Optical Network for Uncompressed High Definition Video Transmission

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Outline

• Uncompressed HD video applications
• Hardware & network bandwidth for supporting HD video
• Bottleneck for HD video applications
• Hybrid cable solution to bottleneck
• Opportunity for on-demand bandwidth premium services
• Conclusions
HD Video Applications for High Resolution & Large Screen Display

- Education
- Medical
- Government
- Business
- Entertainment/Hospitality
- Worship

“Delivering Breakthrough Cost and Performance”
Resolutions Increasing
Demanding Higher Bandwidth

8K - UHDTV
7680x4320

4K 3840 x 2160

2K - HD
1920x1080

“Delivering Breakthrough Cost and Performance”
Current Resolutions (1080p)

Up to 6 Gb/s Raw Data or 7.5 Gb/s 8B/10B coded
4K Resolution (2160p)

Up to 24 Gb/s raw data or 30 Gb/s 8B/10B coded
8K Resolution (4320p)

Up to 96 Gb/s raw data or 99 Gb/s 64B/66B coded
8k Ultra HD Display and Camera/Player Ready for Market

LG 98” 8k TV  

NHK 8k Video Camera
Network & Equipment Technology for Cloud Storage and Distribution

- **IEEE standard**
  - 802.3ba and 802.3bm for 100GE
  - 802.3bs for 400GE
- **ITU-T SG15**
  - G.709 (OTM-n.m)
- **OIF**
- **Fiber Channel T11**
  - Gen-6 FC 32Gb/s and 128 Gb/s
Video Interfaces Falling Behind

- **HDMI**
  - Ver 2.0 @ 6 Gb/s per channel or 18 Gb/s total bandwidth

- **DisplayPort**
  - Ver 1.3 @ 8.1 Gb/s per channel or 32.4 Gb/s total bandwidth

- **Thunderbolt**
  - Ver 2.0 @ 20 Gb/s total bandwidth
  - Ver 3.0 -> 40 Gb/s

- **USB3.x**
  - Ver 3.0 @ 5 Gb/s
  - Ver 3.1 @ 10 Gb/s

- **Others**

  **Copper Wire Centric & not ready for 8k Video**
HDMI Market Size

Global Shipment Forecast of HDMI-Enabled End Equipment (Millions of Units)

Source: IHS iSuppli Research, March 2011
DisplayPort Market Size

Worldwide Forecast for DisplayPort-Enabled End Equipment (Millions of Units)

Source: IHS iSuppli Research, April 2011
Interface Requirements for HD Video Network?

- Distance going beyond consumer applications
- Support existing market while future proof
- Compatibility to existing video standards
- Cost competitive to copper
Market Implications

Cost Driven

Broadcasting
Social media

Performance/Quality Driven

Professional Specialties

Volume

Cost

“Delivering Breakthrough Cost and Performance”
Market Implications

- **Merchant & Home Entertainment --- competing against copper**
  - 1080p and low end 4k for mobile, consumer
  - 10 G as commodity
  - Leverage datacom and data center optical technologies
  - Substantial cost reduction to support high volume market

- **Professional and Specialty market**
  - 4k and 8k initial mover
  - Performance and guaranteed quality of service
  - 40G - 100G and above for future proof
  - On-demand solutions from service providers?
Cosemi Response

- **Hybrid fiber/copper cable**
  - Fiber for high speed data
    - Low power consumption
    - Low EMI
    - Extends Reach
  - Copper for low speed control & power
    - Transparent to copper standard
    - No distance constrain
    - Low cost compatibility

- **Technology portable across platforms**
  - HDMI, USB, Thunderbolt, …

- **Chip on board packaging for high volume low cost**
  - Wafer level integration
  - Passive alignment
Cosemi 10G – 100G OSAs

- 10G OSA
- 40G/100G OSA

25.8G VCSEL TX Eye
25.8G RX Eye
Opportunity for Service Provider

● Seamless high speed network from content to display
  ▪ Leveraging copper based standards with active optical cables
  ▪ Enable HD video network supporting premium services over longer distances
    ♦ Custom solution for guaranteed bandwidth

● Support on-demand bandwidth for quality and reliability of services for mission critical tasks
  ▪ Medical
  ▪ Government
  ▪ Convention
  ▪ …
Conclusions

- Uncompressed high definition video transmission requires high bandwidth from 10Gb/s to 100Gb/s.
- New market opportunity for transceiver manufacturer on active cables for HDMI, USB, Thunderbolt, etc.
- Enable new business opportunity for service provider to provide premium dedicated on-demand bandwidth services for HD video on optical networks.