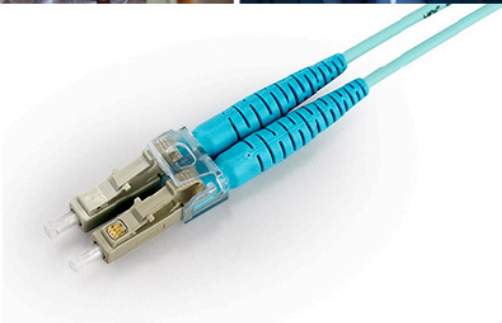





# TE Connectivity Looking toward next generation VPX Optical Solutions

January 20, 2015: Matt McAlonis, Rod Smith



EVERY CONNECTION COUNTS



An aerial night view of a city, likely Dubai, with a prominent mirrored digital overlay on the left side. The overlay shows a futuristic, glowing blue and white structure, possibly a data center or a digital cityscape, with light trails and a central figure. The background shows a dense urban landscape with illuminated buildings and roads.

**IN A WORLD WHERE  
EVERYTHING IS CONNECTED**

**TE CONNECTIVITY**

# Consumer products world...



*“Don’t take it serious...  
live and laugh at it all...”*

*“a bowl of cherries”*

# Telecom products world...



*"a box of chocolates"*

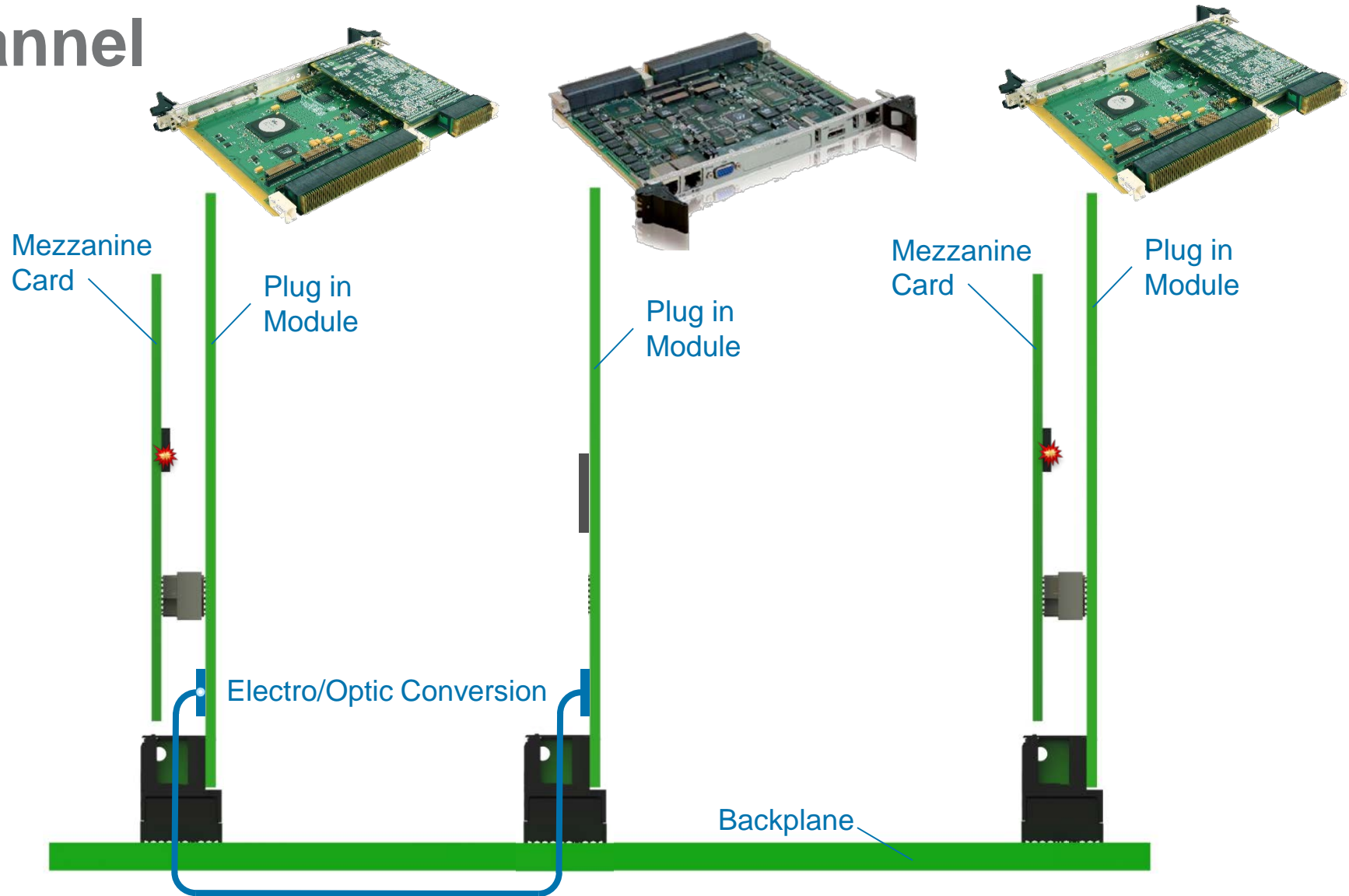
# Embedded Computing world...



*“What we do today, might burn us tomorrow...”*

*“jar of jalapeños”*

# VPX Channel



Or even high speed cable...

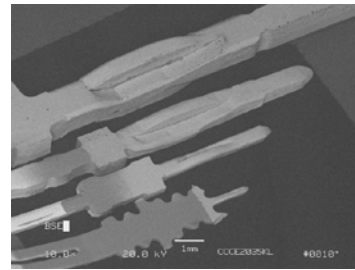
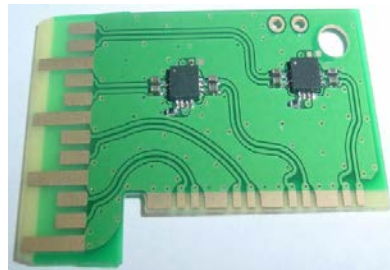
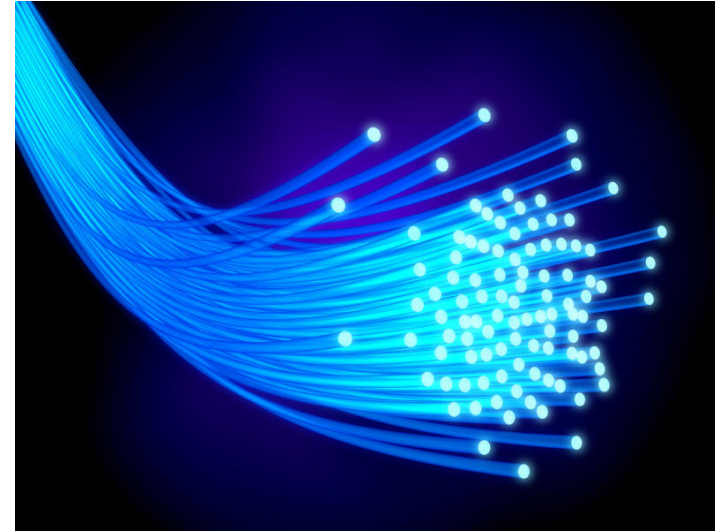
# Embedded Tech Trends...where we left off last year...

Where things are going (protocols)...

Performance and reliability matters

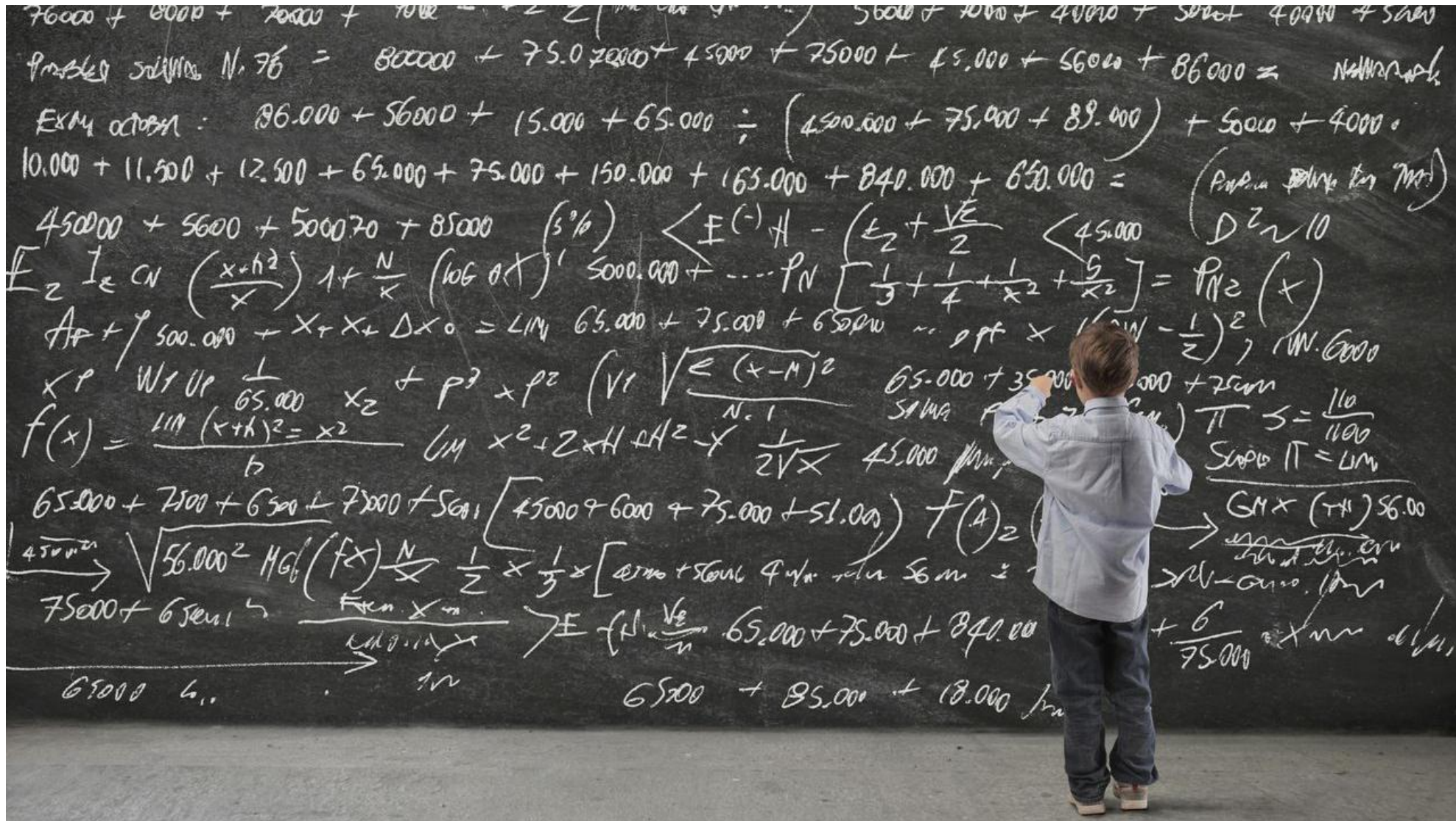
What can we do about it?

- VITA 46 compliance
- Leap to alternate technology (F/O, etc.)
- Intermateable VPX derivatives with enhanced performance



Know what we really **need**...Everything Matters!

# When is optics the right solution?





# When is optics the right solution?

## What is driving the Applications?

The “Algebraic-approach” – Weighted Attributes to obtain a solution

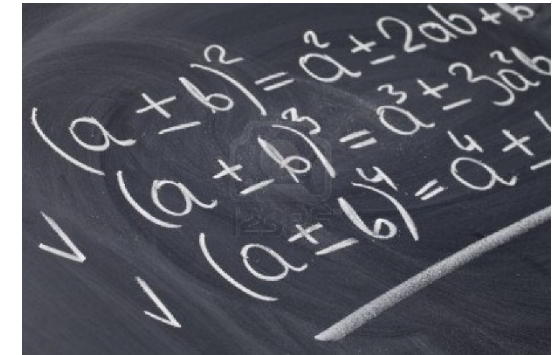
## What is happening within Industry Groups?

Need for common language and attributes

Leverage the Industry to streamline effort

## What is possible?

- Examples or technologies to support next generation optical systems



# Focus of Next-Generations System Designers

- **IO Density** of data per cable/fiber out of the box: Gb/s/mm<sup>2</sup>
- **Power** consumption (or heat generation) per data: W/Gb/s
- **Applied cost** of connectivity solutions: \$/Gbps/m
- Density of data per **PCB real estate**: Gb/s/mm<sup>2</sup>
- Standardized **reliability** metrics & qualification criteria

Component suppliers will drive development efforts to a standard set of objectives

The “Algebraic-approach” – Solving multiple variable, single equation

Solution = Weighted importance of list of key attributes to a given application

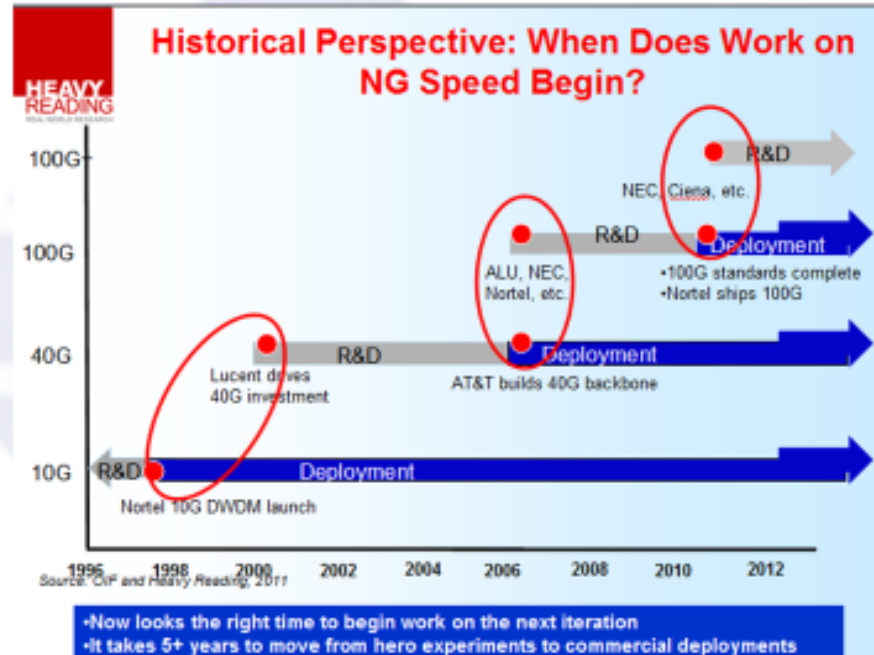
= Density + Power Consumption + Applied Cost + PCB Density + Weight + Reach



Application driven solutions

# Leveraging other industry initiatives to decrease time to market on VPX Solutions

Looking at what is next



Courtesy: Sterling Perrin, Heavy Reading  
OFC/NFOEC 2011



PCIe working on 16G

SAS working on 24Gb/s

InfiniBand finishing on 25G EDR

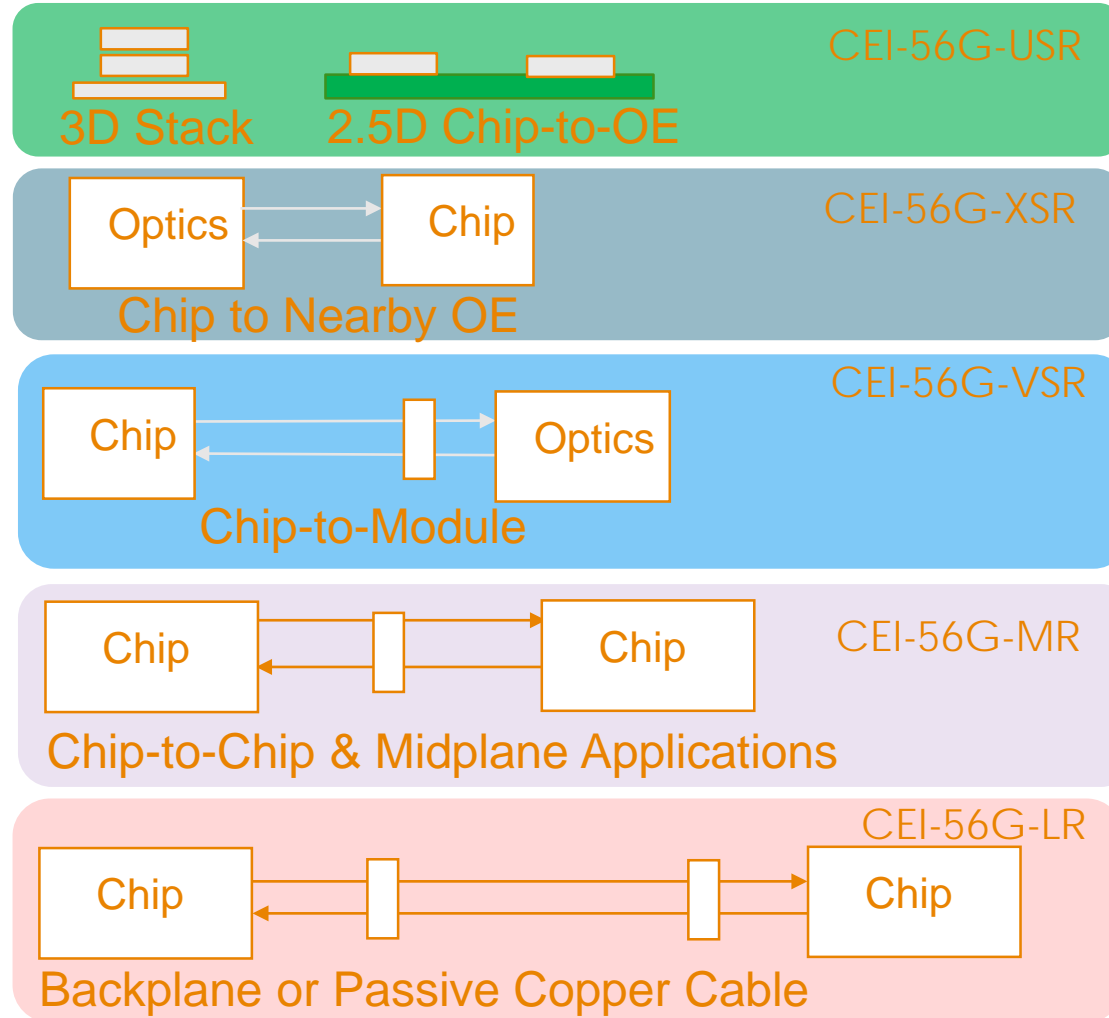
OIF is defining 56Gb/s NRZ and PAM4 electrical interfaces

Fibre Channel beginning to work on 64G Fibre Channel

IEEE is defining 400Gb/s

Trend is to support higher and higher per lane data rates and aggregate data rates

# CEI-56G Application Space



- ❖ USR: 2.5D/3D applications
  - ❖ 1 cm, no connectors, no packages
- ❖ XSR: Chip to nearby optics engine
  - ❖ 5 cm, no connectors
  - ❖ 5-10 dB loss @28 GHz
- ❖ VSR: Chip-to-module
  - ❖ 10 cm, 1 connector
  - ❖ 10-20 dB loss @28 GHz
- ❖ MR: Interfaces for chip to chip and midrange backplane
  - ❖ 50 cm, 1 connector
  - ❖ 15-25 dB loss @14 GHz
  - ❖ 20-50 dB loss @28 GHz
- ❖ LR: Interface for chip to chip over a backplane
  - ❖ 100cm, 2 connectors
  - ❖ 35dB at 14Ghz

# IEEE 802.3



Current IEEE projects and study groups:

- **802.3bm 40 and 100 Gb/s Fiber Optic Task Force**
- 802.3bn EPON Protocol over Coax (EPoC) Task Force
- 802.3bp Reduced Twisted Pair Gigabit Ethernet PHY Task Force
- 802.3bq 40GBASE-T Task Force
- 802.3br Interspersing Express Traffic Task Force
- **802.3bs 400 Gb/s Ethernet Task Force**
- 802.3bt DTE Power via MDI over 4-Pair (POE) Task Force
- 802.3bu 1-Pair Power over Data Lines (PoDL) Task Force
- 802.3bv Gigabit Ethernet Over Plastic Optical Fiber Task Force
- **802.3by 25Gb/s Ethernet Task Force**
- 802.3 Industry Connections NG-EPON ad hoc
- 802.3 2.5Gbs/ and 25Gb/s BASE-T Study Groups are expected soon

# As VITA looks to the future

- Time to market



- Clear set of objectives

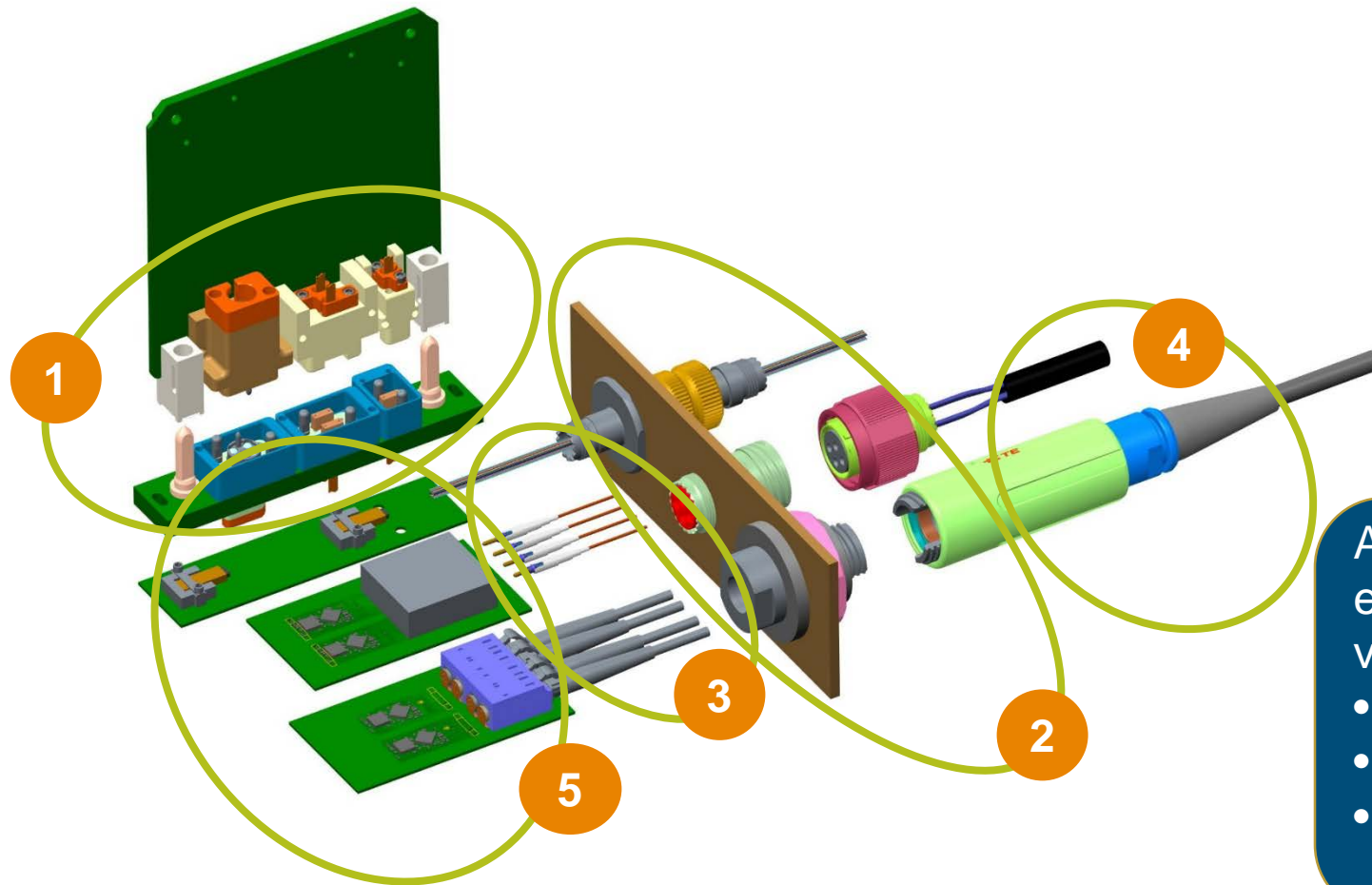


- Standard, measureable, quantifiable metrics

- Industry collaboration



# To support VPX initiatives...common building blocks to drive membership & supply base



Item	Product Area
1	Board-to-Board
2	Ruggedized External I/O
3	Contacts
4	Cable
5	E/O – Board Mount / Panel

As optical solutions VPX solutions continue to evolve and proliferate the market, a complete view is needed

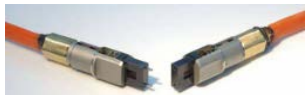
- SI as bandwidth demands continue
- Opto-Mechanical package
- Understanding of the density & interconnect demands

# Technologies promoting VPX architecture



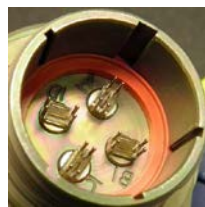
## Terminus Technology

Technology support industry standard and high density contacts



## Higher Density Technology

Hi Density ferrule technology supporting 96 fibers in 38999 stile III, size 19



RTC Magazine (rtcmagazine.com, "Is There Life Beyond Defense and Aerospace for VPX," Sept 2010; Photo supplied by Extreme Engineering Solutions

Image(s): TE Connectivity



# Additional Technologies driving VPX platforms



flexor 5973 3U OpenVPX FMC Carrier

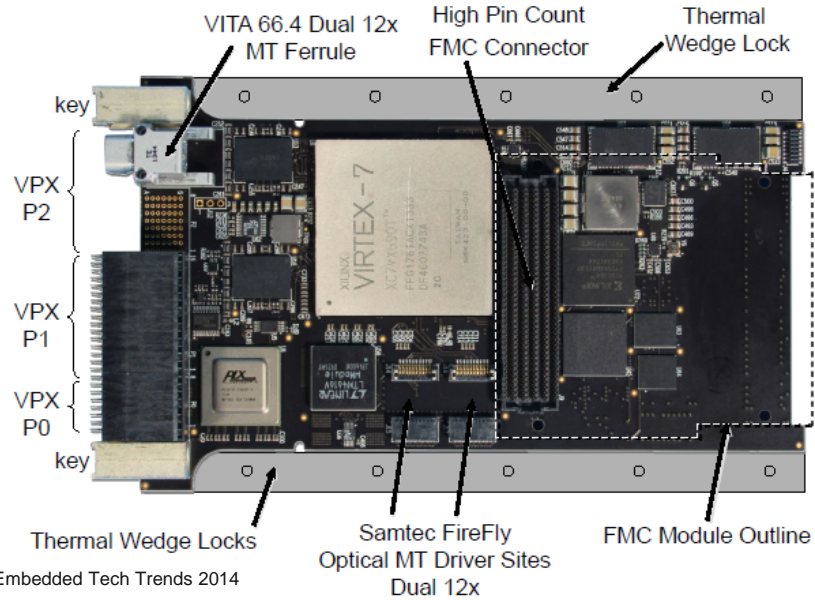
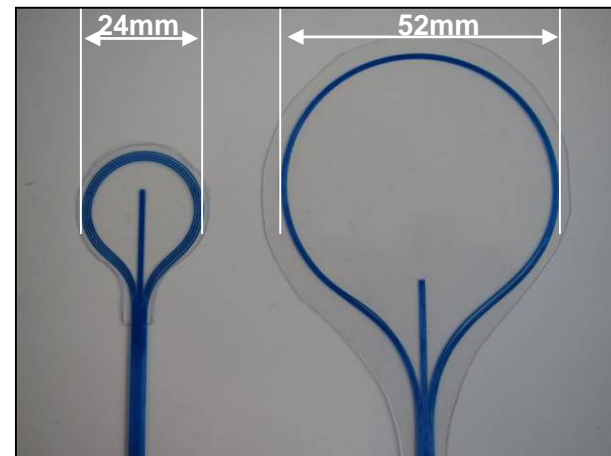
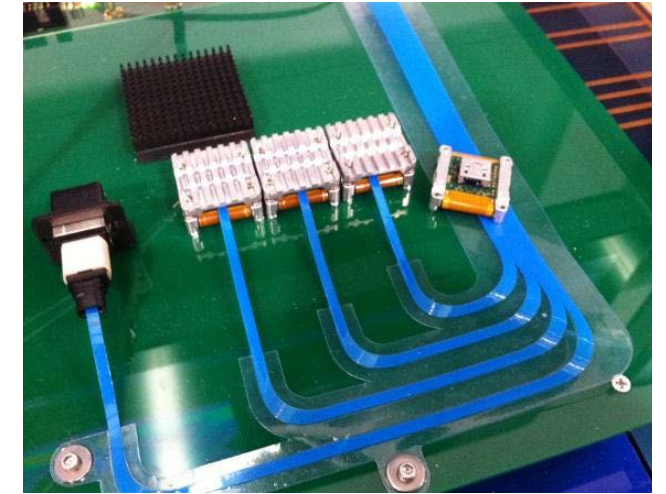
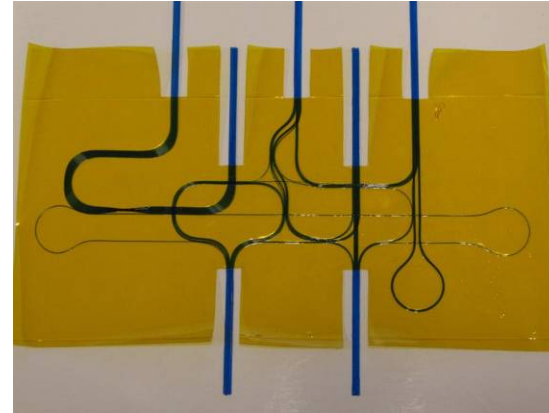
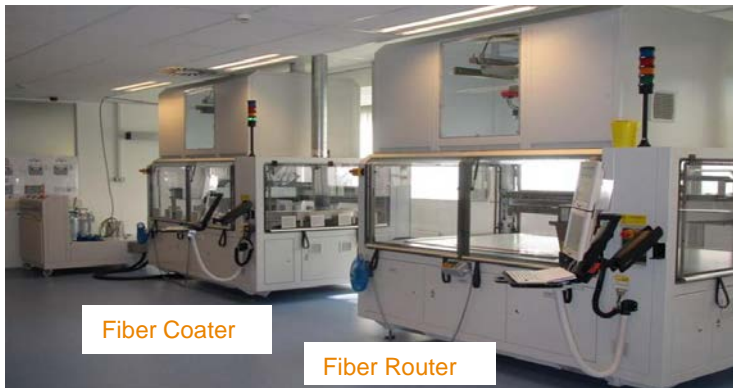


Image: Pentek, Embedded Tech Trends 2014

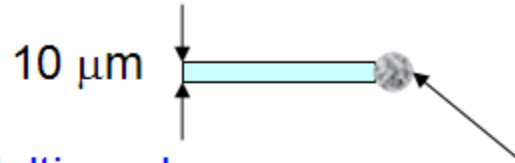


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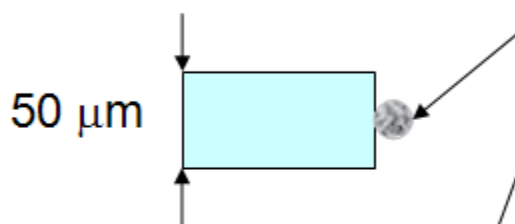


# Why Choose a Lensed Ferrule? ....The Effect of Dust

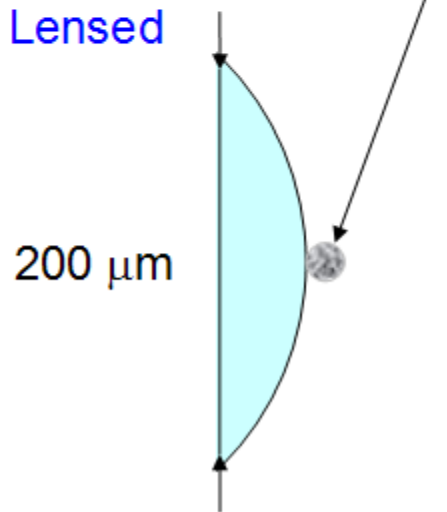
Single-mode



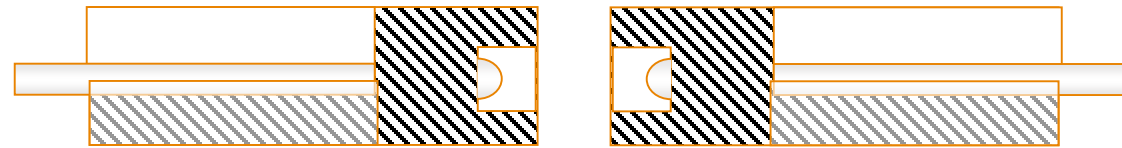
Multi-mode



Lensed



20 μm dia. Dust

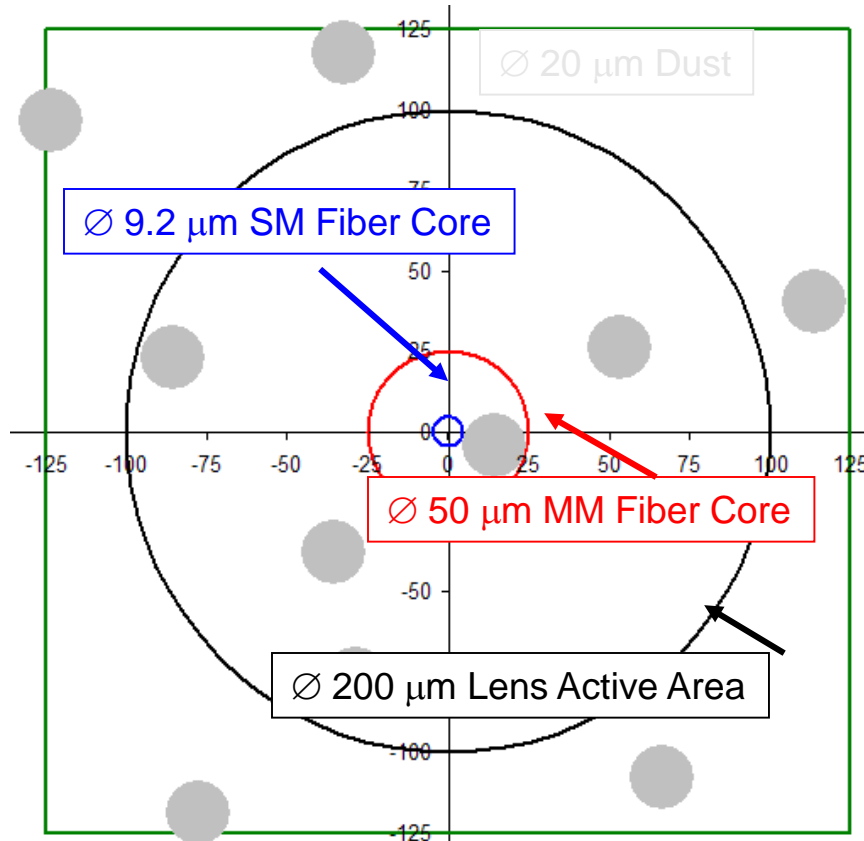


TELLMI Connector Pair

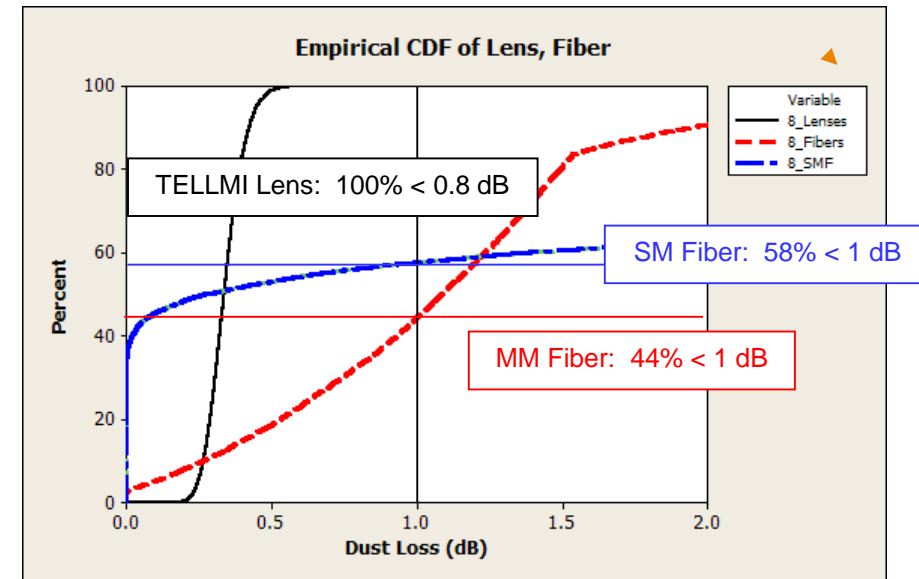
# Why Lensed, Expanded Beam Interconnect ?

A Primary Reason is Contamination Resistance

8 Fiber Ferrule - Max Dust IL  
(SM, MM, TELLMI Lens)



10 Dust Particles per 250 x 250 μm  
5% of Area Obscured



	97% CL	Average
Lens	0.5 dB	0.34 dB
MM Fiber	2.7 dB	1.1 dB
SM Fiber	33.6 dB	5 dB

# Key Take Aways...

- Depending on the strategic direction of VITA and its members, there are industry efforts currently in the market that have paved the way for faster Time to Market for VPX architectures
- By encouraging a core group of metrics, common attributes and language, the eco-system support VPX can focus its development efforts
- A systems approach is key ensure the supply base for VPX systems are on the right path and develop the key technologies needed
- At TE, we are committed to the efforts of VITA and the VPX architecture for both today and tomorrow.

EVERY CONNECTION COUNTS

