ClusterMax™ Apex | High Performance Supercomputing Cluster
HPC Cluster Solution for CPU-Intensive, Large Scale Deployments

Future proof system with massive scalability for large scale deployments

AMAX’s ClusterMax™ Apex Supercomputer Cluster is ideal for large-scale deployments that integrate the latest CPU-based computing technologies and require extreme performance and high-density computing. Based on the 22nm 18-core Intel® Xeon® E5-2600 v3 processor series and 2,592 Intel Xeon® CPU cores, AMAX’s ClusterMax™ Apex features up to 2,592 Intel Xeon® or 2,304 AMD Opteron processor cores per 42U standard rack cabinet, doubling the density compared with traditional rack mounted servers.

AMAX's ClusterMax™ Apex Supercomputer Cluster offers customers performance scalability, industry leading density and maximum efficiency at scale for applications ranging from in-memory databases, to a diverse set of data and compute-intensive HPC applications.

Key Features:
- High density balanced compute solution for large scale power conscious users.
- Based on new Intel Sandy Bridge architecture for best in class performance.
- Integrated web based cluster management for turnkey provisioning and hassle free management.
- Optimized MPI implementations and pre tuned networking components to get parallel application up and running.
- Highly scalable, modular architecture with FDR Infiniband and PCIe Gen 3.0 support

Applications:
- Bio-chemical / Biotechnology / Life Sciences
- Computational grid endpoint
- Computer-aided engineering (CAE)
- Computational fluid dynamics (CFD)
- Data mining and stream processing
- Electronic design automation (EDA)
- Financial market modeling
- HPC applications (eg. Nastran, Ansys, LS-Dyna)
- Petro-clusters / oil & gas
- Server consolidation
- Scientific research
- Simulations
- Visualization / rendering modeling
- Web hosting

Cluster Specifications:
- Up to 72 nodes with 22nm 18-core Intel® Xeon® E5-2600 v3 processor series and 2,592 Intel Xeon® CPU cores
- Up to 72 nodes with 22nm 12-core Intel® Xeon® E5-2600 v2 processor series and 1,728 Intel Xeon® CPU cores
- Up to 72 nodes with AMD Socket G34 Opteron 6300 processor series and 2,304 AMD CPU cores per 42U cluster
- Up to 36TB DDR4 2133 MHz system memory with 22nm 16-core Intel® Xeon® E5-2600 v2 processor series
- Up to 36TB DDR3 1866/1600/1333 MHz system memory with 22nm 12-core Intel® Xeon® E5-2600 v2 or AMD Opteron 6300 processor series
- Up to 1,296TB hot swap storage capacity per 42U cluster
- Great serviceability with hot-pluggable processor nodes and hot-pluggable PSU
- High speed interconnect with QDR/FDR Infiniband, Intel True Scale, Fibre channel, and Ethernet (Gigabit, 10GbE/40GbE) options
- Dedicated on-board management port, providing a flexible and secure management environment
- IPMI 2.0 with KVM over LAN and Virtual Media over LAN

Cluster Features:
- Delivers high availability, scalability, flexibility and power efficiency in a dense cluster architecture
- Improves RAS with hot-swapable and redundant fans, and hard disk drives
- Addresses today’s natural business growth of mid to large-sized HPC and high-density computing
- Lowest TCO for support, maintenance and upgradeability
- Ideal for mid to large data centers scaling up to 1,000 nodes

Complete Cluster Assembly and Set Up Services:
- Fully integrated and pre-packaged turnkey HPC solution, including HPC professional services and support, expert installation and setup of rack-optimized cluster nodes, cabling, rails, and other peripherals
- Configuration of cluster nodes and the network
- Installation of applications and client computers to offer a comprehensive solution for your IT needs
- Rapid deployment
- Server management options include Standards-based IPMI or AMAX remote server management
- Seamless standard and custom application integration and cluster installation
- Cluster management options include a choice of open source software solutions
- Firmware upgrades & BIOS modification
- Supports a variety of UPS and PDU configuration and interconnect options, including Infiniband (QDR, FDR, EDR), Myrinet, Fibre channel, and Ethernet (Gigabit, 10GbE, 40GbE)

Clustered File Storage (from Terabyte to Petabyte):
- Hardware design and software stack
- Lustre / Open source file system (Redundancy across system nodes)

Rack Level Verification:
- Performance and Benchmark Testing (HPL)
- ATA rack level stress test
- Rack Level Serviceability
- Ease of Deployment Review
- MPI jobs over IB for HPC
- GPU stress test using CUDA
- Cluster management

Large Scale Rack Deployment Review:
- Scalability Process
- Rack to Rack Connectivity
- Multi-Cluster Testing
- Software/Application Load
- Cluster management

Optional Cluster System Software Installed:
- Intel Cluster Ready
- Microsoft Windows Server 2012
- Bright Computing Cluster Manager
- SuSE® / Red Hat Enterprise Linux, Red Hat Enterprise MRG
- IBM Platform, IBM Platform Cluster Manager, IBM Platform HPC Enterprise, IBM Platform LSF
- Beowulf Cluster, Luster/Cluster, Rocks cluster
- OSCAR (The Open Source Cluster Applications Resources) clustering software
- High availability/failover cluster
- Virtualization cluster
- Virtualization cluster
- Support for GPU, integrated and pre-packaged turnkey HPC solution, including HPC professional services and support, expert installation and setup of rack-optimized cluster nodes, cabling, rails, and other peripherals
- Configuration of cluster nodes and the network
- Installation of applications and client computers to offer a comprehensive solution for your IT needs
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**ClusterMax™ Apex Intel Platform Standard Configuration:**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Node Count</td>
<td>Up to 72 nodes per 42U cluster</td>
</tr>
<tr>
<td>Processor</td>
<td>2x 22nm 18-core Intel® Xeon® E5-2600 v3 or 12-core Intel® Xeon® E5-2600 v2 processor series per node</td>
</tr>
<tr>
<td>Memory</td>
<td>16x DDR4 DIMM slots, 2, 4, 8, 16 and 32 DDR4 2133 MHz ECC registered DIMMs (with Xeon® E5-2600 v3)</td>
</tr>
<tr>
<td>Max Memory</td>
<td>36TB DDR4 2133MHz (with Xeon® E5-2600 v3)</td>
</tr>
<tr>
<td>Max Cores/Threads</td>
<td>2,592 cores/3,456 threads (with Xeon® E5-2600 v3)</td>
</tr>
<tr>
<td>Networking</td>
<td>4X FDR Infiniband 56Gb/s (1 per node)</td>
</tr>
<tr>
<td>Network Port Latency</td>
<td>1us</td>
</tr>
<tr>
<td>Management</td>
<td>Intel RMM4 with media redirection</td>
</tr>
</tbody>
</table>

**Enclosure Specifications**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form Factor</td>
<td>2U</td>
</tr>
<tr>
<td>Systems per enclosure</td>
<td>4</td>
</tr>
<tr>
<td>Enclosures per rack</td>
<td>18</td>
</tr>
<tr>
<td>Airflow</td>
<td>Front to Back</td>
</tr>
<tr>
<td>Power Supplies</td>
<td>Dual Redundant</td>
</tr>
<tr>
<td>Hard Disk Drives</td>
<td>12x 3.5&quot; or 24x 2.5&quot; SAS/SATA/SSD Drives</td>
</tr>
<tr>
<td>Max Disk Capacity</td>
<td>6TB per drive, up to 1,296TB hot swap storage capacity per 42U cluster</td>
</tr>
</tbody>
</table>

**Processor**

- Haswell, 22nm process with Haswell New Instructions
- Refreshed mid-life with Broadwell, 14nm process
- DDR4 Memory Support

**CPU architectural improvements**

- Haswell micro architecture will provide compelling IPC increases for legacy performance improvements
- Haswell New Instruction set including FMA for up to 2X improvement in floating point improvement
- AVX 2.0 enabling acceleration of enterprise-class workloads
- Hardware improvements for easier multi-core programming (Intel® TSX)

**ClusterMax™ Apex AMD Platform Configuration**

- The world’s first 16-core x86 processor, delivering a rich mix of performance, scalability and efficiency for today’s highly threaded computing environments.
- AMD Turbo Core technology – digitally boosting all cores simultaneously up to 500MHz or up to 1GHz with half the cores active.
- Technical applications like HPC can take advantage of the innovative design of the new Flex FP that brings 256-bit floating point processing to the mainstream with more throughput for both 128-bit and 256-bit technical applications
- FMAC units in the Flex FP help boost computational horsepower of HPC and technical applications, driving more performance by executing FMA4 instructions that execute complex calculations in half the cycles; AVX and SSE instructions can also be performed in one cycle on the two different Flex FP pipelines
- Straight-through computing helps ensure that there are no bottlenecks or compromises — when the workload grows up to 16 tasks each has their own dedicated core, with maximum memory and I/O speed available on every processor model

**Wellsburg PCH**

- Enhanced SATA support
- Enterprise SMBus and MCTP support
- Intel® SPS 3.0 Firmware with BMC-assist modules

**Next Generation of processor power management**

- Energy Efficient Turbo
- Uncore Frequency Scaling
- Per-Core P-state

**Improved I/O capabilities**

- Increased Intel® Integrated I/O performance
- Increased QPI link speed: 9.6GT/s

**Cluster Specifications**

- 36 nodes 1U 4-Way AMD Opteron 6300 series supercomputer cluster per 42U rack
- Up to 144 AMD Opteron 6300 processor series, Socket G34, and 2,304 CPU cores (Quad processors per node)
- Up to 18TB DDR3 Registered ECC 1333/1066/800MHz system memory
- Supports low voltage 1.35V DDR3 memory
- Up to 324TB hot swap storage capacity
- High speed interconnect with ConnectX-2 QDR Infiniband 40Gbps, QSFP
- Dedicated on-board management port, providing a flexible and secure management environment
- IPMI 2.0 with KVM over LAN and Virtual Media over LAN
- 1400W High-efficiency Gold-level power supply with PMBus (93%+)
- Power-efficient cooling subsystem designs
- High efficiency VRMs (Voltage Regulator Module)
- Dynamic fan speed control and intelligent power management

**Network Configuration**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch</td>
<td>36 QSFP FDR ports</td>
</tr>
<tr>
<td>Form Factor</td>
<td>1U</td>
</tr>
<tr>
<td>Switching Capacity</td>
<td>4Tb/s</td>
</tr>
<tr>
<td>Configurations</td>
<td>FDR (56Gb/s) and FDR10 (40Gb/s)</td>
</tr>
<tr>
<td>Interconnect Topology</td>
<td>Fat Tree</td>
</tr>
<tr>
<td>Management</td>
<td>RS232 over DB9</td>
</tr>
<tr>
<td>Port to Port Latency</td>
<td>Dual 10/100/1000G Ethernet ports</td>
</tr>
<tr>
<td>Power Supplies</td>
<td>Dual Redundant</td>
</tr>
</tbody>
</table>

**Software options**

- Operating Systems
  - Red Hat Enterprise Linux (RHEL)
  - SuSE Enterprise Linux
  - CentOS
  - Ubuntu
  - Microsoft Windows Server 2012

- System Management
  - IBM Platform HPC or Bright Computing Bright Cluster Manager

- Virtualization
  - Microsoft Windows Hyper-V
  - Citrix XenServer
  - OpenStack
  - VMware ESXi/vSphere

**Special Features for Intel® Xeon® E5-2600 v3 processor Series**

- Haswell, 22nm process with Haswell New Instructions
- Refreshed mid-life with Broadwell, 14nm process
- DDR4 Memory Support
- Next Generation of processor power management
  - Energy Efficient Turbo
  - Uncore Frequency Scaling
  - Per-Core P-state
- Improved I/O capabilities
  - Increased Intel® Integrated I/O performance
  - Increased QPI link speed: 9.6GT/s
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