



# Connecting with VITA 66.5

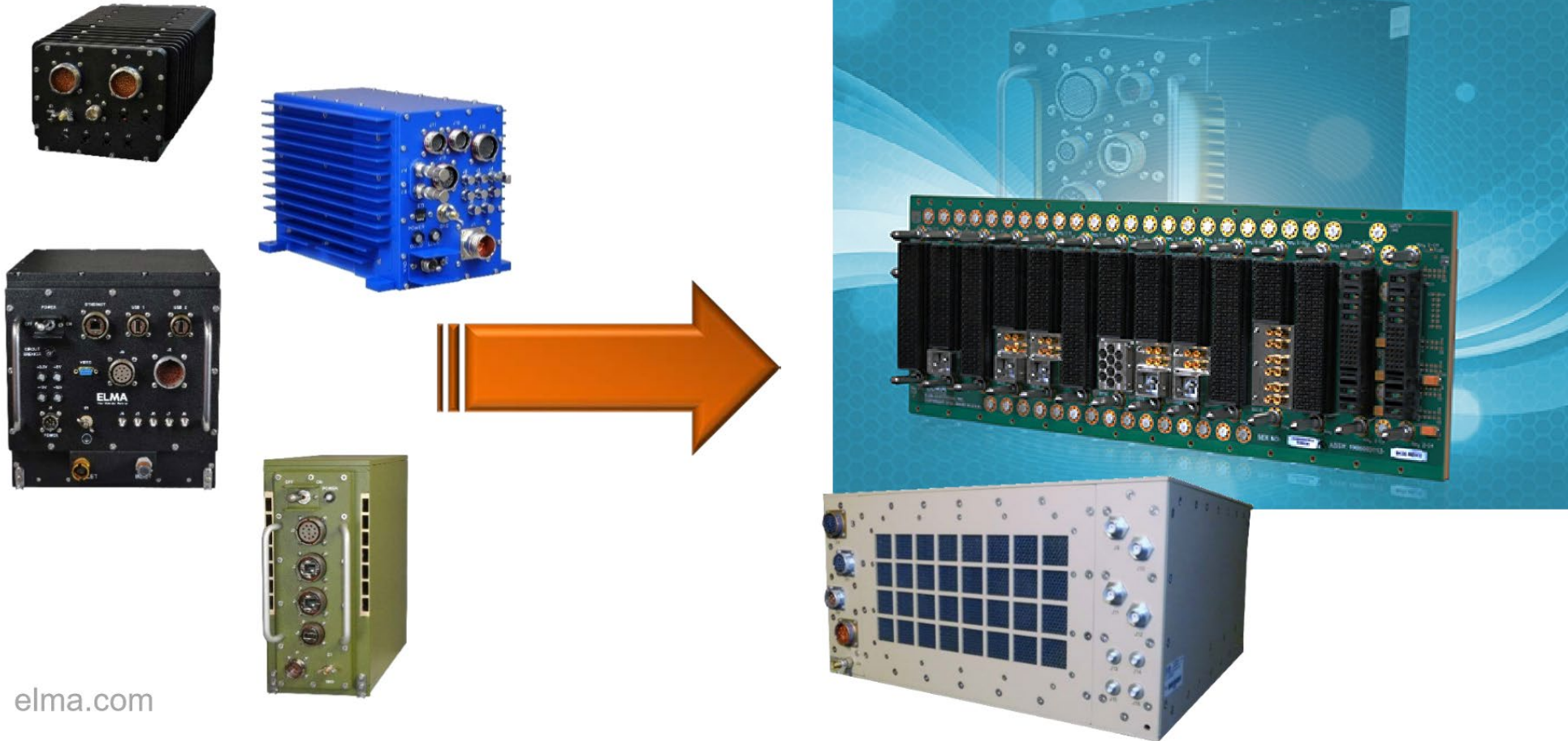
Xavier Marchand

January 2020





# More complex VPX systems



elma.com

→ Need for Bandwidth + Reconfig + Flexibility in Backplane



# Backplane Communication technologies within SOSA



	Communication Technology
Data Plane	Ethernet
Control Plane	Ethernet
Expansion Plane	PCIe (or Aurora)



# Connecting at higher speed in Backplane?

(1) By increasing Lane speed  
→

Communication Technology	Connector	Today	Tomorrow
Ethernet	Vita 46.0 (copper)	1GBase-KX (1 lane)	
		10GBase-KR (1 lane)	25G Base-KR (1 lane)
		40GBase-KR4 (4 lanes)	100G Base-KR4 (4 lanes)
	VITA 66.x (optical)	1GBase-SX (1 lane)	
		10GBase-SR (1 lane)	25GBase-SR (1 lane)
		40GBase-SR4 (4 lanes)	100GBase-SR4 (4 lanes)
PCIe	VITA 46.0 (copper)	Gen 1 (2.5GTS) Gen 2 (5GTS) Gen 3 (8GTS)	Gen 4 (16GTS)

↓  
(2) By increasing Lane density in the backplane



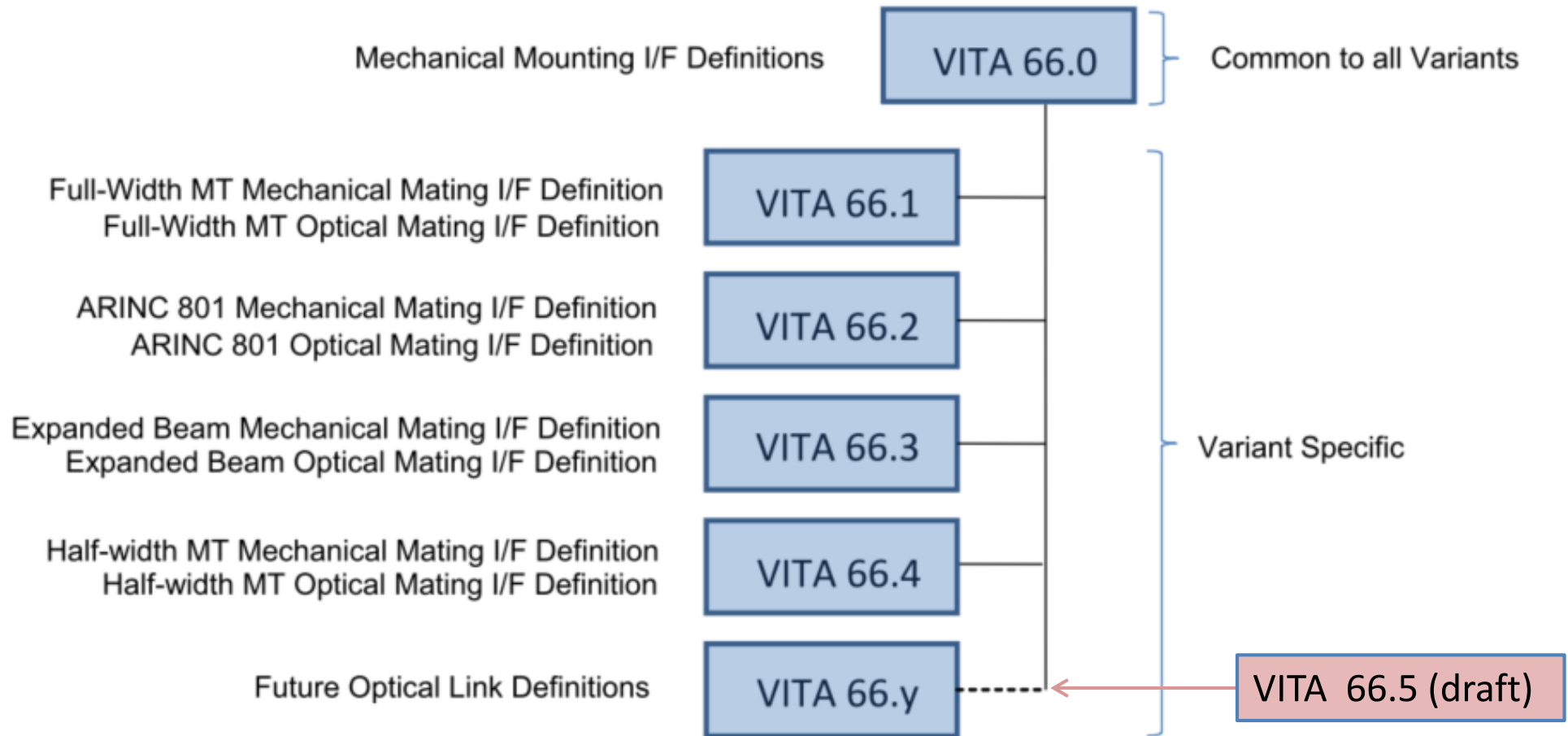
# What is VITA 66.5

HOME	ABOUT VITA	STANDARDS	PURCHASE	PRODUCTS	NEWS AND EVENTS	LEARN	COMMUNITIES	EMBEDDED TECH TRENDS	☰
ANSI/VITA 66.1-2012	VPX: Optical Interconnect On VPX - MT Variant	MT Mechanical Mating I/F Definition MT Optical Mating I/F Definition							ANSI Ratified
ANSI/VITA 66.2-2013 (R2018)	On VPX - ARINC 801	ARINC 801 Optical Mating I/F Definition							ANSI Ratified
ANSI/VITA 66.3-2012 (R2018)	VPX: Optical Interconnect On VPX - Expanded-Beam	Expanded Beam Mechanical Mating I/F Definition Expanded Beam Optical Mating I/F Definition							ANSI Ratified
ANSI/VITA 66.4-2016	VPX: Optical Interconnect On VPX - Half Width MT Variant	Half Width Optical Interconnect							ANSI Ratified
VITA 66.5	VPX: Optical Interconnect, Spring-Loaded Contact on Backplane	This document describes an open standard for configuration and interconnect within the structure of VITA 66.0 enabling an interface compatible with VITA 46 containing blind mate optical connectors with fixed contacts on the Plug-In Module and floating displacement on the backplane.							Working Group - Draft

- Draft standard
- Defines optical interconnect i/f on backplane
- Compatibility with VITA 46.0
- Blind mate connection with fixed contact on VPX board and spring-loaded contact on backplane



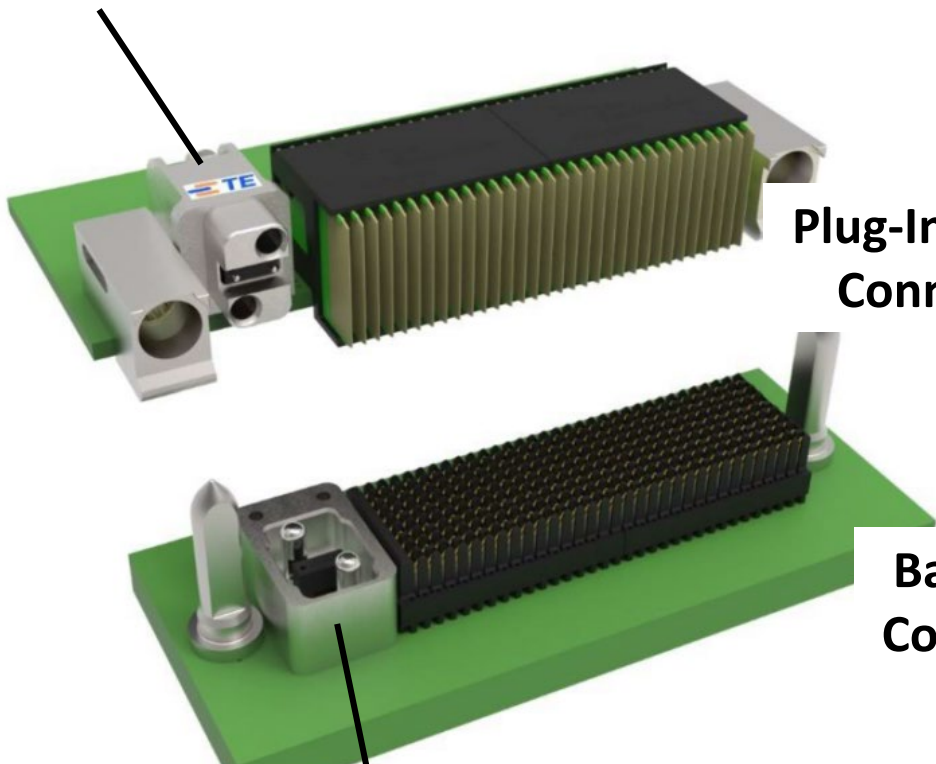
# Standards for Optical Interconnect on VPX





# Legacy Backplane Optical Connectors

Half-width MT  
(VITA 66.4)



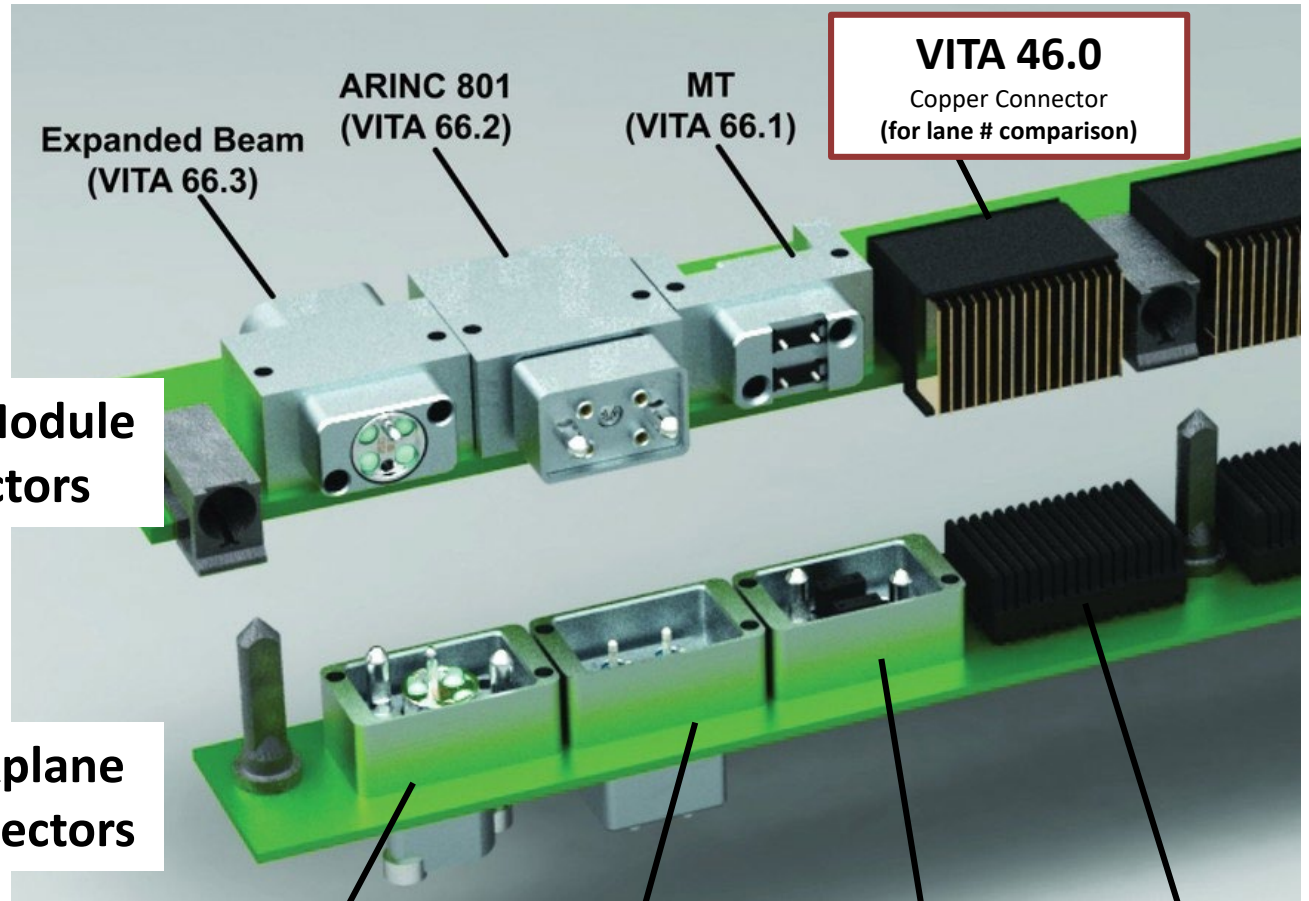
Plug-In Module  
Connectors

Expanded Beam  
(VITA 66.3)

ARINC 801  
(VITA 66.2)

MT  
(VITA 66.1)

**VITA 46.0**  
Copper Connector  
(for lane # comparison)



Backplane  
Connectors

**Max # fibers**

24 fibers

**Connector size**

half-width

**Max # lanes**

12

4 fibers

full-width

2

4 fibers

full-width

2

48 fibers

full-width

24

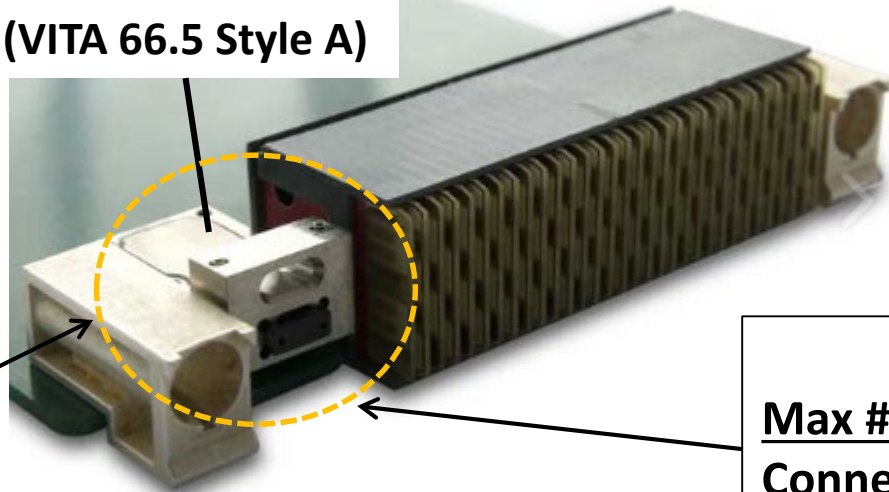
N/A

16



# VITA 66.5 Connector example (Style A)

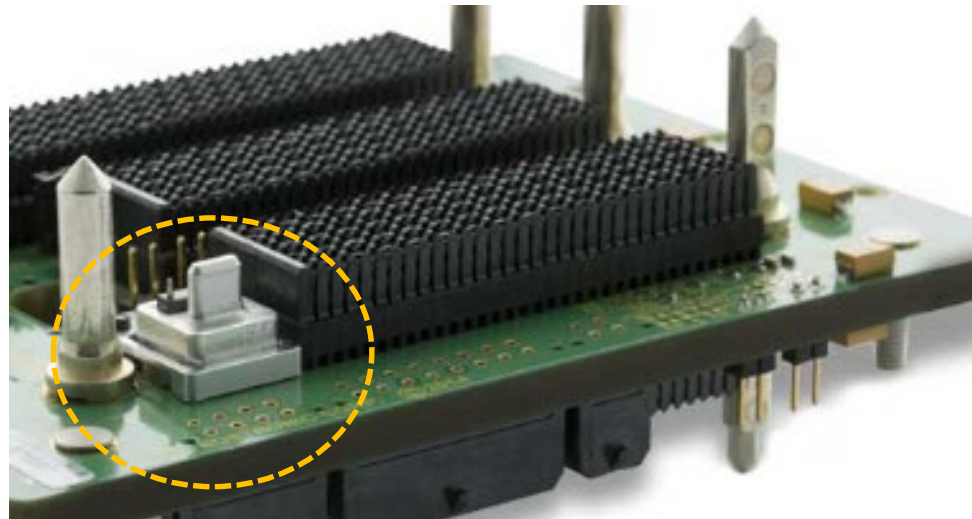
Half-width MT  
(VITA 66.5 Style A)



Plug-In Module  
Connectors

	<u>Picture (1 MT)</u>
<u>Max # fibers</u>	24 fibers
<u>Connector size</u>	half-width
<u>Max # lanes</u>	12

Reflex Photonics  
LightCONEX 12TRX  
VITA 66.5 Style A  
transceiver module



Backplane  
Connectors





# VITA 66.5 Connector Options

## LightCONEX styles A, B, and C product line

VITA apertures

### What drives the choice

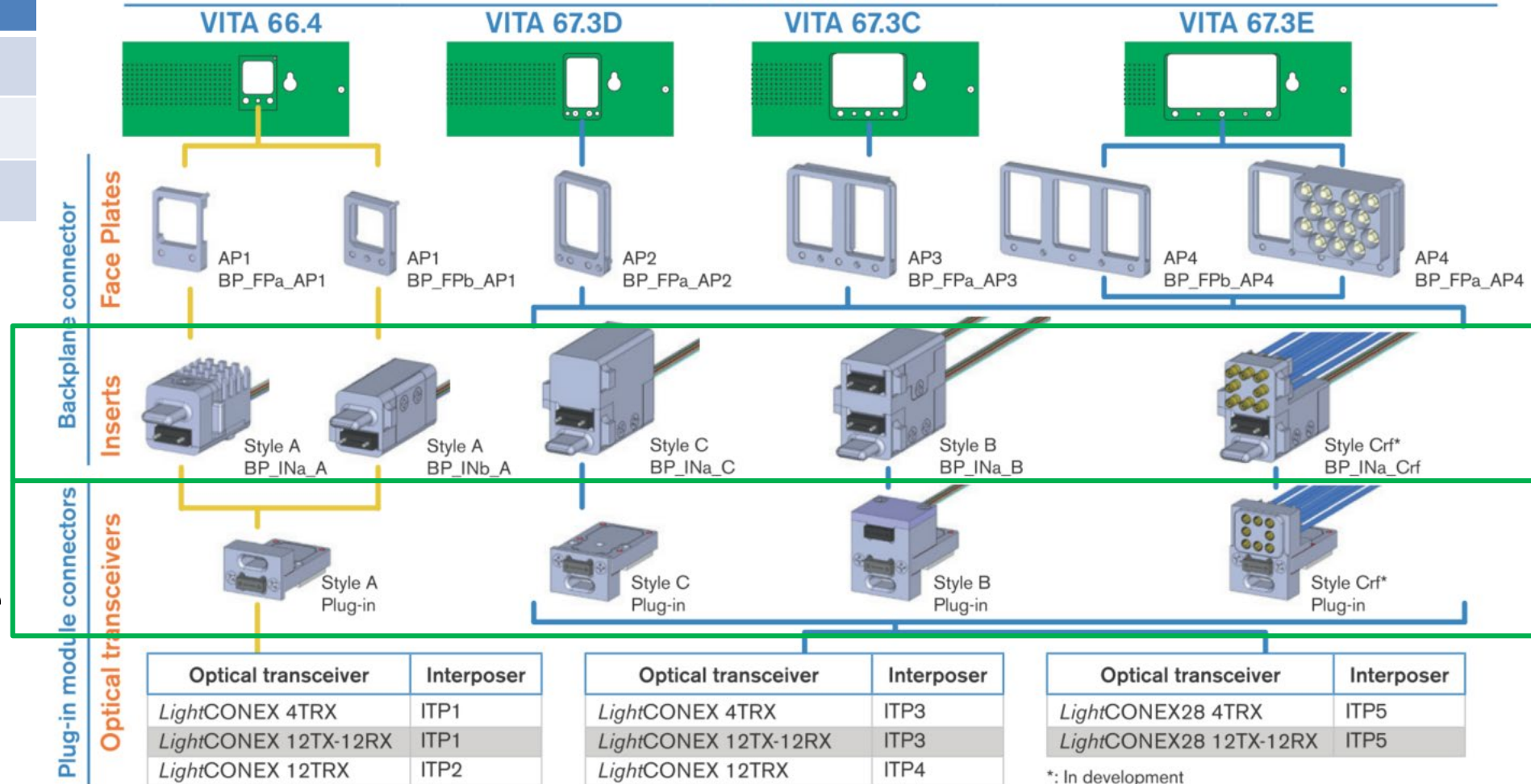
Backplane Aperture Type

Number of MT Ferrules

Need or not for RF connectors

For Backplane

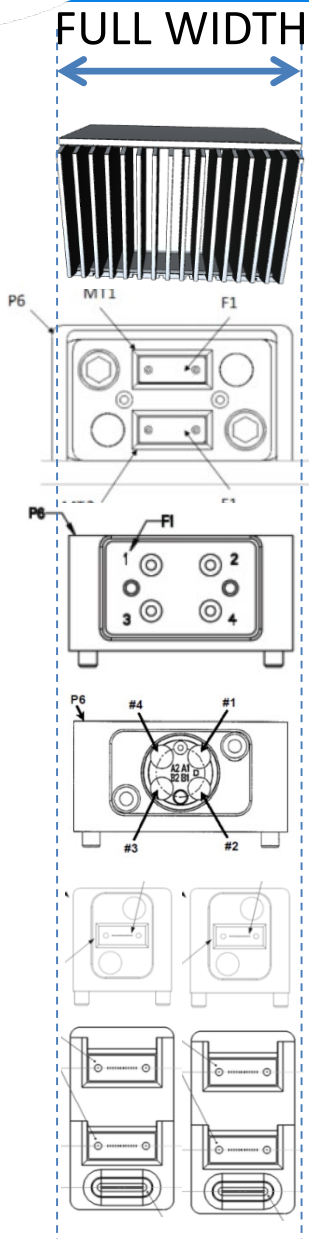
For Plug-in Module



\*: In development



# Which VPX connector provides the best density?

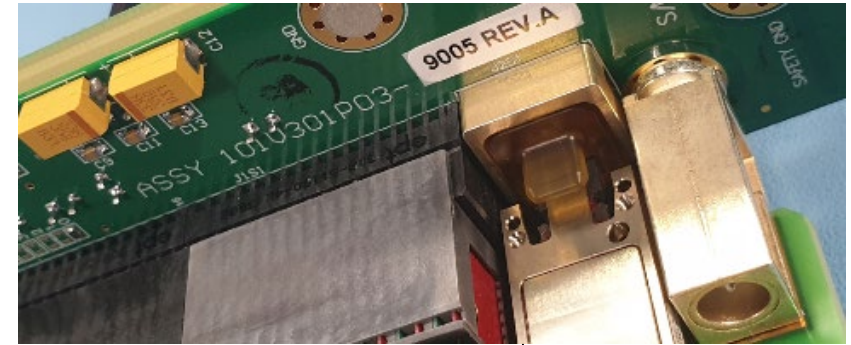


Connector Standard	Connector Description	Max # Fibers	Max # Lanes
VITA 46.0	16 wafers	N/A	16
VITA 66.1	2 MT Ferrules Up to 24 fibers / MT Ferrule	48	24
VITA 66.2	4 fiber terminals	4	2
VITA 66.3	4 fiber terminals	4	2
VITA 66.4	1 MT Ferrule / Connector Up to 24 fibers / MT Ferrule	48 (2*24)	24
VITA 66.5 Style B	2 MT Ferrules / Connector Up to 24 fibers / MT Ferrule	96 (2*2*24)	48



# Simplified board replacement / 2-level maintenance

Interface Concept ComEth4590a switch w/ 3 front panel 10G optical connectors



## VITA 66.5 BENEFITS:

- Easier & faster board replacement (inc. 2-level maintenance in the field in harsh environment)
- Better board interoperability (standardized BKP i/f)

Interface Concept ComEth4082e switch implementing VITA 66.5:

- Reflex Photonics LightCONEX 12TRX Style A VITA 66.5 module
- 12\* 10G optical lanes in the backplane



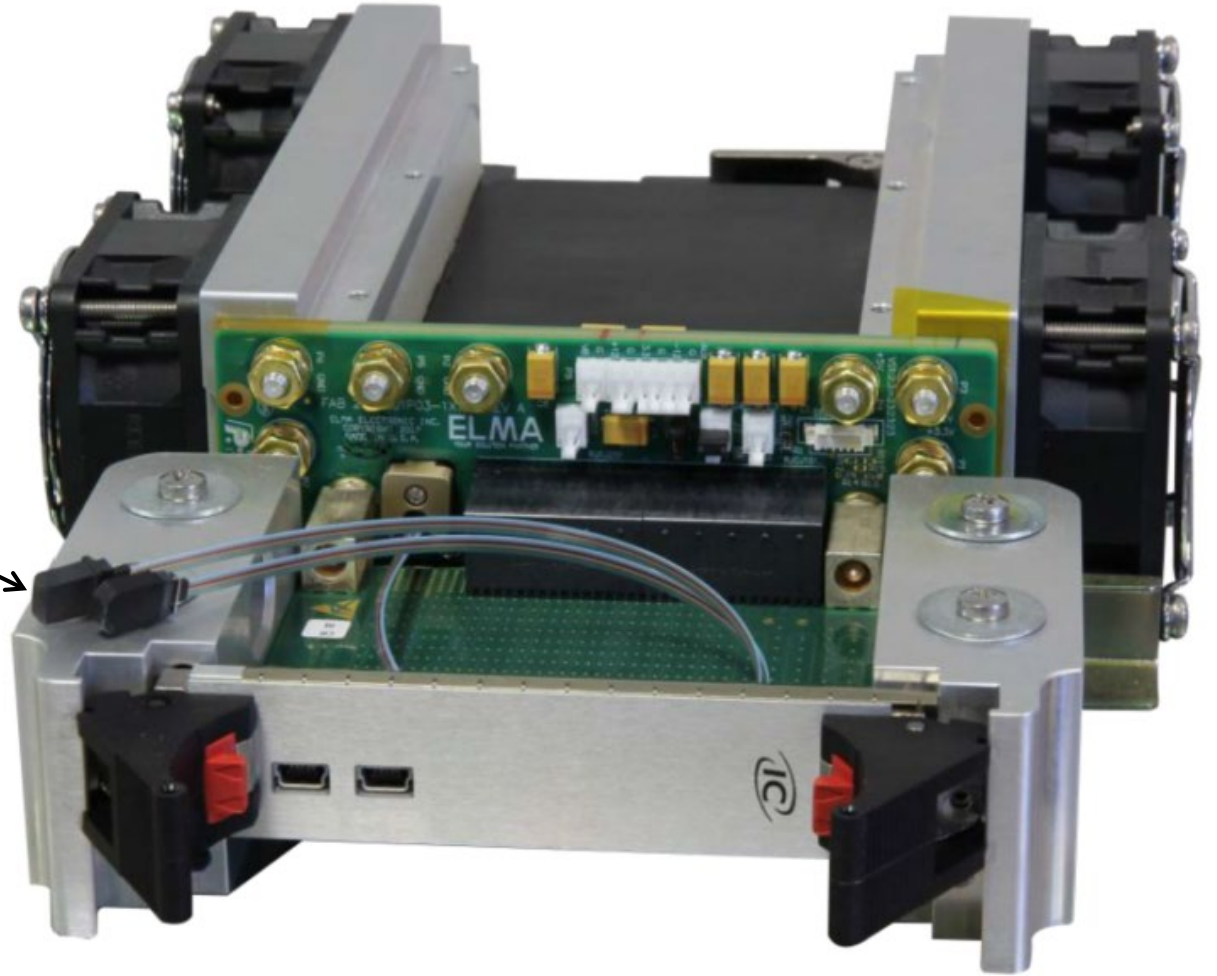
# Flexible backplane connections

## VITA 66.5 Benefits:

- Easy separation of optical lanes for:
  - board-board connections
  - connections to System I/O ports

Fanout Example: 24-Fiber Cable with Fanout from Single MTP/MPO to 2 MTP/MPOs (2 groups of 12 fibers)

Other Fanout Example: 24-Fiber Cable with Fanout from Single MTP/MPO to 3 MTP/MPOs (3 groups of 8 fibers)



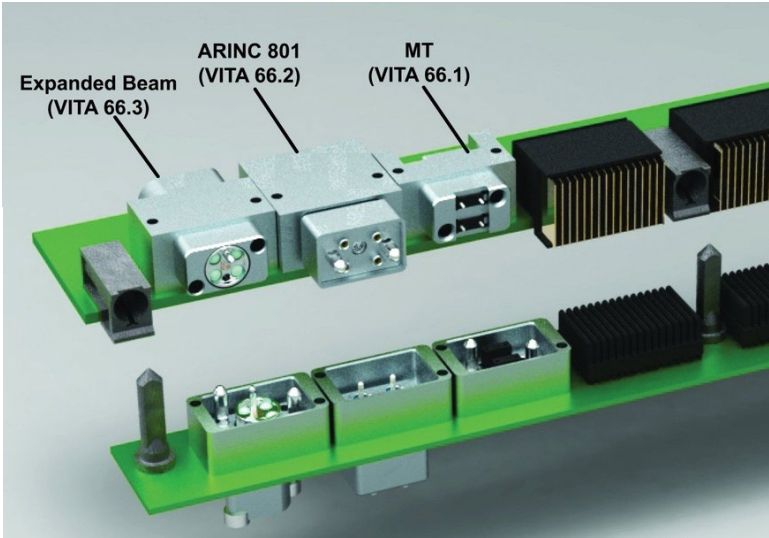
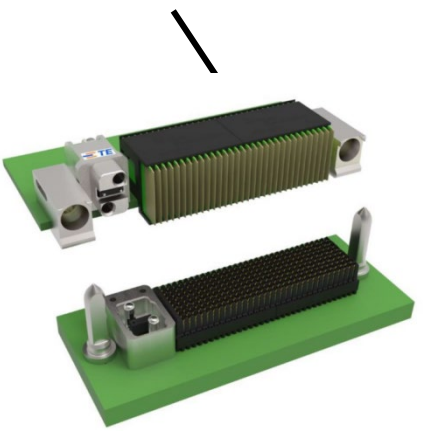
## Interface Concept ComEth4082e switch implementing VITA 66.5:

- Reflex Photonics LightCONEX 12TRX Style A VITA 66.5 module
- 12\* 10G optical lanes in the backplane



# Integration of optical and RF connectors

Half-width MT  
(VITA 66.4)

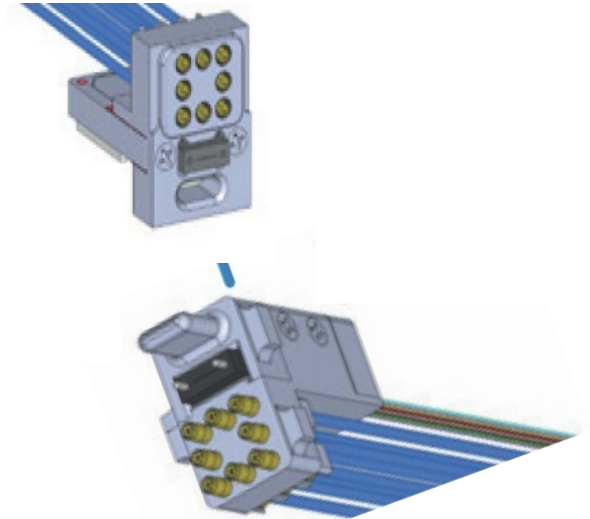


Plug-In Module  
Connectors



Backplane  
Connectors

VITA 66.5 style Crf

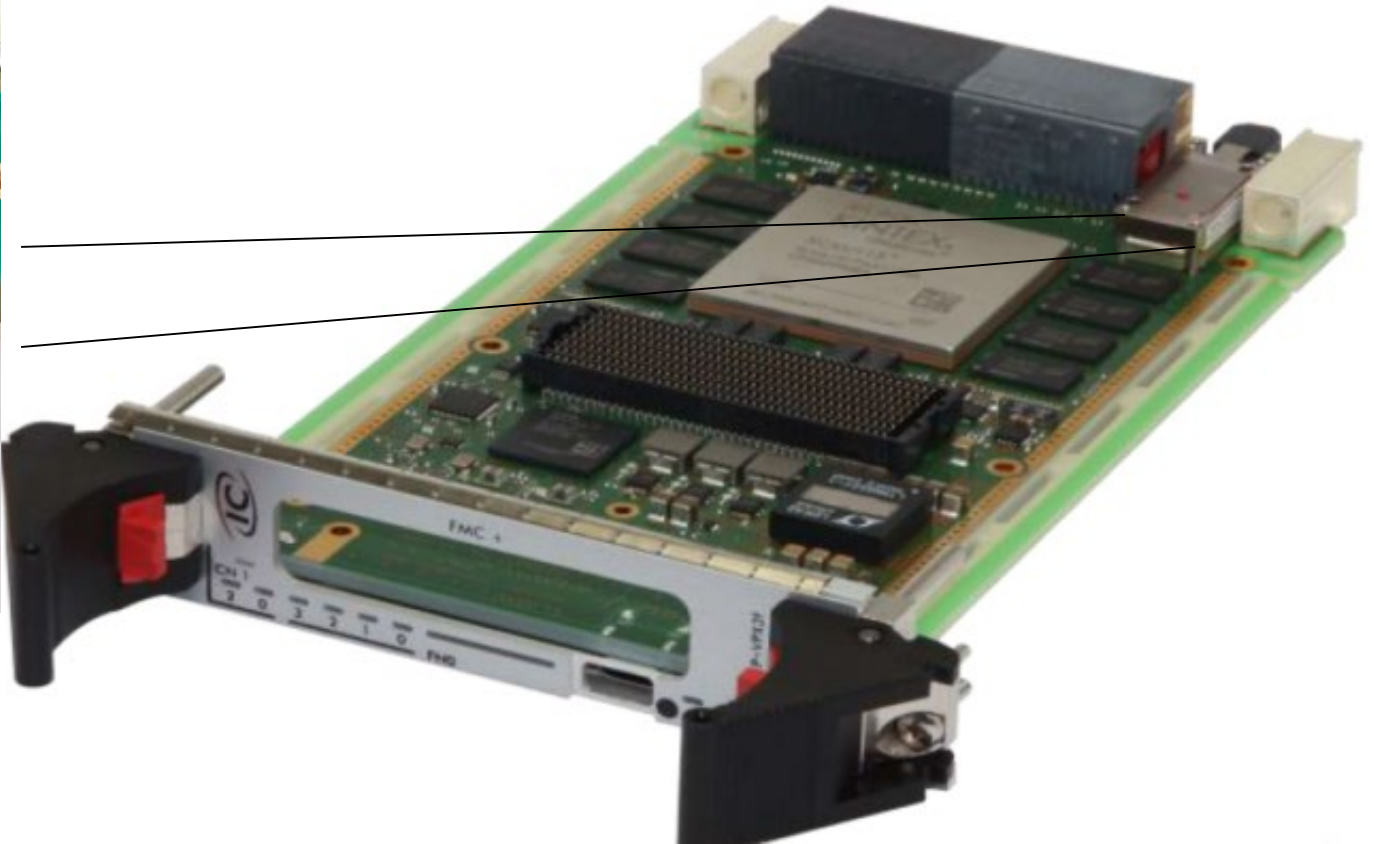
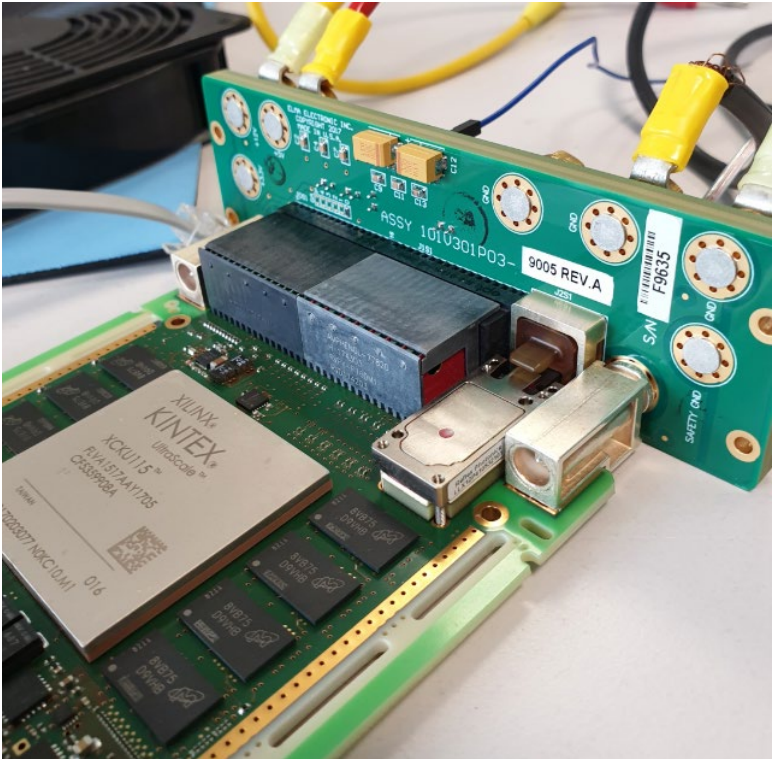


VITA 66.5 Benefits:

- Optical and RF connectors integrated in a single ½ width module



# High-density PCB with VITA 66.5 plug-in module



## VITA 66.5 Benefits:

- Optimized PCB area thanks to optical transceiver & connector integration

## Interface Concept IC-FEP-VPX3f Kintex UltraScale board implementing VITA 66.5:

- Reflex Photonics LightCONEX 12TRX Style A VITA 66.5 module
- 12\* 10G optical lanes in the backplane



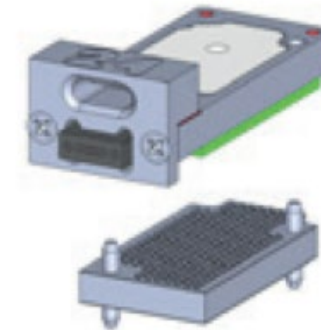
# Board Customization for VITA 66.4 & 67.3D apertures

## Board Customization:

- Style A & Style C VITA 66.5 transceiver modules pin compatible
- Proper VITA 66.5 style (A/C) to be mounted based on BKP aperture
- No Software Change



Style A & C  
Transceiver modules



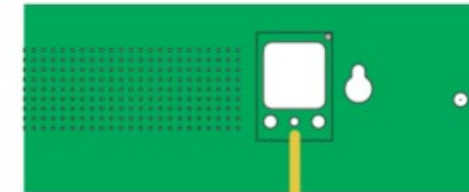
Style A



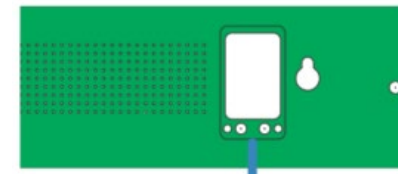
Style C

Backplane  
Apertures

VITA 66.4



VITA 67.3D



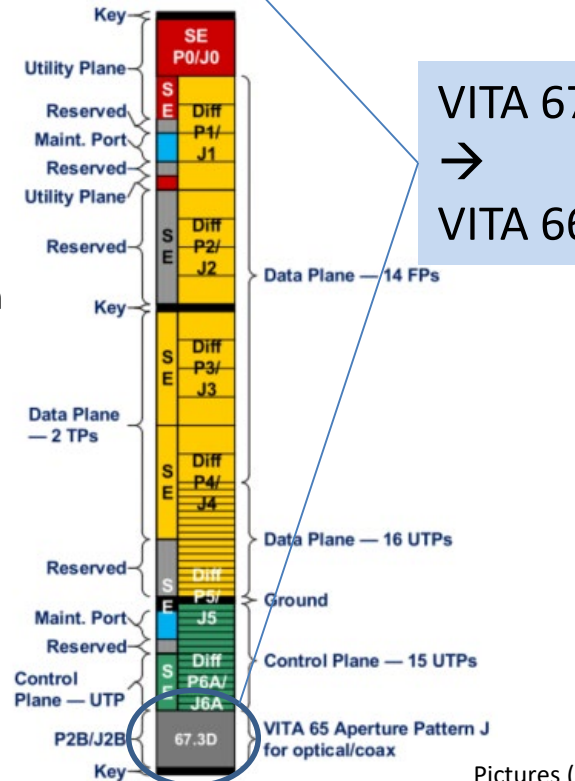
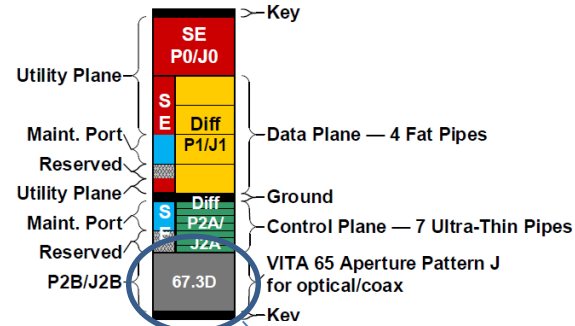
## Interface Concept ComEth4082e switch implementing VITA 66.5:

- Reflex Photonics LightCONEX 12TRX Style A or C VITA 66.5 module
- 12\* 10G optical lanes in the backplane



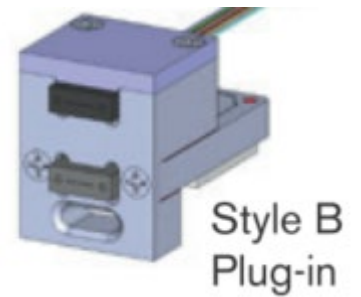
# VITA 66.5 Opportunities with SOSA 3U/6U switch profiles

## SOSA switch slot profiles with VITA 66.5



VITA 67.3D backplane aperture  
 →  
 VITA 66.5 Style B/C plug-in module

## Transceiver module option examples for VPX board





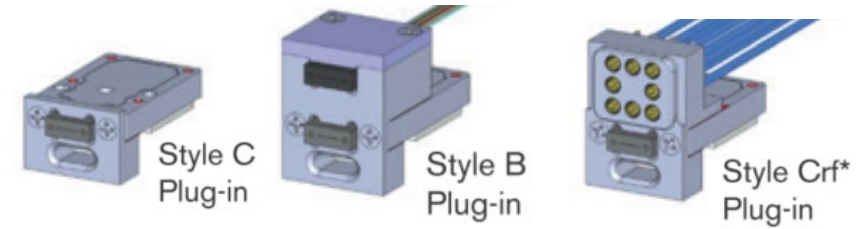
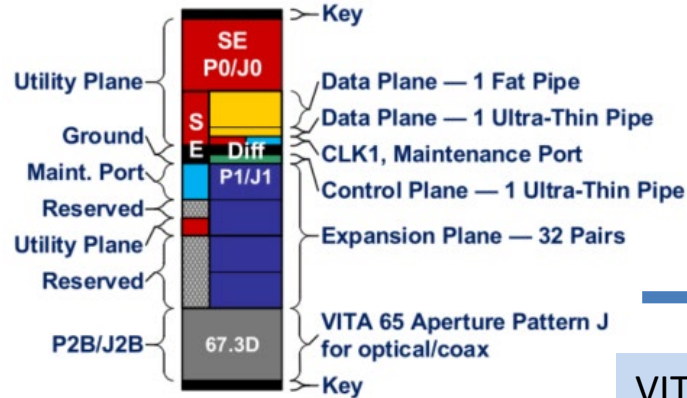


# VITA 66.5 Opportunities with SOSA 3U payload profiles

## SOSA 3U payload slot profiles with VITA 66.5

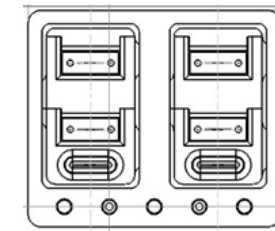
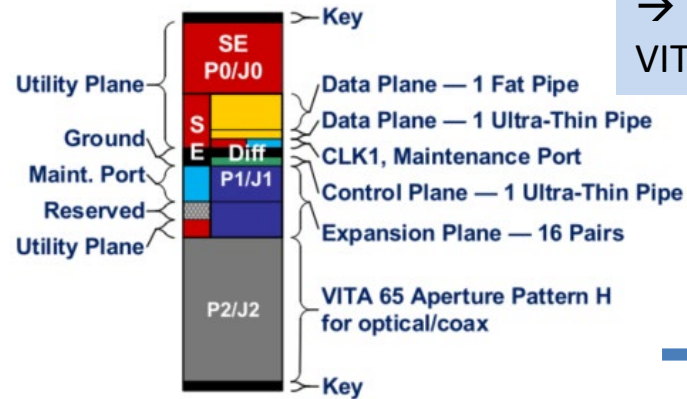
## Transceiver module option examples for VPX board

SLT3-PAY-1F1U1S1S1U1U4F1J-14.6.13-n



VITA 67.3D backplane aperture  
 →  
 VITA 66.5 Style B/C plug-in module

SLT3-PAY-1F1U1S1S1U1U2F1H-14.6.11-n



Showing here 2\* Style B

VITA 65 Aperture Pattern H =  
 VITA 67.3C Aperture  
 →  
 Dual VITA 66.5 Style B/C plug-in module

Same modules as above used in combinations of 2

The following are connector Aperture Patterns:

- A = [VITA 66.1]
- B = [VITA 66.2]
- C = [VITA 66.3]
- E = [VITA 66.4], [VITA 67.1], or [VITA 67.3] type A
- G = [VITA 67.2] or [VITA 67.3] type B
- H = [VITA 67.3] type C
- J = [VITA 67.3] type D
- K = [VITA 67.3] type E

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# Summary and outlook

- VITA 66.5 (draft) **appealing optical interconnect technology** in the BKP: lane density, board replacement, flexible options in backplane, high integration
- Solutions existing today and being deployed (switches, FPGA boards...)
- Various opportunities for this technology in the new SOSA ecosystem