

The power of invention: a history of ProLiant servers from HP

technology brief, 5th Edition



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Abstract

HP systems provide features differentiating them from the competition. The number and variety of options and features available for HP industry standard servers has grown rapidly and continues to grow today.

This technology brief examines both the tangible and intangible features that make HP ProLiant servers the number one choice for customers who demand quality, reliability, manageability, and total cost of ownership (TCO) of their server products.

Overview

Within this document we provide valuable information on current HP industry standard servers, features, and options. The Glossary provides descriptions of features, options, and industry-specific technology terms.

This document is intended as a reference aid for those who want to understand how HP adds value to enterprise products.

Most of the features described in this paper are operating system independent but not all features are available on every operating system.

Historical partnership

In 1987, HP and Compaq led the way in developing Extended Industry Standard Architecture (EISA). Both successfully opposed the proprietary Micro Channel Architecture from IBM and laid the foundation for today's Standard Industry Architecture Server (SIAS) market. Again in 1993, both companies led the industry by launching Netserver and the ProLiant line of servers. These servers established new levels of fault tolerance and manageability using an industry standard platform. The two companies also worked together in 1998-2000 to lead the development of PCI-X, a high performance extensions to the PCI local bus standard. Another joint effort led by the two companies was the development of InfiniBand, a high performance, switched fabric interconnect standard for servers.

In keeping with tradition, HP provides customers with the total enterprise customer experience by continually producing product innovation and quality, strategic relationships with partners, total cost of ownership (TCO), and ease of integration and support. For additional information about ProLiant innovations, refer to [server news and press releases](#).

Total cost of ownership

After you invest in any distributed computing solution, hidden costs quickly pile up - and continue mounting throughout its lifecycle - as IT professionals configure, maintain, repair, support, upgrade, and manage the environment. For large enterprises, millions of dollars are at stake because the total ownership cost soars high above the acquisition cost.

HP has a compelling interest in raising TCO awareness and promoting TCO measurement. The more rigorously you track the lifecycle cost of owning a client/server environment, the more you discover it costs less to own HP product-based solutions than other brands. That adds up to huge savings and higher productivity for both IT staff and end-users alike.

Within this document learn how our industry standard servers are built with quality, reliability, and manageability in mind – all of which lower your total ownership cost.

Acronyms in text

The following acronyms are used in the text of this document.

Table 1. Acronyms

Acronym abbreviation	Acronym expansion
ATA	Advanced Technology Attachment
DAS	Directed attached storage
DIMM	Dual in-line memory module
DRAM	Dynamic random access memory
DRM	Data Replication Manager (software)
ECC	Error checking and correcting
EISA	Extended Industry Standard Architecture
FDDI	Fibre Distributed Data Interface
HBA	Host bus adapter
iLO	Integrated Lights-Out
MSA	Modular Smart Array
NAS	Network attached storage
NIC	Network interface controller
NOS	Network operating system
PCI	Peripheral component interconnect
PMP	Performance Management Pack
RDP	Rapid Deployment Pack
RILOE	Remote Insight Lights-Out Edition
RILOE II	Remote Insight Lights-Out Edition II
SAN	Storage area network
SAS	Serial attached SCSI
SATA	Serial ATA
SCSI	Small computer system interface
SIAS	Standard Intel architecture server
SDRAM	Synchronous dynamic random access memory
RAID	Redundant array of independent disks

Definitions for most of the acronyms above can be found in the glossary at the end of the document.

Management tools

HP continues to set the standard for platform manageability, providing built-in capabilities and industry-leading management tools that enable IT managers to be in control of their assets, ensure system availability and reduce their administrative costs. HP provides a comprehensive set of products and services that simplify the challenges of managing technology and help them respond quickly to ever-changing demands on their IT infrastructures.

HP ProLiant management tools are delivered as ProLiant Essentials software. A description of these products and services can be found in the "ProLiant Essentials software" section of this document.

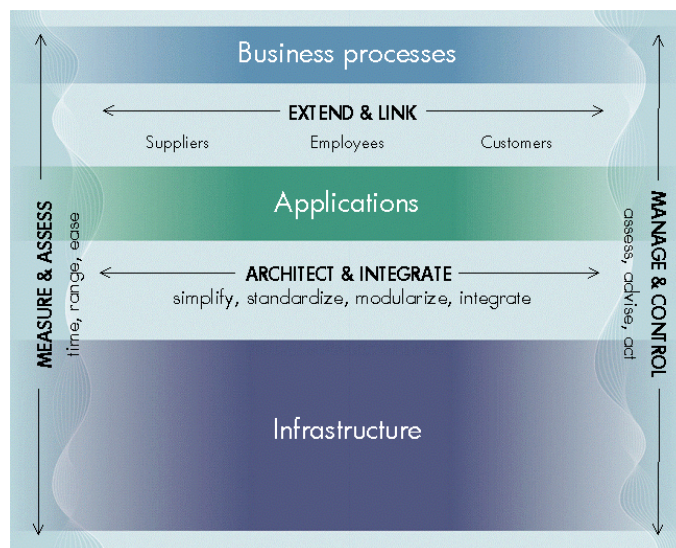
Adaptive Enterprise

An Adaptive Enterprise isn't something you buy. It's something you build. It's combining industry-leading solutions, services and products from HP and our partners that help you move quickly to turn challenge into opportunity. It's constructing an IT environment flexible to deliver what you really need – simplicity, agility and value. It's lowering your IT-related costs, maximizing return and mitigating risk. HP works with leading companies in manufacturing, financial services, communications and other industries in their journeys to becoming Adaptive Enterprises.

HP's Adaptive Enterprise approach is based on four key design principles: simplify, standardize, modularize, and integrate; designed and deployed IT for maximum agility.

The four fundamental design principles are crucial to ensuring a tight link between IT and business. As these principles drive technology decisions, HP remains focused on delivering realizable and practical value for our enterprise customers.

Figure 1. Adaptive Enterprise



For additional information on the HP Adaptive Enterprise vision visit the HP website at <http://h71028.www7.hp.com/enterprise/cache/6842-0-0-0-121.aspx?jumpid=go/adaptive>

ProLiant servers

HP's vision for the Adaptive Enterprise aspires to create computing infrastructures that match IT service levels with the flow of real-time business activities, providing low-cost, dependable, and scalable services whenever needed. The HP Adaptive Enterprise strategy directs the research and development across HP products, services and solutions and ensures that the core capabilities required for an adaptive enterprise are available for customers of all sizes in any environment.

To deliver this vision to customers deploying HP ProLiant server technologies in Windows, Linux and Novell environments, HP has accelerated investment in innovations that integrate improved automation, reliability and intelligent control into every piece of the infrastructure. Key areas of investment include blade architectures, next generation management software, components embedded in every ProLiant server, and infrastructure solutions. With a modular approach to increasing adaptability, the ProLiant portfolio allows customers to incorporate new capabilities incrementally for maximum return on each IT investment while building a foundation for an increasingly automated, utility-like infrastructure.

With ProLiant as the server backbone, customers can operate efficiently and effectively in a world that demands business agility to adapt to change and growth. Visit www.hp.com/go/proliant for more information.

HP BladeSystem

HP BladeSystem solutions start with a server blade enclosure, ProLiant server blades, networking interconnects, management tools and a centralized power sub-system. Additionally you can add a variety of HP storage options, create consolidated client solutions with blade PCs, and rely on HP Services to ensure success and accelerate your results.

HP BladeSystem p-Class enclosures

Each enclosure holds server blades and network switches and connects them to a common backplane, eliminating the need for multiple cables for each component and reducing cables by up to 87 percent. The enclosure also provides interconnection to other enclosures, shared power and networked storage.

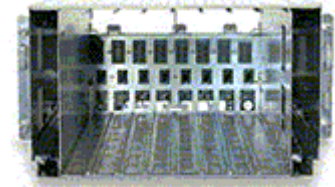
Through the management built-in to every blade component, it is as easy to manage one enclosure full of servers and network switches as it is to manage one server.

HP BladeSystem management

HP provides a suite of management software optimized to enable automated, policy-based management of the HP BladeSystem. This innovative, industry-standard suite is delivered via plug-ins to HP Systems Insight Manager, providing an integrated, virtualized, and automated solution. The HP BladeSystem Management Suite provides the single console to integrate and simplify advanced infrastructure management.

The BladeSystem Management Suite saves you time and money by delivering in one package the tools you need to get the most value out of your HP BladeSystem. The suite is available as part of an enclosure or as a software-only add-on.

Figure 2. HP BladeSystem enclosure



Red Hat Enterprise Linux and management bundle for HP BladeSystem

The Red Hat Enterprise Linux and management bundle for blades™ combines 8 instances of the RHEL 4.0 OS, 8 instances of the Red Hat Management & Provisioning modules, and the Red Hat Network (RHN) Proxy server software. All components of the bundle are registered under the same subscription number.

HP has specially priced this bundle to help customers deploy Red Hat Enterprise Linux on HP BladeSystem servers. HP also includes additional tools to ease deployment of multiple servers within an HP BladeSystem enclosure. HP BladeSystem Integration Toolkit for RHN v1.0 includes:

- Automatic detection and configuration tools supporting the Integrated Lights Out (iLO) for remote management, incorporated into Red Hat Network
- Channel Setup Guide allowing customer to create their own HP channel in Red Hat Network providing "Up2date" access to HP's drivers and management stack for Linux

The RH Management and Provisioning modules manage the complete life cycle of a Linux infrastructure. Deploy, configure, manage, update, and then re-deploy your Linux systems, all from a single console - complete with all the necessary enterprise functionality and controls.



ProLiant server blades for HP BladeSystem





Delivering best-in-Class performance, choice and reliability on Xeon, Opteron, Itanium for Windows, and Linux the HP ProLiant portfolio of server blades supports a variety of application requirements for scale-out architectures. HP offers 1P, 2P, and 4P server blades, including the widest range of performance and form factors and the most processing density of any other blade portfolio.

ProLiant BladeSystems

HP set the pace in the blade market, pioneering the concept of enterprise blade server design for industry standard applications in 2001. HP moved to the second phase of blades in August 2002 when it became the first major vendor to bring multi-processor blades to enterprise customers. In January 2003, HP was the first to ship four-processor blades. Visit www.hp.com/go/proliant for additional information.

Table 2. Current ProLiant BL servers

Product	Picture	First model introduced
ProLiant BL20p G3		August 2004
ProLiant BL25p		February 2005

Product	Picture	First model introduced
ProLiant BL30p		May 2004
ProLiant BL35p		February 2005
ProLiant BL40p		January 2003
ProLiant BL45p		April 2005

ProLiant BL e-Class (discontinued)

The ProLiant BL e-Class servers were the first power-efficient, ultra-dense edge server blades engineered for the enterprise as part of the ProLiant BL line. The system featured a 3U enclosure that held 20 ProLiant BL10e server blades. The enclosure provided redundant, hot-plug power and cooling to all installed blades as well as an integrated, remote management tool called Integrated Administrator.

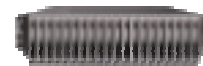
The ProLiant BL10e server blades integrated a server-class chipset, power-efficient processor, and other power-saving components in an ultra-dense design that saved valuable data center power and cooling resources and space.

ProLiant BL10e (discontinued)

Introduced in January 2002, the ProLiant BL10e server blade featured up to a 900 MHz Ultra-Low Voltage Intel Pentium III processor. The ProLiant BL10e server blade was the industry's most power-efficient server blade delivering the highest Web serving transactions per Watt.

ProLiant BL e-Class servers were optimized for use with the ProLiant Essentials Rapid Deployment Pack allowing automatic configuration and installation of operating systems and applications on tens or hundreds of servers simultaneously.

Figure 3. ProLiant BL10e server blade



ProLiant BL server blades included HP industry-leading technologies such as tool-free mechanical designs, cable reducing interconnect switch, hot-plug redundant components, and integrated management functionality.

Included with each ProLiant BL e-Class interconnect tray is the ProLiant BL e-Class Integrated Administrator — the first integrated server blade management solution offered remote/local access for monitoring and management of the enclosure and all its installed server blades.

The ProLiant BL10e server was replaced by the next generation in ProLiant BL e-Class servers.

ProLiant BL10e G2 (discontinued)

The ProLiant BL10e G2 server blade offered maximum density for sale-out solutions and featured the latest Ultra-Low Voltage Intel Pentium M processor, 1 MB level 2 cache, and up to 1 GB DDR memory. The ProLiant BL10e G2 server blades shared all the same ProLiant BL e-Class blade enclosure and interconnect options with earlier ProLiant BL10e blades.

ProLiant BL p-Class

The ProLiant BL p-Class system is part of the generation of ProLiant BL server blades and infrastructure portfolio developed for adaptive computing and optimized for rapid deployment and automated provisioning. ProLiant BL p-Class systems are high performance, high availability server blades for multi-tiered data center architectures.

The ProLiant BL p-Class server blades slide in and connect into a server blade enclosure so there are no cables coming from the server. The system enables dynamic scaling and protects your investment with an intelligent, modular infrastructure that can accommodate future blades.

ProLiant BL20p (discontinued)

Introduced in August 2002, the ProLiant BL20p server was the first blade in the ProLiant BL p-Class family that was engineered for the enterprise.

This server blade featured up to two Pentium III 1.40 GHz processors, 4 GB error correction coding (ECC) SDRAM max memory, integrated Redundant Array of Independent Disks (RAID), and two hot-plug SCSI drives. Using the ProLiant BL20p server, IT expenses could be reduced by managing remotely from anywhere in the world with the advanced version of Integrated Lights Out (iLO).

In addition, an integrated management system and full compatibility with the Insight Manager Suite gave you maximum virtual presence and control, management and health monitoring with blade visualization of all your edge-of-the-network applications.

This server was replaced by the ProLiant BL20p G2 server. For additional details, refer to the "ProLiant BL20p G2" section of this technology brief.

ProLiant BL20p G2 (discontinued)

The ProLiant BL20p G2 server is a performance dual-processor server blade engineered for the enterprise. The ProLiant BL20p G2 server includes the latest Intel processors, SAN storage capability, up to 8 GB of PC 2100 DDR memory, and gigabit NICs standard. The ProLiant BL20p G2 server fits into the same server blade enclosure as the ProLiant BL20p server and the ProLiant BL40p server and shares the same power.

Figure 4. ProLiant BL20p server blade



The ProLiant BL20p G2 server delivers optional Fibre Channel support for SAN implementations and clustering capabilities. Through the implementation of a SAN with the ProLiant BL20p G2 server, customers can achieve improved data availability, easily scale capacity, and realize management cost savings from consolidating disk resources. In addition, with HP's fusion of SAN and NAS (Network Attached Storage), customers can design a storage architecture that incorporates application, database and file serving solution functionality. Fibre Channel capability is achieved using a Dual Port Fibre Channel Mezzanine Card (2-Gb) specifically designed for the ProLiant BL20p G2 server. The ProLiant BL20p G2 server is optimized for HP StorageWorks and compatible with EMC and Hitachi SANs.

ProLiant BL20p G3

HP offers the industry's broadest portfolio of blade servers and technologies optimized to address customers' needs. The ProLiant BL20p G3 is a performance dual-processor server blade engineered for the enterprise. The ProLiant BL20p G3 delivers high performance Intel 3.6GHz/800MHz Xeon processors available with 1M L2 cache, SAN storage capability, up to 8GB of PC 3200 DDR2 memory and four gigabit NICs standard. The ProLiant BL20p G3 shares the same infrastructure components as the BL20pG2, BL30p, and BL40p (Note: Some models may require the BL p-class server blade enclosure with enhanced backplane components).

The ProLiant BL20p G3 delivers optional Fibre Channel support for SAN implementations and clustering capabilities. Through the implementation of a SAN with the ProLiant BL20p G3, customers can achieve improved data availability, easily scale capacity, and realize management cost savings from consolidating disk resources. In addition, with HP's fusion of SAN and NAS (Network Attached Storage), customers can design a storage architecture that incorporates application, database and file serving solution functionality. Fibre Channel capability is achieved using a Dual Port Fibre Channel Mezzanine Card (2 GB) specifically designed for the ProLiant BL20p G3. The ProLiant BL20p G3 is optimized for hp StorageWorks and compatible with third party storage vendors.

ProLiant BL25p

Introduced in February 2005, the ProLiant BL25p dual-processor server blade, engineered for enterprise performance and scalability, features AMD Opteron™ 200 series processors with dual-core technology, SAN storage capability, and four gigabit NICs standard. The BL25p also shares the same infrastructure components as all other p-Class server blades.

The ProLiant BL25p delivers optional Fibre Channel support for SAN implementations and clustering capabilities. Through SAN implementation with the ProLiant BL25p, customers can achieve improved data availability, easily scale capacity, and realize management cost savings from consolidating disk resources. In addition, with HP's fusion of SAN and NAS (Network Attached Storage), customers can design a storage architecture that incorporates application, database and file serving solution functionality. Fibre Channel capability is achieved using a Dual Port Fibre Channel Mezzanine Card (2 GB) specifically designed for the ProLiant BL25p. The ProLiant BL25p is optimized for HP StorageWorks and is also compatible with a variety of third party storage vendors.

ProLiant BL30p (discontinued)

In May 2004, HP introduced the ProLiant BL30p blade server that offered customers a modular, space-saving blade design, DP Xeon computing power, and uncompromising manageability. The ProLiant BL30p was an addition to the BL line that allowed customers to enjoy additional benefits from the ProLiant BL p-Class rack-centralized power sub-system and network interconnect options. It was available with up to two Xeon 3.2GHz processors, support for 4 GB DDR memory, and optional Fibre Channel connectivity. The ProLiant BL30p was designed for maximum density and manageability for high performance computing and environments that optimized external storage.

The BL30p was ideal for high performance technical computing and environments that fully leveraged NAS and SAN external storage solutions.

ProLiant BL35p

The ProLiant BL35p 2-way server blade delivers uncompromising manageability, maximum compute density, and breakthrough power efficiencies to the high performance datacenter.

Featuring Dual-Core AMD Opteron processor performance advantages, the ProLiant BL35p delivers outstanding performance per watt capabilities. The ProLiant BL35p's ultra-dense footprint and lower power consumption enable denser

rack architectures, with no compromises in performance. Additionally, the ProLiant BL35p shares the same infrastructure components as all BL p-Class server blades, allowing customers to enjoy additional benefits from the HP BladeSystem p-Class rack-centralized power sub-system and network interconnect options.

In September 2005, HP introduced a model that supports two small form factor Serial Attached SCSI (SAS) hard disk drives to deliver even greater performance and reliability in the same ultra-dense form factor. The BL35p is the first server in the BL p-class family to feature SAS hard disk drives.



AMD's Opteron™ wins "Overall Best" of TechEd and runs on ProLiant

ProLiant BL40p (discontinued)

The ProLiant BL p-Class system was part of the ProLiant BL servers and infrastructure portfolio developed for adaptive computing and optimized for rapid deployment and automated provisioning. The ProLiant BL p Class system provided high performance, high availability server blades for multi-tiered data center architectures.

The ProLiant BL p-class system enabled dynamic scaling and protected your investment with an intelligent, modular infrastructure that could accommodate future server blades. The BL40p was the first 4-way server blade in the ProLiant BL p-Class family engineered for the back-end enterprise space. This server blade featured up to four Xeon MP 2.0GHz/1M, 2.2GHz/2M, 2.8GHz/2M and 3.0GHz/4M processors, PC2100 ECC SDRAM (12GB max memory w/ online spare), Integrated Smart Array 5i Plus (with optional BBWC) and four hot-plug SCSI drives.

When the ProLiant BL40p server was used in conjunction with other BL servers, expenses could be reduced by managing remotely from anywhere in the world with the advanced version of Integrated Lights Out (iLO). In addition, an integrated management system and full compatibility with the Insight Manager Suite provided maximum virtual presence and control, management and health monitoring with blade visualization of all your applications.

ProLiant BL45p

Introduced by HP in April 2005, the ProLiant BL45p four-processor server blade designed for enterprise availability and mission-critical application features AMD Opteron 800 series processors, SAN storage capability, and four gigabit NICs standard. The BL45p also shares the same infrastructure components as all other p-Class server blades.

The ProLiant BL45p delivers optional Fibre Channel support for SAN implementations and clustering capabilities. Through SAN implementation with the ProLiant BL45p, customers can achieve improved data availability, easily scale capacity, and realize management cost savings from consolidating disk resources. In addition, with HP's fusion of SAN and NAS (Network Attached Storage), customers can design a storage architecture that incorporates application, database and file serving solution functionality. Fibre Channel capability is achieved using a Dual Port Fibre Channel Mezzanine Card (2Gb) specifically designed for the ProLiant BL45p. The ProLiant BL45p is optimized for HP StorageWorks and is also compatible with a variety of third party storage vendors.

HP Integrity BL60p






The BL60p is the first Itanium 2™ blade for the HP BladeSystem p-Class family. The BL60p is a full height blade capable of supporting 2 processors, and 2 hot swappable U320 SCSI HDDs. The BL60p runs the Enterprise HP-UX Operating Environment which is known for its low TCO. In addition to well established HP-UX management features, the BL60p adds the management features customers are raving about with their ProLiant deployments. Add to that the capability to operate this blade side by side with ProLiant server blades in a single enclosure and customers end up with simplicity.





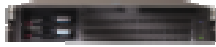




The Enterprise HP-UX Operating Environment enables the BL60p to serve as a critical infrastructure component for small business and enterprise environments. The BL60p supports HP Virtual Machines, allowing for up to 256 operating environment instances on a single server blade. The BL60p is designed to integrate management features and stacks with ProLiant server blades, improving the TCO for UNIX server blades.

ProLiant DL servers

The ProLiant DL line of servers is the industry leader in the dense rack server market. The open, serviceable chassis provides tool-free entry and easy access to critical components. A number of racking solutions support various customer server environments, including rapid deployment and serviceability in ProLiant racks, deployment in telecommunication and third-party racks, and a stackable desktop solution. Embedded technologies, such as Integrated Smart Array controllers, embedded network interface controllers, and Integrated Lights-Out maximize functionality while minimizing server size. Upgrades to future server technology protect the customer's server investment, while component commonality across the ProLiant line, including drives and memory, reduces spare parts and inventory costs. Table 3 showcases the rack models; tower models are available for select servers (refer to the product QuickSpecs for details). View www.hp.com/go/proliant for more information.

Table 3. Current ProLiant DL servers

Product	Picture	First model introduced
ProLiant DL140		November 2003
ProLiant DL140 G2		April 2005
ProLiant DL145		November 2003
ProLiant DL145 G2		April 2005
ProLiant DL320 G3		February 2005

Product	Picture	First model introduced
ProLiant DL360 G4		March 2005
ProLiant DL360 G4p		June 2005
ProLiant DL380 G4		February 2005
ProLiant DL385		June 2005
ProLiant DL560		March 2003
ProLiant DL580 G3		June 2005
ProLiant DL585		February 2004
ProLiant DL740		January 2003
ProLiant DL760 G2		January 2003

ProLiant DL140 (discontinued)

The ProLiant DL140 server included all the performance features needed for the High Performance Technical Computing (HPTC) market. The 1U size and the support for two Xeon processors provided HPTC customers with a low cost, high performance, dense optimized solution.

The performance features included the latest Intel Xeon processor, PC2100 ECC DDR SDRAM expandable for 4 GB for future investment protection, 64-bit/133MHz PCI-X slot offered for maximum bandwidth, two embedded 10/100/1000 controllers, and two ATA hard drive bays for internal data storage.

ProLiant DL140 G2

The ProLiant DL140 G2 server is an affordable 1U, dual processor capable server equipped with essential performance features that provide customers with a platform to design a fully optimized solution. It is ideal for general purpose and high performance computing. Equipped with Xeon 2.8GHz and 3.4GHz processors with 2M L2 cache, the DL140 G2 is ideal for customers needing faster cache and more flexibility at a great price.

The second generation of the DL140 has an array of improved, robust features which set it apart from both the DL140 G1 and the competition. For memory, the DL140 G2 includes 8 DIMM slots, for a maximum memory load of 16GB of PC2-3200 DDR memory. In terms of I/O, it offers PCI Express capability in its standard full height/full length PCI slot and an additional low-profile/half-length PCI slot. Regarding storage, it supports both non-hot plug (NHP) Serial ATA and SCSI hard disk drives.

ProLiant DL145 (discontinued)

The ProLiant DL145 server was optimized for the HPC market, designed with industry-leading performance features that included the latest AMD Opteron processors, with on-board memory controllers, up to 16 GB of 2-way interleaved PC2700 memory, an embedded dual-channel Gbit NIC, a 133 MHz PCI-X I/O expansion slot, and support for 2 non-hot plug ATA or SCSI drives. The 1U size, low power consumption, and the support for dual Opteron processors provided HPC customers with a high performance, low cost, dense optimized solution.

ProLiant DL145 G2

The HP ProLiant DL145 G2 server is a maximum performance 2P/1U compute node that delivers deployment flexibility at an affordable price. The AMD Opteron-based platform is ideal for large clustered High Performance Computing (HPC) environments and general purpose compute requirements for corporate datacenters and cost-conscious small and medium businesses.

The second generation ProLiant DL145 now supports AMD Opteron 200 series dual-core processors with PowerNow!™, delivering enhanced compute performance. In addition to new dual-core processors, the HP ProLiant DL145 G2 server delivers enhancements in server design, deployment flexibility and management functionality. The HP ProLiant DL145 G2 delivers enhancements in memory, I/O and storage technologies, along with a new bezel design complete with unit ID (UID) light diagnostic for easy system identification in large rack-mount environments, a universal 1U rail kit with optional cable management arm, and more. Visit [HP ProLiant Lights Out 100i Remote Management](#), for more information.

ProLiant DL320 (discontinued)

Introduced in April 2002, the ProLiant DL320 server was a robust and affordable, 1-way, dense server that brought the density-optimized features of the DL line to emerging, fast-growing Internet companies. Previously, rapidly growing, emerging Internet Service Providers (ISP) and dot-com companies had to rely on incomplete white boxes or closed-box systems that offered little more than a "thin-server". The ProLiant DL320 server included models with either a 1.26 GHz, 1.13, or 1.0 GHz Pentium III and came standard with 128 MB of 133 MHz registered SDRAM ECC memory in slot 1 of the four DIMM sockets.

Memory could be expanded to a maximum of 2 GB by installing four 512 MB PC133-MHz ECC Registered SDRAM DIMMs (one in each DIMM socket).

Figure 5. ProLiant DL320 server



Memory could be expanded 1 dual in-line memory module (DIMM) at a time. The ProLiant DL320 server shipped standard with either an Ultra ATA/100 or Ultra2 SCSI controller.

The available 64-bit PCI slot allowed support for high performance (64-bit) SCSI Controllers, Array Controllers, Gigabit Ethernet Controllers, and Fibre Channel Controllers. In addition, most 32-bit cards were supported in the 64-bit slot.

This server was replaced by the ProLiant DL320 G2 server. For more information, refer to the "ProLiant DL320 G2" section of this technology brief.

ProLiant DL320 G2 (discontinued)

The DL320 G2 was designed with all the performance a fast paced, fast growing front-end and single-function that applications demand in a 1U server. The 1U size and the 1-way processor capability provided the customers with a low cost, rack-optimized solution for single function and front-end applications.

The performance features included the latest Intel Pentium 4 processors, a 533 MHz Front Side Bus (FSB) and 512 K cache, standard 128 MB PC2100, 266 MHz ECC DDR SDRAM DIMMs expandable for 4 GB for future investment protection, 64-bit PCI slot offered twice the bandwidth of 32-bit PCI for enhanced data transfer rates, two integrated Fast Ethernet 10/100/1000 controllers for flexible network connectivity, two ATA or SCSI hard drive bays for internal data storage, and ATA RAID 0 or 1 for data protection and availability of servers.

ProLiant DL320 G3

The HP ProLiant DL320 G3 server is designed with all the performance, management and serviceability that you expect from ProLiant servers. The 1U size and 1-way processor capability provides a cost efficient solution for single function and front-end applications.

The performance features of the ProLiant DL320 G3 include standard 400MHz DDR1 memory and either a Celeron 2.93GHz processor with 256 Kilobytes of Level 2 cache or up to a Pentium 4 3.6GHz processor with 2 Megabytes of Level 2 cache. The ProLiant DL320 G3 also offers iLO Remote Management with the option to upgrade to iLO Advanced Pack. For enhanced I/O capabilities, this product includes 1x64-bit/133MHz PCI full-length slot, which is upgradeable to PCI Express, and a 64-bit/100MHz PCI half-length low profile slot. In addition to two integrated gigabit NICs, the ProLiant DL320 G3 supports both SATA and SCSI HDD solutions.

The ProLiant DL320 G3 is an ideal solution for single function, front-end applications utilized by both enterprise and SMB customers. In addition to the latest Intel chipset, an array of new features is available.

HP ProLiant DL320 Firewall/VPN/Cache Server

The HP ProLiant DL320 Firewall/VPN/Cache Server running Microsoft® Internet Security & Acceleration Server 2004 is an advanced firewall, VPN, and Web caching solution that can be quickly and easily deployed to help protect key business applications against new and emerging security threats.

Flexible, feature rich and tight design integration with Microsoft Windows® Server, Exchange Server, Outlook® Web Access, Internet Information Services, and SharePoint® Portal Server, ISA Server 2004 is one of the best application layer firewall, VPN solution for securing Windows networks.

ProLiant DL360 (discontinued)

When introduced in June 2000, the ProLiant DL360 server targeted customers focused on saving space in the data center and planning to scale their environment by adding servers by the tens, hundreds or even thousands. Likely deployment environments included massive data centers, where server management in mass becomes important, or regional data centers where remote management is key. The ProLiant DL360 server provided customers with the drive capability they require for their Web or application hosting, or infrastructure application, without having to make any functionality tradeoffs.

The ProLiant DL360 server offered uncompromising performance, expanded availability and unprecedented configuration flexibility.

The ultra-thin 1U chassis housed either up to two 1.26 GHz or 1.13 GHz with 512 KB cache, or 1.0 GHz, 933 MHz or 866 MHz with 256 KB cache Pentium III Flip/Chip processors. It also offered 128 MB of 133 MHz ECC registered SDRAM DIMM memory, which is expandable to 4 GB, and a 133 MHz GTL bus to deliver excellent performance.

A replacement for this product is the ProLiant DL360 G3 server. For additional information, refer to the "ProLiant DL360 G3" section of this technology brief.

Figure 6. ProLiant DL360 server



ProLiant DL360 G2 (discontinued)

Introduced in January 2002, the dual processor capable ProLiant DL360 G2 server offered state-of-the-art performance and on-board management with tool-free serviceability in a dense rack-mount chassis. This robust 1U [4.45 cm (1.75 inches)] server supported rapid deployment and configuration flexibility, making it an unbeatable computing solution for high density server requirements.

The ProLiant DL360 G2 server supported the latest Pentium III technology. The ProLiant DL360 G2 server used the ServerWorks HE-SL chipset. This chipset supported a 133 MHz GTL bus; triple peer Peripheral Component Interconnect (PCI) bus architecture and 2:1 interleaved registered SDRAM ECC DIMM memory. The triple peer PCI bus architecture enabled concurrent memory and processor access from both PCI buses, as well as 64-bit/66 MHz PCI slots for an addition improvement in system performance.

This server was replaced by the third generation of ProLiant DL360 servers. For additional information, refer to the "ProLiant DL360 G3" section of this technology brief.

Figure 7. ProLiant DL360 G2 server



ProLiant DL360 G3 (discontinued)

The ProLiant DL360 G3 server led the scale out environment, combining concentrated, 1U compute power with unmatched system features such as embedded remote management and optional redundant power. Xeon processors with 533 MHz front side bus, combined with DDR SDRAM and PCI-X technology meant the ProLiant DL360 server handled greater transaction workloads for Web hosting, infrastructure applications, and terminal services. ProLiant engineering leadership was evident in the remote management capabilities of Integrated Lights Out technology embedded in every ProLiant DL360 server providing OS-independent remote console and remote power on/off. In

addition, to meet the demanding fault tolerance requirements of corporate data centers, the ProLiant DL360 G3 server offered optional hot plug redundant power.

ProLiant DL360 G4

Combining concentrated 1U compute power, integrated Lights-Out management, and essential fault tolerance, the DL360 is optimized for space constrained data center installations. Xeon processors with 800MHz front side bus, DDR SDRAM, and PCI-X technology provide a high performance 2P system ideal for the full range of scale out applications. The virtual presence of embedded Lights-Out technology provides secure text based remote console and remote power on/off. Optional graphical remote console and virtual media functionality further enhances the iLO feature set. ProLiant engineering leadership is evident in optimum fault tolerance for an ultra dense form factor, with redundant fans online spare memory, and optional redundant power. What's more, the DL360 G4 is ideal for high availability clustering and storage area networks.

The ProLiant DL360, optimized for space constrained data center installations, now supports the Intel Xeon 3.6GHz processor for SCSI and SATA models.

ProLiant DL360 G4p

Combining concentrated 1U compute power, integrated Lights-Out management, and essential fault tolerance, the DL360 is optimized for space constrained installations. Dual Xeon processors, DDR2 SDRAM, and PCI-X and PCI Express technology provide a high performance system ideal for the full range of scale out applications. What's more, the DL360 G4p steps up the fault tolerant in an ultra dense platform with redundant power, redundant fans, and online spare memory, embedded RAID capability, and full-featured remote Lights-Out management.

Powerful HP ProLiant DL360 G4p introduces new Serial Attached SCSI model providing support for four Serial SCSI or Serial ATA disk drives. Provides increased deployment flexibility with increased disk drive bays, high performance RAID controller, and external Serial SCSI connector for MSA50 storage connectivity.

ProLiant DL380 G2 (discontinued)

In July 2001, the second generation of the ProLiant DL380 server, which was optimized for rack environments, was completely redesigned to offer unparalleled levels of performance, uptime and serviceability. Previously, these features were only found in high-end servers. The modular design, flexible deployment options, and innovative HP management tools made the ProLiant DL380 server the easiest on the market to install, deploy, maintain and service.



Figure 8. ProLiant DL380 G2 server

Setting the standard for 2-way dense computing, the ProLiant DL380 server was the first density-optimized server to provide enterprise-Class availability and performance for demanding Internet and business applications: all in a 2U form factor.

The ProLiant DL380 server enabled customers to do more with less. The chassis provided better performance, increased uptime, and easier ownership than the previous model, not to mention any other 2-way dense rack server in the industry. The 2U included two Intel Pentium III 1.4 GHz processors, with 512 KB cache; up to 6 GB of 2-way interleaved 133 MHz ECC SDRAM; hot plug redundant fans, power supplies, and hard disk drives; two HP 64-bit/66 MHz PCI slots and one 64-bit/33 MHz PCI slot; and quick deploy, ball bearing, tool-free rails.

The ProLiant DL380 G2 server was replaced by the third generation of ProLiant DL380 servers.

ProLiant DL380 G3 (discontinued)

The ProLiant DL380 G3 was the next generation of the award-winning dense 2-way server line and combined Integrated Lights-Out (iLO) with the next generation of performance technologies to give customers more control and performance in the same space-saving form factor.

This server met a wide range of deployment needs with features like the user-configurable single/dual channel backplane, six drive bays, three expansion slots (two of which are hot-pluggable), optional redundant power and cooling, available DC power supplies and internal tape drive, and the most robust software support in the industry.

ProLiant DL380 G4

The HP ProLiant DL380, the world's largest selling server, delivers on its history of design excellence with enterprise-class uptime and manageability, proven 2-way Intel Xeon performance, and 2U density for a variety of rack deployments and applications. The DL380 G4 is now available with the latest Dual-Core Intel Xeon 2.8 GHz processor with 2 MB L2 Cache per core on U320 SCSI models and a new U320 SCSI high performance model, based on the Dual-Core Intel Xeon 2.8 GHz Processor 2x2 MB, is also available for convenience and value.

Protect your investment and increase efficiency with HP ProLiant DL380 G4 SAS models with support for 8 universal small form factor hot plug SAS or SATA drives featuring the Smart Array P600 performance array controller for maximum throughput and reliable data protection.

The DL380 is ideal for environments of all types. It is not just for enterprises. Small and medium businesses with rack environments that can benefit from remote server management or network backup should consider the DL380 as should space-constrained corporate data centers and service providers, and sophisticated SMB locations.

ProLiant DL385

The new ProLiant DL385 delivers on the DL380's history of design excellence with enterprise-class uptime and manageability, and now with proven 2-processor AMD Opteron performance, and 2U density for a variety of rack deployments and applications.

- Proven performance for demanding scale-out applications
- Industry-leading management solutions enable powerful administration
- Engineered for reliability and ease of ownership

The DL385 introduces two new features, dual-core processor and SAS drives. Dual-core is available for both SCSI drives and SAS drives:

ProLiant DL560

The ProLiant DL560 server, an ultra-dense 4-way server, designed for environments that require high levels of computing power while maintaining maximum cooling and power efficiency. The ProLiant DL560 server combines maximum levels of compute performance, system efficiencies, and manageability to today's and tomorrow's enterprise data center. The server takes advantage of Xeon Processor MP, PCI-X architecture, Wide Ultra320 SCSI, DDR SDRAM memory, and Gigabit networking technology to provide the performance and scalability required for today's compute intensive applications.

The ProLiant DL560 server delivers enterprise class performance based upon award-winning ProLiant engineering and industry standard technology, and its compact 2U form factor means the server uses at least 50 percent less rack space than most enterprise servers on the market.

In addition, ProLiant management features such as remote administration from a standard web-browser and Insight Manager event and configuration management significantly reduce total cost of ownership. The ProLiant DL560 server combines maximum levels of compute performance, system efficiencies, and manageability for today's and tomorrow's enterprise data center.

ProLiant DL580 (discontinued)

Introduced in June 2000, the ProLiant DL580 server built upon the tradition of product excellence found in the ProLiant 6400R server. It featured the latest generation of Intel microprocessors, ServerWorks Enterprise ServerSet HE chipset and up to 16 GB of ECC SDRAM memory (512 MB standard).

This server supported up to four Pentium III Xeon processors at 700 MHz with 1M or 2M L2 cache standard to provide the processing power and scalability needed by your growing data center requirements. The ProLiant DL580 server provided maximum 4-way performance and the highest levels of availability and serviceability in a 4U-form factor making it an ideal platform for the corporate data center or ISP environment.

The ProLiant DL580 server shipped standard with the slot-based NC3134 DualPort 10/100 network interface controller (NIC), 64-bit/66 MHz (upgradeable to Gigabit) with redundant NIC support. The Wide Ultra2/Wide Ultra3-ready drive cages supported four 1-inch Wide Ultra2/Wide Ultra3 SCSI hard drives for up to 145.6 GB of internal storage. Hot-plug redundant fans and an optional hot-plug redundant power supply provided protection in the case of component failure and allow replacement without bringing down the server.

This server was replaced by the next generation of ProLiant DL580 servers. For additional information, refer to the "ProLiant DL580 G2" section of this technology brief.

ProLiant DL580 G2

The ProLiant DL580 G2 server is an enterprise class, 4-way server designed for environments that require maximum computing power and robust high availability features in a versatile, rack-optimized form factor. Based upon industry standard Xeon Processor MP, DDR SDRAM, PCI-X, Wide Ultra3 SCSI, and Gigabit networking technology, the ProLiant DL580 G2 server provides the highest levels of performance demanded by today's compute intensive applications. High availability features, including Advanced Memory Protection technology, an integrated RAID controller, a duplex drive cage, and hot-plug redundant components guarantee maximum uptime for business critical environments. Featuring iLO technology, the ProLiant DL580 G2 server allows remote administration from a standard Web browser without ever having to visit the server.

Innovative features, such as the QuickFind Diagnostic Display, enable rapid response to service events, radically decreasing overall IT costs and server downtime. With 6 full-length PCI-X slots, up to 32 GB of DDR SDRAM memory, 4 Ultra3 hard disk drives, and 2 pluggable multibays, the ProLiant DL580 G2 server's highly expandable architecture provides maximum application deployment flexibility in a virtually cable-less interior design.

ProLiant DL580 G3

The HP ProLiant DL580 G3 server, the industry's best selling x86 4-way rack server, is available with Dual-Core Intel Xeon processors, plus 8 GB (2 x 4GB 2RANK) PC2-3200R Option Kit, ideal for

Figure 9. ProLiant DL580 server



mission-critical data center deployments. Its radically redesigned chassis offers unsurpassed flexibility and serviceability in a versatile, rack-optimized form factor.

Based upon the latest industry standard processing, memory, I/O and networking technologies, the ProLiant DL580 G3 provides the highest levels of performance demanded by today's compute intensive applications. Unparalleled high availability features including Hot Plug RAID Memory, an integrated Ultra320 Smart Array 6i controller, duplex drive cage, and hot-plug redundant components guarantee maximum uptime. The ProLiant DL580 G3's Integrated Lights-Out (iLO) technology allows remote administration from a standard web-browser without ever having to visit the server. Within the 4U dense form factor, the ProLiant DL580 G3's highly expandable architecture provides maximum application deployment flexibility with the ability to add PCI-Express, hot plug PCI-X or battery-backed write cache options. Innovative new features, such as the ability to access processors, memory, hard drives, and power supplies while the unit remains secured in the rack, enable rapid response to service events, radically decreasing overall IT costs and server downtime.

Introduced in June 2005, the HP ProLiant DL580 G3 is available with 64-bit Intel® Xeon™ Processors MP, Hot-Plug RAID Memory and a highly flexible redesigned chassis.

ProLiant DL585

The ProLiant DL585, the best performing x86 4-processor servers in the industry, now supports the new AMD Opteron Dual-Core processor further increasing the performance leadership of this system. These new Dual-Core AMD Opteron processors will enable a huge boost in performance; depending upon the application and environment, customers can expect to see anywhere from 15 to 65% performance improvement in the same 4U chassis! The ProLiant DL585 combines AMD Opteron processor technology, best-in-class management and outstanding uptime features in a system ideal for large data center deployments.

The ProLiant DL585 was the first Tier 1 server in the industry supporting 4 AMD Opteron processors and was the first platform which demonstrated Opteron Dual-Core processors in August 2004. It continues to maintain performance leadership, especially with a variety of 32-bit benchmarks. The 64GB memory footprint enables most applications to run faster or support more users than other systems. The DL585 now supports Models 865 and 875 Dual-Core processors, running at 1.8 and 2.2GHz, with 1GHz HyperTransport and PC2700 or PC3200, running at 266-400MHz. Combining the new performance features with the best-in-class ProLiant setup and management tools results in an enterprise-class server which is truly leading the industry.

ProLiant DL740

Today's business critical applications demand ever-increasing scalability and availability from enterprise servers. Space in enterprise class data centers is becoming increasingly scarce, driving the requirement for servers that provide maximum performance per U. The ProLiant DL740 server, with the latest Intel Xeon MP processors, Hot-Plug RAID Memory, and a full implementation of PCI-X I/O, delivers the performance and uptime required to meet the current and future demands of enterprise server consolidation, database, ERP, CRM, mail and messaging, and data mining/warehousing applications.

Based on HP developed F8 architecture, the ProLiant DL740 server offers excellent scalability driven by its balanced system architecture. Capable of supporting up to 8 Intel Xeon MP processors in an ultra dense 4U form factor, the ProLiant DL740 server saves critical space in the data center, making it an ideal clustering and server consolidation platform.

ProLiant DL760 (discontinued)

Introduced in June 2001, the ProLiant DL760 server was designed for mission-critical environments and offered an outstanding combination of high performance and high availability features, with eight processors, 16 GB of SDRAM, eleven hot-pluggable 64-bit input/output (I/O) slots including 8 PCI-X, redundant hot plug power supplies and fans and more. The ProLiant DL760 server was developed to meet the needs of customers requiring scalability and fault tolerance in a data center environment. The ProLiant DL760 server, with Intel Pentium III Xeon 900 MHz processors and PCI-X I/O, delivered the performance and uptime required to meet the current and future demands of enterprise server consolidation, e-business, ERP, thin client, compute engine, mail and messaging, and data mining applications.

With a modular, dense 7U form factor design, this server provided an ideal solution for demanding enterprise

applications. PCI-X was the next evolution of the PCI I/O standard and is backward compatible with PCI. Customers could install their existing PCI adapters in the ProLiant DL760 server while investing in PCI-X adapters.

This server was replaced by the ProLiant DL760 G2 server. For more information, refer to the "ProLiant DL760 G2" section of this technology brief..

ProLiant DL760 G2

Today's mission-critical applications and growing customer requirements demand ever-increasing scalability and availability from enterprise servers. The industry's first server with Hot Plug RAID Memory, the ProLiant DL760 G2 server provides the highest levels of intelligent fault resilience, dynamic scalability and powerful, 8-way SMP performance to support your mission-critical enterprise solutions.

The ProLiant DL760 G2 server, with the Intel Xeon MP processors, Hot-Plug RAID Memory, and a full implementation of PCI-X I/O, delivers the performance and uptime required to meet the current and future demands of enterprise server consolidation, database, ERP, CRM, mail and messaging, and data mining/warehousing applications. Based on HP developed F8 architecture, the ProLiant DL760 G2 server offers excellent scalability driven by its balanced system architecture.

ProLiant ML servers

The ProLiant ML line of servers is maximized for internal system expansion and is ideal for remote and branch office environments. These servers provide investment protection with drive, slot, and memory expansion capability. Large internal expansion enables all-in-one server implementations and a large slot count provides versatility for different types of deployments by maximizing the number of Smart Array Controllers, NICs, and host bus adapters (HBA) that can be installed. An open, serviceable chassis with easy access to critical components using limited tools ensures an easy upgrade to future server technology.



Outstanding manageability features including SmartStart, HP Systems Insight Manager, and Front Panel (light-emitting diode) LED status indicators, and support for Remote Insight Lights-Out Edition provide a lower total ownership cost. Unsurpassed software integration enables rapid deployment.

Figure 10. ProLiant DL760 server



Most ML line servers are available in both tower and rack configurations. All ML servers provide rack mount capability. Visit www.hp.com/go/proliant for more information.

Table 4. Current ProLiant ML servers

Product	Picture	First model introduced
ProLiant ML110 G3		August 2005
ProLiant ML110 G2		February 2005
ProLiant ML150 G2		November 2004
ProLiant ML310 G2		February 2005
ProLiant ML350 G4 and ProLiant ML350 G4p		August 2004
ProLiant ML370 G4		August 2004
ProLiant ML570 G3		June 2005

ProLiant ML110 G3

The ProLiant ML110 G3 makes small networks hassle-free. This powerful yet simple platform provides all the necessary server features in an affordable, functional package. Practical features, such as Intel Celeron and Pentium-4 processors, DDR II ECC memory, and PCI-Express slots deliver the functionality that small businesses require. For remote offices, the ML110 G3 can be upgraded with the cost-effective HP Lights-Out 100 Remote Management option. Like all ProLiant products, the ML110 G3 comes with proven ProLiant reliability. The ProLiant ML110 G3 is an affordable server packed with appropriate technology suitable for your small to medium businesses.

The ProLiant ML110 G3 delivers the latest Intel Celeron & Pentium-4 processors, Lights-Out 100 Remote Management Option, new look and feel, smaller chassis, as well as outstanding performance, features, value, and service for SMBs.

ProLiant ML110 G2

The ProLiant ML110 G2 provides all the relevant server features in an easy-to-use package. Practical performance, such as Intel Celeron and Pentium 4 processing, ECC memory, and PCI-X and PCI-Express support deliver the IT functionality small businesses require. For remote site locations, the ML110 G2 can be easily upgraded with a cost efficient management option and utilized as a remote managed server. As with all ProLiant products, rigorous testing of the ML110 G2 ensures dependability. All of this comes at the price of a desktop PC. The ProLiant ML110 G2 is affordable with appropriate technology suitable for small/medium businesses.

ProLiant ML150 G2

The ProLiant ML150 is a remarkable value for workgroups or small-to-medium businesses that need dependable server performance and trusted service and support. The ProLiant ML150 is a 5U tower server that is expandable to grow with business needs. With room for two Xeon processors, six I/O adapter cards, four memory slots, and six hard disk drives, the ProLiant ML150 adapts to meet the demands of growing business. The ProLiant ML150 delivers a balance of performance, manageability, and expandability at an aggressive price.

ProLiant ML310 (discontinued)

Introduced in January 2003, the ProLiant ML310 server was a Pentium 4-based server for growing businesses running sophisticated small applications and branch offices of larger organizations that needed a platform for single-function solutions. The ProLiant ML310 server had the same chassis as the ProLiant ML330 server and delivered ProLiant reliability together with best-in-class data protection and management to simplify ownership.

The ProLiant ML310 server included support for the Intel 2.8 GHz Pentium 4 processor for faster processor performance, a 533 MHz Front Side Bus for increased processor and memory performance, 256 MB PC2100 DDR SDRAM base memory for increased application performance with the base server and a 36 GB SCSI hard drive in base unit (SCSI models only) for increased storage capacity right out of the box.

This product was replaced by the ProLiant ML330 G3 server.

Figure 11. ProLiant ML310 server



ProLiant ML310 G2

The ProLiant ML310 G2 is a single processor tower that is designed for remote site offices and small-medium size businesses. The entry-level platform is simple, reliable and easy to own at an affordable price. The ML310 G2 is true ProLiant reliability and ease of use for sophisticated small-business applications and branch office solutions.

For growing businesses running sophisticated small applications and branch offices of larger organizations that need a server for single-function solutions, the ProLiant ML310 G2 is the answer. The ProLiant ML310 G2 is an Intel based server that delivers ProLiant reliability together with best-in-class data protection and management to simplify ownership. The ML310 G2 is a competitively priced managed server which will fulfill any sophisticated small-business or corporate remote customer's needs. Choosing a HP ProLiant server is making a wise investment in your company's future.

ProLiant ML310 G3

The HP ProLiant ML310 G3 is an affordable, single processor tower server designed to provide the solid network foundation essential to fuel thriving small offices. Dual-Core Intel® Pentium® D or Pentium® 4 processing power combines with industry-leading management and essential data protection features for a secure, affordable platform that helps you run your business efficiently.

The third-generation HP ProLiant ML310 supports HP Integrated Lights-Out 2 and is available with Dual-Core Intel® Pentium® D processors, Integrated Lights-Out 2, and up to 8 GB of 533 MHz DDR2 Memory with optional interleaving.

The ML310 G3 is ideal for corporate branch offices that support local users or customers and exchange data with headquarters and for small businesses where technology provides an opportunity to get a competitive edge.

ProLiant ML330 G2 (discontinued)

The ProLiant ML330 G2 server was an entry-level, 2-processor server in the same chassis as the original ProLiant ML330 server. The ProLiant ML330 server was the first to offer a choice of Ultra3 SCSI or Integrated ATA RAID 0, 1, or 1+0 when introduced in October 2001. The ProLiant ML330 G2 server had several improvements over the previous generation of the ProLiant ML330 and ML330e servers. The ProLiant ML330 G2 server supported 1.26 GHz, 512 KB iL2 cache PIII processors or 1.40 GHz, 512 KB cache PIII processors (ML330/ML330e only supported 1.0 GHz, 256K cache PIII processor).

This server supported up to 4 GB of maximum memory (ML330/ML330e supported up to 2 GB) and contained an integrated, dual-channel Ultra3 SCSI controller in SCSI models (ML330 contains a single-channel Ultra2 SCSI controller).

The ProLiant ML330 G3 server replaced the second generation product. For additional details, refer to the "ProLiant ML330 G3" section of this technology brief.

ProLiant ML330 G3 (discontinued)

For growing businesses running sophisticated small applications and branch offices of larger organizations that needed a platform for single-function solutions, the ProLiant ML330 G3 server was

Figure 12. ProLiant ML330 G2 server



a 2P Xeon-based ProLiant that delivered ProLiant reliability together with best-in-class data protection and management to simplify ownership. Features of the ProLiant ML330 G3 server included support for up to two Intel Xeon processors for faster processor performance.

ProLiant ML350 G2 (discontinued)

The ProLiant ML350 server, a 2-way server, provided the perfect balance of price and performance when it was introduced in October 2001. Pentium III technology with 512 KB on-die cache coupled with 64-bit PCI, 133 MHz ECC SDRAM, and Ultra 3 I/O minimize bottlenecks delivered the processing power needed to satisfy corporate workgroups, remote sites, and growing businesses. Essential availability features, such as hot-plug redundant power and hot plug drive bays provided increased uptime enhancing end-user productivity.

The ProLiant ML350 G2 Array model added the Smart Array 532 RAID controller and an additional 128 MB (Total RAM 256 MB) of RAM in both tower and rack configurations offering customers Pentium III technology and storage availability at an affordable price.

The expansion features of the ProLiant ML350 G2 server, included six hot-plug drive bays, six available PCI slots (5 in the array model) and up to 4 GB of memory providing flexible configurations for a multitude of applications such as file and print or mail and messaging.

Its simple to service 5U design was optimized for both tower and rack environments where it delivered tool-free access to system components as well as deployment tools designed to reduce ownership hassles. The ProLiant ML350 server delivered affordable performance and essential availability to discriminating corporate workgroups and growing businesses that demanded expandable, easy to own, tower and rack solutions.

This server was replaced by the ProLiant ML350 G3 server. For more information, refer to the "ProLiant ML350 G3" section of this technology brief.

ProLiant ML350 G3 (discontinued)

The ProLiant ML350 G3 server delivered on a long tradition of engineering excellence with state of the art technologies that maximized reliability and performance at an affordable price. The ProLiant ML350 G3 server was an expandable rack or tower platform that delivered affordable 2-way performance and essential availability to corporate workgroups and growing businesses. The ProLiant ML350 G3 server supported the latest Intel Xeon processors.

Engineered for maximum reliability, the ProLiant ML350 G3 server delivered essential availability features including six hot-plug drive bays and an optional hot-plug redundant power supply that minimized expensive downtime.

Figure 13. ProLiant ML350 G2 server



ProLiant ML350 G4 and ProLiant ML350 G4p

The HP ProLiant ML350 G4 and G4p are closely related. Both offer fourth generation processor, chipset, and chassis features. The HP ProLiant ML350 G4 and G4p servers are traditional tower servers refined with essential availability features to form a versatile, dependable backbone for expanding businesses and dedicated workgroups.

The fourth generation server delivers enhancements in server design, compute performance, and availability. These servers also have a different front bezel design than previous generations for easy access to removable media, a front USB port, and improved universal rail design for both round and square hole racks.

The ML350 G4p includes additional performance and management capabilities

Figure 14. ProLiant ML350 G4/G4p server



ProLiant ML370 G2 (discontinued)

When introduced in July 2001, the ProLiant ML370 G2 server was the industry's most versatile 2-way rack or tower server that was the first in its class to offer Advanced Memory Protection and high availability features. Delivering more configuration possibilities than its predecessor, the ProLiant ML370 G2 server offered hot plug redundant fans, 1+ 1 hot plug redundant power supplies, hot plug PCI slots, and multiple tool-free racking solutions.

Powered by Intel Pentium III processors, with 512 KB cache, up to 6 GB of 2:1 interleaved 133 MHz ECC SDRAM, and 64-bit/66 MHz PCI slots, the ProLiant ML370 server offered unprecedented performance levels never before seen in this class of server product. The added configuration flexibility, enhanced chassis design, and additional availability features resulted in a highly versatile 2-way server product that was ideal for a myriad of business scenarios.

The ProLiant ML370 G2 server was replaced by the ProLiant ML370 G3 server. For additional details, refer to the "ProLiant ML370 G3" section of this technology brief.

Figure 15. ProLiant ML370 G2 server



ProLiant ML370 G3 (discontinued)

The ProLiant ML370 G3 server was a versatile, high performance 2-way platform that enabled IT infrastructures to adapt to today's demanding business requirements. A wide variety of configuration possibilities and powerful integrated Lights-Out management made it useful for the corporate data center to the remote site.

Because the ProLiant ML370 G3 server delivered a high degree of uptime, great serviceability, and expandability, it was the ideal server for workgroups of medium to large corporations. The ProLiant ML370 G3 server delivered a high degree of reliability, expansion, and powerful integrated remote management.

ProLiant ML370 G4

The ProLiant ML370 G4 server provides industry-leading management, performance and availability in a dual processor expansion server engineered to excel in a variety of environments from corporate work groups in growing businesses to critical remote sites requiring continuous accessibility and uptime.

In June 2005, HP introduced ProLiant ML370 Generation 4 (G4) Serial-Attached SCSI (SAS) models available with high performance Serial-Attached SCSI (SAS) storage solutions and the latest Intel Xeon 2MB L2 cache processors. Special pre-configured SAS High Performance and Array models are also available enabling convenient rapid system deployment!

ProLiant ML530 (discontinued)

The ProLiant ML530 server was the world's fastest 2-way server when it was introduced in January 2000. This server featured a Highly Parallel System Architecture (HPSA), 128 MB of 133 MHz SDRAM, 64-bit/66 MHz PCI, and the 1-GHz Pentium III Xeon processors.

The ProLiant ML530 server shipped with memory expandable up to 4 GB and dual processing support, ensuring expandability to the highest level of investment protection. The ProLiant ML530 server, the evolution of the ProLiant 3000 server, featured sixteen bays, including twelve hot-plug hard drive bays, as well as eight PCI slots. The PCI slots included two 64-bit/66 MHz, five 64-bit/33 MHz, and one 32-bit/33 MHz.

The internal hot pluggable storage capacity of 436 GB offered plenty of room for expansion. The ProLiant ML530 server shipped with support for redundant hot-plug fans, redundant hot-plug power supplies, and redundant NICs.

This server featured the NC3123 Fast Ethernet PCI 10/100 WOL NIC and an integrated dual-channel Wide Ultra2 SCSI Adapter. With exceptional 2-way performance, expansion, and manageability features, the ProLiant ML530 server was the perfect solution for critical file/print, database, and complex Web applications.

The ProLiant ML530 server has been replaced by the next generation. For more information, refer to the "ProLiant ML530 G2" section of this technology brief.

ProLiant ML530 G2 (discontinued)

When introduced in May 2002, the ProLiant ML530 G2 server was a high-performance 2-way server that delivered industry-leading expansion and availability features. ProLiant engineering and design expertise optimized system resources for intensive data center and remote office environments. Processor, memory, and I/O subsystems combined to provide unbeatable price/performance for database engines or server consolidation efforts.

The ProLiant ML530 G2 server offered the latest dual Intel Xeon processors and Hyper Threading Technology. Internal expansion of up to fourteen hot-plug hard drives and seven PCI-X slots allowed application flexibility and headroom for

Figure 16. ProLiant ML530 server



Figure 17. ProLiant ML530 G2 server



future growth. Intelligent fault resilience features, such as Advanced Memory Protection technology and hot-plug components guaranteed maximum uptime for business-critical and infrastructure applications.

ProLiant ML570 (discontinued)

Introduced in June 2000, the ProLiant ML570 server, an all-inclusive server/storage solution for enterprise users, boasted a 7U form factor optimized for internal expansion up to twelve 1.0-inch SCSI disk drives and expandable to 16 GB of SDRAM memory. This server was available in either tower or rack models, 700 MHz, 1M or 2M cache or 900 MHz 2M cache. The ProLiant ML570 server chassis design and slide-out electronics tray provided easy access to the system internals for tool-free replacement of parts.

The ProLiant ML570 server supplied the performance, scalability, availability, manageability, and design features needed by large business and enterprise customers, application service providers (ASPs), and ISPs using business-critical and e-Commerce applications.

High availability features included hot-plug redundant fans, power supplies, NICs, and drives in addition to memory error correcting technology built into the chipset. Powered by the Highly Parallel System Architecture and using the ServerWorks Enterprise ServerSet III HE chipset and up to four Intel Pentium III Xeon processors, this server maximized performance and output. Five 64-bit slots, including two running at 66 MHz, provided increased bandwidth and faster network connections. The ProLiant ML570 server shipped with a NC3123 Fast Ethernet PCI 10/100 WOL NIC and an integrated dual-channel Wide Ultra2/Wide Ultra3 ready SCSI Adapter.

The ProLiant ML570 G2 replaced this server. For more information, refer to the "ProLiant ML570 G2" section of this technology brief.

ProLiant ML570 G2

The ProLiant ML570 G2 is the industry's first 4-way expansion server that offers not only best performance, but also increased reliability with hot-plug mirrored memory, powerful management capabilities, unmatched internal expansion and flexibility, and the latest Intel Xeon processors.

With expansion capabilities featuring up to 32 GB max memory, support for up to 14x1" hot-plug hard drives, up to 7 PCI-X 100MHz I/O slots, the ProLiant ML570 G2 is a truly expandable and reliable server for a data center or remote enterprise environment.

Figure 18. ProLiant ML570 server



ProLiant ML570 G3

The HP ProLiant ML570 G3 server, the industry's first 4 processor expansion server, is available with Dual-Core Intel Xeon processors, featuring up to 64 GB of 400 MHz DDR2 memory with 4 GB DIMMs, support for up to 10×1-inch hot-plug Ultra 320 SCSI hard drives or 18 Small Form Factor (SFF) SAS drives, and up to 10 PCI I/O slots, ideal for multi-threaded applications, e.g. database, financial services, and supply-chain management. The ML570 G3 offers not only exceptional performance, but increased reliability with hot-plug RAID memory, powerful management capabilities, and unmatched internal expansion.

With expansion capabilities featuring up to 48GB max memory, support for up to 10×1" hot-plug Ultra 320 SCSI hard drives, and up to 10 PCI I/O slots, the ProLiant ML570 G3 is a truly expandable and reliable server for a data center or remote enterprise environment. The ML570 G3 now offers SAS models with even better performance and higher reliability with support for up to 18 universal Small Form Factor (SFF) SAS drives and the Smart Array P600 Controller.

Figure 19. ProLiant ML570 G3 server



ProLiant Storage Servers

HP offers a comprehensive range of ProLiant Storage Server solutions for small business, branch office and enterprise data center customers. HP ProLiant Storage Server products include both tower and rack-mount form factors to fit a variety of IT environments. HP ProLiant Storage Server solutions are built on two industry-leading business platforms: HP ProLiant servers and the Microsoft® Windows® Storage Server 2003 operating system. Dedication to industry standards enables HP to lower your total cost of ownership through investment protection and improved IT efficiency.

The family includes ProLiant ML110 Storage Server, ProLiant DL100 Storage Server, ProLiant DL580 G2 Storage Server, ProLiant ML350 G4 Storage Server, ProLiant ML370 G4 Storage Server, and ProLiant DL380 G4 Storage Server. Select models of HP Storage Servers can be upgraded to include block storage services over Ethernet with the HP ProLiant Storage Server iSCSI Feature Pack.

Note:

As of November 1, 2004, HP ProLiant Storage Server became the brand name for the NAS family of products formerly known as HP StorageWorks NAS.

High availability

HP ProLiant Clusters integrate hardware and software to provide a total solution for business-critical environments. HP servers, interconnect, HP Storage Systems, Microsoft and HP software, and HP integration documentation have all been thoroughly tested in cluster configurations. HP's close relationship with application partners such as Microsoft, SAP, BAAN, PeopleSoft, Oracle, Informix, and many others has resulted in the development of cluster applications on HP hardware. HP uses this expertise to assist customers to design cluster configurations that will meet customer demand.





HP products provide clustered solutions with industry standard ProLiant servers and HP SCSI and Fibre Channel storage arrays on all major operating systems, including Microsoft Windows NT/2000,

Novell NetWare, and Linux. Each group is broken up into separate clustering solutions. They are: Packaged Clusters, clusters for Microsoft, clusters for Novell, clusters for Linux, and clusters for Oracle. Additional information on HP ProLiant Clustering Solutions is available at www.hp.com/servers/proliant/highavailability.

High Availability Packaged Clusters

High Availability Packaged Clusters are the easiest, most affordable, clustering solutions that are powered by ProLiant servers and Smart Array Technology running Microsoft Windows, Novell, Linux, and Oracle.

Table 5. Packaged Clusters

Product	Picture	First model introduced
ProLiant DL380 G4 Packaged Cluster with MSA500 G2		August 2004
ProLiant DL380 G4 Packaged Cluster with MSA1000		November 2003
Modular Smart Array 500 G2		January 2002
Port Shared Storage Module with Smart Array Multipath Software for Smart Array Cluster Storage		January 2003

ProLiant DL380 G2 Packaged Cluster (discontinued)

The ProLiant DL380 G2 Packaged Cluster consisted of two ProLiant DL380 G2 servers and a Smart Array Cluster Storage system, pre-packaged in a cost effective, space efficient fixture giving the customer the most affordable clustering solution for Microsoft NT Enterprise Edition, Windows 2000 Advanced Server, Novell NetWare, and Linux. The ProLiant DL380 G2 Packaged Cluster provided greatly expanded shared storage bay capacity of fourteen hot plug drives. This provided a maximum storage capacity of over 1 TB of shared storage using 72 GB drives. Storage also featured 128 MB battery backed cache and supported pre-failure warranty.

Availability was improved on the ProLiant DL380 G2 server through clustering server failover. All major components had redundant options such as processors, memory, power supplies, fans, and shared storage controllers.

ProLiant DL380 G3 Packaged Cluster (discontinued)

The ProLiant DL380 G3 Packaged Cluster set a standard for performance and value in the enterprise. The Packaged Cluster consisted of two next generation ProLiant DL380 G3 award-winning servers and a Smart Array Cluster Storage system. These were pre-packaged in a cost effective, space efficient fixture that provided the most affordable clustering solution for Microsoft NT Enterprise Edition, Windows 2000 Advanced Server, Novell NetWare and Linux. The ProLiant DL380 G3 Packaged Cluster was ideal for remote locations or rack mounted in your datacenter running alongside your other ProLiant servers. This Packaged Cluster included up to two Intel Xeon processors, ServerWorks GC-LE chipset, supporting a 400 MHz FSB and three full-length PCI-X expansion slots: two hot plug 100 MHz and one 133 MHz.

It contained 512 MB of 2-way interleaved, 200 MHz DDR SDRAM with Advanced ECC and Online Spare Memory capabilities, expandable to 6 GB.

Two embedded NC7781 Gigabit Ethernet NIC ports and embedded Wide Ultra3 Smart Array 5i Plus RAID controllers were also standard.

ProLiant DL380 G4 Packaged Cluster with MSA500 G2

The ProLiant DL380 Packaged Cluster with MSA500 G2 sets a standard for performance and value in the enterprise. The Package Cluster consists of two next generation ProLiant DL380 G4 award-winning servers and a Modular Smart Array 500 G2 shared storage cabinet. These are pre-packaged in a cost effective, space efficient fixture giving you the most affordable clustering solution for Windows Server 2003 Enterprise Edition, Novell Netware, and Linux. Our Racked Model factory integrates the packaged cluster in a 14U Rack. This Racked model arrives in a single package on a shock pallet.

It is ideal for remote locations or rack mounted in your datacenter running alongside your other ProLiant servers. The ProLiant DL380 G4 Package Cluster with MSA500 G2 complements your IT investment by providing high availability uptime for your business critical applications. Specifically designed to ensure outstanding performance and seamless integration throughout the entire enterprise, the ProLiant DL380 Package Cluster with MSA500 G2 offers an excellent return on investment by drastically reducing downtime.

ProLiant DL380 G4 Packaged Cluster with MSA1000

The HP ProLiant DL380 Generation 4 Packaged Cluster with Modular Smart Array 1000 is a member of the ProLiant Packaged Cluster Family and extends the current product lineup with the addition of the HP StorageWorks Modular Smart Array 1000 storage system (MSA1000).

The DL380 G4 Packaged Cluster with MSA1000 combines the power and reliability of the ProLiant DL380 G4 server with the high performance and scalability of the MSA1000 storage system. In standard configurations, the DL380 G3 Packaged Cluster with MSA1000 offers the convenience of pre-installed storage and server components in a single package. The innovative shipping box simply opens and allows for quick setup while leaving the servers and storage readily accessible in the Packaged Cluster 8U fixture. Colorful configuration and setup guides quickly explain the process of connecting storage, networking and power cables. Once initial setup has been completed, the Packaged Cluster may be quickly re-packaged for deployment at another site or facility, or simply removed from the 8U Packaged Cluster fixture and installed in an HP rack with the enclosed universal rail kits.

The MSA1000 combines the array controller shelf and the drive shelf, which holds up to fourteen 1" universal disk drives in a single 4U rackmount cabinet. More storage can be easily deployed with the addition of up to two HP StorageWorks MSA30 disk enclosures with space for forty-two drives giving maximum storage capacity of 12 TB when using 300 GB drives. The Packaged Cluster may be used with Microsoft Windows® Server 2003, Windows 2000, and Linux operating systems for standard and clustered configurations. The performance and scalability of the MSA1000 allows for up to 18 additional ProLiant servers to be connected providing maximum return on investment and minimal storage management costs.

Modular Smart Array 500 G2

The Modular Smart Array 500 G2 is a simple and reliable RAID storage system for enterprise remote offices, distributed computing environments and medium business. Built upon reliable and high performance Smart Array technology the Modular Smart Array 500 G2 offers customers flexibility to cluster servers or share storage for improved storage utilization. The 2nd generation MSA500 system incorporates end-to-end Ultra320 SCSI technology and delivers best-in-class performance and rapid drive rebuild technology. It supports up to 14 HP Universal disk drives and is expandable with an in-

place upgrade to the MSA1000. The new Modular Smart Array 500 G2 system adds support for 4-node clusters and a combined cluster and storage sharing environment.







ProLiant High Availability Clusters

ProLiant High Availability – continuous, reliable, and secure operations for the volume enterprise.

Clusters for Microsoft

High Availability Clusters for Microsoft provide full storage support (SCSI to Fibre Channel), support of two to four Node Microsoft Cluster Server, Disaster Tolerant Stretch Cluster, and deployment flexibility utilizing cluster kits. ProLiant Cluster products for Microsoft Windows are available with cluster features and documentation that increase functionality and availability, support for OpenView Storage Mirroring v4.4, and ProLiant server certifications.

Table 6. Microsoft Clusters

Product	Picture	First model introduced
ProLiant DL380 G4 Packaged Cluster with MSA500 G2		August 2004
ProLiant DL380 G4 Packaged Cluster with MSA1000		November 2003
ProLiant Cluster F200 for the Entry-Level SAN		May 2004
ProLiant Cluster F500 for the Enterprise SAN		May 2004
ProLiant Cluster HA/F500 for Enhanced DT Solution		August 2000
ProLiant Cluster HA/F500 for Enterprise Virtual Array		September 2001

ProLiant Cluster F200 for the Entry Level SAN

The ProLiant Cluster F200 for the Entry Level SAN is designed to assist in simplifying the configuration of cluster solutions that provide high levels of data and applications availability in the Microsoft Windows Operating System environment through clustering to provide no-single-points-of-failure. The ProLiant Cluster F200 for the Entry Level SAN supports a two-node cluster based on Microsoft Windows 2000 Advanced Server and two to eight-nodes cluster based on Microsoft Windows Server 2003 Enterprise Edition operating system, the StorageWorks Modular Storage Array (MSA1000 or MSA1500 cs) or RAID Array or RA4100, and ProLiant servers. This solution also supports StorageWorks Secure Path management software.

Customers that require HP StorageWorks SecurePath 3.1c to upgrade a ProLiant Cluster F200 Cluster from Microsoft Windows 2000 Advanced Server to Microsoft Windows Server 2003 must purchase the ProLiant Cluster F200 for the Entry Level SAN cluster kit. The Part number required is 364026-B21 & 291(JPN). This kit contains two (2) SecurePath 3.1c licenses for the RA4100 and two (2) SecurePath licenses for the MSA1000/MSA1500 cs.

ProLiant Cluster F500 for the Enterprise SAN

The ProLiant Cluster F500 for the Enterprise SAN is designed to assist in simplifying the configuration of cluster solutions that provide the highest level of data and applications availability in the Windows Operating System environment through clustering to provide no-single-points-of-failure. It has also been tested to support Disaster Tolerant cluster solutions in which the nodes can be up to 100 Km apart through the use of switch fabric, dark fibre or ATM links, and StorageWorks Continuous Access EVA software option, purchased as part of the storage subsystem. This configuration can also take advantage of the cluster in that the nodes can fail over from the local site to the remote site, and provide for Disaster Recovery in a matter of minutes not hours or days.

High availability is achieved by the fact that the servers in the network take over for each other in the event of hardware or software failure. The ProLiant Cluster F500 for the Enterprise SAN can be configured with no-single-points-of-failure. This is accomplished through the use of dual server to storage connectivity (two HBA's per server, two switches, and dual RAID controllers in the storage subsystem), and the installation of Secure Path software in the servers to manage the HBA fail over.

ProLiant Cluster HA/F100 and HA/F200 – RA4100 (discontinued)

The ProLiant Cluster HA/F100 for RA4100 uses HP's industry-leading HP ProLiant server products, StorageWorks RAID Array 4100, Ethernet interconnect and HP's leading installation and systems management utilities. The ProLiant Cluster HA/F100 uses the industry-standard Microsoft Cluster Server software for cluster operation and management. This solution provides a single path connection between the HP ProLiant Servers and the RA4100, with a fibre channel hub, FC-AL switch, or Fabric Switch, creating an affordable entry-level fibre channel high availability configuration. The cluster kit, which HP offers for the HA/F100, contains detailed installation documentation and a 10 foot Ethernet interconnect cable for heartbeat connection between server nodes.

The ProLiant Cluster HA/F200 for RA4100 also uses HP's industry-leading ProLiant servers, StorageWorks RAID Array 4100, Ethernet server to server interconnect, and HP's industry-leading installation and systems management utilities. The HP ProLiant Cluster HA/F200 for RA4100 delivers a higher level of availability in clusters by enabling dual path fibre channel connections. SANworks Secure Path management software (Secure Path v3.1c) is included only in the HA/F200 for RA4100 kit. It features support for a redundant fibre channel infrastructure (two paths through the fibre channel hub, FC-AL switch, or Fabric Switch). SecurePath utilizes dual Host-Bus-Adapters in each server connected to one or more RA4100 storage subsystems, each with dual RAID controllers that creates a configuration with higher levels of availability than a single path configuration.

ProLiant Clusters HA/F100 and HA/F200 - MSA1000 (discontinued)

ProLiant Cluster solutions provide high availability for applications and data in a business-critical environment. The ProLiant Cluster HA/F100 for MSA1000 utilizes HP's industry-leading HP ProLiant server products, StorageWorks Modular SAN Array 1000, Ethernet interconnect and HP's leading installation and systems management utilities. The ProLiant Cluster HA/F100 utilizes the industry-standard Microsoft Cluster Server software for cluster operation and management. This solution provides a single path connection between the HP ProLiant Servers and the MSA1000, with a fibre channel port mini-hub, and embedded 6-Port SAN switch or fabric switches, creating an affordable entry-level fibre channel high availability configuration. The cluster kit, which HP offers for the HA/F100, contains documentation and a 10' Ethernet interconnect cable for heartbeat connection between server nodes.

The ProLiant Cluster HA/F200 for MSA1000 also uses HP's industry-leading ProLiant servers, StorageWorks Modular SAN Array 1000, Ethernet server to server interconnect, and HP's industry-leading installation and systems management utilities. The HP ProLiant Cluster HA/F200 for MSA1000 delivers a higher level of availability in clusters by enabling multi-path fibre channel connections. SANworks Secure Path management software by HP, included with the kit, features support for a redundant fibre channel infrastructure (two paths through the fibre channel 3 port mini-hub, Embedded 6-Port SAN switch or fabric switches) utilizing dual Host-Bus-Adapters in each server connected to one or more MSA1000 storage subsystems, each with dual RAID controllers that creates a configuration with no single point of failure. HP also provides a cluster kit for the F200, which contains the software components that are required to connect two HP servers and HP Fibre Channel Storage systems together in a cluster, along with documentation and an interconnect cable.

The StorageWorks Modular SAN Array 1000 is a 2 GB Fibre Channel storage system designed for the entry level to mid-range Storage Area Network (SAN). Designed to reduce the complexity, expense and risk of SAN deployment, the MSA1000 is a scaleable, high performance storage system built with investment protection in mind. The modular design of the MSA1000 allows the user to easily add storage capacity on an as needed basis. Both solutions allow the customer to implement their server/storage consolidation strategy with confidence. This is done by allowing up to three 2-node clusters to share one MSA1000.

ProLiant Cluster HA/F500 for MA8000 / EMA12000 / EMA16000 (discontinued)

The HP ProLiant Cluster HA/F500 is a cluster solution made up of a ProLiant HA/F500 Cluster Kit, high end or high density ProLiant Servers, StorageWorks MA8000/EMA12000/EMA16000 or RA8000/ESA12000 storage systems, and a Windows cluster capable operating system. The hardware components are connected by a Fibre Channel infrastructure. The server nodes are connected together via a dedicated Ethernet connection for heartbeat monitoring, or in the case of multi-node clusters (Data Center Server and Windows Server 2003 only) through the network. The Microsoft NT/EE (Enterprise Edition), Windows 2000 Advanced Server, Windows Server 2003 or Data Center Server operating system manages the fail over at the application level in the case of failure. Clients are connected to the servers via a network connection, and see the servers as a single system image.

High availability is achieved by the fact that the servers in the network take over for each other in the event of hardware or software failure. The HA/F500 Cluster can be configured with no-single-points-of-failure. This is accomplished through the use of dual server to storage connectivity (two HBA's per server, two switches, and dual RAID controllers in the storage subsystem), and the installation of Secure Path software in the servers to manage the HBA fail over.

ProLiant Cluster HA/F500 for Enhanced DT Solution

As customer applications and data access become business critical, the requirement for the highest levels of availability with no single points of failure, and the ability to maintain data access and application processing in case of a site disaster is a problem that needs to be solved. In the Windows

2000/NT environment, by combining the strengths of industry standard Microsoft Cluster Server (MSCS) with highly resilient ProLiant servers and StorageWorks RA8000/ESA12000 and MA8000/EMA16000 fibre channel storage subsystems, and software this problem can be solved. The ProLiant Cluster HA/F500 Enhanced DT Solution satisfies both availability and disaster recovery.

The ProLiant Cluster HA/F500 Enhanced DT solution is a two node cluster based on Microsoft Windows 2000/NT Server 4.0 Enterprise Edition, ProLiant servers, StorageWorks RA8000/ESA12000 and MA8000/EMA16000 storage subsystem, StorageWorks Data Replication Manager (DRM) software, and StorageWorks Secure Path software.

This solution combines the failover functionality of MSCS (Microsoft Cluster Server) with the remote data mirroring functionality of DRM, and allows for a distance of up to 100 km between the server nodes and up to 100 km between a primary (local) external storage system, and a mirrored (remote) external storage system. The server to storage interconnect is based on fibre channel switch, short and long wave fibre interconnect, and the server to server communication is over Ethernet and/or FDDI connections.

ProLiant Cluster HA/F500 for Enterprise Virtual Array (discontinued)

HP ProLiant HA/F500 for EVA is a scalable and reliable enterprise cluster powered by ProLiant Servers and StorageWorks Enterprise Virtual Arrays ensuring always on operations of your mission critical applications. The HP ProLiant Cluster HA/F500 for Enterprise Virtual Array is a cluster solution made up of a ProLiant HA/F500 Cluster Kit, high end or high density ProLiant Servers, StorageWorks Enterprise Virtual Array storage systems, and a Windows cluster capable operating system. The hardware components are connected by a Fibre Channel infrastructure. The server nodes are connected together via a dedicated Ethernet connection for heartbeat monitoring.

The Microsoft NT/EE (Enterprise Edition), Windows 2000 Advanced Server or Windows Server 2003 operating system manages the failover at the application level in the case of failure. Clients are connected to the servers via a network connection, and see the servers as a single system image.

This cluster solution is made up of a ProLiant HA/F500 Cluster Kit, high end or high density ProLiant Servers, StorageWorks Enterprise Virtual Array storage systems, and a Windows cluster capable operating system.

The ProLiant Cluster HA/F500 for Enterprise Virtual Array provides an environment in which downtime is significantly reduced or eliminated with regards to applications and data access.

The ProLiant Cluster HA/F500 for EVA Enhanced DT solution will support two-node clusters based on Microsoft NT4 EE, two-node clusters based on Microsoft Windows 2000 Advanced Server and two to eight-node clusters based on Microsoft Windows Server 2003 Enterprise Server, ProLiant Servers, StorageWorks eva3000 or eva5000 storage subsystem, StorageWorks Continuous Access EVA software, and StorageWorks Secure Path software.

ProLiant Cluster Kit with OpenView Storage Mirroring

The ProLiant Cluster Kit with OpenView Storage Mirroring is designed to assist in simplifying the configuration of cluster solutions for customers that require a cost effective disaster recovery alternative. This solution provides high levels of data and applications availability in the Microsoft Windows Operating System environment through clustering to provide no-single-points -of-failure. The ProLiant Cluster Kit with OpenView Storage Mirroring supports a two-node cluster based on Microsoft Windows 2000 Advanced Server and two to eight-nodes cluster based on Microsoft Windows Server 2003 Enterprise Edition operating system, the StorageWorks Modular Storage Array (MSA1000 or MSA1500 cs with MSA20 or MSA30 attached) and ProLiant Servers. This solution also provides replication capabilities to make one or more copies of the cluster data. Replication can take place between a cluster and standalone configuration or between two clusters.

Figure 20. HP OpenView Storage Mirroring



ProLiant Cluster Starter Kit

The ProLiant Cluster Starter kit is a ProLiant cluster "How-to Guide" that includes documentation for ProLiant Clusters that use StorageWorks MSA1000, MSA1500 cs RA4100, EVA5000, EVA3000, MA8000, & EMA12000. The kit also includes multimedia with animation to illustrate the actual components required to build a Fibre Channel Cluster & two 30-day trial licenses of OVSM (Note: This Kit does not include SecurePath Software)

Clusters for Novell

HP has fully qualified clusters for Novell's NetWare environment ranging in size from two to twelve nodes. This allows configurations to be deployed with the highest levels of computing power and with the greatest flexibility and efficiency for industry standard clustered environments. ProLiant NetWare Clusters are comprised of standard HP ProLiant and HP StorageWorks Fibre Channel System components. Support is also available for NetWare Clusters on the StorageWorks MSA1000 and StorageWorks EVA3000 and EVA5000. The Secure Path redundancy manager provides an additional level of protection by eliminating the potential for failures in the path from storage to servers.

Table 7. Novell NetWare Clusters

Product	Picture
ProLiant Cluster for Netware MSA1000	
ProLiant Cluster for NetWare EVA	
ProLiant Cluster for NetWare MA8000	

ProLiant Clusters HA/N100 and HA/N200 – RA4100 (discontinued)

ProLiant Clusters for NetWare were a high availability solution comprised of ProLiant Servers, StorageWorks Storage Arrays, NetWare NOS (5.1 and 6) and Novell Cluster Services software. These clusters were two to twelve node industry standard cluster solutions for NetWare 5.1 and NetWare 6 that provided high levels of uptime and performance for critical business requirements. This allowed configurations to be deployed with the highest levels of computing power and with the greatest flexibility and efficiency for industry standard clustered environments.

ProLiant NetWare Clusters were comprised of standard ProLiant and StorageWorks Fibre Channel System components. The Secure Path redundancy manager provided an additional level of protection by eliminating the potential for failures in the path from storage to servers.

ProLiant NetWare Clusters are qualified for up to twelve node clusters. When compared to smaller numbers of cluster nodes, this allows much better utilization of resources when planning for a failover environment.

ProLiant Cluster HA/N500 – MA8000 (discontinued)

ProLiant Clusters for NetWare were a high availability solution comprised of ProLiant Servers, StorageWorks Storage Arrays, NetWare NOS (5.1 and 6) and Novell Cluster Services software. These clusters were two to twelve node industry standard cluster solutions for NetWare 5.1 and NetWare 6 that provided high levels of uptime and performance for critical business requirements. This allowed configurations to be deployed with the highest levels of computing power and with the greatest flexibility and efficiency for industry standard clustered environments.

ProLiant NetWare Clusters were comprised of standard ProLiant and StorageWorks Fibre Channel System components. The Secure Path redundancy manager provided an additional level of protection by eliminating the potential for failures in the path from storage to servers.

ProLiant NetWare Clusters were qualified for up to twelve node clusters. When compared to smaller numbers of cluster nodes, this allowed much better utilization of resources when planning for a failover environment.

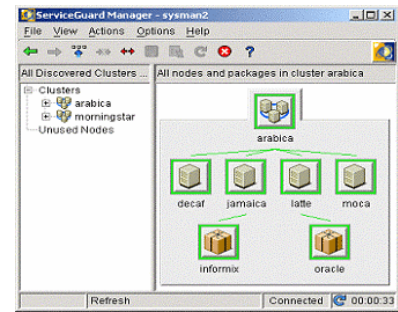
Clusters for Linux

High Availability Clusters for Linux include features such as full storage support (SCSI to Fibre Channel) utilizing HP Serviceguard for Linux, support from two to sixteen nodes, and support of SuSE and Red Hat. HP also works with SteelEye to certify their LifeKeeper product to offer customers a choice between HP's own solution or a partner product that supports third-party hardware.

HP Serviceguard for Linux ProLiant Cluster

Introduced in November 2001, HP Serviceguard for Linux is a high availability solution that leverages the strength of HP's experience in the HA business, bringing the best-in-class mission critical HP-UX technologies to the Linux environment for both ProLiant and Integrity servers. The product includes high availability software that provides critical applications the high availability that enterprise customers require for 24x7 business operations. It is designed to protect applications from a wide variety of software and hardware failures, monitoring the health of each server (node) and quickly responding to failures including system processes, system memory, LAN media and adapters, and application processes. Serviceguard Manager provides an intuitive GUI interface for configuration, administration and monitoring that integrates with Systems Insight Manager and OpenView.

Figure 21. Serviceguard screenshot



Serviceguard for Linux enables customers to cluster HP ProLiant or Integrity server families of with shared storage from HP Smart Array Cluster Storage to HP StorageWorks or EMC disk arrays in a two- to four-node SCSI (IA-32 only) or two to sixteen-node Fibre Channel configuration.

By selecting HP's own high availability product, customers are assured of full solution accountability from a single vendor with a history of supporting mission-critical environments. Complementary products include full range of support offerings, consulting services, disaster tolerance with HP StorageWorks Cluster Extension, and simplification of integration with a range of contributed toolkits for leading Linux applications as well as others available for SAP and Oracle databases.

SteelEye LifeKeeper for Linux certifications

SteelEye's LifeKeeper for Linux Version 4.2 is an enterprise-grade clustering solution that ensures continuous availability of critical business applications, servers, and data. It offers configuration flexibility through support for sixteen or more clustered Intel based servers, Linux distributions, SCSI storage, Network Attached Storage, and Fibre Channel-based Storage Area Networks (SANs). Plug-and-play integration and intuitive Java-based GUI enable IT managers to easily implement automated fault monitoring and recovery to ensure round-the-clock availability of applications.


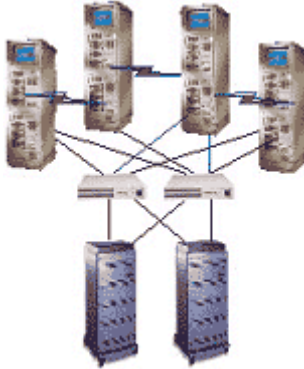

LifeKeeper also offers enterprises consistent reliability management across a variety of computing environments to protect all of their critical applications running on Linux, Windows NT, Windows 2000, and Solaris platforms.

HP works with SteelEye to certify LifeKeeper use around high volume ProLiant DL360 G3, ProLiant ML350 G3, ProLiant ML370 G3, ProLiant DL380 G3, and the ProLiant DL580 G3 clustered servers with RA4100 Storage, MSA1000 as well as the ProLiant DL380 G2 and G3 Packaged Cluster.

Clusters for Oracle

The HP Parallel Database Clusters (PDC) for Windows and Linux are multi-node shared storage clusters, specifically designed, tested and optimized for Oracle Real Application Cluster (RAC) databases on Microsoft Windows or Linux operating systems. These platforms have evolved through years of joint engineering work with Oracle. They hold every Oracle TPC-C performance record between 1999 and 2003 and clear market leadership in production deployments worldwide. To ensure trouble free implementation of these solution stacks, HP provides the Parallel Database Cluster Kits. These kits provide the documentation, tools and support necessary to ensure success.

Table 8. Oracle Clusters

Product	Picture
Parallel Database Cluster for Oracle Real Application Clusters on Linux	
PDC/O2000- MSA1000 for Oracle RAC	
PDC/05000-EVA for Oracle RAC	

PDC for Red Hat Linux Real Application Cluster

The HP Parallel Database Cluster for Red Hat Linux RAC is a multi-node shared storage configuration cluster optimized for Oracle9i Real Application Clusters running in the Linux environment. This solution delivers high availability and scalability for Oracle database environments, at a much lower total cost of ownership than traditional mid-range UNIX solutions.

The Parallel Database Cluster is designed to simplify and accelerate initial startup so customers can focus their resources on the complex issues of data migration, security, and recovery.

PDC/O2000 - MSA1000 for Oracle Real Application Cluster

The HP Parallel Database Cluster Model PDC/O2000-MSA1000 for Oracle9i Real Application Cluster (PDC/O2000-MSA1000) delivers high availability and scalability of Oracle database environments, using industry-standard components and software. It provides significantly improved uptime and lower operating costs than multiple single-server database implementations, and lower hardware, maintenance, and support costs.

Since the PDC/O2000-MSA1000 cluster solution is based on industry standard hardware, it can be implemented at a much lower cost, without compromising availability, making it the perfect solution for business critical applications such as data warehousing, Web back-end databases, custom database application development, packaged applications and database migration from other platforms.

This high availability solution is backed by a portfolio of HP enterprise class services and support offerings, including guaranteed up time, to give customers greater reassurance that HP will continue to provide them with the broadest range of solutions necessary to keep critical information and applications available whenever needed.

The HP PDC/O2000-MSA1000 delivers reliable and cost effective enterprise clusters with NSPoF SAN provide high availability for critical database applications. Concurrent Oracle database access across the cluster allows high performance and scalability across multiple clustered servers.

PDC/O5000-EVA for Oracle Real Application Cluster

The HP Parallel Database Cluster Model PDC/O5000-EVA for Oracle Real Application Clusters with Enterprise Virtual array (PDC for EVA) on Microsoft Windows delivers high availability and scalability of Oracle database environments, using industry-standard components and software. It can be implemented at a much lower cost compared to legacy systems, without compromising availability, making it the perfect solution for business critical applications such as data warehousing, web back-end databases, custom database application development, and packaged applications like PeopleSoft.

The StorageWorks Enterprise Virtual Array (EVA) is the newest generation of the StorageWorks Disk Array that is enabled by VersaStor technology. EVA is a high performance, high capacity and high availability "virtual" RAID storage solution for the high-end enterprise class marketplace that removes the time, space and cost boundaries of traditionally architected storage. EVA is designed for the data center where there is a critical need for improved storage utilization and scalability while meeting application specific demands for consistently high transaction I/O and MB data rate performance, seamless capacity expansion, instantaneous replication, and simplified storage administration.

The PDC for EVA supports both the HP StorageWorks Enterprise Virtual Array 3000 (eva3000) and the HP StorageWorks Enterprise Virtual Array 5000 (eva5000).

High Performance Compute Clusters LC series

The HP High Performance Compute Cluster LC series is an affordable, certified solution suite that delivers on the HP's High Performance Computing strategy for industry standard servers and storage. The LC Series is comprised of HP ProLiant servers, server accessories, HP Procurve switches, Myricom and Cyclades devices and switches designed and integrated into a common hardware solution. This hardware configuration can be combined with optional certified partner application solution stacks spanning both ProLiant IA32 Xeon DP and AMD Opteron 200 hardware configurations providing a turn-key solution.

The LC Series consists of three, 32 Node solution choices: 1) The LC1000 Series is deal for the cost-conscious business and consists of the ProLiant DL380 base control node and 32 ProLiant DL140 base compute nodes. 2) The LC2000 Series is designed for enterprise businesses and consists of the ProLiant DL380 base control node and 32 ProLiant DL360

Figure 22. HP High Performance Compute Cluster LC series



base compute nodes. 3) The LC3000 Series - Optimized for performance minded customers who are interested in 32 to 64 bit scale up, the LC3000 Series consists of the ProLiant DL380 base control node and 32 ProLiant DL145 base compute nodes.

The LC Series supports over 100 additional certified configurations orderable from HP. These certified configurations can be ordered using the LC Series Design and Configuration Guide and will provide the same turn-key solution. In addition, customers can extend LC Series solutions with optional factory-installed and tested software as well as doing further customization like adding their own software or changing components and additional services. This can be handled using the LC Series basic guide and modifying customers' configuration or by using our HP Integration Center staff to assist you in developing your custom solutions. Customers also have the option of having their own software installed and tested by HP or ordering select software offerings through HP Consulting and Integration Services.

High Performance Computing

HP Cluster Platform Express

In September 2005, HP introduced a faster, easier way to configure and order single-rack cluster solutions. Customers can select from a menu of popular cluster components, which are then factory assembled into pre-defined configurations with optional software installation. Rapid and simple configuration design reduces integration costs while shortening time-to-deployment.

HP ProLiant High Performance Computing Partner Software Suite

The HP ProLiant High Performance Computing (HPC) Partner Software Suite is a software suite of offerings that address customer needs in building and maintaining a high performance computing environment. The product suite consists of development tools and migration utilities which can be used to migrate applications from existing architectures into a clustered or a distributed computing environment depending on customer need and design. Compilers and communications libraries are offered, as well as, performance monitoring, checkpoint restart and job management utilities. In addition, a series of Grid Resource Management tools are available used to link high performance computing clusters and other independent IT resources which can span across industries from manufacturing, electronic design automation, digital content creation, and financial services. This type of Resource Management offering is designed to support local or geographic distributed computing configurations including mixed OS configurations where Mobile computing, desktops, workstations, servers, and cluster technology all interoperate to solve a customer need.

This suite of infrastructure and distributed resource management products, based on a select range of partner applications and tools, is designed to make implementation and operation of a high performance computing environment efficient and easy to manage and extend, reducing time to start up and operation improving customer TCO. The ProLiant HPC Partner Software Suite is designed to be plug-and-play:

The ProLiant High Performance Computing Partner Software Suite extends its partner software offering with support for Red Hat Enterprise Linux 4 - 8 Pack Support for Cluster Platform Compute Nodes, additional DataSYnapse Grid Bundles supporting 64 and 128 Node clusters and PolyServe Premium Support offerings for PolyServe single server and single server deployment kit offerings. In addition, the introduction of HP MPI Library support previous only on HP-UX clusters is now available on ProLiant servers for both Red Hat and Novell SuSE Linux implementations.

ProLiant Hardware Options

ProLiant NICs

HP was among the first server providers to offer dual-port adapters, which increase port density and save valuable I/O slots. In 1992, the company shipped the NetFlex-2 DualPort ENET Controller, and in 1996, introduced a dual port 10/100 Ethernet NIC, the Dual 10/100 TX PCI UTP adapter. The following year HP shipped dual port adapters for FDDI, and in August of 1998, shipped the NC3122 PCI Dual 10/100 adapter. Also in 1998, the company introduced a revolutionary dual port product, the NC3131 10/100 adapter, which allowed users to double port density by installing a dual port NC3132 daughter card, thereby providing four 10/100 ports in a single PCI slot. These products were updated as the NC3134 and NC3135 in 2000. In 2003, HP then followed the dual port Fast Ethernet line with a pair of dual port Gigabit server adapters, the NC6170 for fiber-optic environments, and the NC7170 for twisted-pair environments. This rich heritage makes HP a leader in multi-port NICs.

In late 2004, HP introduced its first PCI Express Gigabit server adapter for ProLiant servers supporting PCI Express bus architecture.

In December 2004, HP introduced a line of HP InfiniBand options, a comprehensive and easy to integrate solution can be created for a variety of HP platforms including 2-way to 4-way ProLiant DL servers. Supported options on ProLiant DL include the NC571C PCI Express Dual-port 4x Fabric Adapter, NC570C PCI-X Dual-port 4x Fabric Adapter, a HP 24-Port 4x Fabric Copper Switch, and a variety of InfiniBand cables.

For a list of current offerings, visit www.hp.com/servers/networking.

ProLiant storage options

HP offers a wide range of [storage options for ProLiant servers](#) including hard drives, the MSA family of products, Smart Array Controllers, Host Bus Adapters, racks and rack options, power protection, and tape storage.

Part of the MSA family and introduced in June 2003, the HP Modular Smart Array 30 Enclosure is an HP Ultra320 SCSI disk drive storage enclosure that delivers industry-leading data performance, availability, storage capacity, and upgradeability to meet demanding and growing storage needs.

HP has produced many innovative rack solutions which include the TFT5600 rack mounted keyboard and monitor (RKM) and the HP IP console switch. Introduced in 2001, the TFT5600 RKM was Compaq's first 1U integrated keyboard and monitor. Today, HP continues to ship this advanced space saving RKM product featuring a high resolution 15" TFT panel, hot keys, and a full sized keyboard for ease of use. Since September 2002, the HP IP console switch has provided keyboard, video and mouse (KVM) connections to 16 direct attached servers. This solution provides KVM access to any server with standard PS2 keyboard, video, and mouse connection allowing a single switch to support a variety of device brands from one local console or over a LAN.

For years, HP has provided Uninterruptible Power Systems (UPSs) featuring Enhanced Battery Management (EBM) that doubles battery life with more efficient charging, Extended Runtime Modules (ERMs) that add extra back up run time, Digital Signal Processing (DSP) that allows for more battery with greater run times, free management software, more power (watts) per U, and a 3 year warranty versus the 2 years offered by key competitors. UPSs are available in [rack](#) and [tower](#) models. In addition to UPSs, HP offers a family of [Power Distribution Units \(PDUs\)](#).

ProLiant server management software

ProLiant Essentials is a portfolio of modular, flexible software tools that expands the capabilities of ProLiant servers, extends the reach and breadth of server manageability, and enhances the build out of an Adaptive Enterprise by lowering overall lifecycle costs and reducing demands on IT resources. By redefining and extending ProLiant value throughout the service life of your server, ProLiant Essentials resolves today's IT challenges.

Table 9. Innovative features found in HP server management software

Feature	Description	Proof point
Foundation Pack	<p>The ProLiant Essentials Foundation Pack contains the essential software every customer needs to install, configure, and manage ProLiant servers as part of an adaptive infrastructure.</p> <p>Included with every ProLiant server, the Foundation Pack includes: HP Systems Insight Manager, System Management Homepage, and the Support Pack Remote Deployment Utility (RDU), as well as the latest ProLiant support software.</p>	<p>The convenience of having a single source of essential server software is further extended by including customer access to regular updates and enhancements available on the HP website, as well as by direct shipment to customers who participate in one of several optional subscription services.</p>
HP Systems Insight Manager (HP SIM)	<p>HP Systems Insight Manager forms the foundation of HP's server management strategy and is a key component of HP's industry-leading management portfolio.</p> <p>HP Systems Insight Manager 5.0 and later extends on existing management capabilities for ProLiant with a new management environment for BladeSystem servers and support for network storage devices including SAN and NAS. Advanced storage provisioning, chargeback and usage reporting capabilities are available through the Storage Essentials add on products.</p>	<p>Included as a standard component of SIM, the HP BladeSystem Integrated Management console centralizes access to blade server deployment, configuration, and monitoring tools for HP BladeSystem.</p> <p>All ProLiant Essentials products are tightly integrated. The ProLiant Essentials include Vulnerability and Patch Management, Virtual Machine Manager, Rapid Deployment Pack, Integrated Lights-Out, Performance Management Pack, and Intelligent Networking Pack.</p>
System Management Homepage	<p>The system management homepage provides a consolidated view of all system health and configuration information and simplifies access to HP Web-enabled System Management software running on your ProLiant server.</p> <p>The system management homepage displays critical management information through a simple, task-oriented user interface. All system faults and major subsystem status are reported within the initial view.</p>	<p>It helps systems administrators rapidly respond to potential and actual system failures, increases system stability, and reduces troubleshooting complexity.</p> <p>The tab-based interface and menu structure provide one-click access to server logs and configuration wizards as well as other ProLiant Essentials software.</p>
HP BladeSystem Integrated Management	<p>The HP BladeSystem Integrated Management environment is installed automatically with any Systems Insight Manager (SIM) installation of 4.2 or later. This integrated management environment builds on the current leading capabilities in SIM for managing blades, including automatically-generated, interactive blade system rack views.</p> <p>The HP BladeSystem management environment works seamlessly within the expanding HP Systems Insight Manager environment, including ProLiant Essential Value Packs and third party plug-ins to SIM.</p>	<p>This environment enables users to quickly navigate their HP blade environments including enclosure infrastructure, racks, and integrated switches via hierarchical tree view listings. Users are able to conveniently configure, deploy, and manage individual or groups of blade systems. Additionally, users are able to quickly set up logical groups of blade systems for convenient management and control.</p>
Integrated Lights-Out	<p>Integrated Lights-Out (iLO) virtualizes ProLiant system resources over a network so you are always in control as if at-the-server. iLO Standard provides basic remote management features standard with ProLiant servers.</p> <p>The optional iLO Advanced provides key-activated features that enable remote access to system console</p>	<p>These "do-it-yourself" capabilities enable industry leading remote management of ProLiant servers anywhere, anytime from a secure, standard Web browser, command line or script.</p> <p>The iLO Advanced solution increases security by integrating iLO user identity management</p>

Feature	Description	Proof point
	with full keyboard and mouse control during any server state. iLO Advanced also allows administrators to maintain system firmware or run diagnostics on remote servers from an image on a workstation floppy or CD drive or network web server.	with Microsoft Active Directory, Novell eDirectory or advanced two-factor authentication. iLO delivers remote management simplicity and agility that lowers operational costs, improves IT productivity, and increases system availability.
Integrated Lights-Out 2	<p>HP Integrated Lights-Out 2 (iLO 2) is the fourth generation of Lights-Out management technology which extends HP's undisputed leadership in delivering innovative and standards based remote management. iLO 2 is available in two forms, iLO 2 Standard and iLO 2 Advanced. iLO 2 Standard provides basic system board management functions, diagnostics and essential Lights-Out functionality as standard features on supported ProLiant servers.</p> <p>iLO 2 is now available for the HP ProLiant ML310 G3 by purchasing the existing HP ProLiant Essentials Integrated Lights-Out Advanced Pack. The Advanced Pack provides a license key to activate powerful remote management features to install, configure, monitor, update, and troubleshoot and secure remote ProLiant servers anywhere, anytime from a standard Web browser, command line or script.</p> <p>Lights-Out technology has resulted in reduced operational costs and increased availability on millions of ProLiant servers since its introduction eight years ago.</p>	<p>With iLO 2, you can perform virtually any system administration or maintenance task remotely as if you were at the server using its keyboard, mouse and monitor, power button and floppy, CD or USB key whether or not the server is operating.</p> <p>iLO 2 Advanced provides advanced remote administration functionality as a licensed option and delivers the industry's most complete, high-performance, out-of-band remote management solution. With new Virtual KVM performance, iLO 2 Advanced now provides all of the capabilities required for administrative or maintenance tasks from a single remote console. iLO 2 Advanced provides true in-front-of-the-server control of systems located in datacenters or remote locations from the office, home or travel location. This eliminates unnecessary travel and increases IT efficiency and responsiveness. Now IT customers have a single remote management and control solution.</p>
Intelligent Networking Pack (INP) Windows Edition and Intelligent Networking Pack (INP) Linux Edition	The ProLiant Essentials Intelligent Networking Pack (INP), an innovative networking product designed and developed by HP provides ProLiant servers advanced redundancy and optimum load balancing. These advanced teaming features enhance standard or basic teaming by providing network-aware intelligence to the ProLiant servers. Besides keeping the network reliable, INP can reduce virus threats before they spread to the entire network.	<p>INP Windows Edition enables the ProLiant servers to intelligently and proactively determine the best teamed NIC ports to use based on connectivity. For example, if a lost connection is detected beyond the first layer of switch, it will fail over to the secondary port. It can also determine which teamed port is the optimal port to use for the best network connectivity to the server. Virus Throttle in INP Windows Edition and Linux Edition provides an extra layer of protection against fast spreading and unknown viruses. Virus Throttle does not require knowledge of individual viruses avoiding the need for signature updates.</p> <p>These are just some examples of INP's benefits. For more information, visit www.hp.com/servers/proliantessentials/inp</p>
Performance Management Pack	Performance Management Pack (PMP) is an integrated performance management solution that detects and analyzes hardware bottlenecks on HP ProLiant servers. No software installation on the monitored servers is required, other than the Insight Management Agents.	PMP analyzes performance information to determine if there is a building or existing performance bottleneck issue. You can interactively display this information, log the information to a database for later analysis or reporting, and set up proactive notification using the HP SIM notification mechanism
Rapid Deployment Pack and Rapid Deployment Pack Linux Edition	<p>Rapid Deployment Pack is a server deployment solution that facilitates the configuration and deployment of high-volumes of servers via a web-based console. It integrates the powerful SmartStart Scripting Toolkit with a robust deployment engine.</p> <p>Rapid Deployment Pack – Windows Edition Release offers tight integration with HP Systems Insight Manager (version 4.2 or later), such that un-deployed</p>	<p>This deployment solution provides a fast, easy, point-and-click method for deploying servers from a central deployment management console. Through the console, you can deploy servers using imaging or scripting scaling server deployments to high volumes in rapid fashion.</p> <p>Every new installation (download free at URL</p>

Feature	Description	Proof point
	servers are listed in HP SIM, and deployment jobs can be initiated from HP SIM.	below) comes with a built-in 7-day, 10-server trial license. This trial license can be expanded within 30 days by going to www.hp.com/servers/rdp .
Red Hat Enterprise Linux and management bundle for HP BladeSystem	Red Hat Enterprise Linux and management bundle for HP BladeSystem combines multiple instances of RHEL4 OS and Red Hat Management & Provisioning software – all under one subscription number. The modules manage the complete life cycle of a Linux infrastructure. HP BladeSystem Integration Toolkit for RHN includes automatic detection and configuration tools supporting the Integrated Lights Out (iLO) for remote management, incorporated into Red Hat Network.	HP includes tools specifically developed for Red Hat Network (RHN) to ease deployment of multiple servers within an HP BladeSystem enclosure. The RHN architecture contains management tools to help administrators keep systems up-to-date with the latest Red Hat security patches and errata changes and allow for rapid provisioning of HP BladeSystem servers as additional blades are brought online.
Server Migration Pack (SMP)	Server Migration Pack automates the manual processes required for migrating servers between physical or virtual platforms (P2V, V2P, and V2V), allowing you to easily move servers to appropriate physical or virtual platforms that meet performance and capacity requirements	SMP accelerates server consolidation, client consolidation and disaster recovery projects by automating the migration of servers between physical and virtual platforms
Support Pack Remote Deployment Utility (RDU)	The ProLiant Support Pack Remote Deployment Utility (RDU) remotely deploys driver and management agent updates to network attached servers and can be operated from an IT administrator's workstation. The Remote Deployment Utility is specifically designed to work with ProLiant Support Packs (PSPs). In addition to the graphical RDU interface, the Remote Deployment Utility Console is a command line interface that allows for scripted installation of ProLiant software components including individual software components from HP, such as the Online ROM Flash Components.	This Remote Deployment Utility lowers the overall cost of system software maintenance, by providing an efficient way for IT administrators to manage deployments of system software updates. This utility simplifies the software update process by deploying from a central software repository. The RDU provides a convenient way to browse a network directory or central software repository for a particular version of the PSP, which in most corporate IT environments, is one that has been standardized on for maintaining consistent server software configurations.
ProLiant Support Pack Linux Deployment Utility (LDU)	The ProLiant Support Pack Linux Deployment Utility (LDU) is an application that locally deploys driver and management agent updates to Red Hat Enterprise and SUSE LINUX Enterprise Linux-based servers. The LDU can be executed either on a local server or on remote servers using SSH from a Linux-based administrator's workstation. The Linux Deployment Utility is designed to work with the ProLiant Support Packs (PSPs) for Linux. ProLiant Support Packs are bundles of component RPMs that have been rigorously tested together on supported ProLiant servers. ProLiant Support Packs are Linux distribution specific bundles of optimized drivers, utilities and management agents. For more information about these products, visit www.hp.com/go/proliantlinux and www.hp.com/servers/proliant/manage	The LDU lowers the overall cost of system software maintenance by providing an efficient way for IT administrators to manage deployments of system software updates. In addition to the graphical LDU interface, the Linux Deployment Utility provides both a command-line and a silent installation with scriptable configuration options. HP also simplifies the software update process by allowing deployment of Linux PSPs from a central software repository using the Version Control Repository Manager (VCRM)/Version Control Agent (VCA)/Systems Insight Manager (SIM) remote deployment architecture.
Vulnerability and Patch Management Pack (VMP)	ProLiant Essentials Vulnerability and Patch Management Pack is integrated into SIM 4.2 and later. Based on comprehensive vulnerability assessment technology from Harris Corporation and advanced patch management based on HP industry leading Radia technology.	This pack identifies and remediates known vulnerabilities due to missing patches or mis-configured operating systems that can be exploited by viruses, worms, and blended threats.

Feature	Description	Proof point
Virtual Machine Management Pack (VMM)	Virtual Machine Management Pack (VMM) provides central management and control of virtual machines from Microsoft. Integrated with HP Systems Insight Manager, VMM provides unified management of virtual machines and supporting HP ProLiant host server resources. This integrated approach provides the ability to manage both physical and virtual resources from a single management console.	VMM simplifies day-to-day management and operation of virtual machines. VMM provides at a glance view of VM and host server resource consumption. Using VMM, IT administrators can easily move VMs between host server resources to balance the workload across host servers and better optimize use of datacenter resources.
Workload Management Pack (WMP)	ProLiant Essentials Workload Management Pack is a software solution that controls and dynamically allocates system resources enabling application consolidation and performance optimization on Windows server platforms bringing maximum utilization, lower total cost of ownership and improved availability to IT environments.	ProLiant Essentials Workload Management Pack (WMP) provides the tools you need to fully utilize server resources, maximizing business value delivered to achieve greater returns on server investments. With the WMP software, Resource Partitioning Manager v2.0, you configure resource partitions, application boundaries defined by their allocated quantity of processor and memory resources. Each partition enjoys access to specific, limited processor and memory resources. Limited access means that resources are available for your applications when they need them. Limited access also means no more worries about decreased availability created by memory-leaking applications.

Industry-standard operating system software

Purchasing the server operating system (OS) software with the HP ProLiant server – either pre-installed or on CD – is the fastest, easiest, and least expensive way for a business to purchase and install a new server and server operating system. Offerings include operating systems from the following providers:

- Microsoft
- Linux
- Novell

If preinstalled, the operating system of choice comes integrated and optimized to work on the new server right out of the box. If the OS is shipped on CD with the ProLiant server, the customer has everything needed to install and configure the server. With one purchase, customers get server hardware and OS software at an attractive price. With one phone call, customers gain support for their server and OS.

Table 10. Pre-installed OS benefits

Benefit	Explanation
Preinstalled operating systems save time	Up and running in under 30 minutes, with default settings and standard setup that ensures each installation looks and behaves the same.
Purchasing the server and OS together is convenient and cost effective	The server and software are sourced directly from HP – costing less for the combination than for purchasing the hardware and OS separately.
Backup media is included	The backup media provides the flexibility to tailor customer configurations or reinstall following any system problems during or after installation.
Cuts support costs	One call to HP gives customers access to technical support for both the HP server and the operating system, helping to resolve customer issues quickly and easily.

For more information, visit <http://h18004.www1.hp.com/products/servers/software/OEM.html>.

Summary

We have discussed in this technology brief information about HP industry standard servers, features, and options, as well as providing historical references to communicate the rich heritage of HP innovation and leadership in the industry. HP has outlined a vision for adaptive infrastructures to address customers' dynamic business environments by continuing to fulfill the need for more efficient and manageable solutions that enable customers to adapt their IT infrastructures and increase the agility of their business.

With an Adaptive Infrastructure from HP, businesses can create an environment that best suits their needs allowing them to respond better to market change, achieve greater customer satisfaction and reduce expenditures. The ProLiant servers and software discussed in this paper are the foundation of an Adaptive Enterprise.

Most of the features described throughout this paper and in the QuickSpecs are operating system independent but not all features are available on every operating system. To verify that available features work with your operating system, check www.hp.com/go/proliant.

For the latest operating system (OS) information, check www.hp.com/go/ossupport.

Glossary

In this glossary, features, options, and industry technology are listed alphabetically with detailed descriptions for each entry.

Table 11. Glossary terms

Term	Definition
Dual in-line memory module (DIMM)	A small circuit board that holds memory chips. A single in-line memory module (SIMM) has a 32-bit path to the memory chips whereas a DIMM has 64-bit path. Because the Pentium processor requires a 64-bit path to memory, you need to install SIMMs two at a time. With DIMMs, you can install memory one DIMM at a time.
Discontinued	The term used to describe a product that is no longer being manufactured.
Dynamic random access memory (DRAM)	A type of RAM chip that is less expensive because memory has to be periodically reprogrammed into it.
Error checking and correcting (ECC)	A fault tolerance feature that detects and corrects all single-bit memory parity errors, as well as detecting 2-bit and 3-bit memory errors. Ensures that common memory errors including the failure of an entire DRAM chip can be corrected without interrupting system operation.
Extended Industry Standard Architecture (EISA)	A bus standard for IBM compatible computers that extends the ISA bus architecture to 32 bits and allows more than one CPU to share the bus. It was developed in part as an open alternative to the proprietary Micro Channel Architecture (MCA) that IBM introduced in its PS/2 computers. Unlike MCA, EISA can accept older XT bus architecture and ISA boards. EISA data transfer can reach a peak of 33 megabytes per second.
Fault tolerance	The ability of a system to respond gracefully to an unexpected hardware or software failure. There are many levels of fault tolerance, the lowest being the ability to continue operation in the event of a power failure. Many fault-tolerant computer systems mirror all operations – that is, every operation is performed on two or more duplicate systems, so if one fails the other can take over. See RAID for more information.
Fibre Distributed Data Interface (FDDI)	A dedicated high-speed networking technology that has technical features like fault tolerance which are preferred for mission-critical systems.
Graphical remote console	Enables a graphical view of the Windows console to be displayed on a remote console when accessing the Remote Insight Board in a Windows NT server. This feature requires the use of graphical remote console software such as Carbon Copy or pcAnywhere32.
Hyper-threading technology	Enables multi-threaded software applications to execute threads in parallel within each processor. Thus, providing more efficient use of processor resources for greater parallelism and improved performance on today's multi-threaded software.
Industry-standard components	This feature ensures that common hardware and software components, such as memory and disks, are interchangeable among hardware platforms.
Integrated Lights Out (iLO) Advanced	iLO Advanced, offers sophisticated virtual administration features for full control of servers in dynamic data centers and remote locations. iLO Advanced can be licensed with the optional iLO Advanced Pack (Part Number 263825-B21).
Integrated Lights Out (iLO) Standard	Standard iLO provides server health and remote server manageability. iLO features are accessed from a network client using a supported Web browser. In addition to other features, iLO provides keyboard, mouse, and video capability for a server, regardless of the state of the host operating system or host server. The iLO subsystem includes an intelligent microprocessor, secure memory, and a dedicated network interface. This

Term	Definition
	design makes iLO independent of the host server and its operating system. iLO provides remote access to any authorized network client, sends alerts, and provides other server management functions.
Interleaving	An advanced technique used by high-end motherboards/chipsets to improve memory performance. Memory interleaving increases bandwidth by allowing simultaneous access to more than one chunk of memory. This improves performance because the processor can transfer more information to/from memory in the same amount of time, and helps alleviate the processor-memory bottleneck that is a major limiting factor in overall performance.
Network interface controller (NIC)	A controller installed in a personal computer, workstation, or server that allows the computer, workstation, or server to communicate with other devices connected to the same network. This term usually implies a local area network (LAN) controller.
Out-of-band	Refers to the capacity to deliver information via a modem or other asynchronous connection.
Peripheral Component Interconnect (PCI)	A system bus architecture specification that supports 32- and 64-bit bus-mastered data transfer. It is designed to support plug-and-play configuration of optional peripherals.
PCI-X	Developed as an extension to the PCI Local Bus, PCI-X is capable of operating at frequencies between 50 - 133 MHz and supports either 32- or 64-bit adapter cards. PCI-X is capable of delivering over 1 gigabyte/second of bandwidth and maintains backward compatibility with the PCI Local Bus protocol.
PCI Express	PCI Express is a serial I/O technology compatible with the current PCI software environment that offers low-cost, scalable performance for the next generation of computing and communications platforms. PCI Express provides an attach point for performance-intensive applications such as next-generation graphics, video editing and streaming multi-media, as well as high-speed interconnects such as 1394b, USB 2.0, InfiniBand and Gigabit Ethernet
Profusion architecture	Designed to take advantage of the simple programming model of a shared memory SMP architecture while reducing the potential performance bottlenecks.
ProLiant Essentials Foundation Pack	Essential software every customer needs to install, configure, and manage ProLiant servers. Included with every ProLiant server, the Foundation Pack contains the complete suite of the latest industry-leading tools and support software.
ProLiant Essentials Rapid Deployment Pack (RDP)	An integrated HP and Altiris solution that automates the process of deploying and provisioning server software, enabling you to quickly and easily adapt to changing business demands. RDP is now available with volume licensing options, Linux support, iLO/RILOE integration and scriptable erase.
RAID Level 0	Provides data striping (spreading out blocks of each file across multiple disk drives) but no redundancy. This improves performance but does not deliver fault tolerance.
RAID 1+0	Provides load balancing and physical drives are mirrored in pairs. In each mirrored pair, the physical drive that is not busy answering other requests answers any read requests that are sent to the array. If a physical drive fails, the remaining drive in the mirrored pair can still provide all the necessary data. Several drives in the array can fail without incurring data loss, as long as no two failed drives belong to the same mirrored pair. This fault-tolerance method is useful when high performance and data protection are more important than the cost of physical drives.

Term	Definition
RAID Level 1	Provides disk mirroring, and is done to ensure data reliability or a high degree of fault tolerance. RAID Level 1 stores data redundantly across a number of drives (mirrored set) in an array.
RAID Level 3	Same as Level 0, but also reserves one dedicated disk for error correction data. It provides good performance and some level of fault tolerance.
RAID Level 4	Similar in concept to RAID Level 3, but emphasizes performance for different applications, e.g. Database TP versus large sequential files. Essentially, RAID Level 4 replaces the high data throughput capability of RAID Level 3 with faster data access in read-intensive applications.
RAID Level 5	Provides data striping at the byte level and also stripe error correction information. This results in excellent performance and good fault tolerance.
Redundant Array of Independent (or Inexpensive) Disks (RAID)	A category of disk drives that employ two or more drives in combination for fault tolerance and performance. There are number of different RAID levels. The three most common are 0, 3, and 5.
Remote Insight Lights-Out Edition (RiLOE)	A remote management tool that provides cost-effective remote server management in corporate data centers and remote sites.
RiLOE II	A remote management tool that allows browser access to ProLiant servers through a seamless, hardware-based, OS-independent graphical remote console.
SCSI over internet/Ethernet (iSCSI)	iSCSI enables access to local or remote mass storage over today's communication infrastructure.
Small computer system interface (SCSI)	SCSI interfaces provide for faster data transmission rates (up to 80 MB per second) than standard serial and parallel ports. In addition, you can attach many devices to a single SCSI port, so that SCSI is really an I/O bus rather than simply an interface.
SmartStart	SmartStart is a configuration and software integration tool which aids in the installation of ProLiant servers by simplifying the process of loading the operating system and installing any specialized device drivers and support utilities.
Synchronous dynamic random access memory (SDRAM)	Synchronous DRAM differs from earlier types of RAM in that it does not run asynchronously to the system clock the way older, conventional types of memory do. SDRAM is tied to the system clock and is designed to be able to read or write from memory in burst mode (after the initial read or write latency) at 1 clock cycle per access (zero wait states) at memory bus speeds up to 100 MHz or even higher. SDRAM accomplishes its faster access using a number of internal performance improvements, including internal interleaving, which allows half the module to begin an access while the other half is finishing one. SDRAM is rapidly becoming the memory standard for modern PCs. The reason is that its synchronized design permits support for the much higher bus speeds that have started to enter the market.
Ultra320 SCSI	Another generation of SCSI, again doubling SCSI bandwidth from 160 to 320 MB per second.
Wake On-LAN (WOL)	Wake-on-LAN provides a method of remotely powering on a system based on the MAC address of the NIC. This feature requires hardware support by the NIC, NIC firmware, NIC driver and system ROM support. Starting with G2 ProLiant servers, all integrated NICs support WOL and have this feature enabled by default.

For more information

For additional information, refer to the resources detailed below.

Table 12. Web resources

Resource description	Web address
ProLiant servers	www.hp.com/go/proliant
HP 9000 and 10000 series racks and rack options	www.hp.com/products/racks
Optional rack features	www.hp.com/products/rackoptions
ProLiant server disk drives and enclosures	www.hp.com/products/harddiskdrives
ProLiant server array controllers	www.hp.com/products/smartarray
ProLiant server power protection and management	www.hp.com/products/ups
ProLiant Essentials software	www.hp.com/servers/manage
ProLiant Technology Papers	www.hp.com/servers/technology

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