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## QUOTATION

Quote # MWYQ23427

Date: 3/9/2018

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### Quote To:

Pomona College  
Asya Shklyar  
333 N. College Way  
Claremont, CA 91711

(909) 607-9853  
[asya\\_shklyar@hotmail.com](mailto:asya_shklyar@hotmail.com)

### Ship To:

Pomona College  
Asya Shklyar  
333 N. College Way  
Claremont, CA 91711

(909) 607-9853  
[asya\\_shklyar@hotmail.com](mailto:asya_shklyar@hotmail.com)

### Sales Rep.

Samantha Wheeler  
508-732-5526  
[swheeler@microway.com](mailto:swheeler@microway.com)

Qty	Description	List Price	Your Price	Extended Price
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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.

#### 1 Microway Xeon + Tesla GPU 1U Compute Nodes

\$31,358 \$21,032 \$21,032

NumberSmasher Dual Intel Xeon 1U GPU Server with  
1600W 80 PLUS Platinum Redundant 1+1 Power Supplies  
(power supplies require 208V power for redundancy under full load)  
Up to two Intel Xeon E5-2600 Socket R3 processors  
Intel C612 chipset  
Intel QuickPath Interconnect (QPI) with system bus up to 9.6GT/s  
Sixteen slots for up to 1024GB ECC DDR4-2400/2133 memory  
Dual Integrated Intel i350 Gigabit Ethernet ports  
Three PCI-E x16 3.0 slots for double-width GPUs  
One PCI-E x8 3.0 Slot (Physical x16, low-profile)  
Integrated AST2400 Graphics Controller  
Integrated SATA3 6Gbps Controller  
IPMI 2.0 w/ Virtual Media, KVM and Dedicated LAN Support  
1 VGA, 2 Gigabit LAN, 1 IPMI LAN, 2 USB 3.0 ports, 1 serial header  
Four hot-swap 2.5" SAS/SATA Hard Drive Bays  
Also supports coprocessors  
Rackmount Rail Kit Included



NVIDIA Tesla P100 PCI-E 16GB "Pascal" GPU Accelerator  
Full-Speed PCI-E 3.0 x16 Link  
GP100 GPU chip with NVIDIA-certified Passive Heatsink  
3584 CUDA Cores with Unified Memory and Page Migration Engine  
GPU-boost capability allows for increased clock speeds  
16GB High-Bandwidth HBM2 Memory (732 GB/sec peak bandwidth)  
IEEE Half-, Single-, and Double-Precision Floating Point  
Performance (with GPU Boost): 18.7 TFLOPS (half), 9.3 TFLOPS (single), 4.7 TFLOPS (double)  
Double PCI slot form factor  
Power Consumption: 250W TDP (One 8- and one 6-pin connector on rear)  
Software Development Tools:  
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>

(2) Intel Xeon E5-2699v4 Broadwell-EP 2.20 GHz Twenty-Two Core 14nm CPU  
with 55MB L3 Cache, DDR4-2400, 9.6 GT/sec QPI, 145W  
Supports Hyper-Threading and Turbo Boost up to 3.6 GHz

(8) 32GB DDR4 2400 MHz ECC/Registered Memory (Dual Rank)

**(256GB Total Memory @ 2400MHz)**

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

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Product photos are for reference only. Internal components may vary depending upon your configuration.

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	<p>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<sup>17</sup> bits read</p> <p>Mellanox ConnectX-3 Pro EN Single-Port QSFP 40G Ethernet Adapter  PCI-E 3.0 x8 8GT/s; RoHS (R6) Compliant</p> <p>40GigE Mellanox Ethernet Cable, QSFP+ Passive Copper, 3 meters, 30 AWG</p> <p><b>CentOS 7.x Linux (or your distribution of choice) and NVIDIA CUDA installed, configured, and tested.</b></p> <p><b>Diskless configurations also available. Please inquire.</b></p>			
	<p>IPMI management capability is integrated on the motherboard. IPMI allows administrators to remotely monitor and control each computer individually. Capabilities include:</p> <ul style="list-style-type: none"> <li>* System Power On, Power Off and Reset</li> <li>* Monitor Fan Speeds, Component Temperatures and Voltages</li> <li>* Remote Serial Console and KVM Access</li> <li>* Virtual Media: local devices (CD, USB, etc) appear as directly connected to remote system</li> </ul>			
1	<p><b>NVIDIA Academic Instant Rebate</b></p> <p>\$1,500 EDU discount per NVIDIA Tesla P100 16GB GPU (restrictions apply)</p>	-\$1,500	-\$1,500	-\$1,500
	<p><b>Microway Testing Procedure</b></p> <p>Each computer system is network booted to execute low-level memory tests for 12+ hours.</p> <p>Once passed, operating systems are loaded and Linux stress tests are executed for 24+ 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.</p> <p><b>Microway's hardware warranty may be extended on an annual basis for up to 5 years total warranty.</b></p> <p><b>Microway provides lifetime technical support. Out-of-warranty repairs will be billed at Time and Materials rates.</b></p>			
	<p>Shipping and Insurance: prepay and add</p> <p><b>Total (Academic Pricing)</b></p>			<b>\$19,532</b>

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

<input type="checkbox"/>	1	<b>Switch P100 to 12GB GPU (Optional)</b> NVIDIA Tesla P100 PCI-E 12GB "Pascal" GPU Accelerator Full-Speed PCI-E 3.0 x16 Link GP100 GPU chip with NVIDIA-certified Passive Heatsink 3584 CUDA Cores with Unified Memory and Page Migration Engine GPU-boost capability allows for increased clock speeds 12GB High-Bandwidth HBM2 Memory (549 GB/sec peak bandwidth) IEEE Half-, Single-, and Double-Precision Floating Point Performance (with GPU Boost): 18.7 TFLOPS (half), 9.3 TFLOPS (single), 4.7 TFLOPS (double) Double PCI slot form factor Power Consumption: 250W TDP (One 8- and one 6-pin connector on rear) Software Development Tools: C/C++ language compiler, debugger, profiler and memory analyzer Standard numerical libraries: cuDNN, nvGRAPH, FFT, BLAS, SPARSE, RAND & more: <a href="https://developer.nvidia.com/gpu-accelerated-libraries">https://developer.nvidia.com/gpu-accelerated-libraries</a>  \$1,250 EDU discount per NVIDIA Tesla P100 12GB GPU (restrictions apply)	-\$992	-\$992
<input type="checkbox"/>	1	<b>Upgrade GPU to V100 16GB (Optional)</b> 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: <a href="https://developer.nvidia.com/gpu-accelerated-libraries">https://developer.nvidia.com/gpu-accelerated-libraries</a>  \$1,500 EDU discount per NVIDIA Tesla V100 16GB GPU (restrictions apply)	\$2,768	\$2,768
<input type="checkbox"/>	1	<b>Upgrade Memory to 512GB (Optional)</b> (16) 32GB DDR4 2400 MHz ECC/Registered Memory (Dual Rank)	\$3,064	\$3,064
<input type="checkbox"/>	1	<b>Upgrade Processors to: (Optional)</b> (2) Intel Xeon E5-2699Av4 Broadwell-EP 2.40 GHz Twenty-Two Core 14nm CPU with 55MB L3 Cache, DDR4-2400, 9.6 GT/sec QPI, 145W Supports Hyper-Threading and Turbo Boost up to 3.6 GHz	\$2,522	\$2,522
<input type="checkbox"/>	1	<b>Upgrade to Dual Port Ethernet Adapter (Optional)</b> Mellanox ConnectX-3 Pro EN Dual-Port QSFP 40G Ethernet Adapter PCI-E 3.0 x8 8GT/s; RoHS (R6) Compliant	\$76	\$76
<input type="checkbox"/>	1	<b>Add up to 3 additional drives (Optional)</b> 240GB Intel DC S4500 2.5" SATA 6Gbps 3D NAND SSD	\$156	\$156

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Qty	Description	List Price	Your Price	Extended Price
	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 <sup>17</sup> bits read			
<input type="checkbox"/> 1	<b>Upgrade SSD to: (Optional)</b> 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 <sup>17</sup> bits read		\$149	\$149
<input type="checkbox"/> 1	<b>Upgrade SSD to: (Optional)</b> 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 <sup>17</sup> bits read		\$381	\$381
<input type="checkbox"/> 1	<b>Upgrade SSD to: (Optional)</b> 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 <sup>17</sup> bits read		\$931	\$931
	<b>The following drives have higher endurance:</b>			
<input type="checkbox"/> 1	<b>Upgrade SSD to: (Optional)</b> 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 <sup>17</sup> 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		\$51	\$51

Qty	Description	List Price	Your Price	Extended Price
<input type="checkbox"/> 1	<b>Upgrade SSD to: (Optional)</b> 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 <sup>17</sup> bits read		\$185	\$185
<input type="checkbox"/> 1	<b>Upgrade SSD to: (Optional)</b> 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 <sup>17</sup> bits read		\$674	\$674
<input type="checkbox"/> 1	<b>Upgrade SSD to: (Optional)</b> 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 <sup>17</sup> bits read		\$1,504	\$1,504
<input type="checkbox"/> 1	<b>Add PCI-E NVMe SSD: (Optional)</b> Intel DC P4600 Series 2TB PCI-E NVMe SSD (Half-Height Half-Length) PCI-E x4 3.1 NVMeExpress Interface to System 3D NAND TLC Internal Solid State Drive Targeted Lifetime Endurance: ~3 Drive Writes Per Day, 11.08 PBW Built in power protection Sequential Read: up to 3,200 MB/s Sequential Write: up to 1,575 MB/s Random Read IOPS: Up to 610,000 Random Write IOPS: Up to 196,650 Read Latency: 85µs Write Latency: 15µs 2,000,000 Hours MTBF Uncorrectable Bit Error Rate: 1 sector per 10 <sup>17</sup> bits read		\$1,901	\$1,901

Qty	Description	List Price	Your Price	Extended Price
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**FOB:** Destination (freight PPA)

**Ship Date:** 4 - 5 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 Freight

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.

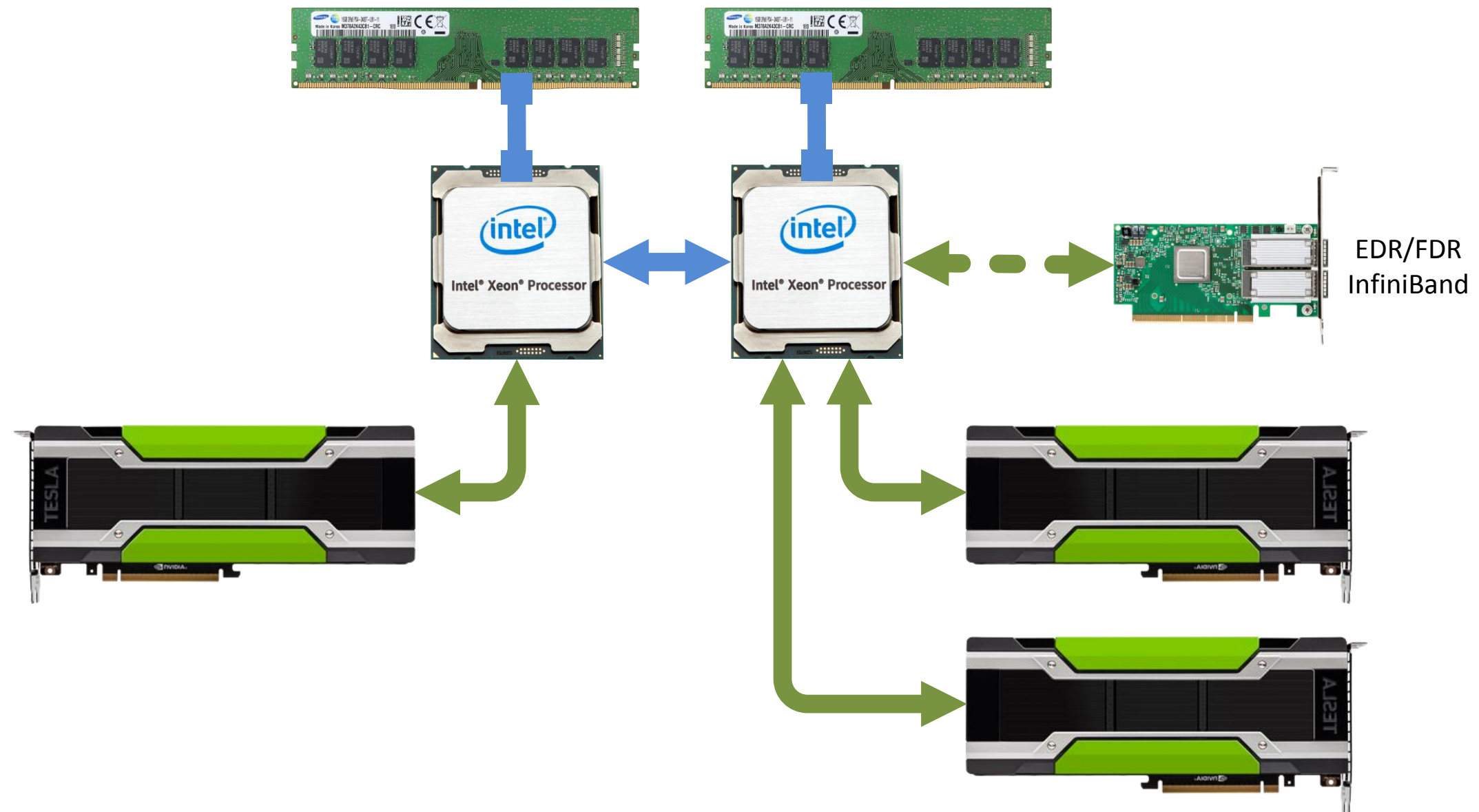
Prices subject to review at time of order due to world-wide component price volatility.

**This quote is valid for 30 days.**



# Server Block Diagram

## NumberSmasher 1U Server with Three PCI-Express GPUs







-  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.