

hp NonStop S-series servers

product description



servers for critical business applications

HP NonStop™ S-series servers combine revolutionary HP ServerNet interconnect architecture with the latest RISC processing technology to deliver outstanding price/performance, breakthrough I/O bandwidth, and virtually unlimited scalability. Designed to meet the needs of a new generation of media-enhanced electronic commerce and business intelligence applications, NonStop S-series servers handle complex transactions and rich data types while maintaining all the benefits of the NonStop Kernel operating system: continuous availability, data integrity, distributed transaction processing and database, open networking, and security.

With NonStop S-series servers, you can run your most critical business applications—centralized or distributed—at peak performance. Each server appears as a single entity to applications and users, regardless of the physical distribution of the nodes. Growth within a server or on the network can occur without disrupting your applications.

To protect your investment in existing solutions, NonStop S-series servers are fully application compatible with all NonStop K-series servers. You can move applications among servers with little or no modification.

To minimize operating costs, many components of NonStop S-series servers can be installed and serviced with minimal training. The TSM toolset and remote support make it possible to perform problem analysis and incident reporting and to replace components without disrupting server operation.

features at a glance

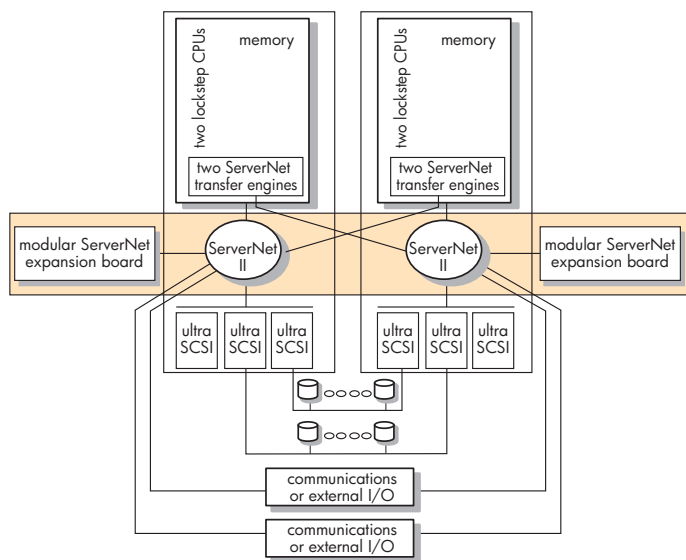
- Scalable performance and bandwidth
- Continuous system availability
- Easy service and management
- Flexibility in configuration and expansion
- Wide range of networking and connectivity options



scalable performance and bandwidth

At the heart of NonStop S-series servers is the ServerNet architecture, a technology that provides high-performance interconnection among processors and I/O devices (see figure). It provides virtually unlimited growth potential, both in processing performance and in system bandwidth, to handle the increasing demands of the most powerful online transaction processing, business intelligence, and electronic commerce applications.

Although ServerNet architecture can accelerate the performance of current applications, it is designed to support the next generation of data-intensive applications by efficiently moving extraordinary amounts of data within the NonStop S-series servers.



A basic two-processor NonStop S-series computing module. To support parallel processing, the NonStop Kernel operating system uses multiple ServerNet interconnections and a message system optimized by ServerNet technology to connect 2 to 16 independent processors per node. These nodes can be interconnected by a variety of local area and wide area networking technologies to create configurations of up to 4,080 processors.

loosely coupled shared-nothing architecture

The processing performance of NonStop S-series servers is scaled in a linear fashion through a loosely coupled shared-nothing architecture, which uses ServerNet technology to connect processors to each other and to I/O devices. This architecture alleviates performance bottlenecks caused by conflicts with shared resources.

Each processor has its own instruction unit, memory, memory access, cache, and router connections. As your applications expand, this unique, loosely coupled architecture delivers linear performance improvement. As each processor is added, a full processor's worth of performance is delivered to the application.

A separate copy of the operating system runs inside each NonStop S-series processor. This distributed operating system eliminates the physical boundaries between processors by making it possible for an operation running in any processor to access system resources in any other processor. Processors operate independently but in a cooperative manner, with control of processes distributed throughout the server.

high-performance routers

Taking advantage of ServerNet technology, the architecture of NonStop S-series servers employs high-performance routers to rapidly route packets of data between devices in the system. Each ServerNet II router delivers 1.5 gigabytes per second of bandwidth, with each of the 12 router paths having a 125-megabyte, full-duplex data-transfer path. The ServerNet architecture is a wormhole-routed, full-duplex, packet-switched, point-to-point network optimized for high bandwidth and low latency.

point-to-point connections

Using high-speed, point-to-point data paths, I/O devices connect directly to processors, communications devices, and other I/O devices in the NonStop S-series server, which allows data transfer directly from one system resource to another, minimizing needless transfers. This capability streamlines data transfers and frees processors for other important application tasks.

With the addition of each ServerNet router, the aggregate system bandwidth capacity grows. Optional disk and communications adapters, each connected via additional ServerNet routers, can be added cost-effectively to NonStop S-series servers. I/O capacity scales independently from processor scaling and allows virtually unlimited device connectivity.

wormhole routing for lowest-latency switching

ServerNet technology optimizes communications with latency of only 300 nanoseconds in each router. To reduce network latency, ServerNet technology uses a technique known as wormhole routing. With this technique, a packet does not need to be completely received before being sent to its next destination (as with store-and-forward architectures). Wormhole routing allows the router to decode the header of the packet as it is received, then locate the port on which the packet will exit by using the header's destination address and the internal routing table. This one-time operation allows the packet to be directed through the router while the router is still receiving the remainder of the packet. As a result, the header information is routed and forwarded well before the end of the packet has been received. Wormhole routing reduces the latency to lower levels than a store-and-forward architecture would require. It provides high performance even if the server is configured with multiple router hops.

continuous system availability

NonStop S-series servers are designed to minimize both planned and unplanned downtime. Running the NonStop Kernel operating system, the servers detect, isolate, and recover from component failures without applications being affected. No modifications to applications are required to enable this transparent recovery.

To meet your specific needs, NonStop S-series servers can be reconfigured online. As application demands change, enclosures can be either added or deleted, minimizing planned downtime. Adapters, disk drives, and other components can also be added or removed from the system, providing a uniquely flexible environment to meet changing application needs.

fault-tolerant processor and memory architecture

NonStop S-series servers provide comprehensive fault detection and isolation and preserve data integrity. Self-checking processors and ServerNet routers use data replication and comparison logic to ensure that faults are detected and faulty components are taken offline so that error propagation does not occur. ServerNet technology prevents adapters and controllers from corrupting memory and ensures that data and addresses are correctly transmitted.

Two central processing units (CPUs) with comparison logic, two copies of level 2 cache, and main memory reside on the processor multifunction (PMF) unit. PMF units have dual-ported access to the ServerNet adapters. Running in lock-step, the CPUs on a PMF unit execute the same instruction stream out of local cache. The output of each CPU is compared continuously to that of the other CPU. If the outputs disagree, the operating system immediately shuts down the processor, thus preventing any corruption of data. The operating system records the failure in the system event log, and sophisticated diagnostic software analyzes the problem.

Each PMF unit contains a memory subsystem that is protected by error correcting code (ECC), which detects and corrects single-bit errors. If a double-bit error is detected, the operating system recognizes the hard memory failure and takes the failed PMF offline until memory can be replaced. The NonStop S-series server continues running—without impact to applications—using a second PMF unit, which contains the backup process. In a NonStop S-series server configured with two or more processors, backup processes can run in any PMF unit in the server. This allows the workload from a failed processor to be distributed across the other processors.

**unlimited scalability,
continuous availability**

comprehensive system interconnect architecture

ServerNet technology ensures fault tolerance by providing multiple paths to all elements of the server.

All processors, I/O devices, and communications adapters are monitored by the service management subsystem, which can detect and isolate any failure within the server, allowing a failed component to be taken offline quickly, diagnosed, and replaced. If any component fails, data is routed via a different path to the same destination. Each processor has two independent paths to other processors or ServerNet adapters.

Data integrity is ensured by cyclic redundancy checking of packets (header, data, and address), which validates all data transferred between ServerNet adapters and memory. Access validation tables ensure that adapters do not contaminate memory. Command link integrity isolates single-bit errors on all high-speed data paths, and hardware protocol acknowledgments ensure end-to-end reliable data transfer.

disk mirroring

NonStop S-series servers support disk mirroring to ensure continuous access to data stored on disks. If a disk drive fails, the server continues to operate using the mirrored copy. When the faulty disk is replaced, the mirrored data is copied to the new disk while the server remains online and operational. Reintegration of the repaired disk is automatically performed online while the system remains operational.

power-failure protection

Power-failure detection hardware, system software, and battery modules allow NonStop S-series servers to shut down gracefully if a power outage occurs, eliminating the risk of losing critical data.

A fault-tolerant battery backup system keeps the servers running (for up to 30 seconds) during transient AC power failures. This programmable ride-through capability ensures availability for most power outages. In the case of extended AC power loss, the battery backup retains data in memory for up to one hour.

easy service and management

The management and service features of NonStop S-series servers maximize system availability and minimize your operating costs. Special diagnostic and maintenance software automatically isolates faults, tests and restarts components, and reports any needed action. For ease of manageability, NonStop S-series servers include the TSM toolset, which provides a graphical, object-oriented interface for maintenance and administration. This subsystem comprises the following components:

- *TSM workstation*. Provides a graphical, object-oriented interface for maintenance and administration.
- *TSM workstation applications*. Perform basic operations and service tasks.
- *TSM open service applications*. Run under the NonStop Kernel operating system.
- *Service processor*. Resides in each PMF module and works in conjunction with other subsystem components to perform operations and service functions.

While providing sophisticated service management, TSM coexists with other operations management software and with major third-party software products.

service management subsystem

The TSM subsystem of NonStop S-series servers comprises hardware and software that take over maintenance and test functions as soon as the server is powered up. Monitoring conditions within the server, the service management subsystem detects and isolates failures, performs analysis, and allows recovery while the server continues running. The service management subsystem logs events, notifies the system administrator of needed actions, and makes it possible to perform service action tasks.

If a component needs to be replaced, a NonStop S-series server can be configured to dial out to the Global Customer Support Center (GCSC), which will dispatch a replacement part. When a component is replaced, the service processor manages the reintegration process.

The service management subsystem includes software to test the hardware modules in NonStop S-series servers and to check and control the operating state of each module.

online expansion and servicing with minimal training

Servicing and system upgrades of NonStop S-series servers are quick and easy. With minimal training, a user can replace major system components—including system processing units, memory, ServerNet Expansion Boards (SEBs) and Modular ServerNet Expansion Boards (MSEBs), ServerNet adapters, disk drives, fans, power supplies, and battery modules—without special tools and without disrupting application processing. User serviceability helps keep your maintenance costs low.

To meet your specific needs, HP offers a variety of service and support options. These programs are complemented by the server features that support remote access for diagnostics and repair, which maximize system availability and minimize operating costs.

efficient system monitoring and control

System management products from the NonStop Enterprise Division and its partners give flexibility and choice to tailor specific system management environments to specific business needs. In addition, NonStop servers integrate easily into standards-based network management environments such as those of Compaq Insight Manager XE software and HP OpenView software, and enterprise management frameworks such as CA-Unicenter, Tivoli, and BMC Software's PATROL.

flexibility in configuration and expansion

NonStop S-series servers let you configure and expand the system to match the needs of your business. The NonStop S-series server family comprises high-end, midrange, and entry-level servers.

The newest members of the high-end server line are the NonStop S76000 and S86000 servers, both of which are based on the MIPS R14000 microprocessor. Earlier models include the NonStop S74000 server, which is based on the MIPS R12000 microprocessor.

The new processor in the midrange server line is the NonStop S7600 server, which is based on the MIPS R12000 microprocessor. The earlier model is the NonStop S7400 server, which is based on the MIPS R10000 processor.

The NonStop S760 and S76 servers are the newest models into the entry-level server line. They are available only in a two-processor configuration using either the NonStop S76000 or the S7600 processor. Earlier offerings include the NonStop S740 and S74 servers. The entry-level servers are intended as low-cost entry points for distributed branch applications that require continuous availability and data integrity but not scalability. If a NonStop S760, S76, S740, or S74 server needs to be scaled for more than two processors, it will have to be converted to a NonStop S7400, S7600, S74000, S76000, or S86000 server, with the appropriate license fee changes applied.

As applications grow, any of the servers can be expanded in increments of 2 processors at a time, up to 16 processors in a single node. For high-end servers, you can attach up to 36 additional I/O enclosures, each supporting 16 internal disk drives and 4 dual-ported ServerNet adapters. For midrange systems, you can add up to 16 I/O enclosures, which also support up to 16 internal disk drives and 4 dual-ported ServerNet adapters.

From its smallest to its largest single-node configuration, the NonStop S-series server offers an eightfold increase in performance. With the added capability to expand to multiple nodes, NonStop S-series servers offer scalability for your most critical applications.

A comprehensive set of capabilities is included with each processor. The NonStop S76000 and S86000 server PMF units have a multifunction I/O board that includes the following components:

- *ServerNet router.* Provides connections between the two processors, the SEBs or MSEBs in the system enclosure, and storage connections (such as the SCSI ports) within an I/O or system enclosure.
- *Three SCSI ports.* Includes one differential Ultra SCSI port for attaching external tape subsystems and two Ultra SCSI ports to control internal disk drives.
- *Ethernet controller.* Supports the system console.
- *Service processor.* Provides the hardware component of the server's maintenance and diagnostic functions.

The NonStop S7600 server PMF unit has the same structure as the S76000 or S86000 server PMF unit.

NonStop S-series servers have a minimum of two PMF units with the following memory configurations:

- *S7400 server.* Contains 512 megabytes of main memory (only one configuration).
- *S7600 server.* Contains 1 gigabyte of main memory (only one configuration).
- *S74000 server.* Accommodates 512 megabytes, 2 gigabytes, or 4 gigabytes of main memory.
- *S76000 server.* Accommodates 1 gigabyte, 2 gigabytes, 4 gigabytes, or 16 gigabytes of main memory.
- *S86000 server.* Accommodates 1 gigabyte, 2 gigabytes, 4 gigabytes, or 16 gigabytes of main memory.

Each processor in the server configuration can have a different memory size to provide cost-effectively for varying application environments.

NonStop S-series servers provide a wide range of performance. From the entry-level NonStop S76 server to the massively parallel NonStop S86000 server, they offer the highest levels of scalability and connectivity in the industry. A single 16-processor node can support up to 25.3 terabytes of internal disk capacity. NonStop servers can scale from 2 to more than 4,000 processors, providing virtually unlimited disk and I/O capacity. Each server appears as a single entity to applications and users, regardless of the physical distribution of the nodes. NonStop S-series servers can accommodate your largest critical business applications—centralized or distributed—at peak performance. For more information about standard configurations, see the *NonStop S-Series Servers Ordering and Configuration Information* document.

A NonStop S-series server—with a compact system design that minimizes floor space requirements—can operate in a non-computer room environment. A four-processor NonStop S-series server containing up to 1.1 terabytes of disk storage fits into an industry-standard, 19-inch rack that occupies only 5 square feet.

The new NonStop S86000 server and the S76 family of servers all have a brand new visual image. For customers that already have NonStop S-series servers and want to provide a consistent visual image across all of those servers at a given location, an image upgrade package is available.

new high-performance disk drive

The new 18-gigabyte 4619 disk drive (which replaces the 9-gigabyte, 10,000-rpm 4609 disk drive) addresses the key requirements of the online transaction processing (OLTP) market segment: low price and high performance. The aim is to deploy multiple access arms (disk drives) cost-effectively to support massively parallel high-volume OLTP applications.

The 4619 disk drive makes significant contributions to OLTP and delivers higher performance than any previous NonStop system disk storage product, with its 15,000-rpm rotational speed and reduced seek times. Disk random I/O throughput performance on a NonStop S74000 server can be as much as 25 percent greater than with any earlier 10,000-rpm NonStop system disk drive product, depending on the specific application.

wide range of networking and connectivity options

NonStop S-series servers support open networking standards, including Parallel Library TCP/IP, IPX/SPX, NetBIOS, SNA, and OSI. They also support protocols that enable you to integrate a wide variety of standard and nonstandard devices into your information system.

Using a LAN-based communications architecture, NonStop S-series servers can be configured with the four-port ServerNet/4E adapter (3861 E4SA) for 10-megabit-per-second Ethernet LANs, the one-port ServerNet Fast Ethernet Adapter (3863 FESA) for 10/100-megabit-per-second Ethernet LANs, or the one-port ServerNet ATM adapter (3860 ATM3SA), for 155-megabit-per-second Asynchronous Transfer Mode (ATM) networks, providing connection to a wide range of workstations, other servers, and/or wide area networks (WANs). These high-performance adapters are designed for the demands of peak-load, low-latency client/server use. To support more users, you can add adapters, one at a time or in pairs (for fault tolerance). NonStop S-series servers can be configured with any combination of communications adapters without limitations.

If desired, you can also use HP Expand software to connect NonStop S-series servers to other NonStop servers. The NonStop ServerNet Cluster product provides high-performance, low-latency connections between NonStop S-series servers. This is the best performing medium (that is, the physical layer on which data is transmitted) available for Expand connections. ServerNet/FX adapters also enable you to connect NonStop S-series servers to K-series servers that use the HP TorusNet or FOX ring connections. These adapters provide a connection between the ServerNet architecture and the FOX fiber.

There are also several ways to connect NonStop S-series servers to WANs, including via the ServerNet Wide Area Network (SWAN) or SWAN 2 concentrator, which provides WAN client connectivity to servers that have Ethernet ports and appropriate communications software. You can also use the Asynchronous Wide Area Network (AWAN) access server, which offers economical asynchronous-only WAN access.

To preserve your investment in peripherals, ServerNet/DA technology lets you attach external storage devices (used with NonStop K-series servers) to NonStop S-series servers.

specifications

For specifications of NonStop S-series servers, refer to the *NonStop S-Series Servers Ordering and Configuration Information* document. For compatibility or configuration restrictions and limitations, refer to the *Ordering and Configuration Information* document.

for more information

Visit the website at www.hp.com/go/nonstop.

**the right server for the
real-time enterprise**



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