**GENERAL MICRO SYSTEMS, INC.**
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***2U isometric, front***

# *GOLIATH-AI*

*Rugged, 16-inch Short Rack, 2U Artificial Intelligence ( AI ) Server/Co-Processor with Dual Intel® Scalable Xeon® Processors, Dual Nvidia® Tesla V100s, 22 SSDs and 5 Removable Cartridges, Dual-Redundant PSUs, 1/10/40 Gigabit Ethernet and 3 Add-in Slots*

Dual Intel® CPUs
**Scalable Xeon®**
Up to 24 Cores Each

22x SSDs Up to 168 TB
**5 NAS Cartridges**
SAS/SATA/NVMe Gen 3

Dual Nvidia® Tesla 100
**220+ TFLOPS**
Artificial Intelligence Processing

16" Deep Rugged Chassis
**Superior Shock/Vib**
Optional -20 °C to +55 °C

## *SYSTEM HIGHLIGHTS*

- Dual Intel® Scalable Xeon® CPUs up to 24 cores (Platinum/Gold)
- Compact rackmount NAS: up to 168 TB (20x U.2 plus 2x M.2)
- Field-deployable Artificial Intelligence ( AI ) co-processor, data mining engine, vector processor
- Air-cooled with COTS or optional 38999 mil-circular connectors
- Only 16-inch deep short rack saves size, weight, power
- Up to 2 TB total DDR4 ECC DRAM
- Up to three PCIe Gen 3 add-in slots
- Five 4-drive removable cartridges (SAS/SATA/NVMe)
- 2x 1/10 GbE and optional dual 10/40 QSFP+
- Optional hardware RAID or Intel VROC software RAID
- Dual-redundant 2000W 220VAC PSUs
- Rack or standalone mounting options
- Optional SecureDNA™ zeroize and SourceSafe™ BIOS

## *SYSTEM OVERVIEW*

Compact, rugged "Goliath-AI" servers are only 16-inches deep and are designed for harsh environment use where rack or free-standing space is at a premium. Ideal for airborne, ship-based, or battlefield-mobile installations, "Goliath-AI" brings both exceptional network-attached storage (NAS) with field-deployable AI processing (over 220 TFLOPS), plus rackmount processing and flexibility to defense applications in a very small footprint. Each server uses two of Intel's second-generation Scalable Xeon® processors, up to 24 cores each (embedded, Gold/Platinum SKUs) with up to 2.0 TB total system memory (ECC, 2933 DDR4). GMS recommends Nvidia V100 Tesla co-processors, but Nvidia TITAN V (Volta) accelerators are a lower cost option. 1/10/40 GbE is available (dual 1/10 GbE is standard), and there are up to 22 SSDs in "Goliath". The SAS/SATA/NVMe drives are installed in five removable cartridges for easy, secure transport and system de-classify. Dual internal 2280 M.2 drives are used for OS boot or protected application software. Hardware RAID is standard for all SAS/SATA drives, and Intel VROC or RSTe software RAID is available for all 20 NVMe U.2 SSDs. The front panel drive bays can accommodate four-drive cartridges and one bay can also accept GMS "B Drive" modules for application-specific I/O such as CANbus, ARINIC-429, or HD-SDI video.

Unique features in the overall "Goliath" 1U/2U server family are the short rack depth of only 16-inches, dual GPGPU accelerators such as Nvidia V100 Tesla artificial intelligence / data mining cards (2U only), a DVD R+W or Blu-Ray unit, removable cartridges

in lieu of individual SSDs, dual redundant power supplies in both 1U and 2U, and the GMS zero-charge NRE modification policy. For example, both "Goliath-X" (1U), "Goliath-NAS" (2U), and "Goliath-AI" (2U) can be lengthened to add MIL-STD-704 power hold-up (via supercaps), an auxiliary power unit battery, or an additional two (in 1U) or four (in 2U) extra add-in slots. Alternatively, mil-circular 38999 connectors can be substituted for COTS-style connectors (depth will increase slightly).

Designed for value-conscious rugged applications and built with GMS RuggedDNA™ design methodology, all "Goliath" servers are air-cooled using GMS-proprietary "TwoCool™" fan control. The server uses our proven egg-crate ruggedization technique that stiffens the chassis to provide exceptional shock and vibration for a rackmount server. A 3-year warranty is standard, along with GMS's made-in-America end-of-life component monitoring and long-lifecycle sustainment policy. Custom versions can be developed with full programmatics and certifications.

***GOLIATH-AI (front view)***
*2U, isometric, with 38999 connectors*

***GOLIATH-AI (rear view)***
*2U, isometric, with 38999 connectors*

## *I/O AND EXPANSION OPTIONS*

- COTS connectors or 38999 mil-circular (increases depth)
- Nvidia V100 or TITAN V vector/math artificial intelligence accelerators
- 3x PCIe Gen 3 slots
- SAS, SATA or NVMe SSDs up to 20 SSDs
- Two M.2 SSDs (internal)
- Dual 1/10 GbE ports
- Optional dual 10/40 GbE QSFP+ cages (inserts for 1/10/40)
- BMC with IPMI and 1 GbE port
- 2x USB 2.0 and 2x USB 3.0
- VGA for console video
- Dual-redundant 2000 W PSUs (220 VAC)
- DVD or Blu-Ray player
- Front-mount or side rails (fixed or sliding)
- Optional dual GMS "B-Drive" I/O in lieu of SSD(s)
- GMS FlexIO™ panel for user-customized options
- Extended chassis depth for: MIL-STD-704 hold-up/APU and up to 2 more PCIe slots

## *ENVIRONMENTAL SPECS*

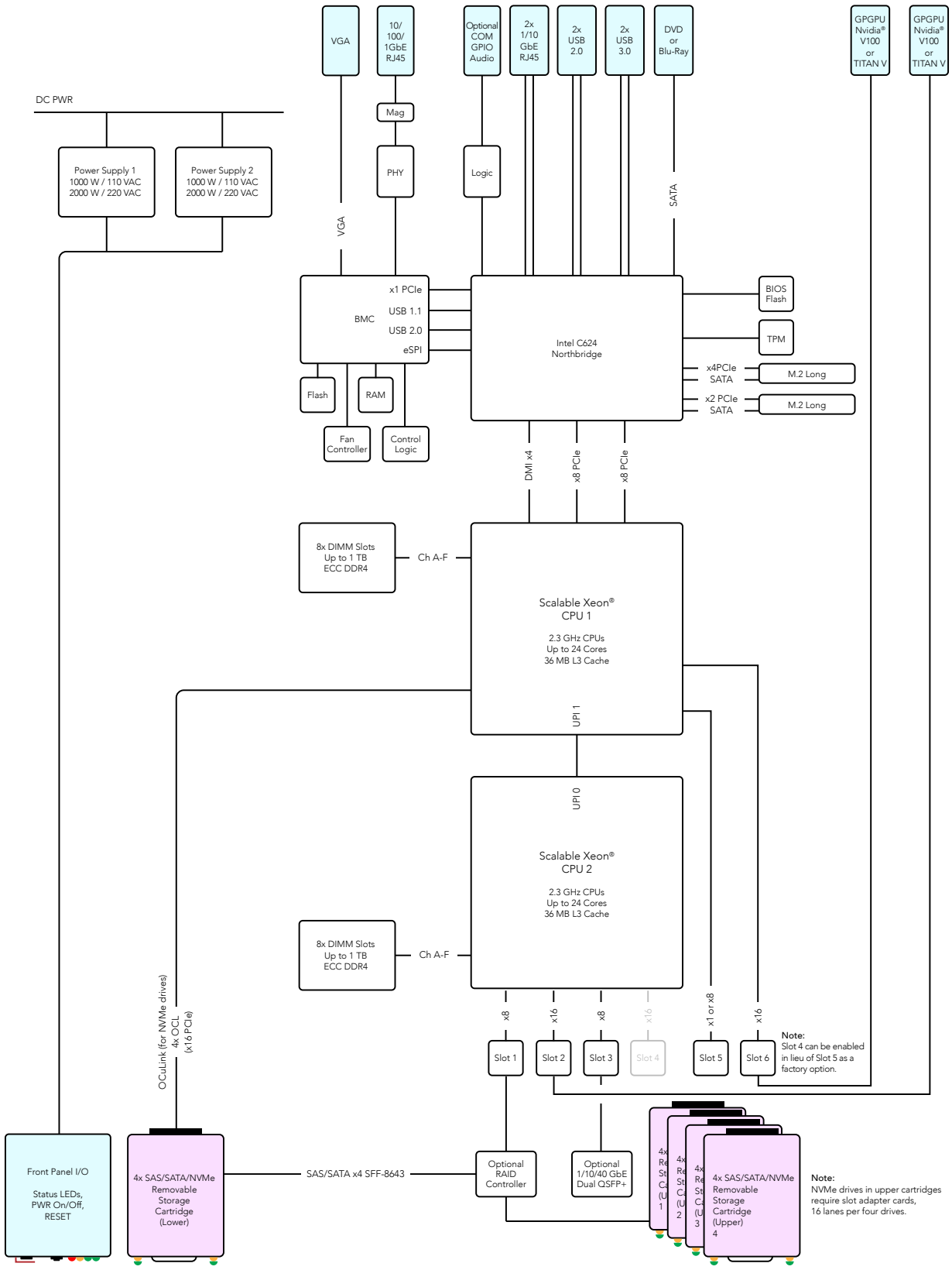
| | |
|---|---|
| SWaP-E: | Short rack server with unmatched density in one footprint |
| Size: | 2U x 16-inches deep |
| Weight: | As low as 10 lbs. |
| Power: | As low as 700 W (with dual AI engines) |
| MIL-STD: | MIL-STD 810G, MIL-STD-1275D, MIL-S-901D, DO-160D, MIL-STD 461E and IP60 compliant (Optional separate MIL-STD-704F AC PSU with 50 ms hold-up) |
| Temperature: | 0° C to +55° C<br>-20° C to +55° C (Optional) |
| Ruggedness: | Available in ruggedization levels R1-R2 |

## *RUGGEDIZATION LEVELS*

| | TEMP | SHOCK | VIBRATION | MAX IP LEVEL |
|---|---|---|---|---|
| RUGGED 1 | 0 °C - 55 °C | 20G | .0001 $g^2$/Hz | 54 |
| RUGGED 2 | -20 °C - 55 °C | 20G | .0008 $g^2$/Hz | 64 |

* Vibration frequency for systems tested between 5Hz – 2000Hz

# *BLOCK DIAGRAM: GOLIATH-AI (2U)*



| | GOLIATH-X (1U) | GOLIATH-NAS (2U) | GOLIATH-AI (2U) |
|---|---|---|---|
| Height | 1U | 2U | |
| Depth (COTS connectors; deeper by 3" w/ 38999 MIL) | 16 inches | | |
| Processors (24C max with "embedded" SKUs<br>20C max in 1U with dual-red. 500W PSUs) | Intel® Scalable Xeon®<br>Gold/Platinum; Up to 20C max | Intel® Scalable Xeon®, Gold/Platinum, up to 28 cores<br>(non-embedded SKU) | |
| # CPUs | 2 | | |
| # UPIs | 2, between CPUs | | |
| Compute architecture | Workload-balanced, flow-through data: HPC, SMP, NUMA | | |
| Max memory/CPU (2.0 TB/CPU with select SKUs) | 1.0 TB/CPU | | |
| # DDR4 DIMM Slots up to 2933 MT/s (w/ECC) | 8/CPU | | |
| Add-in cards (RAID requires 1 slot; 40 GbE requires 1 slot) | 2 (DVD reduces by 1 slot) | 6 | 3 |
| # x16 (FLHH) slots (See optional extended chassis below) | 1 | 3 | 1 |
| # x8 (FLHH) slots (omit DVD)<br>Note: For AI, Slot 4 can be enabled in lieu of Slot 5 as a factory option | 1 | 3 (x1 slot covers one x8) | 2 (x1 slot covers one x8) |
| PCIe speed: 8 GT/s, Gen 3 | PCIe Gen 3 | | |
| Max number of SSDs (incl. 2x M.2 2280) | 6 | 22 | |
| Removable SSD cartridges w/RAID (RAID reduces one x8 PCIe slot) | 1 | 5 | |
| # M.2 slots | 2x 2280 (x4 and x2) | | |
| # SSD hot-swap slots, 7 mm max (SAS/SATA/NVMe) | 4 (4 in single cartridge) | - 4x in lower tier (4 in single cartridge)<br>- 16x in upper tier (4 cartridges; requires RAID card) | |
| External storage (optional, requires 1 slot) | eSATA, 4x Mini-SAS HD | | |
| Intel VROC software RAID (key is required, RSTe is optional) | Yes (excludes M.2) | | |
| Hardware RAID 0,1,10,50, other (Required for SATA/SAS drives) | Yes (uses FLHH slot) | | |
| Ethernet Service port (copper, 1 GbE) | 1 for BMC | | |
| Ethernet (copper, 1/10 GbE) | 2 | | |
| Ethernet (fiber, 1/10/40 GbE) (add-in card uses one HHFL slot<br>1/10 GbE requires adapter cable with insert) | 2x QSFP+ (copper, fiber inserts) | | 2x QSFP+ (copper, fiber inserts) |
| Optional Nvidia® co-processing GPGPU for vector apps,<br>AI or data mining (Tesla V100 or Titan V, dual-slot) | 0 | | 2 (double-slot, up to 250 W/slot)<br>(requires power management) |
| USB 2.0 (rear) | 2 | | |
| USB 3.0 (rear) | 2 | | |
| DVD/Blu-Ray (front) | 1 | | |
| VGA, 2D video (rear) (+ KVM video redirection up to 1080p) | 1 | | |
| BMC with Ethernet port (rear) | 1 BMC with dedicated 1 GbE port | | |
| Optional Audio | Mic In/Stereo Out | | |
| Optional General purpose I/O | 8 GPIO | | |
| Optional Serial ports (RS232/422/485) | 1 | | |
| Dual-redundant PSUs; 80_Plus Platinum; For 110VAC, 2U PSUs are<br>1000 W/110VAC or 2000 W/220VAC each | 2x, 500 W each | 2x, 2000 W each (Requires 220VAC) | |
| # Optional B Drive I/O modules | 2 | | |
| Cooling | Convection-cooling GMS TwoCool™ fans | | |
| Connectors | COTS/commercial-style or optional 38999 MIL-SPEC | | |
| Optional SecureDNA™ Zeroize, Status, SourceSafe™ BIOS | Yes | | |
| Temperature, standard | 0 °C to +55 °C | | |
| Temperature, optional (excl. add-ins) | -20 °C to +55 °C | | |
| Optional chassis extension options | Increased power supplies; APU<br>hold-up; 2x FHFL add-in slots | Increased power supplies; APU hold-up; 4x FHFL add-in slots | |
| Optional FlexPanel™ I/O customization | Consult factory | | |