

Hitachi Freedom Storage™ Lightning 9900™



Taking the New Economy by Storm



Hitachi Freedom Storage™ Lightning 9900™ The first of a new generation of intelligent storage systems

Highlights

Instant access to data around the clock

- 100% data availability quarantee
- No single point of failure
- Highly resilient multi-path fibre architecture
- Fully redundant, fault-tolerant, hot-swappable components
- Global dynamic hot sparing
- Duplexed write cache with battery backup
- Hi-Track® "call-home" maintenance system
- Non-disruptive microcode updates
- RAID-1+ and/or RAID-5 arrays within the same system
- Industry-leading business continuity solutions for rapid recovery from application failures or disasters
- Proven point-in-time software enables data backup and recovery
- Professional Services to enable rapid deployment of multi-site, multi-platform high availability solutions
- Non-disruptive, real-time copies for backups, application testing, and data warehousing/data mining activities
- Proven support for Geographically Dispersed Parallel Sysplex™ (GDPS™), a failover and load sharing offering from IBM®
- Open systems host failover and alternate path support

Unmatched performance and capacity

- Industry's only switched fabric architecture, featuring 64 switched, point-to-point simultaneous data paths
- Up to 6.4GB/sec internal system bandwidth
- Fully addressable 32GB cache
- Hitachi FlashAccess™ provides cache speeds to frequently used volumes
- Extremely fast and intelligent cache algorithms
- Non-disruptive expansion to over 37TB raw capacity
- Simultaneous transfers from up to 32 separate hosts
- Flexible LUN support
- Automated performance tuning
- High-throughput 10,025 RPM Fibre Channel disk drives with dual segmented cache buffering and redundant pathing

Extensive connectivity and resource sharing

- Concurrent operation of UNIX®, Microsoft® Windows® 2000, Windows NT®, Linux®, Novell® NetWare®, and S/390® hosts
- Fibre Channel and ESCON® server connections
- Support for SANs, Fibre Channel Switched, Fibre Channel Arbitrated Loop, and Point-to-point configurations

CARE software solutions

- Copy Suite supports disaster recovery, rapid backup/restore, on-line data migration, tape-less data vaulting, application testing, and data warehousing/data mining applications
- Availability Suite ensures non-stop access to information
- Resource Management Suite enables Freedom Storage management from any location
- Exchange Suite supports data exchange between UNIX, Windows 2000, Windows NT, Linux, and OS/390° platforms

Electrify Your Business with the Hitachi Freedom Storage Lightning 9900

The New Economy is in full force, moving faster than ever. The Internet, as a platform for sharing information, has had a powerful effect on business models, bringing a new wave of competitors. Business-to-business e-commerce is growing rapidly, promising cost reductions. Computer speeds are faster than ever before. The World Wide Web is becoming ubiquitous. Smart appliances are beginning to be deployed. High-speed, high-bandwidth, fibre optic digital highways are expanding worldwide. Wireless technology is spreading quickly. Billions of transactions and enormous amounts of text, video, graphical, and audio data are being transferred everyday, and growing exponentially.

Are you prepared to weather the e-deluge? Are you capable of turning it to your advantage? How will you keep your competitors at bay? How will you ensure that your company has the Information Technology infrastructure in place to support the strategic initiatives that will determine success in the New Economy?

The biggest problem facing IT managers today is figuring out how they can provide instant access to data from any computer, anywhere, anytime. Hitachi Data Systems answered this challenge by bringing the world's most advanced enterprise storage system to market now—when you need it most—as you plan your e-infrastructure. Designed with the New Economy in mind, the Hitachi Freedom Storage Lightning 9900 actually lets you conduct your business in ways you never could before.

We understand how important it is to deliver non-stop instantaneous access to mission-critical information, to manage it on a worldwide basis, and to protect it from disaster. Our no-limits storage vision enables the enterprise-wide flow of information across multiple platforms and multiple geographies. In this e-driven world, IT is no longer a cost center—it's a revenue center. Information no longer supports your business, information *is* your business. In the New Economy, the quickest return on your investment comes not from lowering the cost of goods, but rather, from lowering the cost of your business-to-business or business-to-consumer transactions. The Lightning 9900 is the only enterprise storage system designed and built specifically to support these new business demands.

We also understand that you can't afford to have your system down, disrupted, or busy for even a few seconds. You need an intelligent storage system that can dynamically adapt, scale, grow and be there when you need it. The Lightning 9900 won't just ramp up your enterprise, it will provide you with previously unattainable levels of efficiency and performance and scale seamlessly to accommodate future growth. With the Lightning 9900, your company won't just be able to take advantage of the opportunities presented by the New Economy. It will be positioned to thrive.



In the New Economy, continuous data access ensures your competitive edge

Companies are shifting attention and resources to e-commerce initiatives so that they can better position themselves for the future. That future may be hard to predict, but industry analysts agree that when it comes to e-commerce, downtime is the enemy. Beyond lost revenues and lost customers, the reputation and market valuation of your e-business rides on your ability to avoid downtime and deliver transactions on demand.

100% data availability—guaranteed

Let's face it—if your storage system can't deliver continuous data access, you're risking your bottom line. Completely redundant and fault tolerant throughout, the Lightning 9900 remains the only storage system in the industry to be backed by a 100% data availability guarantee. With the revolutionary Hi-Star™ fabric architecture that provides 64 switched, point-to-point internal paths, the Lightning 9900 is also the world's first high-resiliency storage system. If one path is lost, 63 remain. There is no disruption in service because no bottlenecks occur in the event of a failed path.

We know your system can never be down, not even for a second, so we gave the Lightning 9900 the ability to perform all maintenance activity without disruption to your 24x7x365 operation. Redundant hardware components (including disk drives) can be replaced, features can be added, capacity can be expanded, and microcode can be upgraded—all without shutting down or even slowing your critical applications.

Up to 32GB of nonvolatile cache is accessible to all disk arrays at all times. The cache protects your valuable data by automatically maintaining two copies, each of which is independently protected by its own power source and batteries. In fact, even the batteries are redundant, so data can remain in cache until power is restored. Unlike systems that wait to destage your data to disk until cache is full, or until a power outage occurs, the Lightning 9900 destages to disk continuously.

The Lightning 9900's disk drives are the most reliable in the world. Hitachi drives are designed for high reliability and are rated at almost three times the MTBF (Mean Time Between Failures) of the nearest competitor. And, our unique Global Dynamic Sparing feature—permitting any hot spare to replace any drive within the entire system—saves you time and money. No other enterprise storage system offers such high levels of reliability and availability.

Volume replication for non-stop operation

Hitachi Shadowlmage software allows you to duplicate logical volume images (LVIs) and logical units (LUNs) simultaneously without disrupting service—and without quiescing, timing out, or affecting the performance of your business-critical applications. Up to three S/390 and up to nine open systems RAID-protected duplicates can be created within a single system at hardware speeds. These point-in-time copies can be used to create backups, to test applications, and to support data mining activities.

When used in conjunction with Hitachi's remote copy software products, Shadow-Image lets you maintain up to 20 copies of critical data. Usability is further enhanced through a resynchronization capability that reduces data duplication requirements while sustaining normal levels of operation. Since every e-second counts, ShadowImage provides a compelling value proposition to your business because it actually increases your overall efficiency and productivity as your enterprise grows.

Around-the-clock protection to keep you up and rolling

Maintaining accurate copies of your data is essential to ensure that your business keeps running. Our copy suite of software solutions provides unbeatable data protection for multi-platform environments, enabling comprehensive backup and rapid recovery in the event of application failures or disasters—natural or manmade. Hitachi's remote copy software accommodates all major platforms, including UNIX, Windows 2000, Windows NT, NetWare, Linux, and S/390.

We offer both Hitachi Synchronous and Asynchronous Remote Copy to continuously update and maintain reliable copies of your extremely valuable data at a secondary site. Our innovative Hitachi NanoCopy™, based on Asynchronous Remote Copy, is an industry first and can replicate data between any number of primary systems and any number of secondary systems anywhere in the world with full data integrity. In conjunction with Hitachi ShadowImage, NanoCopy maintains duplicates of critical data with full protection against rolling disasters, allowing you to initiate production at a backup location immediately following an outage.

You can also develop comprehensive disaster recovery solutions by dynamically maintaining a copy of data either locally or across long distances, using industry-standard channel extenders. And you can migrate an application from one data center to another without experiencing lengthy—and costly—outages.

Hitachi Command Control Interface (CCI) allows open system users to manage Hitachi's remote copy and Hitachi ShadowImage from their host's management station. With Hitachi CCI, storage administrators can create batch streams to automate Hitachi's remote copy or ShadowImage operations using a command line interface. Hitachi CCI functions can also be integrated with host-based failover software such as IBM's HACMP™, HP's MC/Service Guard, and VERITAS FirstWatch®.

Sleep tight: Keep your data safe off site

Rest assured that the Lightning 9900 is safeguarding your valuable data with BETA® Systems HARBOR® Backup software. HARBOR Backup provides the industry's most cost-effective, user-controlled back-up/restore with simplified setup and installation processes. The premier backup and recovery solution for distributed environments, HARBOR Backup improves data protection and reduces operation costs.

HARBOR Backup also offers standardsetting performance levels. Its design incorporates the fastest connectivity options, including parallel backup stream support, 100MB/sec Fibre Channel speeds, and multi-threading capability. Another outstanding benefit of HARBOR Backup is its ability to recover single files without having to restore entire data volumes.



For open systems, we offer Hitachi Multiplatform Backup/Restore (HMBR) software, which allows you to save a significant amount of money by utilizing your already existing S/390 host, ATL environment, and established procedures to back up your open system data. The "any-to-any" connectivity of the Lightning 9900 enables S/390 systems to access Windows NT, Windows 2000, and UNIX open systems LUNs as 3390-3 or 3390-9 devices via standard utilities, such as DFDSS™ or FDR.

GDPS Support

Hitachi Data Systems is the only vendor demonstrating proven remote copy support for Geographically Dispersed Parallel Sysplex™ (GDPS™), an IBM service offering for system failover, workload balancing, and data mirroring on systems spread across two or more sites up to 40 kilometers (25 miles) apart. We provide a number of services to help you plan, integrate, and deploy your GDPS environment based on Lightning 9900 storage systems.

Failure is not an option: Clustering support

Clustered servers provide additional support for continuous data access. The Lightning 9900 supports several industry-leading host failover open systems software solutions. Host failover allows a standby host to take control of a primary host's storage and network (in the event of a failure in the primary host) and restart the primary host's applications.

The path between a host and the Lightning 9900 is a potential single point of failure, which could result in complete loss of data access. Hitachi's alternate path support allows a LUN to be accessed through two separate paths. In the event of a failure on the primary path, the I/O is restarted through the alternate path. Path failover software allows your hosts to recover promptly from interface failures, and provides continuous data access. Hitachi Path Manager offers failover protection and load balancing in Windows NT and IBM AIX® environments. In addition, products are available from thirdparty suppliers to support other platforms, including VERITAS FirstWatch for Sun™ Solaris $^{\text{\tiny{M}}}$ servers.

Hitachi Data Systems Professional Services: Putting it all together

Achieving continuous availability and integrating it with a cost-effective disaster recovery solution for mission-critical applications is one of the major goals of enterprise IT management. The need for better availability and recovery solutions has been magnified by the growth of Internet, intranet, and extranet services that require non-stop access to enterprise resource planning, legacy, and customer service applications. The decreasing cost of hardware has made it feasible for IT departments to develop in-house disaster recovery solutions, allowing greater control over availability, disaster recovery, and the integration between the two.

Hitachi Data Systems' XtraPlex Service provides you with a cost-effective, flexible, and integrated solution tailored to fit your unique business needs. XtraPlex is a multi-site, multi-platform business continuity solution that combines the proven functionality of Parallel Sysplex with Hitachi's advanced data mirroring and networking technologies to surpass the application- and data-recovery performance offered by other solutions. Improving on the fundamental high availability capabilities of Parallel Sysplex, XtraPlex provides a more cost-effective and flexible solution for the availability and disaster recovery needs of large organizations.

XtraPlex strikes a realistic balance between resources and the demand for continuous availability. Offering lower costs, better performance, and fewer risks than comparable solutions, XtraPlex is also less distance-dependent and can accommodate non-S/390 platforms. It provides the capability to manage remote copy configuration, storage subsystems, Parallel Sysplex operational tasks, failure recovery, and data re-routing from a single control point, significantly improving application availability and recovery times.

Superior service and support: We're there before you need us

Our world-class service is consistently recognized by our customers as the best in the industry. And our advanced service capabilities are integral to our commitment to delivering 100% data availability.

The Hi-Track* "call-home" system is our unique predictive maintenance system and is designed to ensure maximum availability. Hi-Track continuously monitors the Lightning 9900 and automatically transmits collected hardware status information to a Hitachi Data Systems support center. The center analyzes the information and proactively takes corrective action, where appropriate, in order to avoid problems that could impact system throughput or availability. Most maintenance activities are quickly performed remotely from one of our support centers without disrupting your 24x7x365 operations.

Scalable capacity and performance that grow as you go

No doubt about it—the biggest threat to your e-business is your own success. Users, partners, suppliers, and customers all promise to push your storage infrastructure to its limits. Your next storage system should allow you to add capacity without compromising performance. You need to partner with a storage company that understands this and can help you prepare your e-infrastructure for unprecedented growth and exponential demand.



A bottleneck-free architecture maximizes capacity and performance scalability

If your e-business is like most, you have to move text, graphics, sound, and video to thousands of users worldwide. At the same time, you must account for backups, restores, application development, application testing, transaction traffic, and multiple time-consuming data mining queries in your data-intensive environment.

All of this activity can create bottlenecks that slow down critical applications, including your Web site. Research shows that the average customer will leave a Web site if the site takes more than four seconds to download. You hate to wait when you click on an Internet site, and so do your customers, partners, and vendors when they click on yours. In the context of the New Economy, performance and availability go hand-in-hand—when your system is busy, it is unavailable to those trying to access it. Your lost opportunities become your competitor's gains. Behind every great Web site is a storage system that can weather both the high tide and unexpected deluge of demand.

Greater agility for the dynamic, expanding enterprise

You need an enterprise storage system designed to handle heavy loads and capacity upgrades without affecting performance. The Lightning 9900's highly sophisticated Hi-Star architecture easily handles the most demanding I/O loads your users, customers, partners, and vendors can throw at it. Unlike traditional bus architectures, standard in previous generations of storage systems, Hi-Star incorporates an advanced point-to-point crossbar-switched fabric which interconnects disks, cache, and server interfaces. With this architecture, the internal bandwith of the Lightning 9900 actually *increases* as more array controllers and front-end channel adapters are added up to 6.4GB per second!

This technological breakthrough makes the Lightning 9900 the first truly bottleneck-free enterprise storage system; 64 switched, point-to-point data paths mean no costly service disruptions due to a busy system. The Lightning 9900 will pump data at speeds you never thought possible.

Moreover, the efficiency of Lightning's sophisticated cache management and RAID algorithms combines with its standard-setting bandwidth capability to sustain a data transfer rate that is more than six times that of any competing storage system. The Lightning 9900 uses the industry's most intelligent caching algorithms to dramatically improve system performance. Record and Logical Block Address (LBA) level caching is available, along with an Intelligent Learning Algorithm that monitors data access patterns and dynamically alters staging criteria to ensure the highest possible hit ratios for randomly accessed data. That makes the Lightning 9900 as much as two-to-five times faster than its nearest competitor.

Sizzle not fizzle: raise your ROI by lowering your transaction costs

In the old economy, profitability was realized by lowering the cost of goods. In the New Economy, your competitors have access to the same low cost of goods. Today, profitability is realized by lowering the cost per transaction. And this is where the Lightning really shines.

Competitive systems bog down from increased overhead when capacity is increased. Not the Lightning 9900—the more users it supports, the faster it gets. Adding options and components only increases the Lightning's available bandwidth. For example, you can leverage multiple Web-based applications to provide your customers, business partners, and vendors with the instant access to data they require.

Unsurpassed flexibility: the perfect configuration for your unique business

Powered by the Hi-Star architecture, the Lightning 9900 provides the highest bandwidth and highest level of resiliency, delivering speed, flexibility, and cost-savings that will let you take the New Economy by storm. The 9960 Model, the first in the Lightning 9900 family, enables you to avoid the future shock of a weak e-infrastructure with up to 37TB of highly-scalable raw storage, 32GB of cache memory, and 32 Fibre Channel or ESCON connections in a multi-cabinet configuration.

Stretch your investment with intermixed RAID and drives

The Lightning 9900 offers three 10,025 RPM drive options—18GB for high-performance configurations, 47GB for standard installations, and 73GB for high-capacity configurations. Developed and manufactured by Hitachi, these hard disks are the most reliable and highest performing in the world. Each of these active dual-ported Fibre Channel drives has an onboard dual segmented cache buffer which contributes to the Lightning's extremely fast back-end performance.

What's more, the Lightning 9900 permits you to mix RAID levels as well as drives within the system. This, in turn, allows you to maximize protection and performance for individual applications. For example, our RAID-5 implementation provides the equivalent performance of competitive RAID-1 offerings at two-thirds of the cost. For highly randomized write environments, such as e-mail or extremely busy OLTP e-commerce sites, RAID-1+ groups can co-exist with RAID-5 in the Lightning 9900.

Both open systems and S/390 customers can intermix 18GB, 47GB, and 73GB drives within the same Lightning 9900 storage system. And S/390 LVIs and open systems LUNs can be intermixed behind the same Array Control Processor (ACP) pair, providing unparalleled configuration flexibility.



Managing your data's growth and performance

Successful e-companies know that to dramatically decrease time to market and get to targeted customers fast, they have to significantly increase the amount and type of data they collect, analyze, and transfer. These companies also know that they have to take more care than ever before in planning their storage initiatives. One mistake can cost millions of dollars. With the Lightning 9900 as an integral part of your e-infrastructure, you'll be able to manage multitudes of terabytes for years to come.



Direct attach or SAN: the world's first truly consolidated storage solution

The Lightning 9900 removes the downtime and bottleneck risks normally associated with typical consolidated storage approaches. Competitive storage systems, that claim to be enterprise-ready, actually slow down with each additional host. The performance and scalability of the Lightning 9900 enables you to consolidate vast amounts of storage across open systems and mainframe servers, as has been traditionally done with platform-independent storage systems. What's more, you can also replace three to five of the previous generation's bus-bound storage systems with one Lightning 9900. In either case, the Lightning 9900 dramatically lowers your IT costs, and extends your capital investment by consolidating storage resources and sharing information across disparate platforms.

With 32 Fibre Channel or ESCON host connections, the Lightning 9900 not only easily performs fast simultaneous transfers between any combination of UNIX, Windows 2000, Windows NT, Linux, NetWare, and S/390 hosts, it actually scales to maintain the levels of performance your customers expect from previously-installed host systems. Hitachi Multiplatform Resource Sharing allows the Lightning 9900 to be shared between UNIX-, Windows 2000-, Windows NT-, or Linux-based servers and S/390-compatible mainframe platforms.

Your SAN-optimized storage backbone

Storage Area Networks (SANs) provide lasting benefits ranging from shared pooling and better utilization of storage resources to improved performance, better security, and higher availability. SANs also place new demands on storage systems: switches allow more hosts, possibly hundreds of hosts, to access storage ports; I/O rates increase as access becomes more dispersed; and cache hit rates decrease, leading to more data being retrieved directly from disk.

From its Hi-Star architecture and its all-fibre, multiple-looped FC-AL back end and disks, to its support for World Wide Names and SAN security, the Lightning 9900 is ready to support the largest SANs, including our own Hitachi Freedom SAN*. The Lightning 9900 provides 32 Fibre ports with support for shortwave (500m distance) and longwave (10km distance) interfaces.

Because the Lightning 9900 was specifically designed to handle data from hundreds of SAN-enabled hosts, it can handle far more simultaneous "hits" than traditional direct-connect storage systems. Now you can seamlessly add those absolutely critical business-to-business applications to your e-infrastructure to ensure your success and out-maneuver your competitors.

Centralized control: CARE Software Suites

Our CARE (Copy, Availability, Resource, and Exchange) software solutions complement the built-in excellence of the Lightning 9900, ensuring uninterrupted and continuous data availability and accessibility. Providing you with this level of security means that a consolidated storage strategy is a reality, not merely a dream.

Hitachi Multiplatform Data Exchange (HMDE) eliminates many of the constraints associated with sharing or moving data between heterogeneous systems. HMDE is ideal for data warehouses because it moves vast amounts of data quickly from mainframe to UNIX, Windows 2000, or Windows NT environments without tying up networking resources or intermediate tape media. When used with Hitachi FlashAccess Manager, HMDE delivers lightning-fast data transfer speeds.

The Lightning 9900 sets a new standard for high-speed data transfer with HARBOR File Transfer (HFT), another proven, cost-effective, and flexible solution from BETA Systems. Part of the CARE Exchange Suite, HFT facilitates the quick, reliable transfer of data files between OS/390 mainframes and open systems servers.

Hitachi Graph-Track™ provides the ultimate in reliable, easy-to-use hardware performance monitoring, and is available for open systems and S/390 environments. Graph-Track displays real-time or historical hardware performance data in a user-friendly Windows® 95, 98, or 2000 format on a PC attached to the Lightning 9900.

Utilizing World Wide Names, Hitachi Zone Allocation Manager controls host access to Lightning 9900 LUNs in open systems, multi-platform, or SAN environments. This enables you to restrict server access to specific LUNs and protect your data from unauthorized access.

Supercharge your data: Decrease those bottlenecks

Scarce technical resources often prevent proactive tuning of storage systems. Hitachi Dynamic Optimizer solves this problem by providing automatic performance tuning for the Lightning 9900. Utilizing the Lightning 9900's many high-speed internal paths to optimize data placement, Dynamic Optimizer monitors, analyzes, and moves logical volumes to eliminate "hot-spots," provides load balancing, and maintains predetermined performance levels. Independent of host type or attachment, the Dynamic Optimizer makes recommendations for administrator approval in either automatic or assisted mode. Dynamic Optimizer replaces time-consuming, and sometimes error-prone, manual load balancing with simple automated procedures, ensuring long-range optimal performance and reduced cost of ownership.

Bringing lightning-fast speed to Lightning 9900 environments, FlashAccess Manager "locks" Lightning 9900 data into cache in real time. Read and write functions are performed at cache speeds without any delays. FlashAccess Manager can be used in conjunction with HMDE to dramatically increase data transfer speeds.

The Lightning 9900 supports IBM's Transaction Processing Facility/Multi-Path Lock Facility (TPF/MPLF) in either native mode or under VM. Providing recordlevel locking, the Lightning 9900 enables high levels of concurrent data access across multiple channel paths. RAID-5+ and 3390-3 LVIs are both supported as well.

Managing LUNs and LVIs

In addition to unsurpassed RAID and drive flexibility, the Lightning 9900 offers LUN and VIVI Manager products to provide you with the granular levels of agility you need to adapt to your ever-evolving application requirements. In open systems environments, the flexible logical unit size supports 1.9GB, 2.4GB, 7.3GB, and 14.6GB LUNs for operating systems that can handle file sizes greater than 4GB. Hitachi LUN Manager provides multiple virtual LUNs in place of an actual LUN to address any user requirement and significantly improves efficiency when handling very large databases.

Simplifying configuration management, Hitachi LUN Manager lets you define, configure, add, delete, resize, and assign LUNs to specific paths, and maintain open systems LUNs on your own, without vendor intervention. Because LUN Manager can assign multiple paths to a single LUN, you gain the necessary infrastructure to support alternate path failover, path load balancing, and clustered systems (when supported by the respective server platform).

In S/390 environments, Hitachi Virtual Logical Volume Image (VLVI) Manager permits users to configure logical volumes with capacities as small as a single cylinder and as large as a full 3390-3 image. Volume size is determined in cylinder increments, and when deployed in conjunction with FlashAccess, VLVI Manager provides optimum performance and agility.

Comprehensive professional services and responsive support ensure a lasting e-infrastructure

As new technologies gain acceptance, companies must decide on long-term plans and implementation schedules that cause the least disruption to business. It takes time to implement any large-scale technological change. The transition to new network topologies will see the coexistence of distributed and legacy systems, and SCSI and Fibre Channel on SANs, ESCON, and FICON. Hitachi Freedom Storage provides the comprehensive connectivity, management, and availability capabilities needed to handle this transition. These built-in strengths are bolstered by Hitachi Data Systems' professional services and service and support organizations, which team with you to ensure the optimal operation of hardware, software, and middleware.

Professional services for enterprise solutions

Hitachi Data Systems professional services specializes in infrastructure and storage management services that provide a vendor-independent view of IT architecture, focusing on ways to streamline operations, costs, and interoperability. They also excel at helping customers chart both the strategies and timelines necessary to remain productive and competitive. Whether you need assistance with SANs, DFSMS[™], performance/capacity issues, migration planning, decisions about platforms and architectures, or maximization of IT investments, Hitachi Data Systems has the expertise and the resources to guide you toward the best solution for your business. A few of the many Hitachi Data Systems service offerings are highlighted here.

On-line data migration

The Hitachi Data Migration Service (HDmS) helps you migrate data from your existing systems to newly installed systems while minimizing the impact on your mission-critical applications. HDmS features a four-phase approach that includes assessment, planning, migration, and postmigration support. The strength of this service lies in the combination of Hitachi Data Systems' professional services methodology/procedure skills, Hitachi's remote copy, Hitachi On-line Data Migration (HODM), and the outstanding reliability of the Lightning 9900. You gain the benefits of unprecedented levels of data protection and integrity through a complete solution that moves terabytes of data quickly and

Hitachi On-line Data Migration plays a critical role in effecting a safe and successful transfer of data. In S/390 environments, HODM migrates terabytes of data between Lightning 9900 systems and other industry-standard systems in a matter of hours—while applications are on-line. HODM provides the utmost in availability, allowing users to access data continuously throughout the migration process. Its superior capabilities reduce migration times dramatically, saving you considerable expense.

SAN services

Controlling explosive data growth and the subsequent increases in storage costs is a daunting task. Storage area networks can help you achieve the increased scalability, availability, and reliability you need to meet this challenge. As you begin to explore options for your future storage plans, you can take advantage of the broad suite of SAN services delivered by Hitachi Data Systems' highly experienced team of SAN specialists. These offerings range from infrastructure assessment, planning, and tactical/strategic design, to project management, installation, and implementation.

Enterprise storage and availability management services

Hitachi Data Systems offers a variety of consulting services to help extend the life of your storage investment and define ways to achieve greater information functionality throughout your enterprise. These storage services cover storage management, availability, disk utilization, performance and timing, data center cabling and configuration, and design/installation of fibre optic components. Hitachi Data Systems' services help you take full advantage of your IT resources, and enhance the continuous availability and integrity of your mission-critical applications.

In addition, our Professional Services consultants can work with your business continuity planners on exploiting the capabilities of the Lightning 9900. Our Cost of Risk Analysis methodology (CORA), a component of our Infrastructure Suite (iSuite) of consulting services, can help to identify the cost, benefit and ROI in your computing infrastructure to reduce outage windows and the impact of an outage. Our findings and recommendations will be in accordance with your business drivers and in terms that you can take to your executive team.

Top-ranked service and support

The 1990s showcased Hitachi Data Systems' stellar service and support standing. Year after year, Hitachi Data Systems has won the highest overall customer satisfaction ratings in independent surveys conducted by Datapro, with "service responsiveness" specifically identified as one of the important evaluation criteria. Our world-renowned service and support organization works closely with you to ensure that Hitachi products operate at peak performance and complement the other hardware and software in your enterprise.

Are you ready to succeed?

You will be with the Lightning 9900. In the fast-paced world of e-business, the Lightning 9900 stands out as the most advanced enterprise storage system on the planet. Specifically designed from the ground up with the rigors of the New Economy in mind, the Lightning 9900 won't just prepare you to meet customer demand, it will have you conducting business in ways you had previously only dreamed of.

As your workloads continue to rapidly evolve and expand, so will your need for around-the-clock instantaneous data access. The Lightning 9900's highly sophisticated, state-of-the-art, exponentially scalable, inherently flexible architecture means that you'll be able to scale seamlessly to accommodate the flow, and capitalize on future technological developments. That makes for happy customers and an exceptionally high ROI.

Does your e-foundation have the competitive edge? With the Hitachi Freedom Lightning 9900, your company will be more efficient, more productive, and more nimble than ever before—and for years to come.



Lightning 9900—Technical Specifications

System Capacity

2 to 496
18, 47, 73
37.3TB
37.3TB
37.3TB
18.4TB
17.2TB
126 (with 8 spares)
124 (with 16 spares)
2GB
32GB
Up to 4,096

Control Frame

Client-Host Interface Processors (CHIPs)

Number of CHIP pairs	Up to 4
Simultaneous data transfers per CHIP pair	4 or 8
Physical interfaces per CHIP pair	4 or 8
Physical Interfaces per Subsystem Maximum	32
Extended Serial Adapters [™] †	0, 4, 8, 12, 16, 24, or 32
Fibre channel (fiber-optic cable)	0, 4, 8, 12, 16, 24, or 32
Logical Paths per Subsystem Extended Serial Adapters	Up to 8,192

Array Control Processor (ACP)

Array Control Processor (ACP)			
Number of ACP pairs per subsystem	Up to 4		
Physical array paths per ACP pair	8		
Physical array paths per subsystem	32		
Simultaneous transfers per ACP pair To nonvolatile cache To disk array	8 16		
Transfer rate Per disk array path Per ACP pair	Up to 100MB/sec Up to 800MB/sec		
Hi-Star switched fabric architecture maximum bandwidth	6.4GB/sec		

[†]Extended Serial Adapters are compatible with ESCON protocol.

Array Frame

Array frames per subsystem	up to 6
Spare drives per subsystem (standard)	1 per drive capacity installed
Spare drives per subsystem (maximum)	16

Hard Disk Drives (HDDs)

GMR (Giant Magnetoresistive) Head Technology

	18.46GB	47.19GB	72.91GB
Rotation Speed	10,025RPM	10,025RPM	10,025RPM
Form Factor	3.0 in.	3.0 in.	3.0 in.
Actuator	Recoilless rotary	Recoilless rotary	Recoilless rotary
Servo System	Digital	Digital	Digital
Interface	FC-AL	FC-AL	FC-AL
Internal Transfer F	Rate		
Inner Zone	30.2MB/sec	30.2MB/sec	33.4MB/sec
Outer Zone	45.6MB.sec	45.6MB.sec	52.8MB.sec
Average Seek Tim	ie		
Read	5.2ms	5.7ms	5.7ms
Write	6.0ms	6.5ms	6.5ms

Physical Specifications	
Control Frame	
Height	1,790mm (70.5 in.)
Width (with two side panels)	750mm (29.5 in.)
Depth	800mm (31.5 in.)
Weight	410kg (903 lbs)
Heat*	2.15kW
Power*	2.2kVA
Array Frame (one to six)	
Height	1,790mm (70.5 in.)
Width	600mm (23.6 in.)
Depth	800mm (31.5 in.)
Weight*	472kg (1,038 lbs)
Heat*	1.5kW
Power*	1.74kVA

^{*} One controller, 16GB cache, one disk array frame, 96 disk drives, 4,770GB raw capacity using 47GB hard disk drives.

Operating System Support

Open systems

Compaq® Tru64™ UNIX

HP-UX®

IBM AIX

Novell NetWare

Red Hat® Linux

Sequent® DYNIX/ptx®

Sun Solaris

Windows 2000

Windows NT

S/390

OS/390

MVS/ESA®

MVS/XA®

TPF/MPLF

VM/ESA™ VM/XA

VM/HPO

VSE/ESA®

VSE/SP (4.1)

CARE Software Solutions

The Copy Suite

Hitachi's Asynchronous and Synchronous Remote Copy

Hitachi Shadowlmage

Hitachi NanoCopy

The Availability Suite

 $\ensuremath{\mathsf{HARBOR}}$ Backup with the HARBOR HMDE Agent

Hitachi Multiplatform Backup/Restore

The Resource Suite

Hitachi Resource Manager

- Hitachi Graph-Track
- Hitachi FlashAccess Manager
- Hitachi VLVI Manager
- Hitachi LUN Manager

Hitachi Dynamic Optimizer

Hitachi Zone Allocation Manager

LDEV Security

LUSE

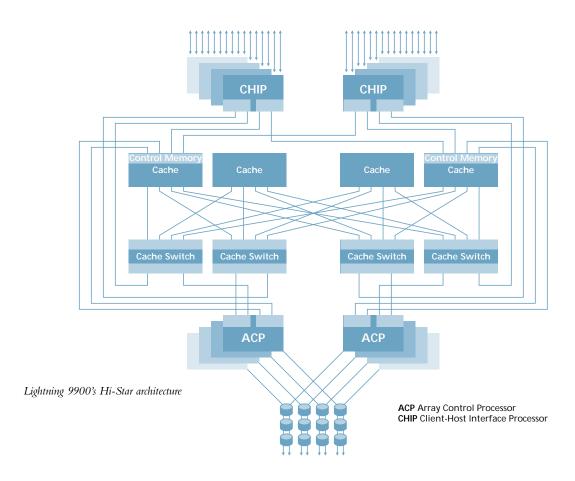
The Exchange Suite

Hitachi Multiplatform Data Exchange

HARBOR File Transfer with the HARBOR HMDE Agent

Host Failover and Alternate Path Support

	Host Failover	Alternate Path
HP-UX	MC/ServiceGuard	HP-UX/Logical Volume Manager
Sun Solaris	VERITAS FirstWatch	VERITAS VxVM
AIX	HACMP™	Hitachi Path Manager
Windows NT/2000	MSCS	Hitachi Path Manager
Compaq Tru64 UNIX TruCluster		_
Sequent	ATAP	Sequent proprietary software



For platform-specific feature availability, please contact your Hitachi Data Systems account representative or visit our Web site at www.hds.com

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The Hitachi Freedom Storage Lightning 9900 is the cornerstone of this architecture.

Hitachi Data Systems

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