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QUOTATION

Quote #   MWYQ23433-01

Date: 3/14/2018

Microway Confidential

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Qty	Description	Your Price	Extended Price

Microway is a small business, woman owned and operated. We are building many clusters at any one time and have built thousands of custom clusters for universities, government research labs and agencies, and corporations. Microway has been in the scientific computing business since 1982.

Qty	Description	Your Price	Extended Price
1	**Microway NumberSmasher Xeon + NVIDIA GPU Server (with 4 GPUs)**	$27,945	$27,945

NumberSmasher Xeon + GPU Tower / 4U Rackmount (Black)
   2200W High-Efficiency "Titanium" Redundant 1+1 Power Supply
   Two Intel Xeon Scalable Family processors (Socket P - up to 205W)
   Triple Intel UPI interconnects between CPU sockets (up to 10.4 GT/s)
   Both CPU sockets support Skylake-F CPU models with integrated Omni-Path
   Sixteen slots for up to 2TB ECC DDR4-2666 memory
   Dual Intel X550 10 Gigabit Ethernet ports (RJ45, 10GBase-T)
   Integrated Intel C621 chipset and ASpeed AST2500 Graphics Controller
   IPMI 2.0 w/ Virtual Media, KVM and Dedicated LAN Support
   PCI-E Slots Support:
      Four PCI-E x16 3.0 slots (double-width for GPUs or coprocessors)
      Two PCI-E x16 3.0 slots (single-width, half-length)
      One PCI-E x4 3.0 slot (x8 physical)
   Integrated SATA controller with ten SATA3 6Gb/s ports
   Eight hot-swap 3.5" 6Gbps SATA3 drive bays (optional SAS3)
   One fixed internal 3.5" drive bay
   Three 5.25" Peripheral Drive Bays
   Locking Front Chassis Bezel with Filter
   Internal ports: two SATA SuperDOM, one M.2 slot (PCIe 3.0 x4 NVMe via PCH), one serial COM header, one TPM header
   Internal USB: one USB 3.0 port (Type A), two USB 3.0 and two USB 2.0 via headers
   Rear ports: two 10GBase-T LAN, one IPMI LAN, one VGA, two USB 2.0, two USB 3.0, and one serial COM port
   Front I/O: power button, reset button, two USB 3.0 ports, headphone audio and mic ports
   Dimensions: 26.5" D x 7.0" H x 18.2" W, 58 lbs
   (convertible between Tower and 4U Rackmount configurations; rackmount kit sold separately)

26.5" to 36.4" Rackmount Rails (Black) for 4U Server

Kit for Passive GPU/Xeon Phi Support

(2) Intel Xeon 8176 "Skylake" 2.10 GHz 28-Core 14nm CPU - 165W TDP
 with two AVX-512 units per core, 38.50MB L3 Cache, up to 768GB DDR4-2666 memory, up to three 10.4GT/s UPI links
 Supports Hyper-Threading and Turbo Boost up to 3.80 GHz (clock speeds with AVX-512 instructions: 1.3-3.5 GHz)
 (optional F-SKU with support for 100GBps Intel Omni-Path fabric interconnect)
 (optional M-SKU with support for up to 1.5TB memory)

(12) 32GB DDR4 2666 MHz ECC/Registered Memory (Dual Rank)

   (384GB Total Memory @ 2666MHz)

240GB Intel DC S4500 2.5" SATA 6Gbps 3D NAND SSD
 SATA 6Gb/s Interface (Supports 3Gb/s)
 3D NAND TLC Internal Solid State Drive
 Targeted Lifetime Endurance: ~1 Drive Write Per Day; 0.62 PBW
 Full data path and Power loss protection; 256 bit AES encryption
 Sustained sequential read: up to 500 MB/s
 Sustained sequential write: up to 190 MB/s
 Random 4KB IOPS: up to 69,000 read; up to 16,000 write
 Average Latency: 36µs read, 36 µs write
 2,000,000 Hours MTBF
 Uncorrectable Bit Error Rate (UBER): 1 sector per 10^17 bits read

2.5" HDD Adapter for 3.5" HDD Carrier Tray

(Operating System)

Mellanox ConnectX-3 Pro EN Single-Port QSFP 40G Ethernet Adapter
 PCI-E 3.0 x8 8GT/s; RoHS (R6) Compliant

40GigE Mellanox Ethernet Cable, QSFP+ Passive Copper, 3 meters, 30 AWG

LITE-ON Dual Layer 24X DVD/CD Burner (Black) SATA
  DVD-R/+R: 24X, DVD+RW: 8X, DVD-RW: 6X
  CD-R: 48X, CD-RW: 32X

CentOS 7.x Linux (or your distribution of choice) & NVIDIA CUDA 9.0 installed, configured and tested.

IPMI management capability is integrated on the motherboard. IPMI allows administrators to remotely monitor and control each computer individually. Capabilities include:
* System Power On, Power Off and Reset
* Monitor Fan Speeds, Component Temperatures and Voltages
* Remote Serial Console and KVM Access
* Virtual Media: local devices (CD, USB, etc) appear as directly connected to remote system

Microway Testing Procedure:

Each computer system is network booted to execute low-level memory tests for 12+ hours.

Once passed, operating systems are loaded and Linux stress tests are executed for 48+ hours. These tests include processor and memory intensive applications that have been shown to cause faults in the field. A separate set of tests accesses all sectors on each hard drive and runs filesystem-intensive applications to ensure drive and filesystem reliability.

Microway's hardware warranty may be extended on an annual basis for up to 5 years total warranty.

Microway provides lifetime technical support. Out-of-warranty repairs will be billed at Time and Materials rates.

Shipping and Insurance: prepay and add

Total	**$27,945**

Qty	Description	Your Price	Extended Price

The following items are optional, and are not included in the total:

☐ 1 **Add Four NVIDIA Tesla V100 16GB GPUs (Optional)** $29,892 $29,892

(4) NVIDIA Tesla V100 PCI-E 16GB "Volta" GPU Accelerator
  Full-Speed PCI-E 3.0 x16 Link
  GV100 GPU chip with NVIDIA Passive Heatsink
  5,120 CUDA Cores with Enhanced Unified Memory and Cooperative Groups
  640 NVIDIA Tensor Cores optimized for Deep Learning training
  GPU-boost capability allows for increased clock speeds
  16GB High-Bandwidth HBM2 Memory (900 GB/sec peak bandwidth)
  Supports INT8, INT32 integer; IEEE Half-, Single-, and Double-Precision Floating Point operations
  Performance (with GPU Boost): 112 TFLOPS (half), 14 TFLOPS (single), 7 TFLOPS (double)
  Double PCI slot form factor
  Power Consumption: 250W TDP (One 8- and one 6-pin connector on rear)
  Software Development Tools:
    OpenACC, OpenCL, C/C++ language compiler, debugger, profiler and memory analyzer
    Standard numerical libraries: cuDNN, nvGRAPH, FFT, BLAS, SPARSE, RAND & more:
      https://developer.nvidia.com/gpu-accelerated-libraries

(4) $1,500 EDU discount per NVIDIA Tesla V100 16GB GPU (restrictions apply)

☐ 1 **Upgrade Memory to 768GB (Optional)** $5,892 $5,892

(12) 64GB DDR4 ECC LRDIMM 2666MHz Memory

☐ 1 **Upgrade Processors to: (Optional)** $2,938 $2,938

(2) Intel Xeon 8180 "Skylake" 2.50 GHz 28-Core 14nm CPU - 205W TDP
  with two AVX-512 units per core, 38.50MB L3 Cache, up to 768GB DDR4-2666 memory, up to three 10.4GT/s UPI links
  Supports Hyper-Threading and Turbo Boost up to 3.80 GHz (clock speeds with AVX-512 instructions: 1.7-3.5 GHz)
  (optional M-SKU with support for up to 1.5TB memory)

☐ 1 **Add Intel Optane SSD: (Optional)** $1,284 $1,284

Intel Optane SSD DC P4800X Series 375GB PCI-E NVMe SSD (Half-Height Half-Length)
  PCI-E x4 3.0 NVMExpress Interface to System
  3D XPoint Internal Solid State Drive
  Targeted Lifetime Endurance: 20.5 PBW
  Built in power protection
  Sequential Read: up to 2,400 MB/s
  Sequential Write: up to 2,000 MB/s
  Random Read IOPS: Up to 550,000
  Random Write IOPS: Up to 500,000
  Read Latency: 10µs
  Write Latency: 10µs
  2,000,000 Hours MTBF
  Uncorrectable Bit Error Rate: 1 sector per 10^{17} bits read

☐ 1 **Add Intel Optane SSD: (Optional)** $2,755 $2,755

Intel Optane SSD DC P4800X Series 750GB PCI-E NVMe SSD (Half-Height Half-Length)
  PCI-E x4 3.0 NVMExpress Interface to System
  3D XPoint Internal Solid State Drive
  Targeted Lifetime Endurance: 41.0 PBW
  Built in power protection
  Sequential Read: up to 2,500 MB/s
  Sequential Write: up to 2,200 MB/s
  Random Read IOPS: Up to 550,000
  Random Write IOPS: Up to 550,000
  Read Latency: 10µs
  Write Latency: 10µs
  2,000,000 Hours MTBF
  Uncorrectable Bit Error Rate: 1 sector per 10^{17} bits read

	Qty	Description	Your Price	Extended Price
☐	1	**Upgrade SSD to: (Optional)**	$149	$149

480GB Intel DC S4500 2.5" SATA 6Gbps 3D NAND SSD
  SATA 6Gb/s Interface (Supports 3Gb/s)
  3D NAND TLC Internal Solid State Drive
  Targeted Lifetime Endurance: ~1 Drive Write Per Day; 0.90 PBW
  Full data path and Power loss protection; 256 bit AES encryption
  Sustained sequential read: up to 500 MB/s
  Sustained sequential write: up to 330 MB/s
  Random 4KB IOPS: up to 72,000 read; up to 20,000 write
  Average Latency: 36µs read, 36 µs write
  2,000,000 Hours MTBF
  Uncorrectable Bit Error Rate (UBER): 1 sector per 10^{17} bits read

	Qty	Description	Your Price	Extended Price
☐	1	**Upgrade SSD to: (Optional)**	$381	$381

960GB Intel DC S4500 2.5" SATA 6Gbps 3D NAND SSD
  SATA 6Gb/s Interface (Supports 3Gb/s)
  3D NAND TLC Internal Solid State Drive
  Targeted Lifetime Endurance: ~1 Drive Write Per Day; 1.86 PBW
  Full data path and Power loss protection; 256 bit AES encryption
  Sustained sequential read: up to 500 MB/s
  Sustained sequential write: up to 490 MB/s
  Random 4KB IOPS: up to 72,000 read; up to 30,000 write
  Average Latency: 36µs read, 36 µs write
  2,000,000 Hours MTBF
  Uncorrectable Bit Error Rate (UBER): 1 sector per 10^{17} bits read

	Qty	Description	Your Price	Extended Price
☐	1	**Upgrade SSD to: (Optional)**	$931	$931

1.9TB Intel DC S4500 2.5" SATA 6Gbps 3D NAND SSD
  SATA 6Gb/s Interface (Supports 3Gb/s)
  3D NAND TLC Internal Solid State Drive
  Targeted Lifetime Endurance: ~1 Drive Write Per Day; 3.27 PBW
  Full data path and Power loss protection; 256 bit AES encryption
  Sustained sequential read: up to 500 MB/s
  Sustained sequential write: up to 490 MB/s
  Random 4KB IOPS: up to 72,000 read; up to 33,000 write
  Average Latency: 36µs read, 36 µs write
  2,000,000 Hours MTBF
  Uncorrectable Bit Error Rate (UBER): 1 sector per 10^{17} bits read

The following drives have higher endurance:

	Qty	Description	Your Price	Extended Price
☐	1	**Upgrade SSD to: (Optional)**	$51	$51

240GB Intel DC S4600 2.5" SATA 6Gbps 3D NAND SSD
SATA 6Gb/s Interface (Supports 3Gb/s)
3D NAND TLC Internal Solid State Drive
Endurance Rating (Lifetime Writes): ~3 Drive Writes Per Day; 1.4 PBW
Full data path and Power loss protection; 256 bit AES encryption
2,000,000 Hours MTBF
Uncorrectable Bit Error Rate (UBER): 1 sector per 10^17 bits read
Sustained sequential read: up to 500 MB/s
Sustained sequential write: up to 260 MB/s
Random 4KB IOPS: up to 72,000 read; up to 38,000 write
Average Latency: 36µs read, 36 µs write

☐ 1 **Upgrade SSD to: (Optional)** $185 $185

480GB Intel DC S4600 2.5" SATA 6Gbps 3D NAND SSD
SATA 6Gb/s Interface (Supports 3Gb/s)
3D NAND TLC Internal Solid State Drive
Targeted Lifetime Endurance: ~3 Drive Writes Per Day; 2.95 PBW
Full data path and Power loss protection; 256 bit AES encryption
Sustained sequential read: up to 500 MB/s
Sustained sequential write: up to 480 MB/s
Random 4KB IOPS: up to 72,000 read; up to 60,000 write
Average Latency: 36µs read, 36 µs write
2,000,000 Hours MTBF
Uncorrectable Bit Error Rate (UBER): 1 sector per 10^17 bits read

☐ 1 **Upgrade SSD to: (Optional)** $674 $674

960GB Intel DC S4600 2.5" SATA 6Gbps 3D NAND SSD
SATA 6Gb/s Interface (Supports 3Gb/s)
3D NAND TLC Internal Solid State Drive
Targeted Lifetime Endurance: ~3 Drive Writes Per Day; 5.25 PBW
Full data path and Power loss protection; 256 bit AES encryption
Sustained sequential read: up to 500 MB/s
Sustained sequential write: up to 490 MB/s
Random 4KB IOPS: up to 72,000 read; up to 65,000 write
Average Latency: 36µs read, 36 µs write
2,000,000 Hours MTBF
Uncorrectable Bit Error Rate (UBER): 1 sector per 10^17 bits read

☐ 1 **Upgrade SSD to: (Optional)** $1,504 $1,504

1.9TB Intel DC S4600 2.5" SATA 6Gbps 3D NAND SSD
SATA 6Gb/s Interface (Supports 3Gb/s)
3D NAND TLC Internal Solid State Drive
Targeted Lifetime Endurance: ~3 Drive Writes Per Day; 10.84 PBW
Full data path and Power loss protection; 256 bit AES encryption
Sustained sequential read: up to 500 MB/s
Sustained sequential write: up to 480 MB/s
Random 4KB IOPS: up to 72,000 read; up to 65,000 write
Average Latency: 36µs read, 36 µs write
2,000,000 Hours MTBF
Uncorrectable Bit Error Rate (UBER): 1 sector per 10^17 bits read

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FOB:	Destination (freight PPA)
Ship Date:	3 - 4 Weeks after receipt of order and documentation
Warranty:	Two years offsite with replacement components typically cross-shipped within 24 hours of problem determination by Microway Tech Support.
Technical Support	Lifetime technical support via telephone, fax, or email.
Terms:	NET 30
Shipping Method:	FedEx 2nd Day
	The Buyer is responsible for any sales taxes or duties related to the purchase.

Since 1982 Microway has been a leader in providing high performance computing solutions. Microway specializes in building complex clusters, servers, and workstations. We are unique in having Linux expertise throughout our organization to provide testing of all systems at our assembly and integration center at our headquarters in Plymouth, Massachusetts. Our validation suite includes a number of MPI applications and Microway proprietary software, including MPI Link-Checker and InfiniScope.

Microway is classified as a small business - woman owned and operated.

Microway welcomes our customers (and potential customers) to personally visit our manufacturing facility. We value the opportunity to share our understanding of the systems we build, and to demonstrate our dedication to quality in our design, fabrication, final testing and technical support. Please contact me if you plan to be in or near Massachusetts and would like to make an appointment.

Prices subject to review at time of order due to world-wide component price volatility.

This quote is valid for 30 days.

Server Block Diagram
NumberSmasher 4U Server with Four PCI-Express GPUs

EDR/FDR
InfiniBand

EDR/FDR
InfiniBand

via PCH

NVMe Flash Storage

Intel QPI bus (GPU-Direct RDMA traffic cannot pass)

Quad-channel DDR4 memory (64GB/s per CPU)

PCI-Express x16 (gen 3.0) bus for GPU-Direct RDMA (12.8GB/s)

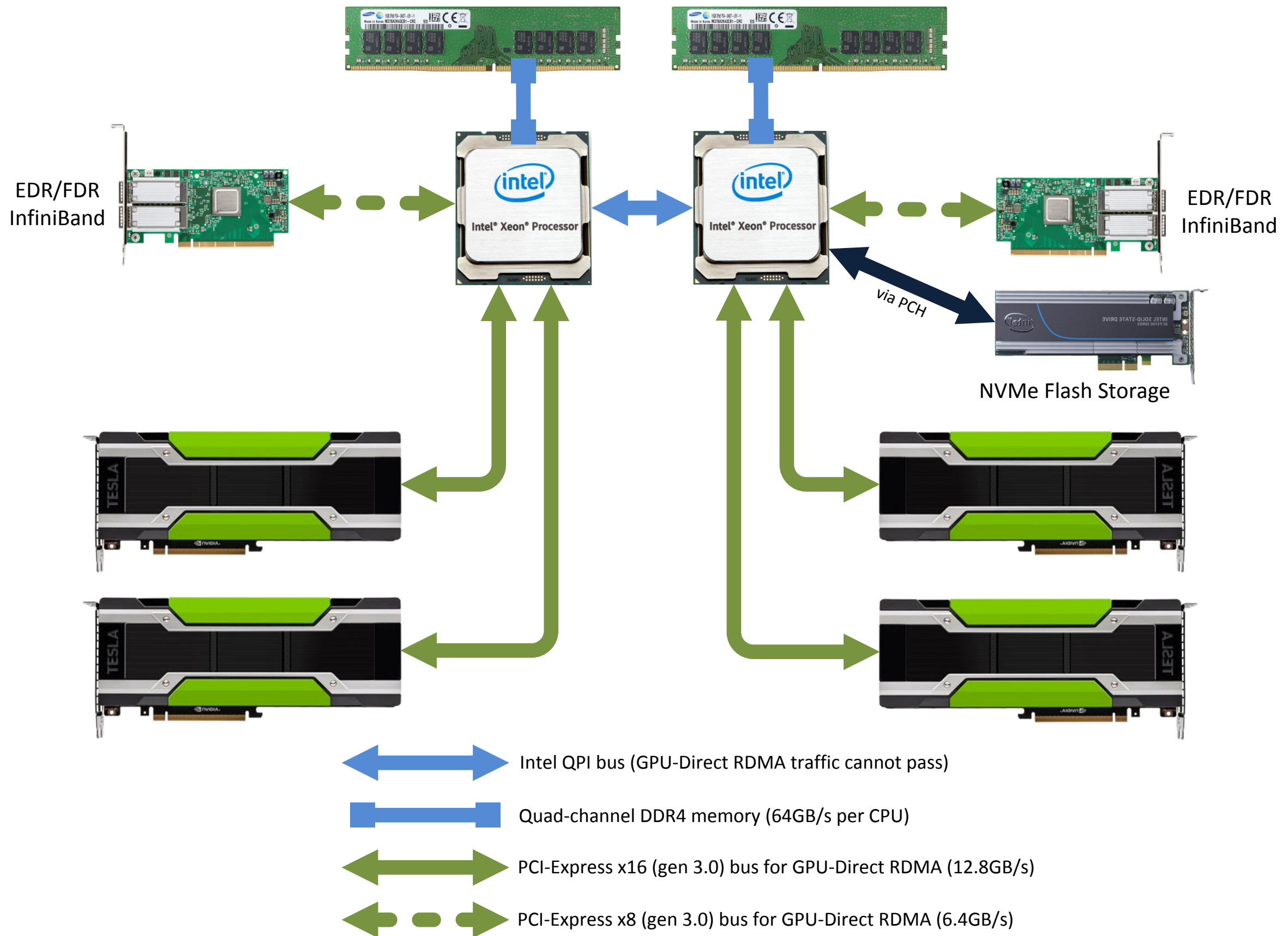PCI-Express x8 (gen 3.0) bus for GPU-Direct RDMA (6.4GB/s)

Diagram is for reference only. Internal components may vary depending upon your configuration.