

# Mellanox Innova™ -2 Flex Open Programmable SmartNIC

Advanced programmable network adapter delivering industry-leading acceleration and performance

Mellanox Innova-2 Flex Open Programmable SmartNIC is an innovative adapter that combines the advanced ConnectX®-5 InfiniBand and Ethernet network controller ASIC with a state-of-the-art FPGA, on board. Maximizing network efficiency and scalability, Mellanox Innova-2 Flex Open Programmable SmartNIC offers customers an open platform to develop custom-made offloads for a range of markets, including Storage, High-Performance Computing (HPC), Machine Learning, Security, and more.

## Mellanox Innova-2 Flex Open Network Adapter

Mellanox Innova-2 Flex Open Programmable SmartNIC is a network adapter card that combines ConnectX-5 with a fully-open programmable Xilinx® FPGA, entirely dedicated to the customer's application logic. The network adapter card is suitable for a wide variety of applications, ranging from Security Acceleration (e.g., encryption/decryption)

to Storage Acceleration (e.g., compression/decompression), and more.

Mellanox Innova-2 Flex Open Programmable SmartNIC reduces TCO by combining the FPGA acceleration with the network card on a single PCIe slot. The FPGA card connects to the host via an on-board PCIe switch supporting x8 Gen4, and also is visible to the host as a PCIe device.

## Ease of Development and Deployment

Users can easily develop and deploy FPGA applications, utilizing the Xilinx Vivado Design Suite development environment and Mellanox tools suite. The Vivado license is to be obtained from Xilinx.

The feature-rich Mellanox Innova-2 Flex adapter card together with the High Level Synthesis (HLS) capabilities of the Xilinx Vivado design and backend development environment, create

the ideal infrastructure for developers to implement their own applications and to achieve hardware-like performance with minimum time-to-market.

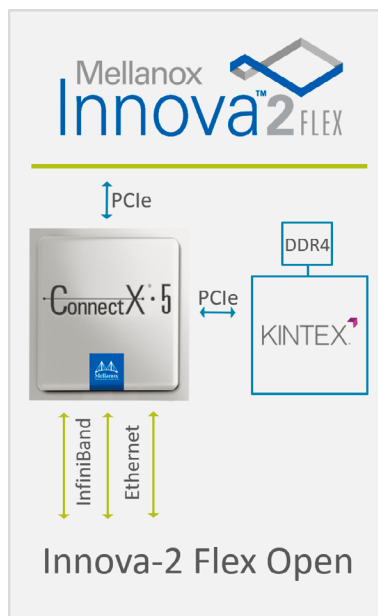


Figure 1: Mellanox Innova-2 Flex Open Network Adapter

## HIGHLIGHTS

### KEY FEATURES

- Open platform for custom-made logic accelerations
- Dual-port 25Gb/s Ethernet or dual-port EDR InfiniBand / 100Gb/s Ethernet
- PCIe Gen4 x8
- 8GB DDR4-2400 (\*flavor-dependent)
- ConnectX-5 accelerations, including:
  - RoCE, and RoCE for overlay networks
  - vSwitch/vRouter offloads
  - Hardware-based I/O virtualization
  - Mellanox PeerDirect® communication acceleration
  - End-to-end QoS and congestion control
- RoHS compliant

### BENEFITS

- Superior FPGA-based accelerator for Security, Storage, Media & Entertainment, Cloud, and more
- Industry-leading performance and low CPU utilization
- Open platform for easy development of custom-made FPGA applications
- I/O consolidation, lower TCO, reduce complexity, power efficiency, and more
- A single PCIe slot for advanced network adapter and custom acceleration



## Mellanox Innova-2 Flex Open Programmable SmartNIC for Security

By integrating their proprietary security application logic into the FPGA and utilizing the advanced network features of Mellanox Innova-2 Flex Open, customers can create highly optimized and unique solutions that serve a variety of security use cases, including data encryption, decryption and more.

## Mellanox Innova-2 Flex Open programmable SmartNIC for Storage

Mellanox Innova-2 Flex Open programmable adapter enables the acceleration and scalability of different types of storage applications. For example, it can help deliver transparent data compression, decompression or deduplication capabilities, improving overall storage utilization with minimal additional load on the CPU.

## Mellanox Innova-2 Flex Open Programmable SmartNIC for Media & Entertainment

Mellanox Innova-2 Flex Open programmable adapter delivers a unique, compliant and differentiated solution for streaming applications through custom accelerations. Using Mellanox Innova-2 Flex Open, multimedia applications can scale to handle multiple 4K/8K streams in a single host, while enjoying greater efficiency with lower CPU and PCIe bandwidth utilization.

Video applications can leverage Mellanox Innova-2 Flex Open further with:

- Packet pacing, natively offloaded by the ConnectX-5 within Mellanox Innova-2 Flex Open, which can be further customized through FPGA logic
- Video down sampling for multi-viewers applications
- Hitless switching for video redundancy, which is implemented by a seamless protection switch

## Software Support

Using the same drivers as the ConnectX-5 NIC, Mellanox Innova-2 Flex Open supports Linux distributions and offers a rich set of tools for the configuration and management of both its network controller and the Xilinx FPGA across operating systems.



## Features and Compatibility\*

### InfiniBand or Ethernet Controller (flavor-dependent)

- Dual-port

### Application Accelerator FPGA

- Xilinx® Kintex® UltraScale™ XCKU15P

### On-Board Memory

- 8GB DDR4-2400 (flavor-dependent)

### InfiniBand

- EDR / FDR / QDR / DDR / SDR
- IBTA Specification 1.3 compliant
- RDMA, Send/Receive semantics
- Hardware-based congestion control
- Atomic operations
- 16 million I/O channels
- 256 to 4Kbyte MTU, 2Gbyte messages
- 8 virtual lanes + VL15

### Ethernet

- 100GbE / 25GbE / 10GbE
- IEEE 802.3bj, 802.3bm 25 Gigabit Ethernet
- IEEE 802.3by, Ethernet Consortium 25 Gigabit
- IEEE Std 802.3ae 10 Gigabit Ethernet
- IEEE Std 802.3ad Link Aggregation
- IEEE Std 802.1Q, .1P VLAN tags and priority
- IEEE Std 802.1Qau Congestion Notification
- IEEE P802.1Qaz D0.2 ETS
- IEEE P802.1Qbb D1.0 Priority-based Flow Control
- IEEE 1588v2
- Jumbo frame support (9600B)

### Remote Boot

- Remote boot over Ethernet
- UEFI-supported

### Enhanced Features & Offloads

- RDMA over Converged Ethernet (RoCE)\*\*
- RAID offload – erasure coding (Reed-Solomon) offload
- Hardware-based reliable transport
- Mellanox PeerDirect RDMA (aka GPUDirect® communication acceleration)
- Enhanced Atomic operations
- Advanced memory mapping support, allowing user mode registration and remapping of memory (UMR)
- LSO, LRO, checksum offload
- RSS VLAN and MPLS tag insertion/stripping, Receive flow steering
- Intelligent interrupt coalescing

### Hardware-Based I/O Virtualization

- Single Root IOV
- SR-IOV: Up to 512 Virtual Function
- SR-IOV: Up to 2 Physical Functions
  - Virtualizing Physical Functions on a physical port
  - SR-IOV on every Physical Function
- Address translation and protection
- Guaranteed QoS for VMs

### Media & Entertainment

- SMPTE 21110-20
- SMPTE 2110-21N/NL

### Management and Control Interfaces

- NC-SI, MCTP over SMBus and NC-SI over MCTP over PCIe - Baseboard Management Controller interface

### PCI Express Interface

- PCIe Gen 4.0, 3.0, 1.1 and 2.0 compatible
- 2.5, 5.0, or 8.0GT/s link rate x8
- Auto-negotiates to x8, x4, x2, or x1 PCIe Atomic
- TLP (Transaction Layer Packet) Processing Hints (TPH)
- Access Control Service (ACS) for peer-to-peer secure communication
- Advance Error Reporting (AER)
- Process Address Space ID (PASID) Address Translation Services (ATS)
- Support for MSI/MSI-X mechanisms

### Connectivity

- Interoperable with Ethernet switches (up to 25GbE)
- Passive copper cable with ESD protection
- Powered connectors for optical and active cable support

### Operating Systems / Distributions\*\*

- Linux

\* This section describes hardware features and capabilities. Please refer to the product release notes and driver release notes for feature availability.

\*\* For more details, please contact Mellanox Customer Support.

Table 1 - Part Numbers and Descriptions

OPN	Description	Form Factor
MNV303212A-ADLT	Mellanox Innova-2 Flex Open for Application Acceleration, dual-port SFP28, 25GbE, KU15P, 8GB, No Crypto, PCI4.0 x8, active heat sink, tall bracket	HHHL
MNV303611A-EDLT	Mellanox Innova-2 Flex Open VPI, dual-port QSFP28, EDR / 100GbE, KU15P, No memory, No Crypto, PCI4.0 x8, passive heat sink, tall bracket	HHHL