Accelerating innovation in HPC

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Accelerate your innovation with HP

HP delivers innovation at any scale

Barriers to Innovation and Scale
• Realized system performance and throughput
• Power capacity and cost
• Infrastructure complexity and inflexibility

Faster
Scientific and research advancements with HP converged infrastructure that is purpose-built for scale

Better
Performance footprint with the world’s most efficient systems decreases costs

Smarter
Easier deployment lets you adapt quickly to change and improve quality of service
Industry’s most complete portfolio for HPC

Workload optimized, engineered for any demand

ProLiant DL Family
Versatile, rack-optimized servers with a balance of efficiency, performance and management

ProLiant BL Family
Cloud-ready converged infrastructure engineered to maximize every hour, watt and dollar

ProLiant SL Family
Purpose built for the world’s most extreme data centers
Introducing HP ProLiant Gen8 Servers

Built on ProActive Insight Architecture

What’s New

Integrated Lifecycle Automation

• Enhanced performance and quality of service with HP Active Health and Agentless Management

Dynamic Workload Acceleration

• 33% more memory capacity, 25% greater performance at full capacity with HP Smart Memory

• Increased storage performance with SSD-optimized PCIe-gen3–based Smart Array Controllers

Automated Energy Optimization

• Energy optimized technology, with 3D Sea of Sensors, automated power discovery, rack level power management and new 94% Platinum Plus power supplies

Proactive Service and Support

• Quality of service innovations such as Smart Socket guides and Smart Drives
HP eliminates the barriers to scale

HP ProLiant Gen8 systems for HPC that is Faster, Better, Smarter

Next gen performance with SL200s Gen8
The ProLiant SL200s Gen8 portfolio, purpose-built for HPC, enables scientific and engineering innovation

Integrated accelerators for explosive growth in performance
Family of integrated accelerator offerings enables explosive growth in performance and efficiency

New levels of scalability with FDR InfiniBand
Mellanox 56 Gb/s FDR InfiniBand establishes the basis for new levels of performance and scalability
Increased Flexibility and Serviceability

ProLiant SL6500 Enclosure – the foundation of a common modular architecture

Performance and Flexibility
- Mix and match for varying requirements
- Multiple compute and storage optimized nodes

Convenient Serviceability
- Individually serviceable nodes
- Cool aisle cabling and node access
- Hot-swap servers, fans, power supplies

Energy Efficiency
- Shared power and cooling architecture
- Energy efficient fans and power supplies
- Common slot power supplies

SL Advanced Power Manager
- Rack/Chassis/Server Power Capping
- On/off control
- Consumption/utilization logging
Modular Configurations to Meet Any Requirement
Mix and match within the shared SL6500 chassis

Balanced HPC GPU Performance = Balanced CPU/GPU for extreme HPC applications

Scalable HPC Performance = Maximum compute and I/O performance for dense HPC environments
Demonstrating the value of SL6500 servers
Built on ProActive Insight Architecture

**SL230s**
HPC optimized for maximum performance, efficiency and density

**SL250S**
HPC optimized for efficiency and density, with balanced GPU performance

**Purpose-built** for HPC performance at scale

**Multi-node** density and efficiency

**Enhanced, simple front serviceability**

**Rack level power management**

Industry Leading Mgmt with Insight Control*

**Maximum speed** FDR IB FlexibleLOM

2LFF/4SFF HDD/SSD (Internal NHP)

Up to 1 I/O Accelerator

Up to 3 integrated GPUs

4SFF HDD/SSD Hot Plug (opt 4SFF NHP)
New levels of fabric performance

Mellanox 56Gb/s FDR* InfiniBand and/or 10/40Gb/s Low-Latency Ethernet

Next generation ConnectX-3 FlexibleLOM
The industry’s first dual-port 56Gb/s FDR InfiniBand and 10/40 Gb/s low-latency Ethernet multi-protocol adapter, with PCIe-gen3 for full bandwidth

End-to-End FDR InfiniBand solutions
A complete solution for 56Gb/s FDR InfiniBand consisting of adapter cards, cables, switch systems, and software, available from HP

Largest FDR system on the Nov’12 TOP500 list
#54, the “Carter” cluster at Purdue University, based on 648 SL230s Gen8 servers

** available mid-’12

* Fourteen Data Rate
Integrated accelerator solutions for the SL6500 family

Driving new levels of performance/$/watt/ft^2

Next generation NVIDIA Tesla performance
Up to 30% higher performance with M2090, combined computation and visualization with M2070Q

Optional HP PCIe IO Accelerator
Integrated solid state storage device to accelerate I/O bound applications

Future: Intel® Many Integrated Core (MIC)
Accelerate highly parallel applications, using the standard IA instruction set
HP ProLiant SL230s Gen8

Maximum compute and I/O performance for dense HPC environments

What’s new

• Choice of FlexibleLOM adapter tailored to meet your system workload
• New Smart Storage family of controllers and drives
• Next-generation cloud-enabled Insight Management
• Easily update your firmware using HP Service Pack for ProLiant
• 160GB SLC PCIe I0 Accelerator to accelerate I/O intensive workloads
• Optional dual front Hot-Plug HDD configuration

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<thead>
<tr>
<th>SL390s G7 1U</th>
<th>SL230s Gen8</th>
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</thead>
<tbody>
<tr>
<td>Processor</td>
<td>Intel® Xeon® E5-2600, 4/6/8 cores</td>
</tr>
<tr>
<td>Memory</td>
<td>(16) DDR3, up to 1600MHz (512GB max)</td>
</tr>
<tr>
<td>Storage</td>
<td>HP Smart Array B320i 2LFF HDD or 4SFF HDD, and 2-Hot-Plug HDD option</td>
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<tr>
<td>Networking</td>
<td>2x10GbE + FlexibleLOM</td>
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<tr>
<td>Management</td>
<td>HP iLO Management Engine</td>
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</table>
HP ProLiant SL230s Gen8 1U half width tray

8 Nodes, 16 CPUs per 4U chassis

- 16 DIMM Slots
- 2 Socket-R CPUs
- PCIe G3 x16 LP Slot
  - Or
  - Hot-Plug HDD
  - Or
  - Fusion-i/o Accelerator
- Chassis Interface Port
- Management Port – iLO4
- Air Flow Exhaust
- System ID Tab
- 2-1GbE Ports
- SUV Port – Serial/USB/Video
- 1-Serial Port
- FlexibleLom Slot
  - Or
  - Hot-Plug HDD
- Rear Kit Options
  - 2 – 3.5 HDDS
  - 4 – 2.5 HDDs
  - 4 – SSD’s

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HP ProLiant SL230s Gen8

System diagram
Purdue builds new TOP500 Advanced Supercomputer

“Carter”

215TF peak, 186.9TF Linpack Rmax, 257kW
From first system delivered to handover -- in 3 weeks

Advanced deployment of new technologies, from HP, Intel, and Mellanox

• 648 new HP ProLiant SL230s Gen8 systems
• Each with 2 future Intel® Xeon® processor E5 family processors
• Each with one integrated Mellanox 56 Gb/s FDR InfiniBand Flexible LOM

2X the performance of Purdue’s last four TOP500 systems combined

Largest FDR cluster on the list, #54 on the Nov’11 TOP500 list

Nearly 4 million hours of research computation to date:

• Research on cancer stem cells, which will lead to more targeted cancer treatments
• Research into new methods for short-term tornado forecasts, delivering forecasts in half the time
SL250s Gen8
Balanced CPU/GPU for extreme HPC applications

What’s new

• Choice of FlexibleLOM adapter tailored to meet your system workload
• New Smart Storage family of controllers and drives
• Next-generation cloud-enabled Insight Management
• Easily update your firmware using HP Service Pack for ProLiant
• Support for latest NVIDIA GPGPUs – M2075, 2070Q, M2090

<table>
<thead>
<tr>
<th>SL390s G7 2U</th>
<th>SL250s Gen8</th>
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<tr>
<td>Processor</td>
<td>Intel® Xeon® 5500/5600, 2/4/6 cores</td>
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<tr>
<td>Memory</td>
<td>(12) DDR3, up to 1333MHz (192GB max)</td>
</tr>
<tr>
<td>Storage</td>
<td>HP Smart Array B110i controller 4SFF Hot-Plug HDD</td>
</tr>
<tr>
<td></td>
<td>HP Smart Array B320i 4SFF Hot-Plug HDD 4SFF Internal Drive Option</td>
</tr>
<tr>
<td>Networking</td>
<td>2x10GbE + 2-port QDR IB/10Gb</td>
</tr>
<tr>
<td></td>
<td>2x1GbE + FleiblexLOM</td>
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<td>Management</td>
<td>HP Integrated Lights-Out 3 (iLo3)</td>
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</table>
HP ProLiant SL250s Gen8 2U Half Width Tray

- **4 Nodes, 8 CPUs, 12 GPUs per 4U chassis**
- 16 DIMM Slots (Below GPU Tray)
- 2 Socket-R CPUs (Below GPU Tray)
- 2 GPU Tray or 4 SFF HDD Tray
- Rear GPU
- Air Flow Exhaust
- Chassis Interface Port
- Optional 4-SFF Kit
- FlexibleLom Slot
- System ID Tab
- 1- Serial Port
- 2- 1GbE Ports
- Management Port – iLO4
- PCIe G3 x8 LP Slot
- 4-Hot-Plug HDD
- SUV Port – Serial/USB/Video

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HP ProLiant SL250s

System diagram
Keeneland

**Initial Delivery** system procured and installed in Oct 2010

201 TFLOPS in 7 racks (90 sq ft incl service area)

902 MFLOPS per watt on HPL (#12 on Green500)

Upgraded April 2012 to 255 TFLOPS

Final delivery system over 500 DP TFLOPS coming this summer

[http://keeneland.gatech.edu](http://keeneland.gatech.edu)

National Institute of Genetics

New SL230s/SL250s Gen8 system for life sciences research

“A new computer system, built on HP ProLiant SL230s/250s Gen8 servers, is expected to help researchers to make full use of the big data generated by the public science. It will also serve as a platform of world-wide DNA data sharing operations at DNA Data Bank of Japan (DDBJ).”

- National Institute of Genetics

System:  288 SL230s Gen8 Servers
        64 SL250s Gen8 Servers
        InfiniBand
        Storage
Compute Rack Building Block for Tsubame 2.0

HP Modular Cooling System G2 Rack enables maximum power density

42U HP Modular Cooling System G2 rack, containing:

- 30 SL390s G7 servers per rack
  - 60 CPUs and 90 GPGPUs
- 8 chassis with SL Advanced Power Manager
- 1 HP Network Switch for shared console and admin local area network
- 2 Airflow Dam
- 4 Voltaire QDR IB 4036 36-port Leaf Switch
- Power distribution units

Power per rack approximately 35 KW
Delivering Maximum Density and Serviceability

HP Performance Optimized Datacenter 240a - HP EcoPOD

No Compromise Approach to Modularity and Density

1/10th the space – Up to 4,400 Servers
Heterogeneous, based on industry standards

7X Capacity Per Rack
Average 30kW per 50U rack (69kW peak)
Closely Coupled Cooling
Hot/Cold Aisle Containment

Enhanced Serviceability and Simplicity
Hot/Cold Aisle Layout
Shared Service Aisle Module
Traditional Data Center Service Model
Airbus HPC data center transformation with HP POD

Deploying the world’s largest industrial supercomputer, in a modular data center

Performance, efficiency, and agility with a Converged Infrastructure for HPC

Scalable performance
- **2X** usable supercomputing power for advanced research and engineering
- HP Cluster Platform 3000BL with 2,016 HP ProLiant BL280c G6 servers, and QDR InfiniBand

Maximum efficiency
- **40% less power** than traditional data centers / 1.25 PUE
- Nearly 1,000 m² of data center space in two 40 ft. (12 m) modular data centers

Instant - on Agility
- Deployed in 4 months

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1 At the time it was deployed, per the TOP500 list of June’11, www.top500.org
What’s next?
The Promise of Extreme Low Energy Servers

New thinking and industry leadership required to unlock savings

By 2015, extreme low-energy servers could grow to 10-15% of the global server market

Space  Energy  Costs

HP Project Moonshot

• 1,000s of servers per rack
• Workload - tuned servers
• Federated infrastructure scales seamlessly with additional servers
Breakthrough Savings and Simplicity

Energy, cost and space savings even better than we announced in November

Traditional x86

$3.3M

- 400 servers
- 10 racks
- 20 switches
- 1,600 cables
- 91 kilowatts

HP ‘Redstone’

$1.2M

- 1,600 servers
- 1/2 rack
- 2 switches
- 41 cables
- 9.9 kilowatts

89% less energy
94% less space
63% less cost
97% less complexity

Select HyperScale Web, and Data Analytics Applications Show Tremendous Promise
Unparalleled Innovation: HP ProLiant and Moonshot

Project Moonshot extends HP Leadership for select markets

HP ProLiant
ML, DL, BL, SL

Mainstream IT SMB, and managed service providers

Large, web, social media, content delivery, hosting.
Scalable Analytics.

Advanced, scientific, and technical computing

HP continues to serve the mainstream market with industry Leading HP ProLiant Portfolio
Accelerate your innovation with HP

HP delivers innovation at any scale

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Easier deployment lets you adapt quickly to change and improve quality of service
Thank you

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