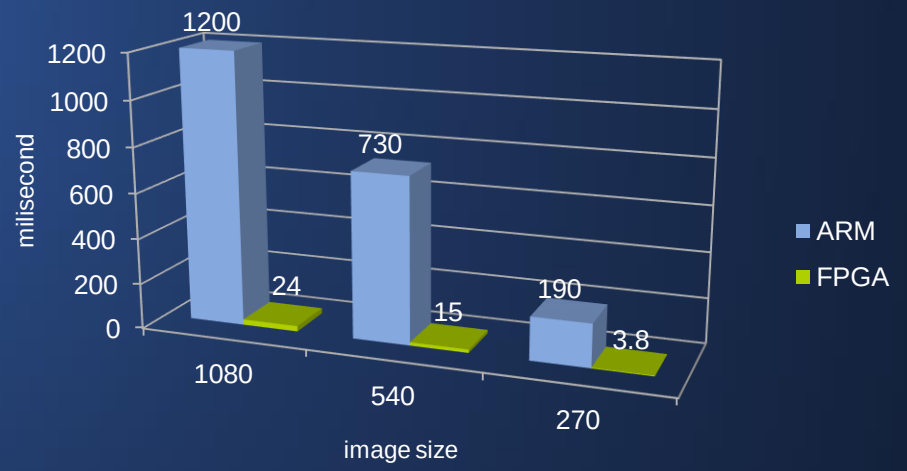
4+9+18 = 31

FPGA Acceleration Results

- Implemented on Aupera v205
- FHOG pyramid feature extraction
- 50X Acceleration

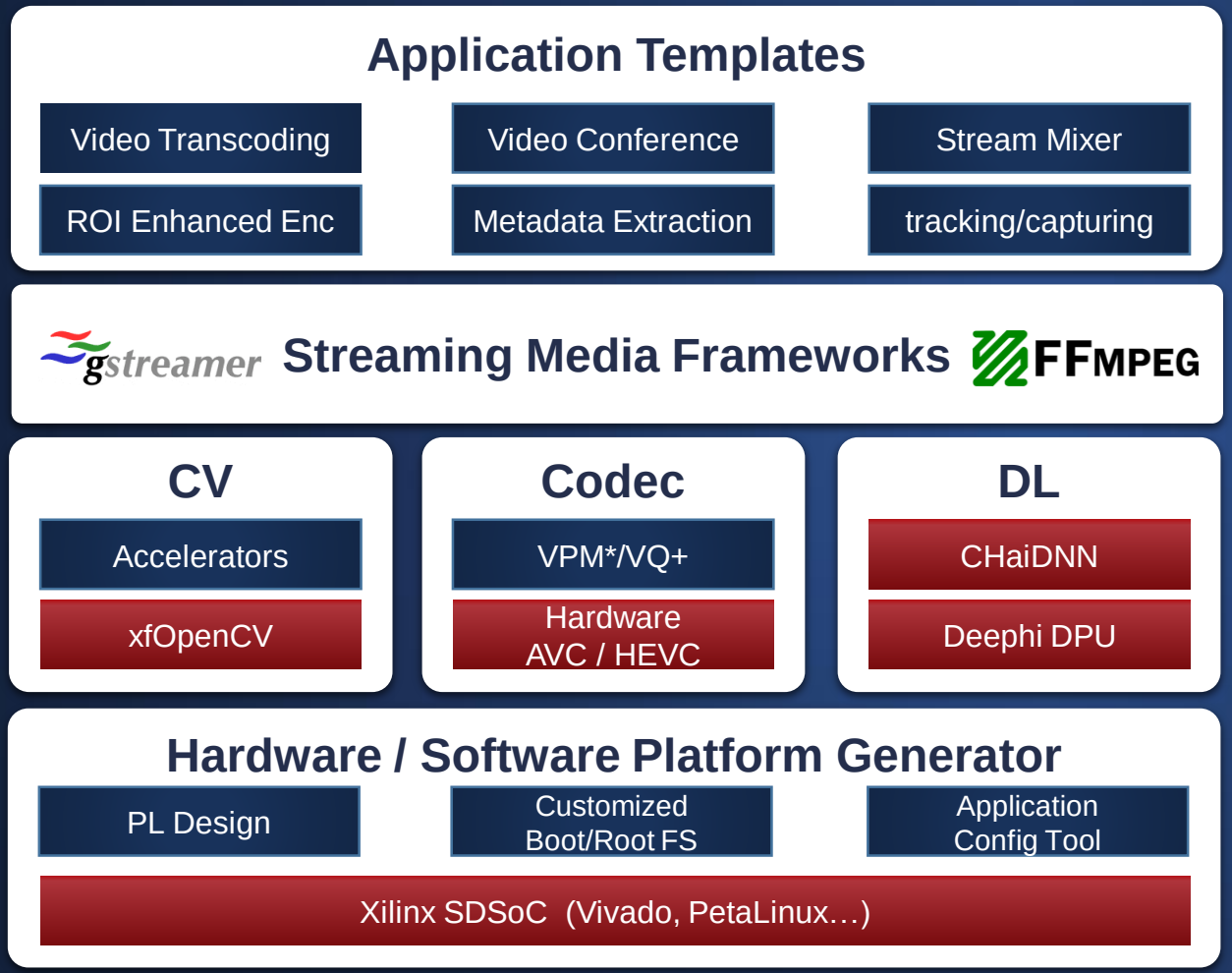
FHOG

	1080	540	270
ARM	1.2 s	730 ms	190 ms
FPGA	24 ms	15 ms	3.8 ms



Aupera Development Framework

Closing the gap between ideas and deployment for video+AI applications



- Video Focused
- Application Oriented
- Optimized Accelerators
- On top of Xilinx SDSoC

Aupera Development Framework

Xilinx Existing Environment

Note*: VPM stands for Aupera Video Processing Module

HW/SW Platform Generator

Accelerate Video Application Development

- **One-Click** to generate runnable images and application templates
- Customize application
- Online evaluation

Search Within Results

Manufacturer	Hardware Model	SDSoC SDK	Function	Boot Device
Aupera Technologies Inc.	*	*	*	*
Xilinx Inc.	V205-A0-Z7EV-1	2018.2p3	VCU,VPM(2scl+1pm), Peta default,MGMT agent,VLAN	QSPI-1
	V205-A1-Z4EV-1	2018.2p2	VCU,VPM(1scl), CV(ROI-HOG),Peta defaut,MGMT age	QSPI-2
	V205-A1-Z7EV-1	2018.2p1	VCU,VPM(1scl), DL(ChaiDNN MobileNet),Peta defaut,	eMMC
	V205-A1-Z7EV-2	2018.1	VCU,VPM(1scl), DL(DPU),Peta defaut,MGMT agent,VL	TF Card
		2017.4	VCU,VPM(2scl+2mixer+2pm), Peta default,DHCP,VLAN	

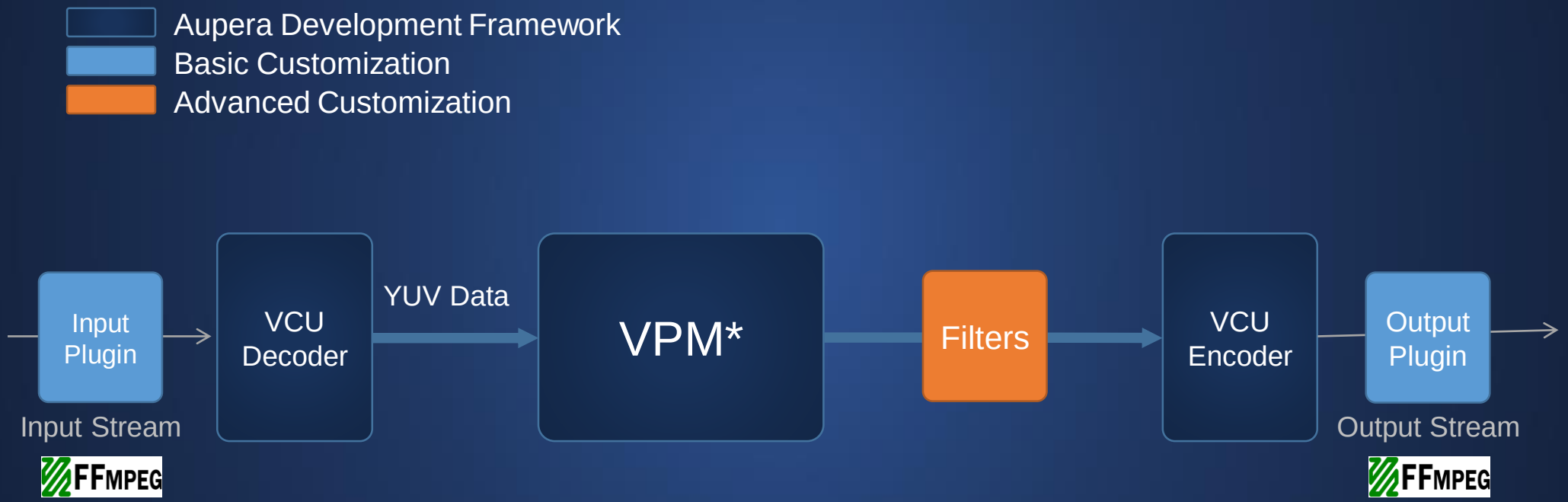
Clear

More Filters

Aupera
Making Video Alive

Video Application Templates

Streaming Mixer



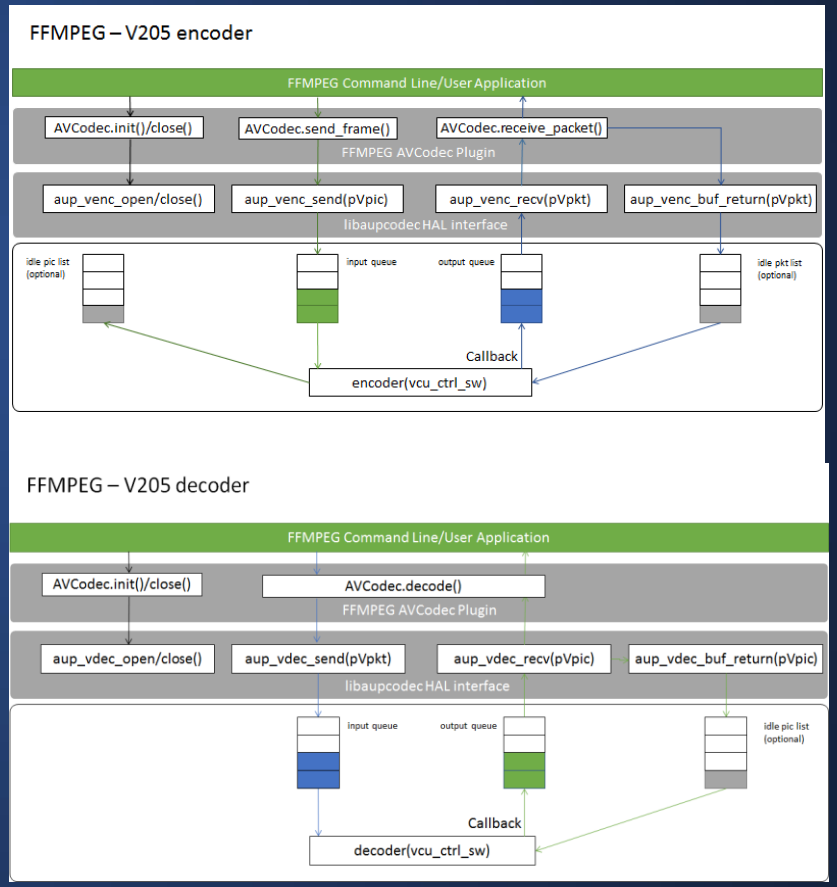
Note*: VPM stands for Aupera Video Processing Module

Aupera HW/SW Platform Highlight

- 380 channels 1080p30 Video streams
- H.264, H.265 Transcoding with AI built-in
- Standard Plugin
- API Compatibility
- Easy Deploy
- Smooth Scale Out
- Remote Upgrade

AUP2603
19 inch 3RU

FFmpeg Plugin
GStreamer Plugin



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Aupera HW/SW Platform Highlight

33x Advantage in Perf/watt with ZU7EV

1 x
Aup2603
(48 ZU7EV)

Video transcoding + AI analytics

	Aupera™ Solution	Intel E5 Solution	
Energy Cost			10x
Transcoding Cost/feed			3.3x
Space			10x

30 x
Intel E5 Server

Aupera
Making Video Alive

Adaptable.
Intelligent.

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XILINX