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QUOTATION

Quote # MWYQ27065
Date: 4/28/2020
Microway Confidential

Quote To:
New Jersey Institute of Technology
Gedaliah Wolosh

(973)596-5437
gwolosh@njit.edu

Ship To:
New Jersey Institute of Technology
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Sales Rep.
Ed Hinkel
508-732-5523
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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.

Microway is a Platinum Intel Technology Provider and an Intel HPC Data Center Specialist.

Total of 112 Compute Nodes; 3,584 cores

27 **Microway Xeon 2U TwinPro² Servers (Four Nodes per 2U)** $23,235 $627,345

NumberSmasher-4X Intel Xeon TwinPro² Servers
2U Rackmount Chassis with
2200W Titanium-Level High-Efficiency 1+1 Redundant Power Supply
26.5" - 36" Rackmount Rail Kit (28.5" chassis depth)

Four Hot-Pluggable Compute Nodes, each with:

Two Intel Xeon Scalable Family processors (Socket P - up to 165W*)
* special considerations needed for 150W+ or frequency-optimized CPUs
Dual Intel UPI interconnects between CPU sockets (up to 10.4 GT/s)
Sixteen slots for up to 4TB ECC DDR4-2933/2666 memory
One slot for SIOM Flexible Networking/Fabric Module
Two PCI-Express 3.0 x16 slots (Low Profile; Half-Length)
Integrated Intel C621 chipset and ASpeed AST2500 Graphics Controller
IPMI 2.0 w/ Virtual Media, KVM and Dedicated LAN Support
Three hot-swap 3.5" 6Gbps SATA3 Drive Bays (SAS3 support optional)
Two internal SATA SuperDOM ports for additional flash storage; One Mini-mSATA port
Rear Connectors: two USB 3.0, one VGA and one IPMI port (see SIOM for networking ports)

(8) Intel Xeon 6226R "Cascade Lake Refresh" 2.9 GHz 16-core 14nm CPU - 150W TDP (up to 2 CPU sockets)
with two AVX-512 units per core, 22MB L3 Cache, up to 1TB DDR4-2933 memory, up to two 10.4GT/s UPI links
Supports Optane memory, Hyper-Threading, and Turbo Boost up to 3.9 GHz
(clock speeds with AVX-512 instructions: 1.9-3.7 GHz)
(2 CPUs per Node)

(48) 8GB DDR4 2933 MHz ECC/Registered Memory

(192GB Total Memory per Node @ 2933MHz)

Qty	Description	Your Price	Extended Price

(4) 240GB Intel SSD D3-S4510 2.5" SATA 6Gbps (5-year ~2 DWPD)
SATA 6Gb/s Interface (Supports 3Gb/s)
3D NAND TLC Internal Solid State Drive
Targeted Lifetime Endurance: five years at ~2 Drive Writes Per Day; 0.9 PBW
Enhanced Power Loss Data Protection; 256 bit AES encryption
Sustained sequential read: up to 560 MB/s
Sustained sequential write: up to 280 MB/s
Random 4KB IOPS: up to 90,000 read; up to 16,000 write
Average Latency: 36µs read, 37 µs write
2,000,000 Hours MTBF
Uncorrectable Bit Error Rate (UBER): 1 sector per 10^17 bits read

(4) 2.5" HDD Adapter for 3.5" HDD Carrier Tray

(One drive per Node; RAID configurations available)

(4) Mellanox ConnectX-6 VPI Single-Port QSFP56 HCA, HDR100 InfiniBand (100Gb/s) and 100GigE
PCI-E 4.0 x16 16GT/s; Supports RDMA, SR-IOV, and multiple offload capabilities
http://www.mellanox.com/related-docs/prod_adapter_cards/PB_ConnectX-6_VPI_Card.pdf

(4) SIOM Dual-Port Gigabit Ethernet Server Adapter with Intel i350 network controller
Includes Multi-Core Processor Support and Server Virtualization Optimization

(4) Cat 6 Ethernet Cable (10 ft, or appropriate length)

CentOS 7.x Linux (or your distribution of choice), MCMS, OFED, OpenMPI, Workload Manager (SLURM is recommended), & GNU Compilers installed and configured.

Diskless configurations also available. Please inquire.

Estimated Power Consumption at Full Load (per unit): 1,975 Watts, 6,739 BTUs/hour

GPU Nodes 4 Nodes; 128 cores

4	**Microway NumberSmasher Xeon + NVIDIA GPU Server (with up to 4 GPUs)**	$52,956	$211,824

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 4TB ECC DDR4-2933/2666 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 or U.2 NVMe)
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 header, one 10-pin 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 Support

Qty	Description	Your Price	Extended Price
	(2) Intel Xeon 6226R "Cascade Lake Refresh" 2.9 GHz 16-core 14nm CPU - 150W TDP (up to 2 CPU sockets) with two AVX-512 units per core, 22MB L3 Cache, up to 1TB DDR4-2933 memory, up to two 10.4GT/s UPI links Supports Optane memory, Hyper-Threading, and Turbo Boost up to 3.9 GHz (clock speeds with AVX-512 instructions: 1.9-3.7 GHz) (12) 16GB DDR4 2933 MHz ECC/Registered Memory **(192GB Total Memory @ 2933MHz)** (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): 28 TFLOPS (half), 14 TFLOPS (single), 7 TFLOPS (double) Provides up to 112 Deep Learning TFLOPS (FP16 matrix multiply with FP16 and FP32 accumulate) 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 960GB Intel SSD D3-S4510 2.5" SATA 6Gbps (5-year ~1.9 DWPD) SATA 6Gb/s Interface (Supports 3Gb/s) 3D NAND TLC Internal Solid State Drive Targeted Lifetime Endurance: five years at ~1.9 Drive Writes Per Day; 3.4 PBW Enhanced Power Loss Data Protection; 256 bit AES encryption Sustained sequential read: up to 560 MB/s Sustained sequential write: up to 510 MB/s Random 4KB IOPS: up to 95,000 read; up to 36,000 write Average Latency: 36µs read, 37 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 (14) Mellanox ConnectX-6 VPI Single-Port QSFP56 HCA, HDR100 InfiniBand (100Gb/s) and 100GigE PCI-E 4.0 x16 16GT/s; Supports RDMA, SR-IOV, and multiple offload capabilities http://www.mellanox.com/related-docs/prod_adapter_cards/PB_ConnectX-6_VPI_Card.pdf Mellanox InfiniBand EDR Cable, QSFP28 Passive Copper, 2 meters Cat 6 Ethernet Cable (10 ft) **CentOS 7.x Linux (or your distribution of choice) & NVIDIA CUDA 10.x installed, configured and tested.** **Estimated Power Consumption at Full Load (per unit): 1,994 Watts, 6,802 BTUs/hour**		
16	**NVIDIA Educational/Inception Discount** $2,175 EDU/Inception discount per NVIDIA Tesla V100 32GB GPU (restrictions apply)	-$2,175	-$34,800

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

Qty	Description	Your Price	Extended Price
1	**EXAScaler 400NVX appliance**	$453,480	$453,480

EXAScaler 400NVX appliance with 24x NVMe drive slots, SAS Expansion Ports, 8x HDR100 IB / 100GbE ports, power cables and rack mount kit; requires EXAScaler support purchased separately.
SS9012 90-slot 12Gb/s SAS/SATA HDD/SSD enclosure. Includes 2x I/O modules, redundant power supplies, power cables, rail kit for rack mounting and cable management arms.
(4) 12Gb/s HD mSAS to HD mSAS Copper cable, 3m

(24) 3.84TB 1 DWPD NVMe dual port 4Kn SSD drive module for 400NV system
23x 3.84TB NVMe (88.31TB RAW ; 67.07TB Usable) Metadata and Hot Pool + 1 Hot Spare
(90) 10TB 7.2K RPM 12Gb/s SAS ISE 4Kn HDD drive module for SS9012 enclosure
88x 10TB Capacity Hard Drives (873TB Raw / 665TB UsableAfter RAID) - 4 Pools - 22 HD/Pool - 2x Hot Spares

(2) Premium Onsite Support; storage systems, storage servers, disk drives and accessories; 7x24 remote support; NBD parts and labor onsite; DDN replace CRU and FRU; SW support separate; annual
Premium Onsite Support; storage systems, storage servers, disk drives and accessories; 7x24 remote support; NBD parts and labor onsite; DDN replace CRU and FRU; SW support separate; 3-year
(2) Premium Software Support; EXAScaler Software; up to 4 OSS's; 1 year

Premium Software Support; EXAScaler Software; up to 4 OSS's; 3 years

Essential EXAScaler services deployment bundle; planning, installation, configuration, training, optimization; installed on DDN-supplied servers
(114) Deployment for all drives, all models and all PS Bundle levels; priced per drive; must be combined with a PS Deployment Bundle
EXAScaler Training; live remote Instruction-led public 20 hour course ; 6 hours SFA and 14 hours EXAScaler content and labs.

Estimated Power Consumption at Full Load: 3,200 Watts, 10,918 BTUs/hour

1	**168-Port Expandable HDR100 InfiniBand Fabric**	$59,141	$59,141

One spine switch and Three Leaf switches with 2.08:1 over-subscription

Mellanox 40-Port HDR 200Gb/s Managed Quantum InfiniBand Switch (1U)
Enables in-network computing through SHARP co-design technology
40 front-mounted QSFP56 ports (also supports up to 80 HDR100 ports via splitter cables)
Non-Blocking Switch Capacity of 16Tb/s
Sub-130ns switch latency
Redundant, Hot-Swap Power Supplies and Fans
P2C (Connector Side Outlet) Airflow, Standard depth, Rail Kit
(includes Mellanox Bronze warranty)

(3) Mellanox 40-Port HDR 200Gb/s Externally Managed Quantum InfiniBand Switch (1U)
Enables in-network computing through SHARP co-design technology
40 front-mounted QSFP56 ports (also supports up to 80 HDR100 ports via splitter cables)
Non-Blocking Switch Capacity of 16Tb/s
Sub-130ns switch latency
Redundant, Hot-Swap Power Supplies and Fans
P2C (Connector Side Outlet) Airflow, Standard depth, Rail Kit
(includes Mellanox Bronze warranty)

Estimated Power Consumption at Full Load: 488 Watts, 1,665 BTUs/hour

1	**HDR100 InfiniBand Cabling**	$58,057	$58,057

(56) Mellanox 100Gbps HDR100 Passive Copper InfiniBand Splitter Cable, 2x100G QSFP56 to 200G QSFP56 (2-meter)

(4) Mellanox 100Gbps HDR100 Active Fiber InfiniBand Splitter Cable, 2x100G QSFP56 to 200G QSFP56 (3-meter)

Switch trunking cables:

(13) Mellanox 200Gbps HDR InfiniBand Cable, QSFP56 Passive Copper, 2 meters

(26) Mellanox 200Gbps HDR InfiniBand Cable, QSFP56 Active Fiber, 5-meters

Qty	Description	Your Price	Extended Price
1	**Management & IPMI Network**	$3,720	$3,720

(3) Netgear 52-Port (176Gbps, 40Gbps Uplink/Stacking) 10/100/1000 Smart Stackable Switch (S3300-52X)
(48) 10/100/1000 Mbps switching ports
(2) 10G Ethernet SFP+ ports for uplink or switch stacking
(2) 10G Ethernet RJ45 ports for uplink or switch stacking
Up to Six switches may be stacked (300 Gigabit ports and 12 10G ports)
Supports up to 26 Link Aggregation Groups (up to 8 ports per trunk); up to 256 VLANs
Supports Jumbo Frames up to 9K packet size
Latency:
< 4.1 us for 64-byte frames (10 G to 10 G)
< 20.5 us for 64-byte frames (1 G to 1 G Copper)
ProSupport Lifetime 24x7 Online Technical Support (included)
Lifetime next business day hardware replacement (included)
(http://www.downloads.netgear.com/files/GDC/datasheet/en/S3300_GS728TX_GS728TXP_GS752TX_GS752TXP.pdf)

(3) 10G Mellanox Ethernet SFP+ Passive Copper Direct-Attach Cable (3-meter)

Estimated Power Consumption at Full Load: 132 Watts, 450 BTUs/hour

3	**42U Rackmount Cabinet with Power Distribution**	$7,898	$23,694

APC NetShelter SX 42U Extra Wide/Deep Enclosure (Black) with Shock Packaging (2000lbs)
Standard 19" Rackmount Cabinet (up to 41" mounting depth)
Includes casters, perforated doors and solid side panels,
Casters and leveling feet,
Locks on front and rear door,
Adjustable mounting channels,
Dimensions: 78.39" H x 29.53" W x 47.24" D (750mm Wide x 1200mm Deep)
Dimensions (packaged): 85.8" H x 43.5" W x 52.0" D
Includes re-usable shock packaging and a ramp to roll the cabinet off the pallet
(http://www.apc.com/products/resource/include/techspec_index.cfm?base_sku=AR3350SP)

(2) APC AP8867 Zero U, Metered Rack PDU 2G (208V 3PH 17.2kW)
Input (208V 3PH): IEC 309 60A 3P+PE on 6 Foot Cord
Output: 30x IEC 320 C13
Provides real-time remote load monitoring and alerts.
(http://www.apc.com/products/resource/include/techspec_index.cfm?base_sku=AP8867)

(3) 1U 19" Black Modular Toolless Airflow Management Blanking Panel (Qty 10 - Black)

1	**Cluster Pre-Installation Service**	$2,400	$2,400

Microway's integration team will communicate with customer to determine the layout of the cluster in the cabinets.

Service performed at Microway:
Rackmount rails installed into rackmount cabinets.
Network and power cables routed and tied in place.
PDUs mounted and power cables connected.

Work performed by customer after delivery:
Move rackmount cabinets into position.
Unbox equipment and slide into pre-mounted rackmount rails.
Plug network and power cables into the correct ports using provided cabinet map.
Connect PDU power plugs to mains power.

Full-service integration and/or onsite integration are also available for an additional fee

1	**Extend Microway Warranty/Support to 5 Years**	$80,646	$80,646

Cluster Configuration

Microway's software integrators will communicate with a designated system administrator to ensure the cluster configuration meets the needs of the users. The cluster will be delivered with the operating system and cluster software tools fully integrated.

A cluster configuration questionnaire will be sent to you once your order has been placed. This questionnaire provides the opportunity for you to customize storage, disk partitioning, mount points, network names & addresses and cluster software.

Microway Cluster Management Software (MCMS) installed.

MCMS is a monitoring and control software package that integrates the tools needed to understand what events are taking place on the cluster and the tools to control the cluster itself.

The monitoring tools provide the administrator with the capability of monitoring the cluster from any location via a web based interface. This allows for checking on the cluster through a web browser and securely logging directly to the machine. Once into the monitoring mode, critical statistics are displayed to you that show global cluster stats, current load, memory utilization, and which nodes are on or off line. In addition to the global parameters you can see the same statistics on a local node basis. The package can be extended from the default parameters to allow execution of additional tasks that are of interest to the administrator.

The control portion of the package allows the administrator to control the cluster from the master node. Among those features available are:
- Backup and Restore Node System Images
- Copy files to all nodes
- Execute commands on all or a particular node
- Test rsh connectivity and authorization
- Test TCP/IP networking connectivity
- Reboot the entire cluster or specific nodes
- Shutdown nodes or the cluster in entirety

The combination of these tools allows for extended control of the cluster as a single unit and gives the administrator the tools he needs to analyze the usage of the complete system.

Complete Cluster Manual

Microway's cluster manual includes installation, usage, maintenance and troubleshooting instructions.
Special instructions pertaining to your cluster, as well as a rackmount cabinet layout, will be provided as necessary.

Manuals for chassis, motherboards and other hardware components are available in electronic form.

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 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.

Finally, cluster utilities, compilers, libraries and applications are installed and configured. The cluster network and node software is configured for optimal latency/throughput. Cluster applications are executed for 48+ hours. These tests insure the final network, hardware and software configurations are stable and reliable.

As a full service provider, Microway offers a broad range of commercial and open source applications. This quote includes the installation of open source and commercial applications purchased from Microway onto the cluster. If a compiler is not purchased with this order, the GNU compiler will be installed. Other arrangements are made at the time of purchase to install other compilers not sourced by Microway, but may incur additional charges. Upon receipt of your order, we will request additional information for our assembly, integration, and quality control teams to insure proper configuration and on-time delivery.

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 Estimate: (Additional services, such as inside delivery or lift gate, are not included)	$800	$800
Total (Academic Pricing)		**$1,486,307**

Total Estimated Power Consumption at Full Load: 65,125 Watts, 222,206 BTUs/hour

Qty	Description	Your Price	Extended Price

FOB:	Destination (freight PPA)
Ship Date:	10 Weeks after Receipt of order and documentation
Shipping Method:	Best Way
Warranty:	Three 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
	Microway requests that invoices be paid by ACH transfer or Wire Transfer.
	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.

Microway quotations are subject to review before acceptance of order due to world-wide component price volatility and tariff regulations. Our quotes will be adjusted to reflect those prices as soon as our suppliers alert us to increases.

If you have delivery deadlines, it is very important to make buying decisions quickly. Lead times are subject to change due to world-wide shortages of critical electronic components.

This quote is valid for 30 days.