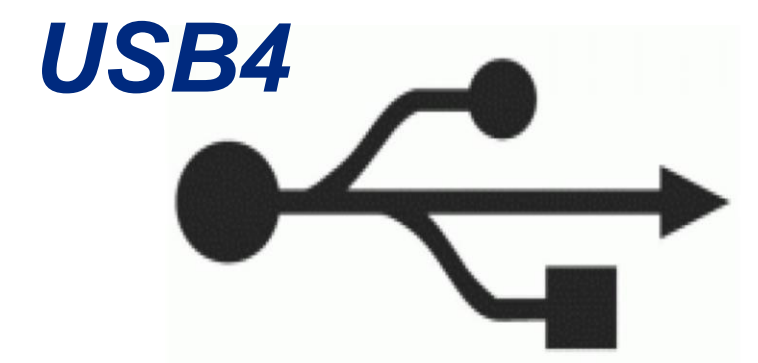# USB for Video, AR/VR Applications

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VP Business & Product Development

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www.corigine.com

Agenda: USB for Video, AR/VR

- Video application needs & the USB option

- Use cases:
  o Machine Vision
  o Automotive
  o AR/VR
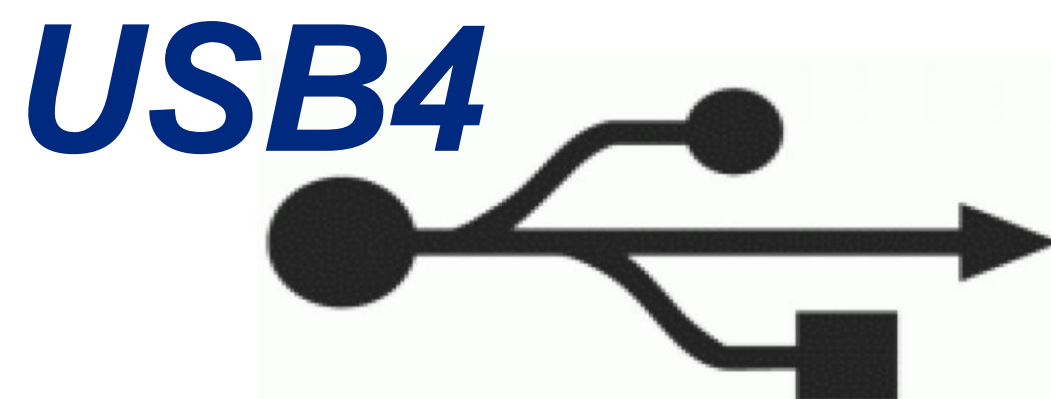 o Video conferencing, 180^0 cameras

- USB from Corigine

USB Standards Roadmap

- USB 3.0, 3.1 renamed USB 3.2

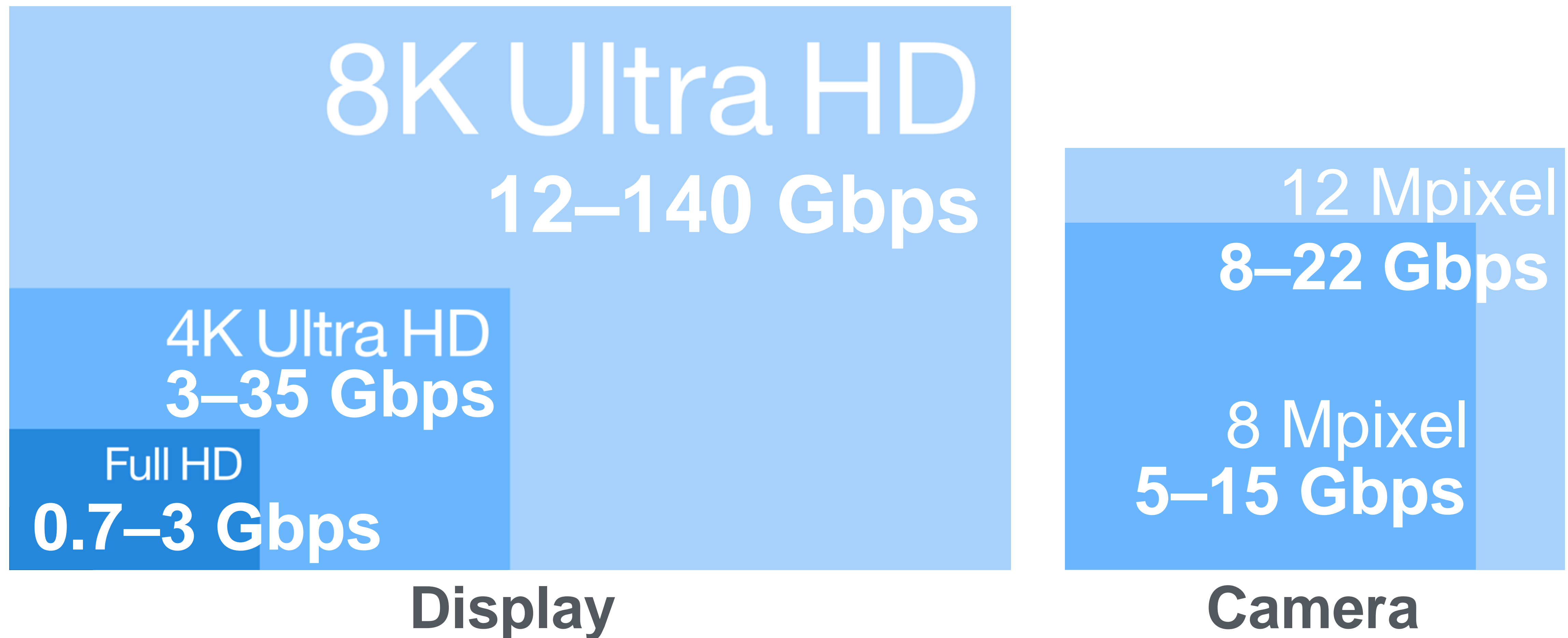- USB 3.2 Gen-1 & Gen-2 addresses upcoming application needs

SUPER**SPEED**+
CERTIFIED **USB**
10*Gbps* ™

- USB4 standard due in 2019
  - Daisy-chained devices, twice the bandwidth, more versatility, Thunderbolt 3 integration...

USB4

USB 1.0	12 Mbit/s
USB 1.1	12 Mbit/s
USB 2.0	480 Mbit/s
USB 3.2 Gen 1	5 Gbit/s
USB 3.2 Gen 2	10 Gbit/s
USB 3.2 Gen 1x2	10 Gbit/s
USB 3.2 Gen 2x2	20 Gbit/s
USB4	20 Gbit/s, 40Gbit/s

Camera/Display Resolution Increase

Corigine

8K Ultra HD
12–140 Gbps

4K Ultra HD
3–35 Gbps

Full HD
0.7–3 Gbps

Display

12 Mpixel
8–22 Gbps

8 Mpixel
5–15 Gbps

Camera

Multiple hi-res displays, cameras → many Gbps

USB in Video, AR/VR Applications

- Video applications requiring higher bandwidth, uncompressed video
  - Machine Vision
  - Automotive
  - AR/VR
  - 360 Cameras

- USB is ideal for streaming video (or audio)
  - Operates in isochronous mode which is more pleasant to the eye, and ear.
  - For audio and video, data transmission occurs at regular intervals
  - USB accomplishes completeness with "bulk transfer" mode
  - USB 3.2 Gen-2 (10Gbps) enough for ~8Gbps required by 4K UHD video streams
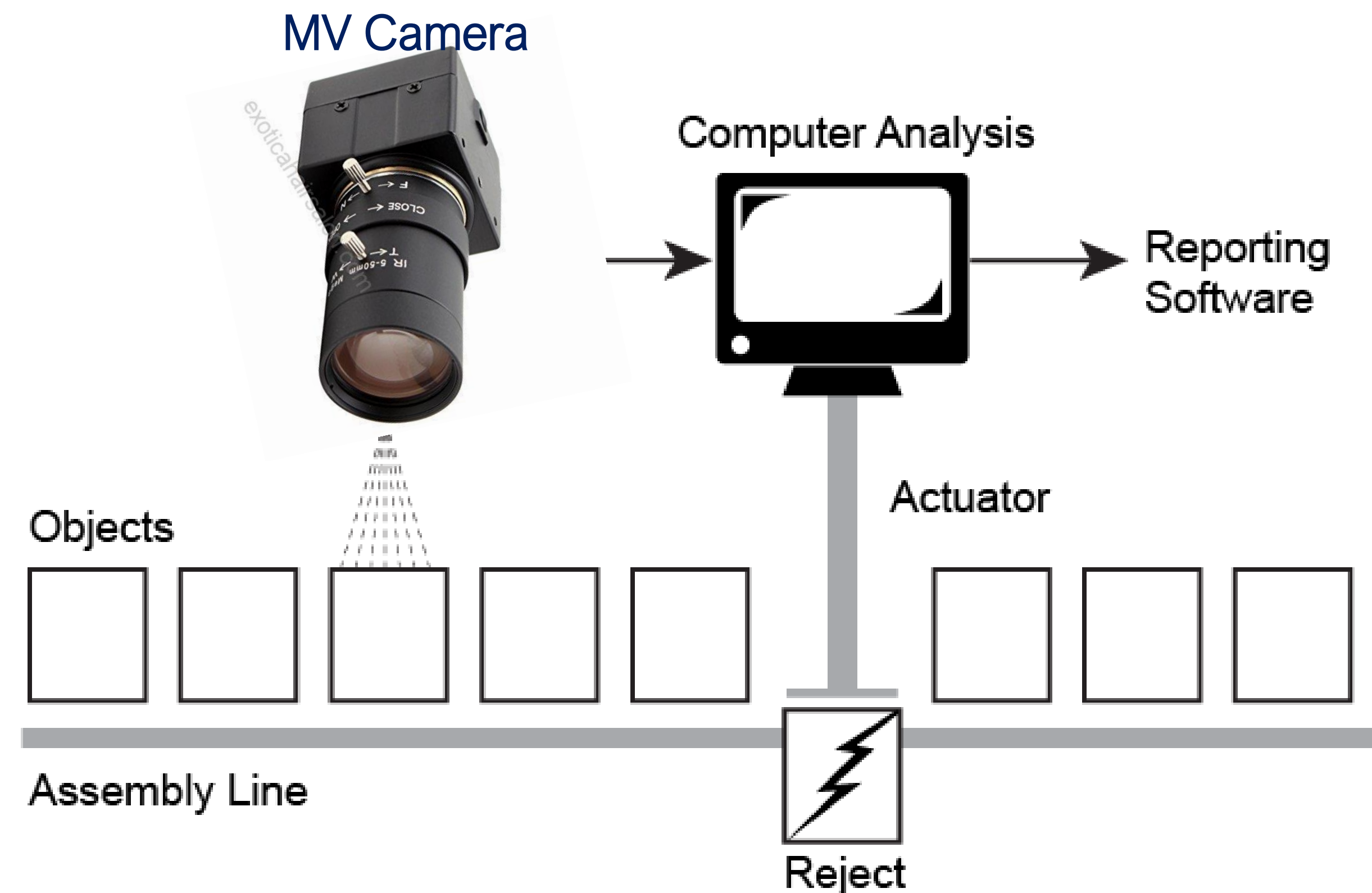
USB Machine Vision Cameras

- Automatic Inspection
- Dimensional Measurement
- Process Control
- Pharmaceutical Inspection
- Food Inspection
- Pattern Recognition
- Facial Recognition
- Serial Number Recognition
- Robot Guidance

$9.5B market in 2020 (doubled in 7 years)

MV Camera

Computer Analysis

Reporting Software
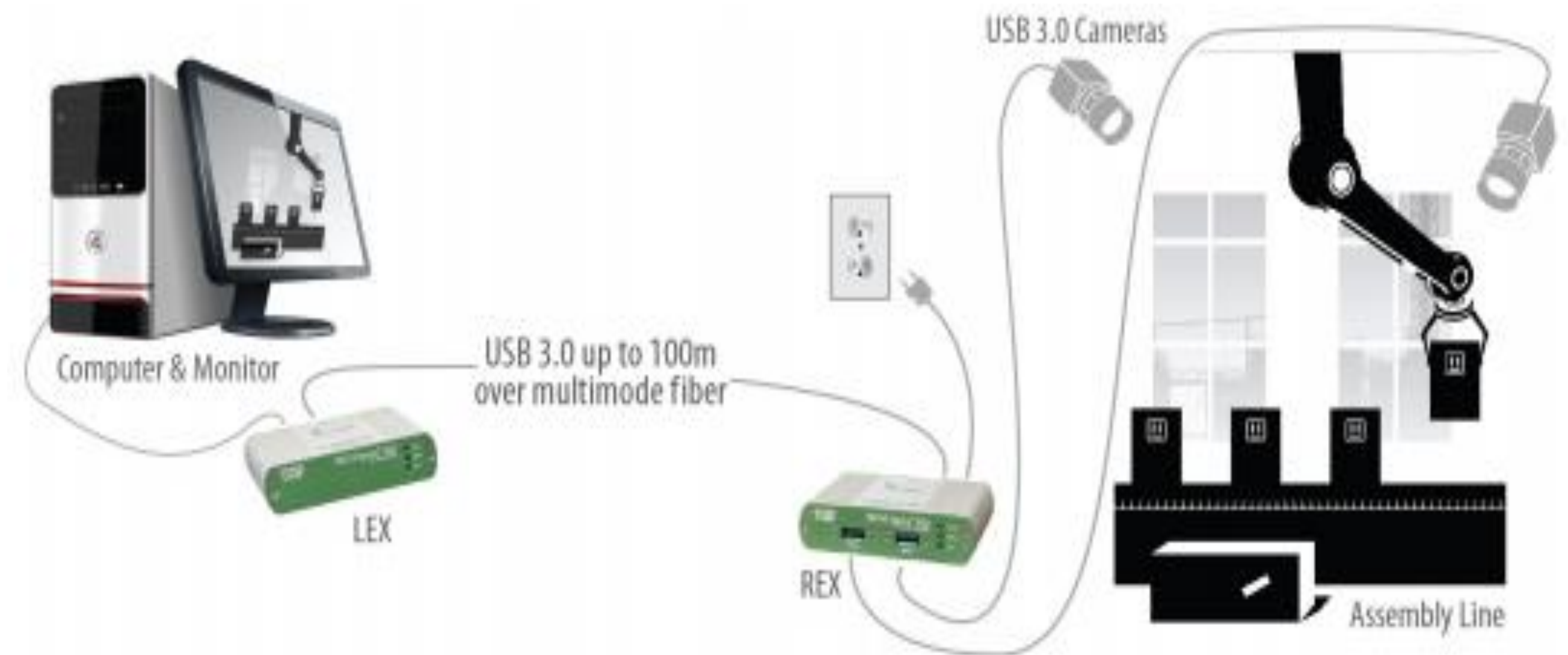
Objects

Actuator

Assembly Line

Reject

USB

USB Machine Vision Cameras

- USB cameras are most popular choice for MV
  - Proven and cost effective
  - Low power
  - 4K60P
  - Bridges to fiber optic, CatX

USB 3
MV Cameras

USB-Fiber extender from
Ikron Technolgies

USB in Automotive

Many cameras and displays

10+ external cameras
- Front, rear, sides
- Different fields of view
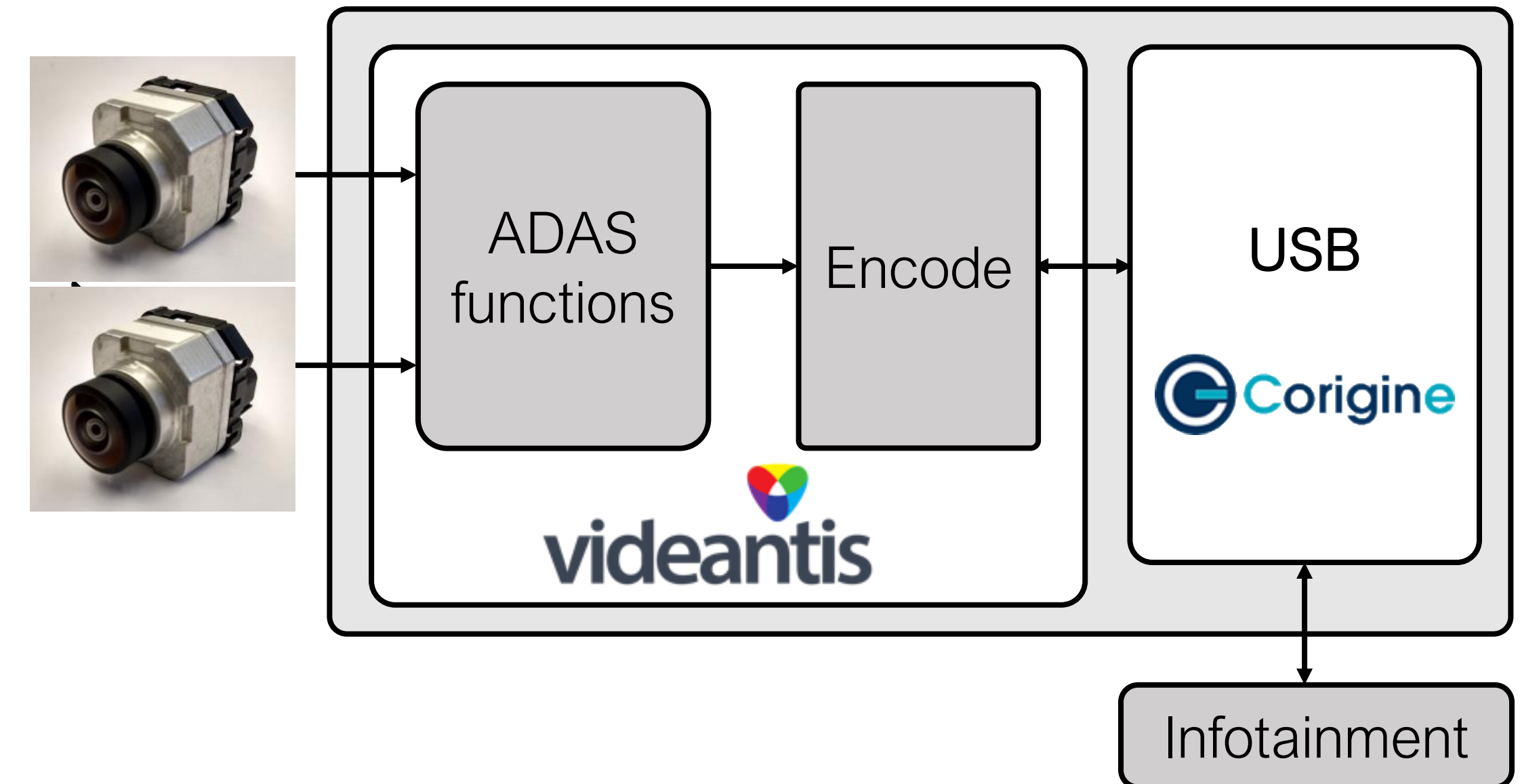
10+ internal cameras
- Driver monitoring (e.g. sleepy)
- Occupant monitor (airbag)
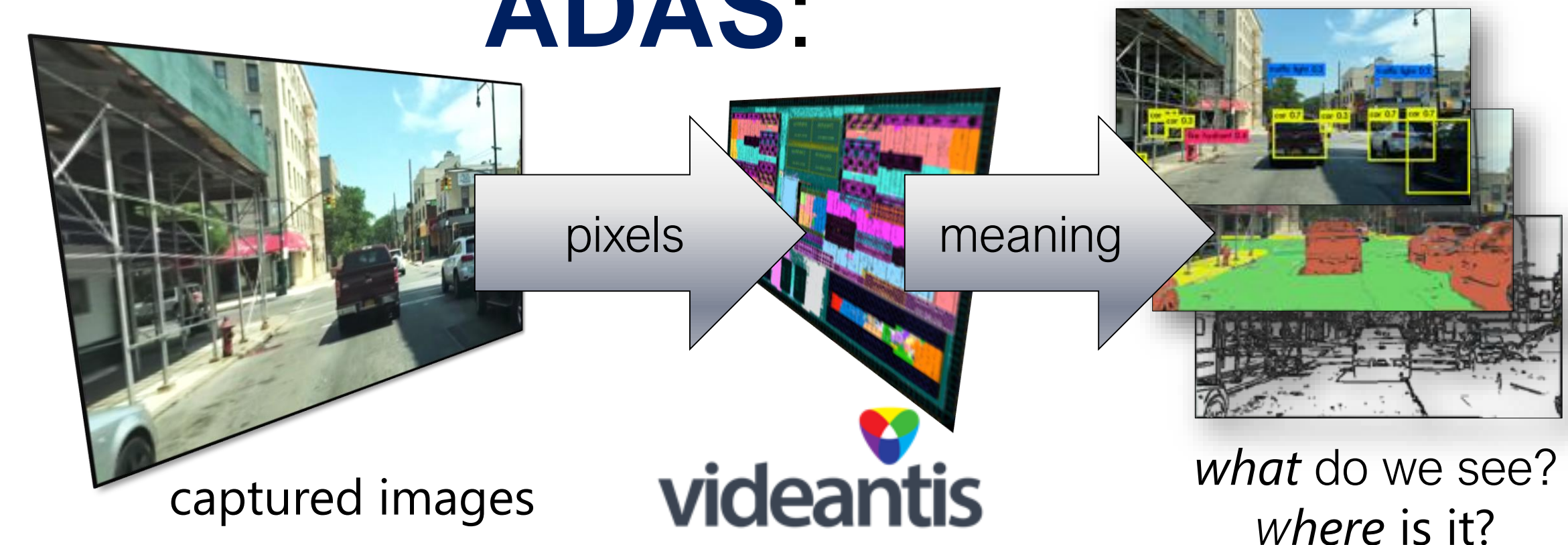- Child monitor / child left behind

5+ displays
- Dashboard
- Electronic mirror
- Infotainment
- Rear seat entertainment

Lots of video transmission→ USB

Dashcam:

ADAS:

captured images

pixels → meaning

what do we see?
where is it?

USB for AR/VR

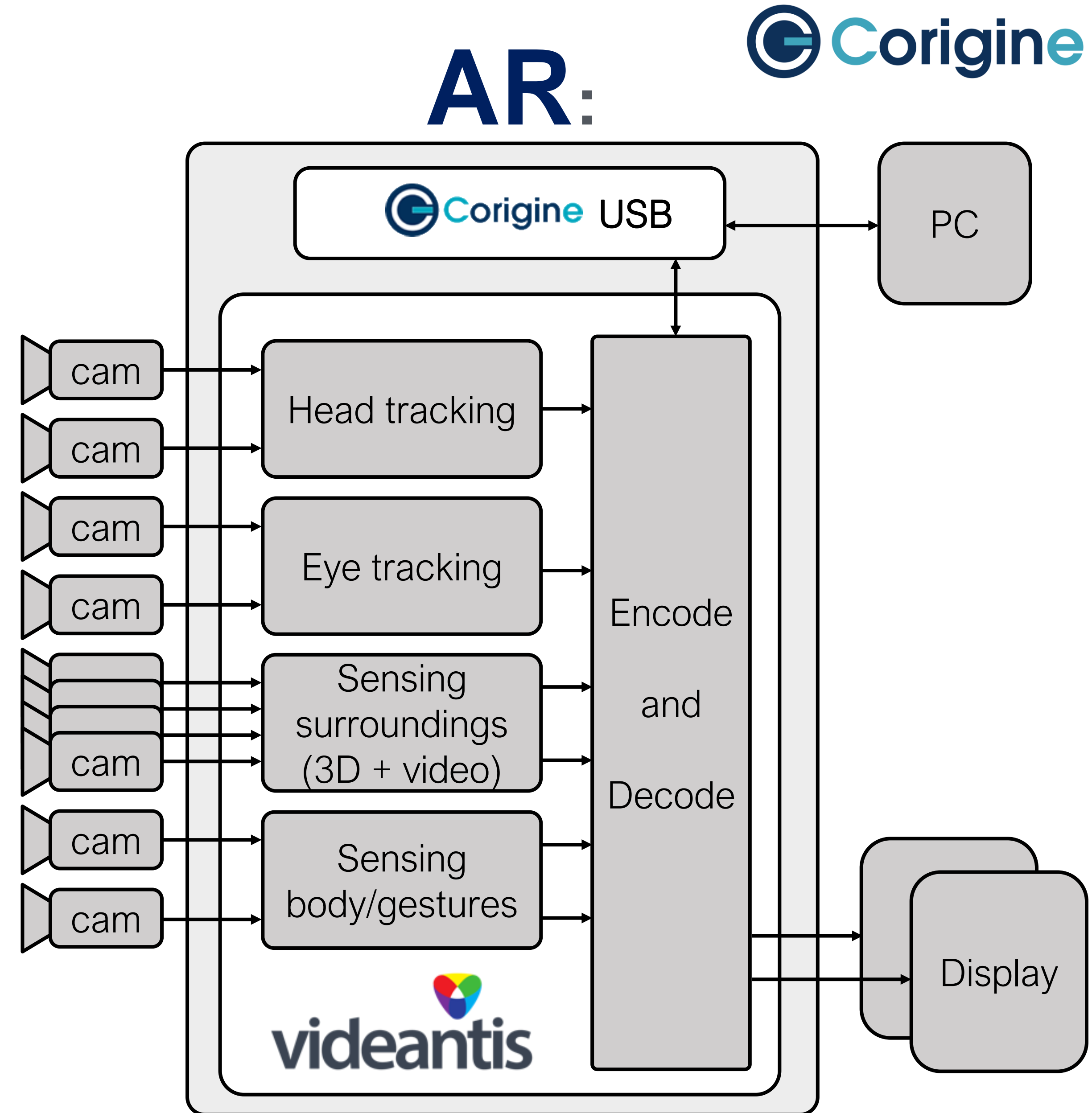**Many cameras for high-end AR**

Two displays, for each eye one

High-bandwidth USB:
- **Connection to powerful PC**
- **Streaming compressed video**

videantis processor:
- **Video encode/decode**
  + Deep learning
  + Computer vision
  + Image processing

AR:

Corigine Solution Partner: Videantis

videantis v-MP6000UDX processor:

- Maintains high picture quality, which is key
- Supports multiple 8K60 video streams
- Supports many standards, runs in firmware
- H.264: right picture quality, power, area tradeoff
- Low latency: below 1ms
- Multi-channel, encode and decode
- Operates with or without external memory
- Scales from <1 Mbps to >1 Gbps bitrates
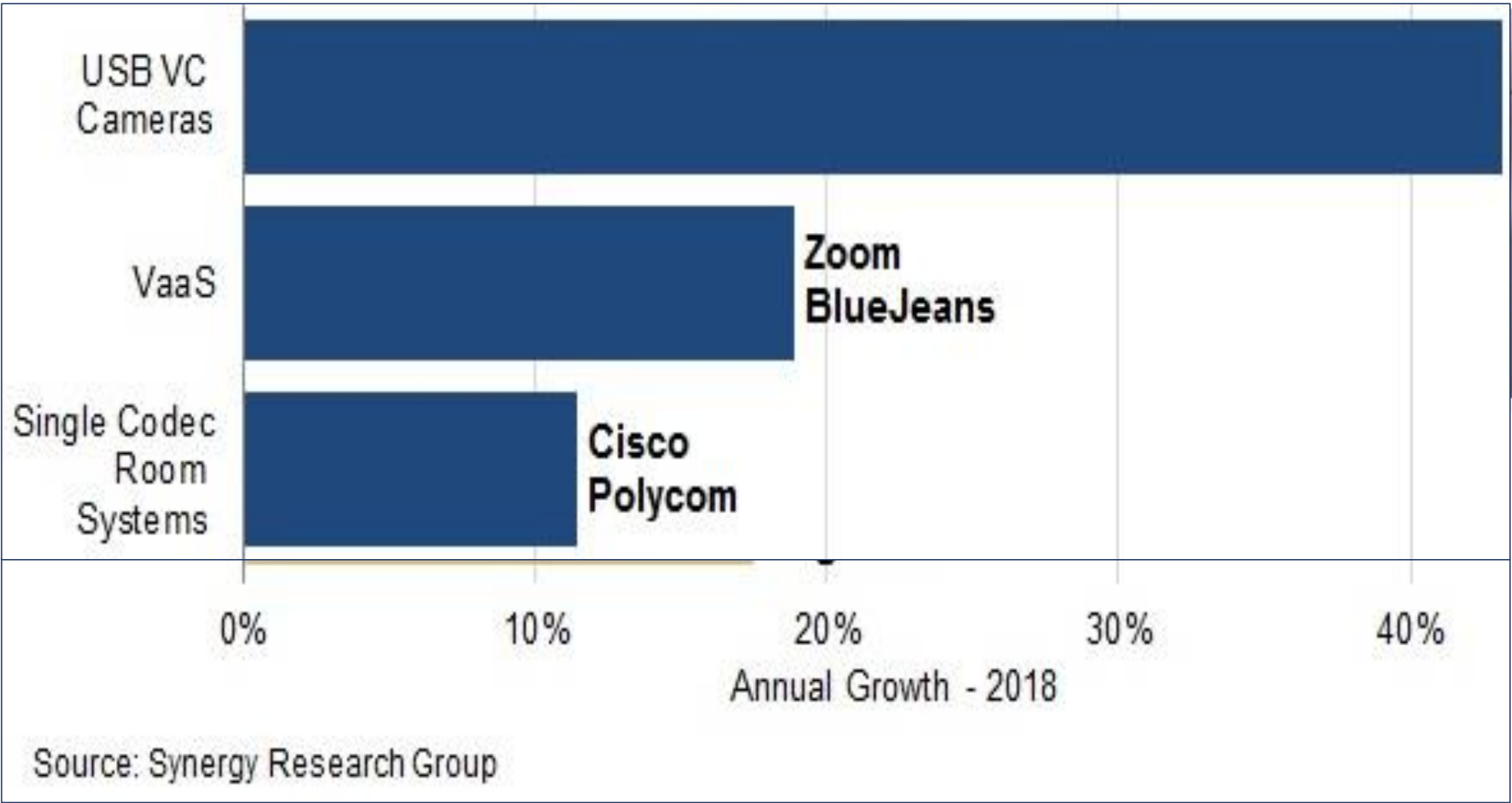- Integrates with USB, Ethernet, cameras, displays

Automotive camera

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USB Enabling Video Conference Growth

- **Videoconferencing market $6B in '19 (Synergy)**

- **USB driving growth in video rooms**

Graphic courtesy of: **PANACAST**

Use Case: Video Conferencing
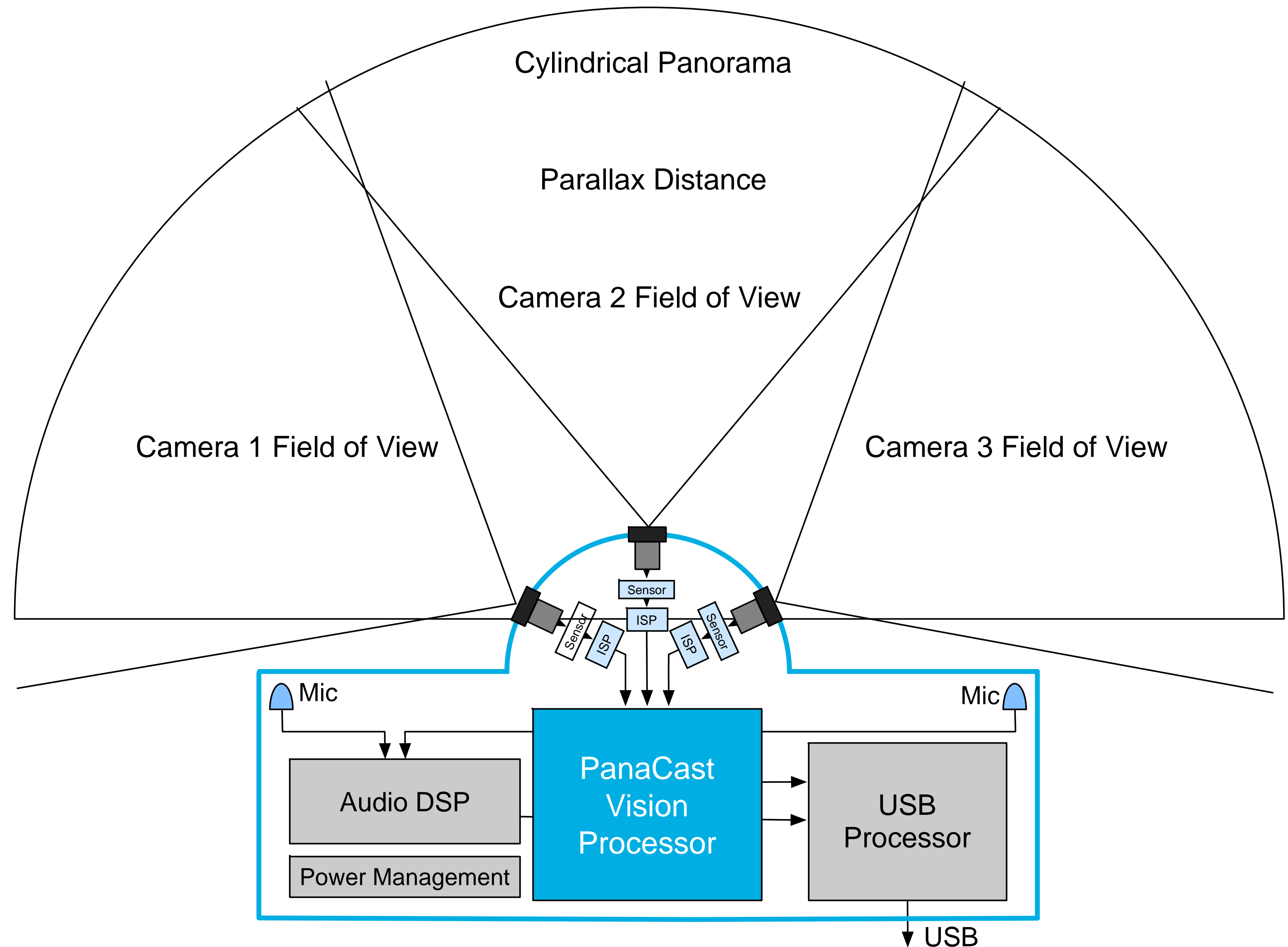
Corigine

Intelligent Vision

Real-time immersive 180° video (2D, 3D)

Real-time detection, sensing, learning

Real-time Connected Experience

Graphic courtesy of: **PANACAST**

Cylindrical Panorama

Parallax Distance

Camera 2 Field of View

Camera 1 Field of View

Camera 3 Field of View

Sensor

ISP

Sensor

ISP

Sensor

ISP

Mic

Mic

Audio DSP

PanaCast Vision Processor

USB Processor

Power Management

USB

www.corigine.com

180⁰ VC Cameras for Huddle Rooms

PANACAST

Whiteboard

TV Monitor

PanaCast 180°
multi-camera array system

Wall-to-wall visibility (100%)

Whiteboard

Whiteboard

Wasted space
(not visible with
conventional cameras)

TV Monitor

Single camera

Limited visibility

Whiteboard

Wasted space
(not visible with
conventional cameras)

People are close to the screen/camera system and to each other in huddle rooms
Need 100% video coverage right up front (People + AI)

http://www.videoconferencegear.com/blog/time-for-video-conferencing-in-all-your-meeting-rooms/

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Managing Growth with USB VC at UBER

USB 180⁰ Camera (PanaCast-3)

- Integrates three 13 Megapixel cameras

- real-time stitching technology

- Plug-and-Play 180º x 54º field of view

- Panoramic-4K output (3840 x 1080), 30 FPS

- Ideal for huddle rooms

Hundreds of PanaCast VC devices across UBER's conference rooms globally

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Things to consider when choosing your USB IP Solution…

USB4

- USB controller should be USB-IF certified
  - If it's not certified, verification will be more difficult
  - Could also result in field returns, or brand name damage
- USB Controller should be architected for today's applications
  - Small gate count, minimal memory requirements, low power
  - Designed for today's USB, without baggage from the past
- USB Controller should be PHY agnostic
  - Some vendors will try to lock you into a PHY choice
 - Better to have a standard PIPE interface to work with any PHY

http://www.usb.org/home

Corigine USB IP

- ✓ **USB controllers for: 2.0, 3.2 Gen1, Gen2. USB4 is next**

- ✓ **Supports Host (PC + Embedded), Device, Dual-role**

- ✓ **All Corigine controllers are USB-IF Certified**

- ✓ **Architected for smallest size, lowest power, maximum configurability**

- ✓ **Complete IP with prototype, verification suite, and PHY from partner**

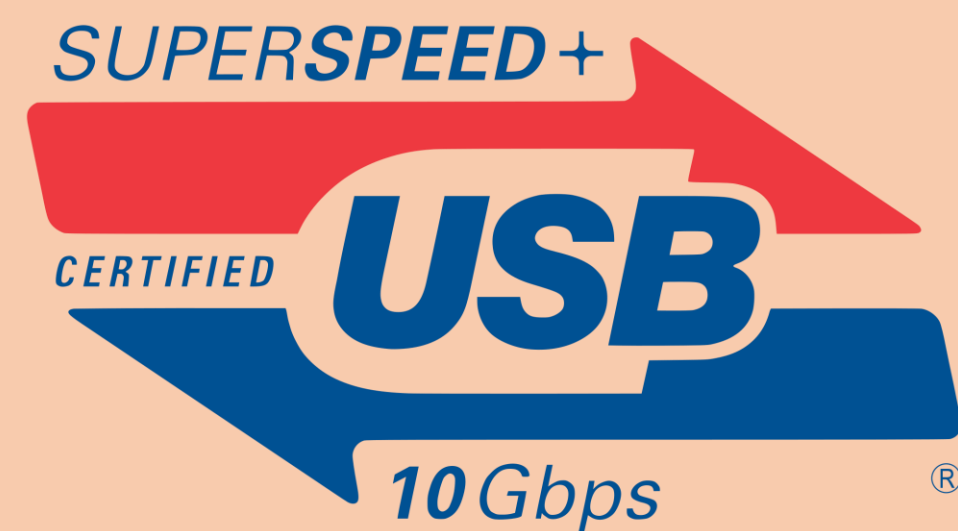- ✓ **Experienced R&D team, responsible for USB IP in millions of devices**

Corigine USB IP Can Also Eliminate External Chip
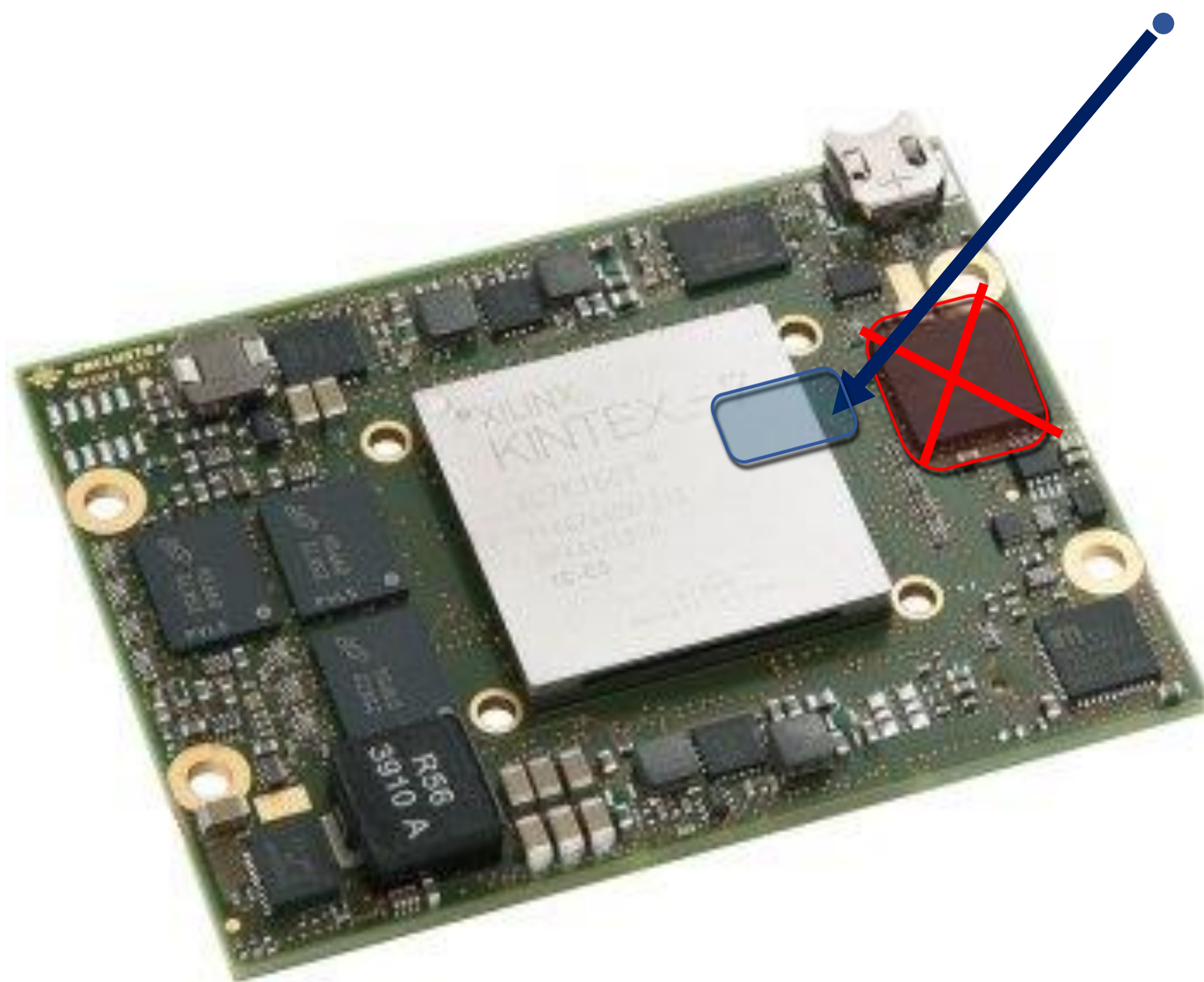
Corigine's embedded USB controller option can:

- Eliminate external chip ($15-$30)
- Smaller PCB
- Reduces power consumption
- Reduces heat, maintaining system fidelity
- USB-IF certified USB3.2 &2.0
- Scalable to 10Gbps

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Thank You