V1161

Dual-Port Programmable 100G Rugged Ethernet XMC ACAP Card

Benefits

Programmable interface solution that leverages off-the-shelf world-class network performance with customizable application processor

Heterogeneous computing card combining hard ARM processor cores, large FPGA fabric, and high bandwidth network interface controller

Designed specifically for sensor interface and data processing, multi-level secure networking, and interface protocol bridging applications

Adding to any single board computer provides a high bandwidth interface, configurable ACAP (FPGA) resources, and rugged optics

Embedded focus with VITA 20 and VITA 47 compliance

Versatile design supports electrical or optical interfaces, optical options for both backplane or front-panel VPX support

Modular optics for flexibility in supporting 1-25Gbs per lane

Options for 3U VPX, 6U VPX, and PXIe form factor via carrier cards

Features

Up to eight (8) 1G to 25G optical ports via MPO front panel I/O or VITA 66 optical backplane I/O. Electrical I/O via Pn6 also available

Xilinx® Versal® ACAP (FPGA)

NVIDIA® Mellanox® ConnectX®-5 Network Interface Device

Hardware offloads for UDP, TCP, RoCE v2, DPDK, GPUDirect, NVMEoF, +more

Supports PCIe Gen4 x16, Gen4 x8, Gen3 x16, Gen3 x8

Onboard embedded PCIe Switch device

Advanced APIs that support multi-core and multi-processor architectures

Wide range of operating system software support

Overview

The V1161 is a next generation high performance embedded computing XMC featuring the Xilinx® Versal™ Adaptive Compute Acceleration Platform (ACAP), the NVIDIA® Mellanox® ConnectX®-5 (MC-X5) network interface device, and rugged optical and electrical IO options. The V1161 is specifically targeted at applications requiring a combination of high speed interfaces, network offloads, and onboard payload processing resources. Use cases include sensor interface design with onboard data processing (or pre-processing), multi-level secure networking, and mixed protocol or protocol bridging applications. Radar, SIGINT, video, storage, medical imaging, and embedded communications systems all have the ability to benefit from the V1161 module.

The V1161 is a proven high-bandwidth and low-latency performance leader in 10/25/40/50/100Gbs Ethernet applications. The V1161 includes hardware offloads for UDP, TCP, RoCE v2, DPDK, GPUDirect, NVMEoF, and many other protocol stacks. The combination of the MC-X5 device and the ACAP device allows for system designers to leverage the off-the-shelf world-class Ethernet performance while deploying unique data processing and security algorithms in the onboard ACAP device. This combination maximizes the effectiveness of the deployed algorithms while eliminating design efforts required to establish high bandwidth Ethernet, PCIe controllers, efficient DMA engines, or low overhead software drivers.

In addition to the Ethernet interfaces described, the FPGA fabric provided within the ACAP part is capable of hosting New Wave DV IP cores for Fibre Channel, ARINC-818, sFPDP, Aurora, and others. This makes the V1161 an ideal hardware platform for mixed interface protocol needs or protocol bridging applications.

The convenient XMC form factor and rugged design of the V1161 can turn a VPX-based single board computer into a single-slot sensor interface and heterogeneous computing solution. The V1161 mounted on a x86 based single board computer will provide 100G optical interfaces, FPGA fabric, ARM processor cores, and x86 processor cores all in a single slot solution. V1161 is also available from New Wave DV in a 3U VPX form-factor instead of XMC if desired.

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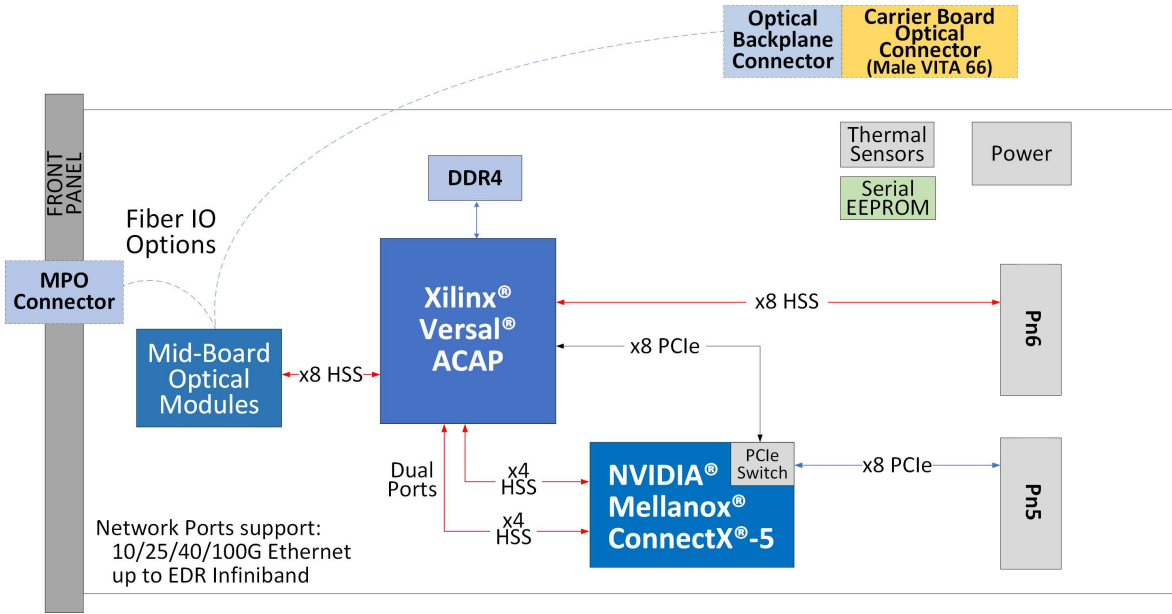
> **V1161 XMC Block Diagram**

## Connector Types

The V1161 offers five different I/O options:

- **Electrical Backplane Connector via Pn6**
- **Optical Front Panel MPO Connector**
- **Optical Backplane MT Connector for VITA 66.1**
- **Optical Backplane MT Connector for VITA 66.4**
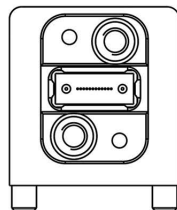- **Custom Optical Cabling/Connector Options**

Backplane Slot Profile

When hosted on a New Wave VPX carrier, the V1161 provides a VITA 46.9 P1w9-X12d+"X4d" compliant interface

- "X4d" includes 4 pairs beyond the standard on P1w15 A/B, D/E and P1w16 B/C, E/F
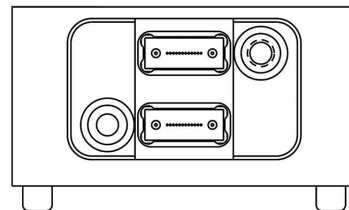
1. Front Panel MPO I/O
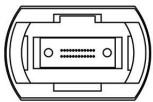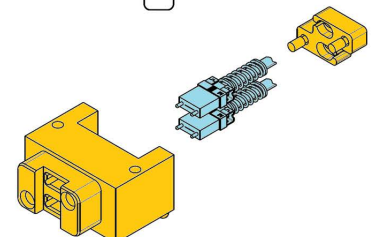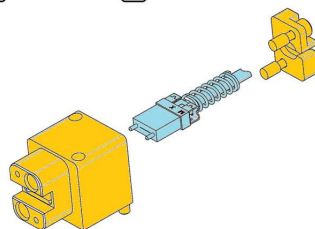
2. VITA 66.4 Backplane MT I/O

3. VITA 66.1 Backplane MT I/O

KEY
New Wave-Provided Hardware
Customer-Provided Hardware

V1161
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Multi-Processor Multi-Core Support

The V1161 is uniquely suited for system architectures involving multiple processing cards on a common switched data plane. Specifically, the V1161 supports shared access from multiple host processors, enabling it to function as a cost-effective, high-performance gateway. This feature enables a single high-speed pipe to carry multiple virtual channels in systems that need to spread or load-balance sensor data across processor arrays.

Complete Product Support Program

New Wave DV prides itself on its excellent customer support, a fact that is echoed by our customers. New Wave DV provides industry standard warranty on its products, but it is the human factor that makes our support so valuable to our customers. Our team takes the time and effort to ensure that the customer experience with our products is a positive one.

Our Commitment

New Wave DV is committed to providing the latest innovations in technology, architectures, and techniques to keep our customers one step ahead of the rest. Our products, complete with the Development Framework, are intended to offer our customers an entirely unique out-of-the-box experience.

Alternate Form Factors

The V1161 is designed for use in a variety of mission-critical applications. Whether you need its capabilities in XMC or other form factors such as VPX, PCIe, PXIe, or others, we are happy to help accommodate your needs and provide you with the solution best suited for your success.

PXIe   VPX   PCIe

Technical Specifications

NETWORK INTERFACE
Up to eight (8) 1G to 25G optical ports (front & backplane options)
• 850nm multi-mode optics
Up to eight (8) 1G to 25G electrical ports to Pn6 (high-speed mezzanine connector)
Dual 10/25/40/50/100Gbs Ethernet port to MC-X5

ETHERNET PROTOCOLS
TCP, UDP, ARP, ICMP, RoCE v2, Multicast, Broadcast, + more
Visit NVIDIA® Mellanox® Datasheet[1]

ADDITIONAL PROTOCOLS
Fibre Channel, sFPDP, ARINC 818, Aurora

ACAP (FPGA) DEVICE
Xilinx Versal VM1502, VM1802
Visit Xilinx® Versal™ Datasheet[3]

ETHERNET DEVICE
NVIDIA® Mellanox® ConnectX®-5 EN IC
Visit NVIDIA® Mellanox® Datasheet[1]

MEMORY
2 banks of 4GB up to 1866MHz LPDDR4 SDRAM

HOST INTERFACE
PCI Express Gen4/Gen3 x8 (Pn5 to MC-X5)
PCI Express Gen4/Gen3 x8 (Pn6 to ACAP)

THERMAL SENSORS
2 digital temperature sensors

COMPLIANCE
VITA 20, 42.3, 47, 61.0, 88
NVIDIA® Mellanox® ConnectX®-5 EN IC
Visit NVIDIA® Mellanox® Datasheet[1]

SOFTWARE SUPPORT
Software drivers available from NVIDIA® Mellanox®[2]
NWDV Maintained x86 OS's: https://newwavedv.com/wordpress/wp-content/uploads/2021/08/V1161-software-info-2021.pdf

PHYSICAL CHARACTERISTICS
Dimensions: 74 mm (width) x 143.75 mm (length)
Weight: 0.276 lbs

POWER CHARACTERISTICS
Power Draw: Maximum 40W
Power Supply: 5V to 12V

TEMPERATURE
Operating: -40˚ C to 55˚ C at 250 LFM (air-cooled)
Operating: -40˚ C to 85˚ C (conduction-cooled)
Storage: -55˚ C to 105˚ C

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[1]NVIDIA® Mellanox® ConnectX®-5 EN IC Datasheet: https://www.mellanox.com/sites/default/files/doc-2020/pb-connectx-5-en-ic.pdf

[2]NVIDIA® Mellanox® Ethernet Software Support/Datasheet: https://www.mellanox.com/products/adapter-ethernet-sw

[3]Xilinx Versal ACAP Datasheet: https://www.xilinx.com/content/dam/xilinx/support/documentation/data_sheets/ds950-versal-overview.pdf

V1161 Hardware Part Number Configuration

Optional

400	-	01161	-	"WXYZ"	-	"IP"	-	"CC"	-	"NB"
Series		Model		Board Configuration		IP Configuration		Coating Configuration		Carrier Configuration
				Select 1 for each W, X, Y, and Z		Network Pass Through Example Design		Select 1 Coating Option		Select 1 Carrier Option
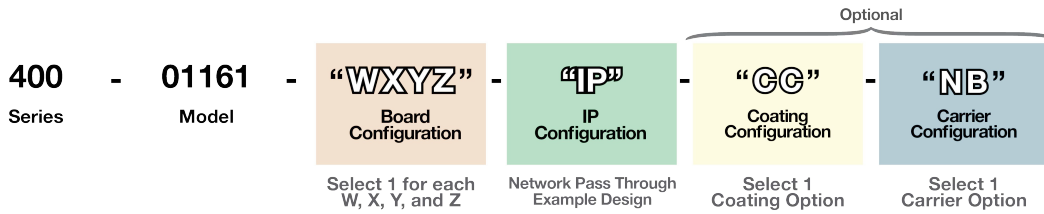
W

Config #	Description
4-F	Reserved
3	Xilinx Versal VC1902 ACAP
2	Xilinx Versal VC1802 ACAP
1	Xilinx Versal VM1802 ACAP
0	Xilinx Versal VM1502 ACAP

X

Config #	Description
F	No optics populated, electrical P16 IO only
E	4-lane 10Gbs front panel optics
D	4-lane 25Gbs front panel optics
C	4-lane 25Gbs & 4-lane 10Gbs (8-lane total) front panel optics
B	8-lane 10Gbs front panel optics
A	8-lane 25Gbs front panel optics
5-9	Reserved
4	4-lane 10Gbs backplane VITA 66.5 / 67.3 optics
3	4-lane 25Gbs backplane VITA 66.5 / 67.3 optics
2	4-lane 25Gbs & 4-lane 10Gbs (8-lane total) backplane VITA 66.5 / 67.3 optics
1	8-lane 10Gbs backplane VITA 66.5 / 67.3 optics
0	8-lane 25Gbs backplane VITA 66.5 / 67.3 optics

Y

Config #	Connector	P16
B	VITA 88	DNP
A	VITA 88	P
9, 8	Reserved	
7	VITA 61	DNP
6	VITA 61	P
5, 4	Reserved	
3	VITA 42	DNP
2	VITA 42	P
1, 0	Reserved	

*P = Populate; DNP = Do Not Populate

Z

Config #	Description
3+	Reserved
2	PCIe Gen3, industrial temp, single-host, PCIe switch enabled
1	Reserved
0	PCIe Gen4, commercial temp, single-host, PCIe switch enabled

400-01161-☐☐☐☐-☐-☐-☐ (W X Y Z IP CC NB)

IP

Config #	Description
1+	Reserved
0	Network Pass Through Example Design

CC

Config #	Description
AR	Acrylic conformal coat
UR	Urethane conformal coat
ER	Epoxy conformal coat
SR	Silicone conformal coat
XY	Parylene conformal coat
BLANK	No conformal coat

NB

Config #	Description
PE	XMC delivered in PCIe form factor via carrier card
3V	XMC delivered in conduction-cooled 3U VPX form factor
3A	XMC delivered in air-cooled 3U VPX form factor
PX	XMC delivered in PXIe form factor via carrier card
BLANK	XMC delivered in XMC form factor without carrier card
	Additional options available. Please inquire.