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Scalability and Interconnect Technologies

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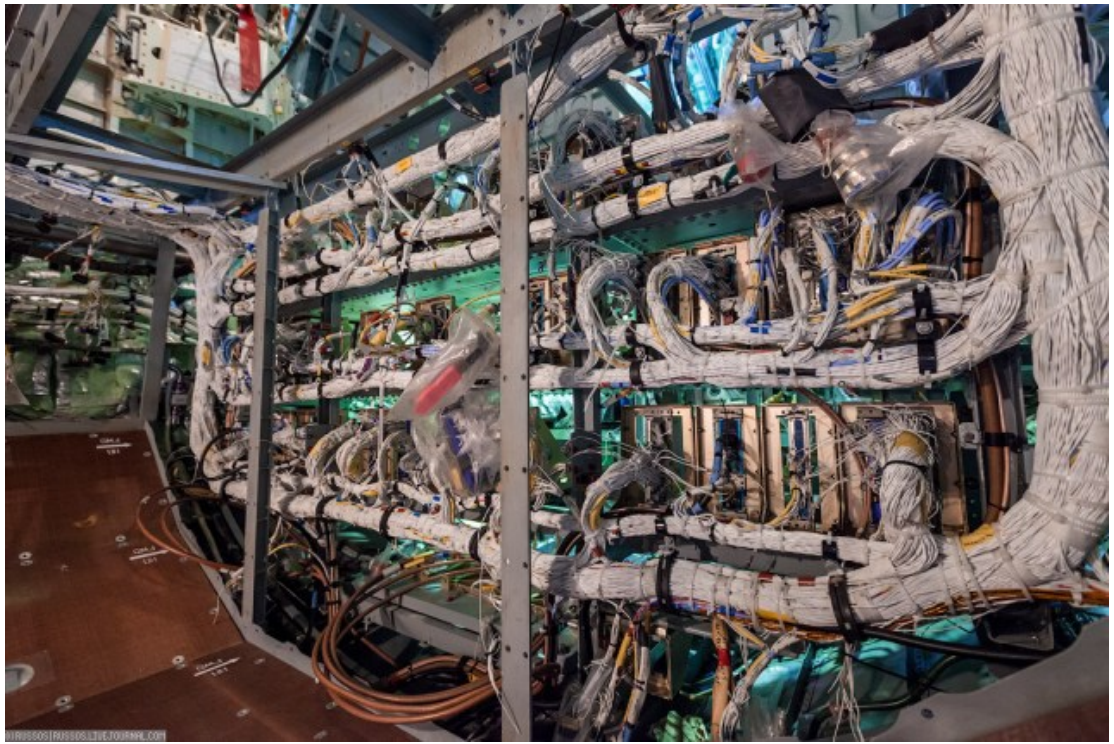
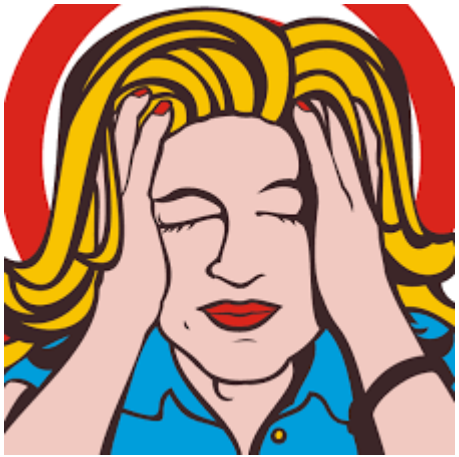
Scalability, is it really a concern?

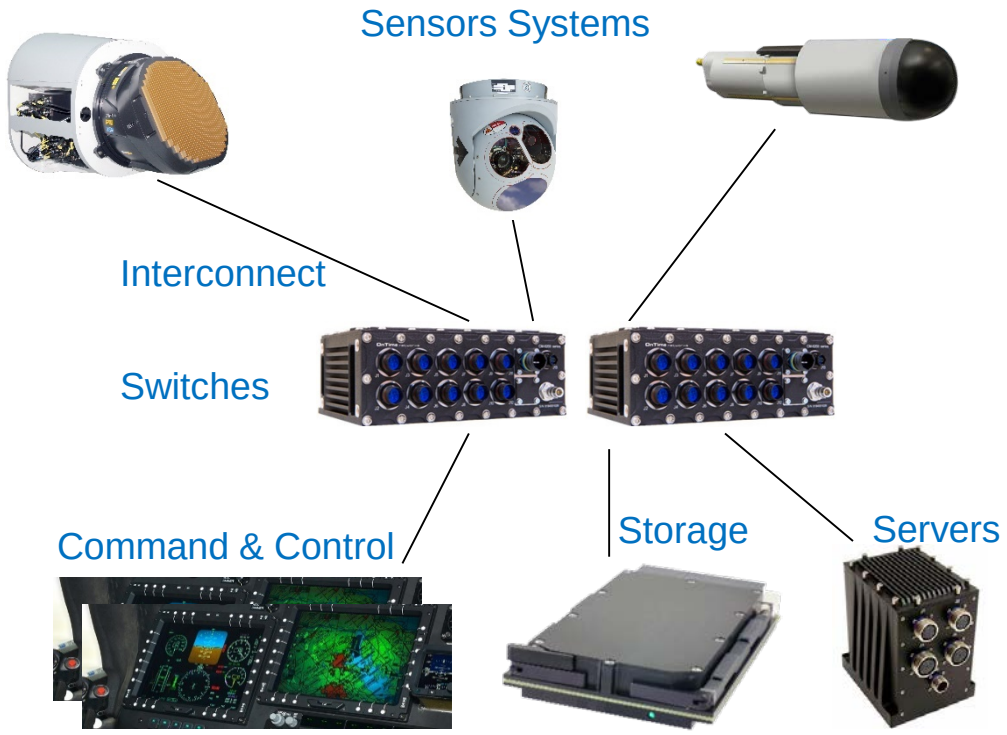


Only if you want to change



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?



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Fast Technologies – Disruptive!!

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

- **OPTICAL TRANSCEIVERS → UNENCUMBERED BANDWIDTH FOR ALL TECHNOLOGIES**

Optical Interconnects, the bridge to Fast

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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

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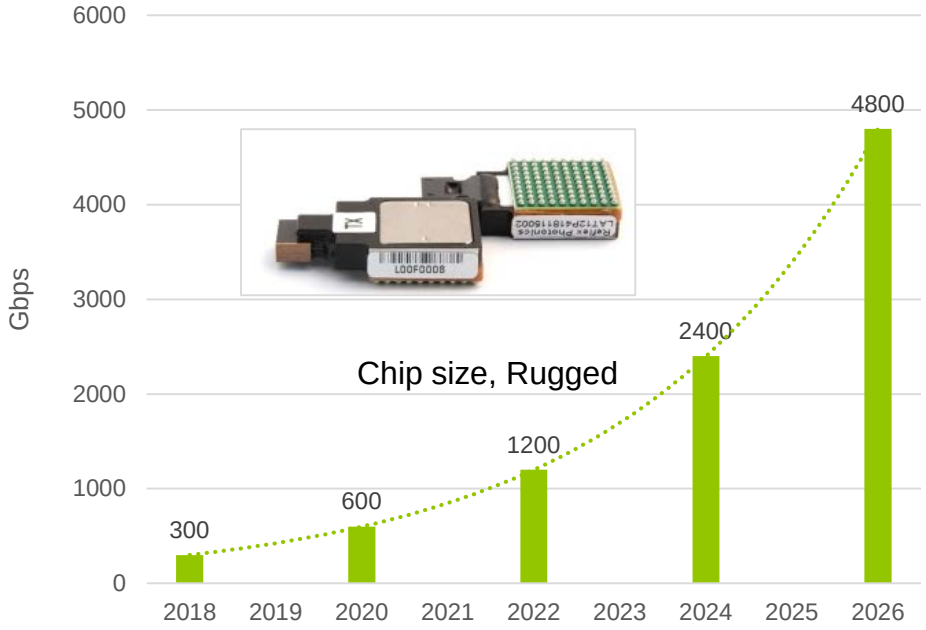
Rugged Optical Transceiver Bandwidth Scale



- 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

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Transceiver Product Range

*Light*SPACE

- Ultra Rugged
- Space Qualified
- RAD HARD

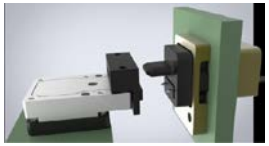
*Light*ABLE

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

*Light*VISION

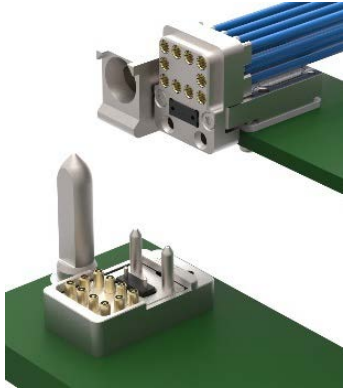
- Industrial
- −40 ºC to 85 ºC

*Light*CONEX



- Blind mate
- Rugged
- VITA 66.5

*Light*CONEX Combo

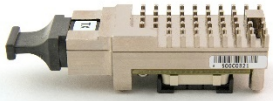


- Blind mate
- Optical/RF Combo
- VITA 66.5

QSFP+/QSFP28

- Pluggable
- Industry standard
- Commercial temp

SNAP12



- MPO bulk head mount
- Industry standard

Many Options to Scale BW

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Optical Transceiver Applications

Digital RADAR

Hi Res Cameras

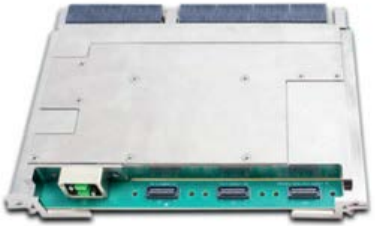
FMC Boards

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