REFLEXPHOTONICS®

Lighting the Way for Embedded Systems

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Objective of this presentation

To show how important and critical optical interconnect is becoming in the development of high-performance embedded systems.

Embedded Systems To Reach $133B by 2020*

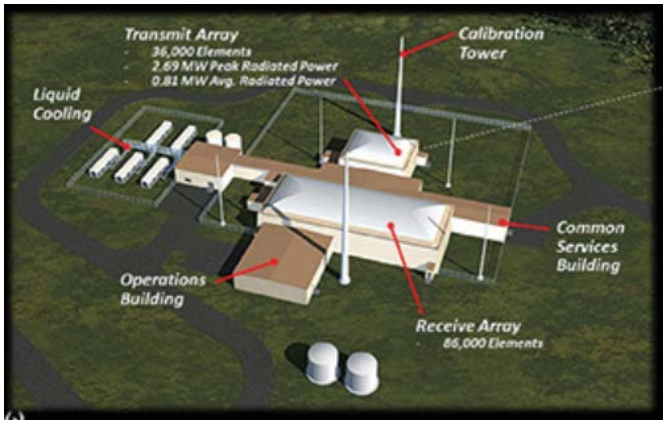
Eyes and Ears Everywhere

ISR Process

* MarketsandMarkets

Space Fence Radar → Toward All-Digital AESA Radar

- US Air force Space Surveillance Network
- Active Electronically Scanned Array (AESA) Radar
  - Detect, track, catalog satellites and debris on earth orbits
- Transmitter array
  - S-Band (2 to 4GHz)
  - 36 000 independent radiating elements
  - can generate thousands of radar beams
- Receiver array
  - Separate from transmitter array
  - 86 000 independent receiving elements
  - DBF & Frequency multiplexing allow for thousands of received beams



http://www.microwavejournal.com/articles/26872-space-fence-radar-leverages-power-of-gan

ISR Embedded Systems

Provides unparalleled advantage

- Intelligent → learning machines
- Data rich → real-time and historical data
- Secure → hack-resistant communications
- Reliable → no single point failure
- Small → more payload for other systems
- Scalable → simple upgrades, long life
- Multi-purposed → target ID, weather, communications.

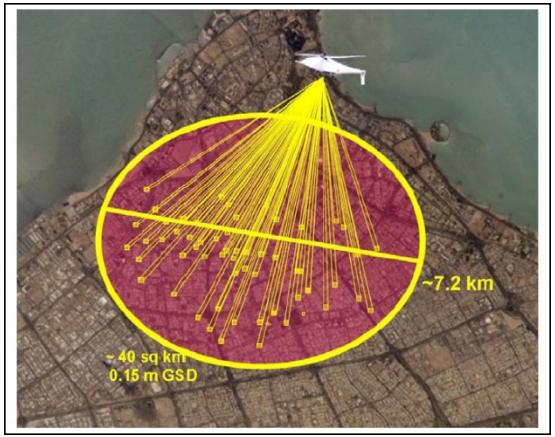
ISR Technology Trends

- Sensors → higher resolution cameras and radars
- Processor → multicore, low power GPGPU, GPP, FPGA
- Storage → solid state, small, rugged, reliable (RAID)
- Sensor fusion → correlate information from sensors
- Computing → Virtualization, parallel processing
- Small SWaP → more capability for SFF (3U VPX)
- All digital → multi-purposed, software defined functionnality

- Optical Interconnect
  - ➢ High BW, low latency
  - ➢ Small SWaP
  - ➢ High density I/O
  - ➢ Defines system performance

https://www.youtube.com/watch?v=rSLJQqrRAFU

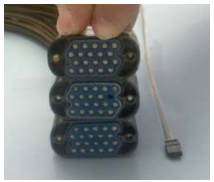
ARGUS-IS System



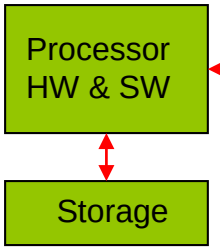
1.8 Gigapixels
(368 x 5 Mpx)

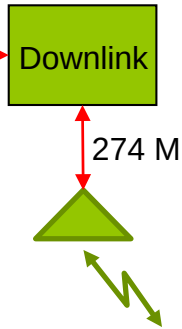
SNAP 12

192 Optical fibers
@ 3Gbps

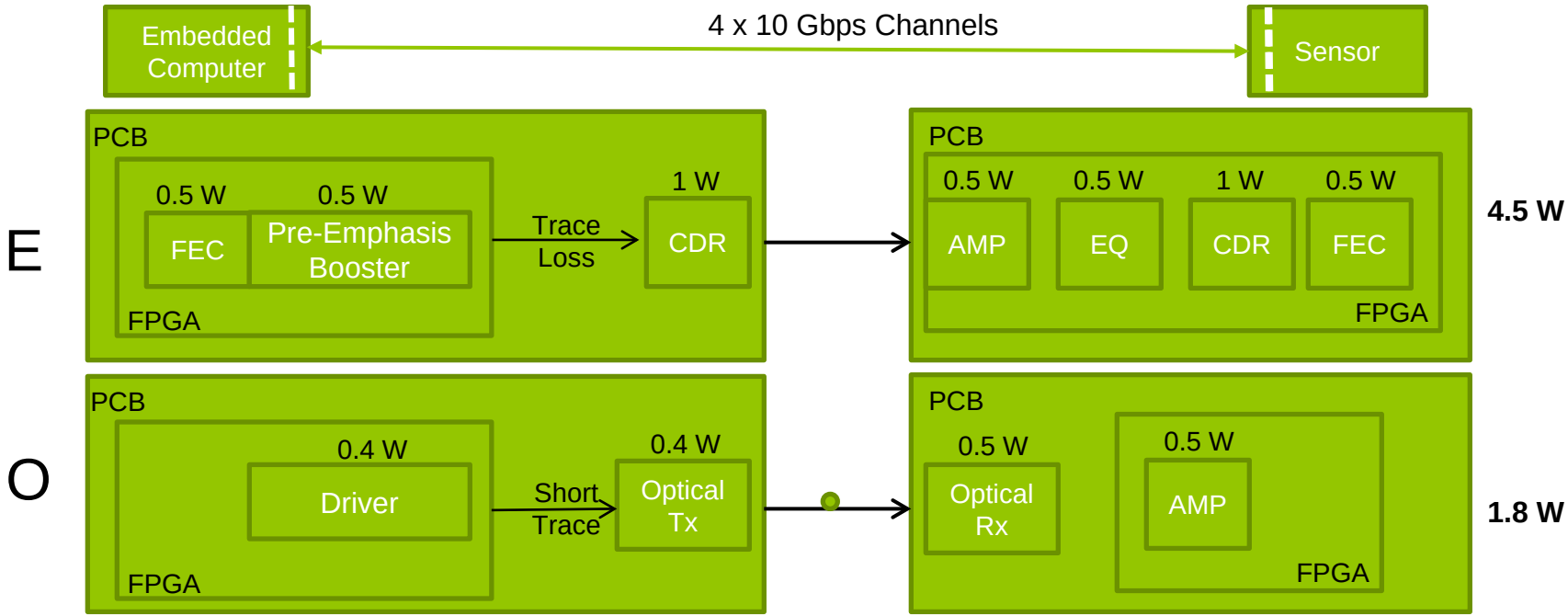


48 coax vs 48 fibers
Small Size & Weight





Electrical vs Optical Interconnect Power Consumption



Embedded Optics Benefits

Performance

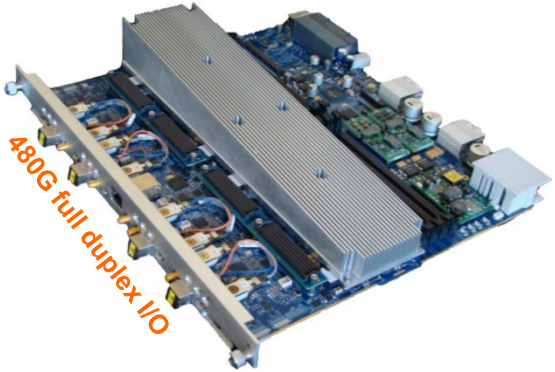
- Scalable BW: 28 Gbps+
- Low bit error rates: 10^{-15}
- Low loss: 0.003 dB/m (OM3 @850 nm)
- Reach: 300 m (OM3 @10G)

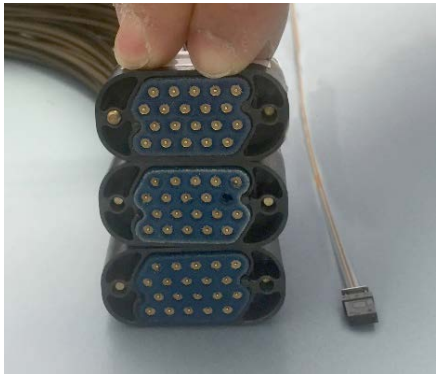
Small SWaP-C

- Chip size optical transceivers
- Small light weight glass fiber
- I/O density: 48 fibers in MT connector
- Low power: 100 mW/10 Gbps

Ruggedness

- -40 ˚C to 85°C operation @ 10 Gbps
- MIL-STD-883 Shock and Vibration
- Moisture resistant
- EMI and EMP immune



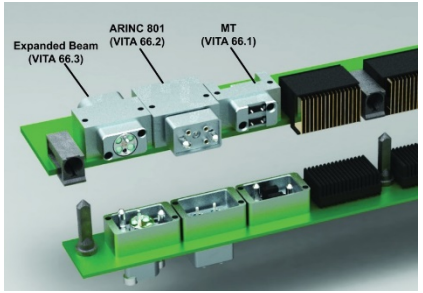


VPX Optical Interconnect Standards

- **ANSI/VITA Standard**
  - **ANSI/VITA 66.0** : Optical Interconnect On VPX
  - **ANSI/VITA 66.1** : Full Size MT Variant
  - **ANSI/VITA 66.2** : ARINC 801 Variant
  - **ANSI/VITA 66.3** : Mini-Expended Beam Variant
  - **ANSI/VITA 66.4** : Half Size MT Variant

  - **Under consideration**
  - **VITA 65**: Open VPX
  - **VITA 67.3c** : VPX: Coaxial & Optical Interconnect,
  - **VITA 76** : High Performance Cable Standard
  - **VITA 78**: Space VPX Systems
  - **VITA 78.1** Space VPX Lite
  - **VITA 74**: VNX: Small Form Factor VPX

- **VITA 66.x**



G. Powers, TE Connectivity

- **VITA 66.4**

Courtesy of ELMA

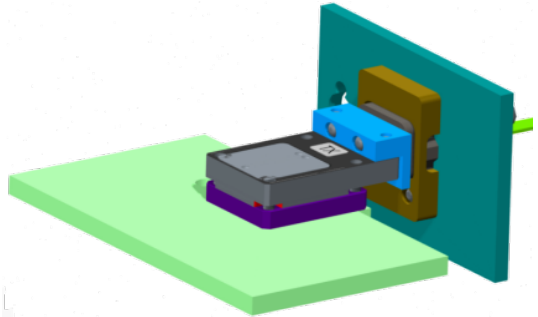
- **VITA 67.3C**

Courtesy of TE Connectivity

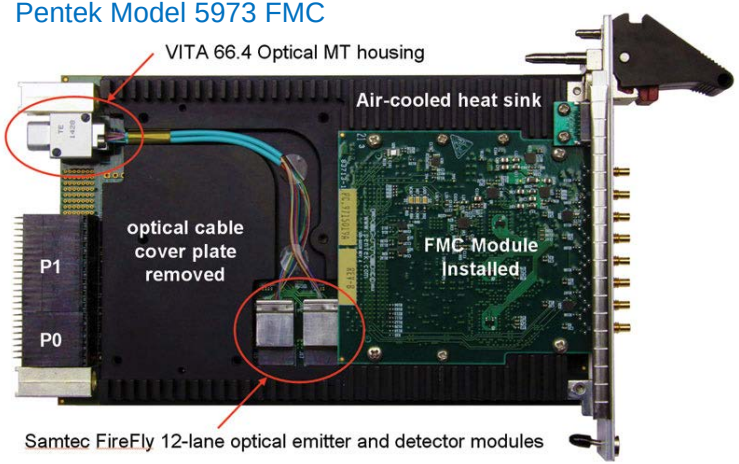
Ref.: G. Rocco, Open VPX Tutorial, 2016

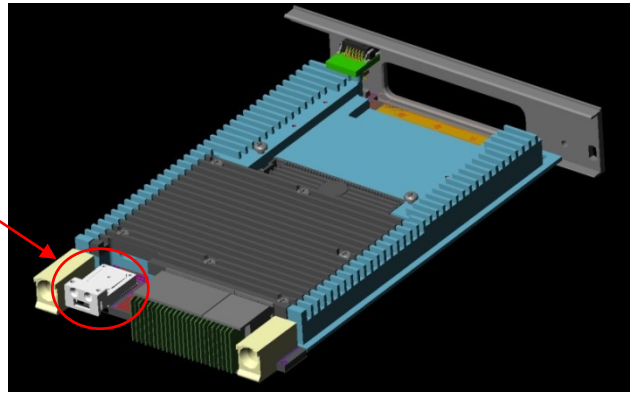
*Light*CONEX™ Blind Mate Optical Interconnect

- Supports 2 level maintenance
- Integrates optical transceiver into module connector
- Less board space needed for optical interface
- Fits VITA 66.4 backplane aperture for upgrades



Pentek Model 5973 FMC





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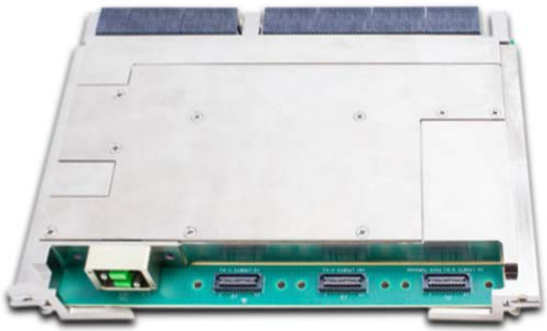
VPX Optical Solutions with Reflex Embedded Optics

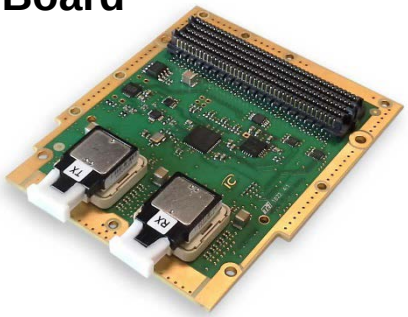
Amphenol VPX Media Converter



- 6U VPX Media Converter
- Converts backplane high-speed signal to front optical and electrical Ethernet I/O
- 32 × 10G BASE SR in a VITA 66.1 connector
- 4 × 10G BASE-T and 8 × 1G BASE-T

Interface Concept Optical FMC Board

- Transceiver board (12Tx + 12Rx)
- 120 Gbps full duplex
- Supports front panel Optical Interface
- Interfaces with 3U VPX FPGA boards



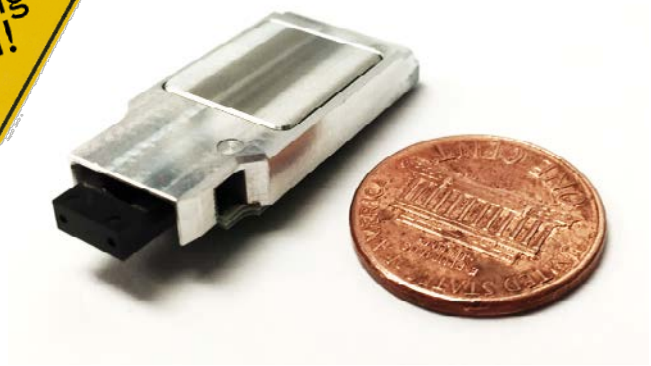
Meritec 40G Active Optical Module

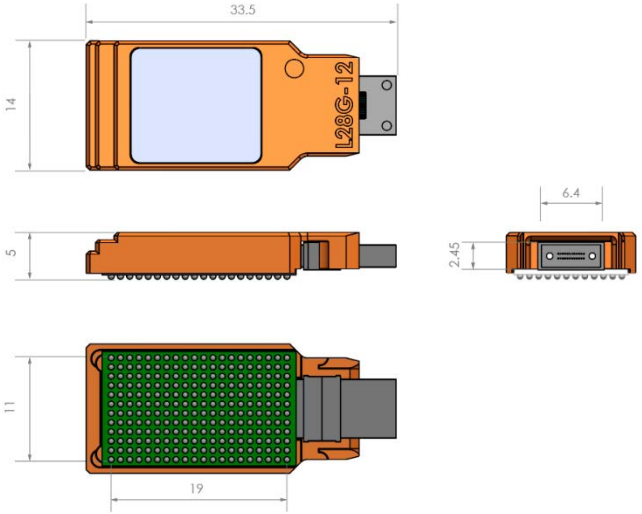
- Extends electrical reach to 100 m @10Gbps
- Converts electrical to optical signals
- Size 17 VITA 76 electrical connector
- 12-lane MT optical in a size 11 shell

THE *Light* on Board® Company

www.reflexphotonics.com

Ultra-Dense I/O Embedded Optical Transceiver





- Full duplex 300 Gbps transceiver
- (12 +12)TRx @ 25 Gbps per lane
- 24Tx or 24Rx @ 25 Gbps per lane
- Standard 2x12 MT optical output port

Embedded Optics Takeaways

- High performance with less SWaP-C
- Proven, rugged, reliable
- Winning edge

For more information

http://reflexphotonics.com/

Thank You