Mobile Influenced Markets – Evolution of Camera and Display Uses
Lattice MIPI D-PHY℠ Applications

- The PC industry created demand in adjacent markets such as test equipment, POS terminals, and industrial controls
- Designers leveraged their access to standardized APIs and hardware
- In a similar way, the mobile industry is experiencing demand for high quality, low cost components in mobile influenced markets
Traditional display applications will include one (maybe two) static displays.
Many consumer, automotive, and industrial applications use older LVDS interfaces.
AR/VR (Displays)

Merging is the favored method to minimize eye-to-eye latency.

Minimum frame rate of 75 Hz is needed to avoid motion sickness.
Video data can be “multiplexed” through a single MIPI D-PHY port by mux-ing frame by frame, or merging to super frames.

**Mux**
- Input
- Output = 1X Input Bandwidth, 1 Frame Latency

**Merge**
- Input
- Output = 2X Input Bandwidth, 0 Latency
Traditional Camera Applications

- Traditional camera applications statically switch from one camera to the other

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AR/VR (Cameras)

Requires Environment Awareness

• IMU – Inertial Measurement Unit Performing Sensor Fusion for Accelerometer, Gyrometer & Magnetometer

• Cameras
  – Distance Measurement
  – Environmental Understanding
AR/VR Tracking

• Two approaches to positional tracking:
  – Outside-In requires external hardware
  – Inside-out is self contained

Inside-Out System (such as Microsoft Hololens)

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AR/VR Permutations for Inside-Out

- Inside-out implementations are growing in the number of cameras and sensors

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360 Cameras • Just more cameras

Drones • Require same things as AR/VR
• Plus more cameras

Automotive • Require same things as AR/VR
• Plus transport

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Everything Else

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Why FPGAs? Flexibility

- FPGAs have general purpose IOs in addition to specialized IOs such as MIPI D-PHY
- FPGAs provide an array of flexible programmable logic cells that can support high speed data flow including splitting and merging functions

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Why FPGAs? Time To Market

- Product development cycle is much faster than ASIC cycles
- FPGAs enable innovation

Features

Consumer = 6 – 12 month dev cycle

ASICs = 18 month dev cycle

Time
Summary

- MIPI components have become ubiquitous
  - Cameras, Displays, APs, Accelerometers, Gyrometers, Magnetometers ...

- Mobile influenced markets are leveraging these components in all sorts of ways and combinations

- FPGAs have been instrumental in enabling these new (and unforeseen) markets in ways that simple bridges cannot, in terms of time and functionality