Scalability and Interconnect Technologies
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Scalability, is it really a concern?

Only if you want to change
Scalability Design Considerations

- **Change complexity**
  - Interconnect → difficult
  - Computing → relatively simple

- **Life cost profile → pay now or pay later**
  -Upgrades, maintenance, installation

- **Infrastructure sizing**
  - Interconnect bandwidth
  - Cooling
  - Power and distribution

- **Open standards (HOST, SOSA, FACE..)**
  - Lower cost, faster tech insertion

- **Modular vs integrated → Modular overhead**

- **Fast (changing) technologies**
  - Can they be deployed before they are obsolete?
Fast Technologies – Disruptive!!

- Deep Neural Networks (DNN) $\rightarrow$ SMART rules
- Augmented/Virtual Reality $\rightarrow$ Manned and unmanned advantages
- Graphic processors $\rightarrow$ Powers SMART, AR and VR
- Solid state memory $\rightarrow$ Knowledge in smaller chips
- Hi-res sensors (Cameras, radar, Lidar, …) $\rightarrow$ See more do more
- Hi-res displays (2K, 4K, 8K) $\rightarrow$ I can see!

- OPTICAL TRANSCEIVERS $\rightarrow$ UNENCUMBERED BANDWIDTH FOR ALL TECHNOLOGIES

Optical Interconnects, the bridge to Fast
Optical Interconnect Overview

**Multi Mode (MM) Transmission**
- Reach less than 300 m
- Lowest cost transceivers
- Easy to work with
- Rugged transceivers
- −55 ºC to 125 ºC without active cooling
- Least SWaP
- Suitable for harsh environments

**Single Mode (SM) Transmission**
- Reach greater than 2 km
- Relatively expensive transceiver
- Difficult to work with due to high precision alignment
- Precise wavelength control needed over temperature.
- Operating temperature limited to 0 ºC to 70 ºC
- Suitable for controlled environment
- DWDM can support more than 160 wavelengths

Multi-Mode is the choice for Harsh Environments
Rugged Optical Transceiver Bandwidth Scale

- 12 to 24 fibers per chip  2018
- 50G to 300G @ 12.5G/fiber  2018
- 600G @ 25G/fiber  2020
- 1200G @ 50G/fiber (PAM4)  2022
- 2400G @ 100G/fiber (SWDM)  2024
- 4800G @ 200G/fiber (SWDM)  2026

Challenge: Reducing power as BW Scales
Transceiver Product Range

LightSPACE
- Ultra Rugged
- Space Qualified
- RAD HARD

LightABLE
- Rugged
- Mil Qualified
- −45 ºC to 100 ºC

LightVISION
- Industrial
- −40 ºC to 85 ºC

LightCONEX
- Blind mate
- Rugged
- VITA 66.5

LightCONEX Combo
- Blind mate
- Optical/RF Combo
- VITA 66.5

QSFP+/QSFP28
- Pluggable
- Industry standard
- Commercial temp

SNAP12
- MPO bulk head mount
- Industry standard

Many Options to Scale BW
Optical Transceiver Applications

- Digital RADAR
- Hi Res Cameras
- FMC Boards
- Optical Switches
- High Performance Computers
- Media Converters
- VPX Plug in Modules
- Optical Backplane

High BW, Low Latency, Small SWaP
Takeaways

• Fast technologies creating uneven advantage.
• Race to AI dominance is fierce.
• System must scale faster than ever to stay viable.
• Optical Interconnects is the most scalable technology for fast upgrades and SWaP.

For more information

• http://reflexphotonics.com/

Thank You