

Enterprise Storage

Hitachi Application Optimized Storage™

Solutions for Aligning IT
and Business Objectives

A White Paper

By Peter Smails and Carlos Soares

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Executive Summary

From Fortune 100 enterprises to small businesses, in today's business world, applications and the storage environments they depend upon have become critical drivers of business processes and decisions that impact organizational growth, risk, and profitability. Therefore, it's imperative that businesses more closely align storage infrastructure with application needs.

Application Optimized Storage™ solutions from Hitachi Data Systems answer this business challenge, enabling organizations to strategically align business applications and storage infrastructure to reduce cost and boost performance, availability, and functionality.

Application Optimized Storage solutions are built upon a common framework of comprehensive storage, data, content, and application services, providing the appropriate infrastructure, management, and data delivery to optimize storage for diverse application requirements. Today, Application Optimized Storage solutions provide organizations, large and small, with the ability to manage and optimize all their application storage requirements with a universal storage platform that provides tiered storage, as well as application-centric storage and data services across heterogeneous environments.

With the introduction of the Hitachi TagmaStore™ Universal Storage Platform, Application Optimized Storage solutions reached previously unattainable levels of performance, consolidation, and virtualization of heterogeneous externally attached storage in one pool, supporting application-centric quality-of-service (QoS), storage area management, and simplified universal data replication. The Universal Storage Platform enables storage managers to logically partition storage resources to maximize application QoS, move data across tiers of storage to match application attributes, establish enterprise-wide business continuity, and manage it all with a single family of software capabilities.

With the Universal Storage Platform at the center of their IT strategies, organizations of varied sizes can greatly enhance business value and efficiency, and reduce total cost of ownership through consolidation, automation, and simplified management and replication. As further advances in hardware and software become available, Application Optimized Storage solutions will continue to evolve and improve the ability to effectively optimize IT infrastructure to meet all application storage requirements.

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Hitachi Application Optimized Storage™

Solutions for Aligning IT and Business Objectives

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“With its latest announcement of Application Optimized Storage, a unique and comprehensive suite of devices, software, and services, Hitachi Data Systems takes a leadership position in business-centric storage management.”

— John Webster, Data Mobility Group

Problems Businesses Are Facing

Organizations are increasingly focused on a number of critical issues, including corporate governance, risk preparedness, business continuity, operational efficiency, and generating business value for all of their stakeholders. To successfully address these issues, organizations must create a closer alignment between IT resources (people, processes, and infrastructure) and corporate objectives.

Supporting this alignment creates significant IT challenges, including managing rapid data growth and increased data retention periods, supporting 24/7 data availability requirements, and consolidating and managing complex infrastructures. Further complicating these challenges, IT organizations must reduce overall total cost of ownership while dealing with technology evolution that outpaces accounting depreciation.

To address these challenges and achieve this alignment, IT departments require solutions that are optimized to fulfill business application requirements, complemented by tools to monitor and manage assets from an application view. Furthermore, businesses will need common management, storage software, and data networks to unite infrastructure and resources if they are to achieve optimal levels of efficiency.

According to the latest Hitachi Data Systems Storage Index, a growing majority (some 55 percent) of IT directors now rate storage management as their single most important investment priority. This is not surprising given continued budgetary austerity and ever-increasing storage demands. Both of these drivers place enormous pressures on IT directors to use their storage resources more efficiently.

However, traditional approaches to measuring the effectiveness of storage management practices have often ignored the underlying business needs of corporate risk managers, document retention managers, and mission-critical applications. This shortcoming is exacerbated by the emergence of tougher regulatory requirements, with compliance officers and board-level executives taking a mounting interest in storage-related matters.

One of the typical approaches to resolving storage priorities has been to calculate the number of terabytes managed per administrator, with the implication that the higher this number, the greater the efficiency. The problem is that this assumes a direct correlation between the number of terabytes consumed by an application and both the criticality of that application to day-to-day business effectiveness and the complexity involved in supporting the application.

To illustrate the flaw in this assumption, one only has to consider the example of a critical messaging application that consumes few terabytes of storage but serves thousands of users daily and requires continuous, high-quality support to counter virus infections, enforce regulatory policies, and so on. Compare this to a less-critical, low-access data mining application, which consumes many more terabytes but requires far less administrative support, and it is clear just how misleading the terabyte-per-administrator methodology can be.

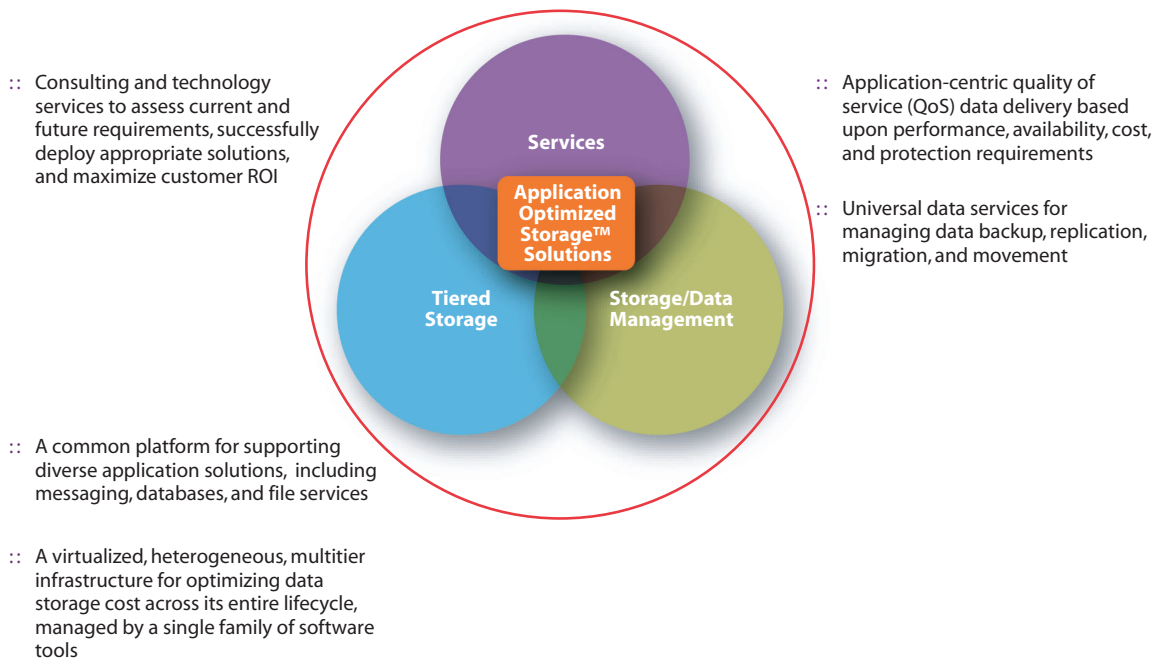
Indeed, using such an approach to measure storage management effectiveness simply diverts attention away from the real business issues: supporting the users of critical applications and complying with business policies laid down by senior management. As a result, IT administrators can become dangerously exposed, with too few resources and too little staff time to manage too much critical data.

How Can Hitachi Data Systems, a Storage Company, Help?

With all the recent hype around information lifecycle management (ILM), numerous storage vendors have tried unsuccessfully to position themselves as “information” companies. This leaves potential customers on their own to resolve their biggest challenge: how to manage and optimize their IT storage infrastructure to meet the myriad needs of applications upon which their businesses run and they rely to be successful.

Companies are looking for storage vendors to help address their immediate business application requirements by providing solutions that deliver key services, software, and hardware capabilities today, as shown in Figure 1.

Figure 1. Key Capabilities



Today's businesses are seeking solutions that manage and optimize their IT infrastructure to meet business application requirements.

To achieve this level of simplicity, solutions must be based upon an integrated, standards-based, technology framework.

A Framework for Aligning IT and Business Objectives

Aligning IT and business objectives is not just about managing data through its lifecycle. It's about IT understanding the needs of the business and building, managing, and adapting a storage infrastructure to optimize data delivery in support of the myriad needs of the applications businesses rely upon. To address this complex problem, Application Optimized Storage solutions are based upon an integrated framework of hardware and software services, including application, content, data, and storage services as represented in Figure 2.

Figure 2. Application Optimized Storage: A Framework for Aligning IT and Business Objectives



A multilevel framework delivers the components necessary to optimize storage and meet the business needs for efficient operations.

Each component in the framework plays a critical role in an overall solution, so let's talk about each layer in more detail.

Application Services

Application Services provide the application-centric infrastructure management that is critical to enterprises today and include the application modules of the Hitachi HiCommand® Suite of software. Application Services enable administrators to correlate the availability of business-critical applications with storage network provisioning, capacity, performance, availability, and monitoring. In other words, administrators can closely correlate application needs with storage resources.

Application Services are delivered through a product set that includes the following application management modules:

- :: Hitachi HiCommand Suite QoS Modules, powered by ApplQ
 - :: HiCommand QoS for Oracle
 - :: HiCommand QoS for Sybase
 - :: HiCommand QoS for Microsoft Exchange
 - :: HiCommand QoS for File Servers
- :: HiCommand Chargeback Module, powered by ApplQ
- :: HiCommand Tuning Manager

These Application Services tools are all integrated and allow robust management of the enterprise's storage infrastructure, from application to disk.

Content Services

Companies run a wide variety of applications in support of their business processes, and these applications have diverse structured and unstructured data storage requirements. Understanding the storage requirements of these myriad data types is a critical capability of Application Optimized Storage solutions. Therefore, Content Services represent any applications that provide the ability to index, store, search, and retrieve information. Just some of the applications supported by Application Optimized Storage solutions include:

- :: Databases
- :: Messaging
- :: File Systems
- :: Enterprise Resource Planning (ERP)
- :: Customer Relationship Management (CRM)
- :: Unstructured Content Management

Understanding the unique requirements of these applications can be a complex process and requires close collaboration with leading application vendors. Unlike other storage vendors who have chosen to deliver their own proprietary application solutions, Hitachi Data Systems is committed to an open, collaborative approach. By partnering with leading application vendors, including IBM, Microsoft, Oracle, and Sybase, as well as vertical industry leaders including OpenText (IXOS), Hitachi Data Systems provides organizations with the flexibility to run the applications they need to support their business.

Data Services

The ability for customers to leverage a single set of Data Services for all their migration, replication, backup, and security needs is a key component of Application Optimized Storage solutions. Based upon an understanding of application storage requirements, storage cost, performance, functionality, and availability can be optimized using comprehensive data management tools for backup, migration, replication, and security.

Hitachi Data Systems offers a comprehensive suite of Data Services software, including:

- :: HiCommand Tiered Storage Manager
- :: Hitachi Volume Migration (formerly CruiseControl)
- :: Hitachi Cross-System Copy (formerly HiCopy)
- :: Hitachi Business Continuity Manager (formerly CopyCentral)
- :: HiCommand Backup Services Manager, powered by APTARE®
- :: HiCommand Replication Monitor
- :: Hitachi Copy-on-Write Snapshot (formerly QuickShadow)
- :: Hitachi Universal Replicator software for TagmaStore™ Universal Storage Platform

- :: Hitachi ShadowImage™ In-System Replication
- :: Hitachi TrueCopy™ Remote Replication
- :: Hitachi Data Protection Suite, powered by CommVault®
 - :: Hitachi Data Archiver
 - :: Hitachi Data Migrator
 - :: Hitachi Quick Recovery
 - :: Hitachi Data Protection Monitor
 - :: Hitachi Backup and Recovery
- :: Hitachi Data Retention Utility (formerly Open LDEV Guard)

Hitachi Data Systems is recognized as a leading provider of copy and data protection products as well as associated business continuity and data migration design and implementation services in both open systems and mainframe environments. These products and skills are essential for tiered storage deployments that match data value to appropriate classes of storage systems.

Storage Services

Storage Services provide the foundation for all Application Optimized Storage solutions by providing a heterogeneous, multitier storage infrastructure supported by common storage management tools. This architecture allows the exact matching of application priority policies and storage infrastructure across an unmatched range of high-end enterprise and midrange storage products that provide a broad selection of performance, availability, functionality, and price/performance attributes.

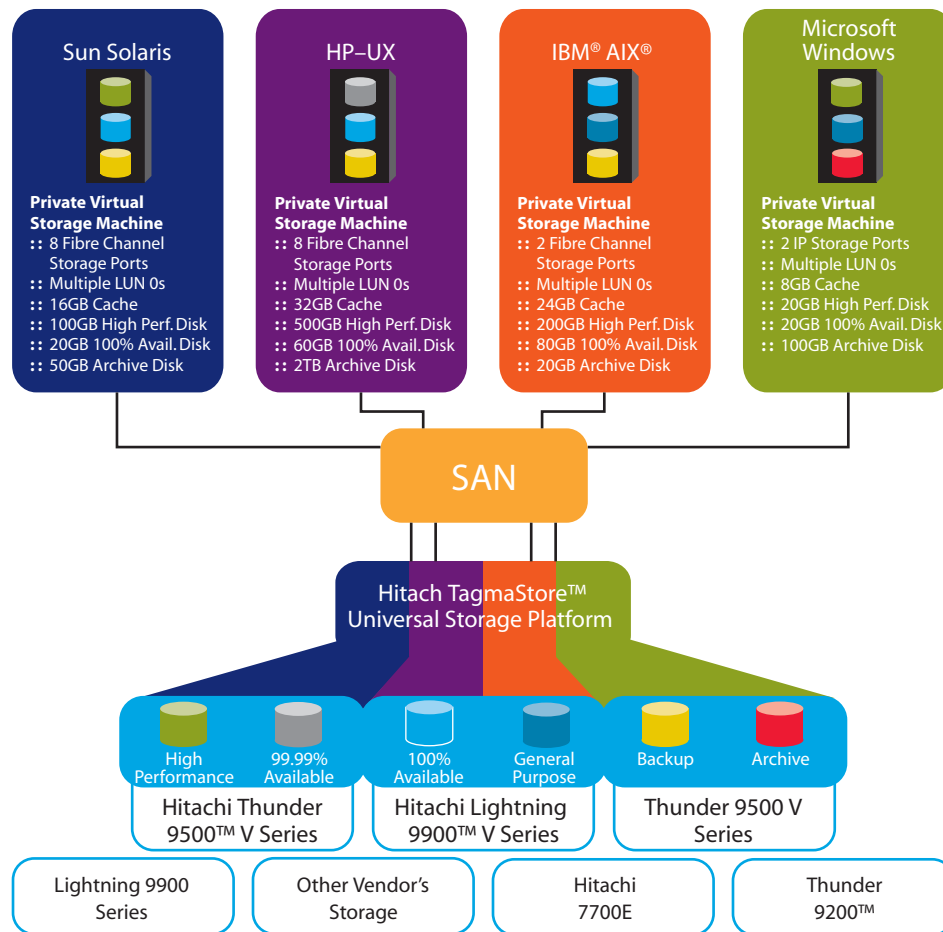
The components of storage services are a heterogeneous, multitier infrastructure, connectivity, and common storage management.

Infrastructure

Hitachi TagmaStore™ Universal Storage Platform

The Universal Storage Platform family is powered by the Universal Star Network™ third-generation crossbar switch architecture. It establishes a new industry category with previously unattainable levels of consolidation and virtualization of up to 330TB internal and 32PB heterogeneous external storage in one pool and supports application-centric storage area management and simplified data replication. The Universal Storage Platform enables storage managers to logically partition storage resources to maximize application QoS (as shown in Figure 3), move data across tiers of storage to match application attributes, establish enterprise-wide business continuity, and manage it all from a single pane of glass.

Figure 3. Logical Partition of the Universal Storage Platform



Through partitioning, you can create up to 32 Private Virtual Storage Machines from internal and attached storage, each with dedicated capacity, cache, and ports.

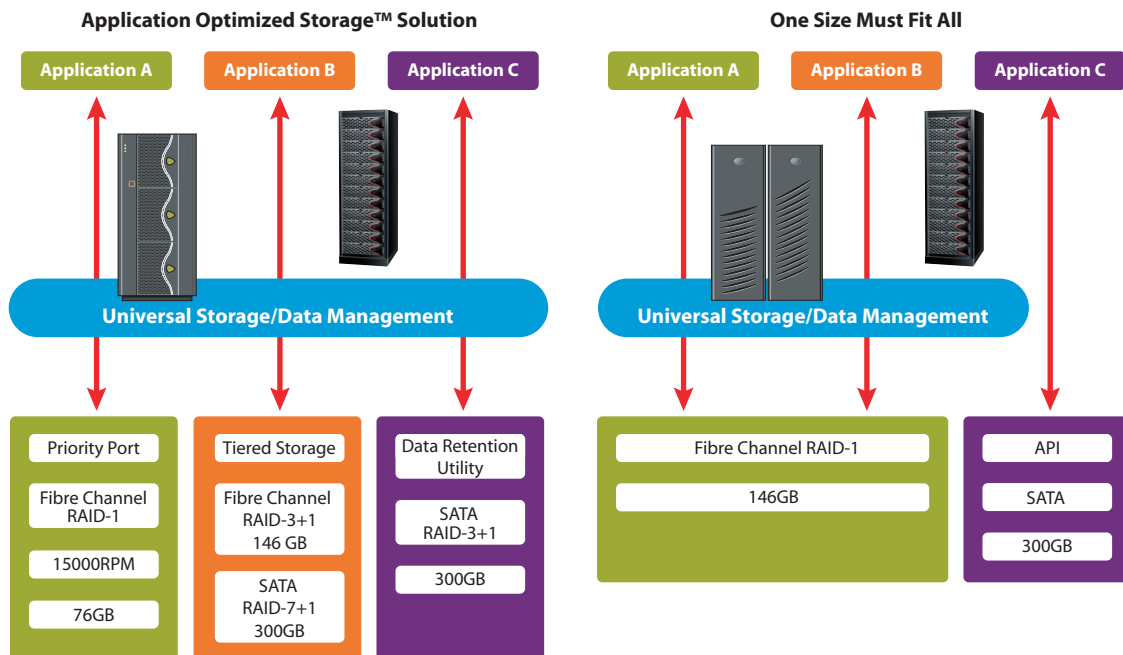
With the Universal Storage Platform, enterprises can for the first time:

- :: Aggregate all disparate storage systems into a common storage pool, reducing complexity and extending the useful life of existing assets
- :: Share the resources of the Universal Storage Platform and externally attached storage across virtual storage machines—addressing application-specific performance, availability, cost, and protection requirements
- :: Reduce data management complexity and cost by using a single replication engine for all data protection and lifecycle management needs
- :: Enhance server, application, and network performance by offloading replication, migration, and data protection tasks
- :: Manage all of this from a single pane of glass

A Fundamental Technical Differentiator

Application Optimized Storage solutions powered by the Universal Storage Platform enable customers to leverage single, multitiered infrastructure for application storage requirements. This capability is unmatched in the industry, and is enabled by the unique Hitachi global cache architecture, which separates the data cache from the control store. This capability was first introduced with the Hitachi 7700 system almost 10 years ago and is important because it enables the dynamic configuration and optimization of data cache, RAID striping, tiers of storage, QoS, and data protection services for multiple unique applications, all running on a single platform. No other storage architecture can match this level of optimization, and with models ranging from the entry-level USP100 to the high-end USP1100, whether you are a Fortune 50 or small business you can leverage the economic benefits of using a single multitier platform for all your storage requirements. (See Figure 4.)

Figure 4. Application Optimized Storage Solutions versus Competitive Solutions



The Universal Storage Platform enables a single multitier platform for all application storage requirements, while competitive products require separate solutions.

Hitachi Lightning 9900™ V Series Enterprise Storage Systems

Hitachi Lightning 9900™ V Series enterprise storage systems provide seamless scalability with non-disruptive expansion to over 140TB to simplify your storage infrastructure through massive consolidation. Lightning 9900 V Series systems are powered by the Hi-Star™ crossbar switch architecture. This assures you of no single point of failure and instant, 24/7 data access—backed up with a 100 percent data availability guarantee. The Lightning 9900 V Series systems support not only open systems, but also mainframe environments through FICON and ESCON as well as copy software compatibility. Recently the Enterprise Strategy Group reported the Lightning 9980V™ multicabinet storage system is unsurpassed for the kind of high-end, multidimensional scalability required for serious storage consolidation.

Hitachi Thunder 9500™ V Series Modular Storage Systems

The Hitachi Thunder 9500 V Series modular storage systems provide industry-leading (up to 64TB) capacity, performance, and connectivity in a small footprint. These systems can grow with your business, addressing applications such as data replication, message archiving, and regulatory compliance. For economical information lifecycle management, match the cost of storage to the value of your data by tiering storage down from Lightning 9900 V Series enterprise systems to lower-cost Thunder 9500 V Series models.

SATA Intermix Option

New global regulatory requirements are driving demand for automated storage solutions that simplify the management and migration of data throughout the entire data lifecycle. Employ Serial ATA by adding the SATA Intermix Option for the Thunder 9500 V Series of modular storage systems to existing Thunder 9585V™ and Thunder 9580V™ ultra high-end and Thunder 9570V™ high-end modular storage systems. This allows you to create the world's first data lifecycle management "in a box"—high-speed Fibre Channel and lower cost native SATA tiered within one storage system.

Connectivity

Storage Area Networks

Storage area networks or SANs are an essential part of the Hitachi Data Systems delivery of Application Optimized Storage solutions. SANs make large storage pools shareable across the enterprise, centralize storage management, and dramatically improve storage utilization, resulting in lower costs. Yet they can simultaneously provide better performance for the applications that drive business.

Hitachi Data Systems SAN solutions encompass storage systems, switches, servers, management software, multiprotocol support, services and other storage network components developed by Hitachi, alliance partners, and third-party providers. Working with the storage networking industry leaders, such as Brocade, Cisco, CNT, and McDATA, Hitachi Data Systems provides extensive connectivity options, including IP (iSCSI, FCIP, iFCP) and Fibre Channel configurations.

In addition, the Lightning family of storage systems supports both ESCON and FICON protocols for mainframe connectivity concurrently with open systems protocols. This makes Lightning family the platform of choice for massive consolidation projects.

Virtual Storage Ports/Host Storage Domains

Virtual storage ports, available in the Universal Storage Platform, Lightning 9900 V Series, and Thunder 9500 V Series storage systems, enable each Fibre Channel physical port to support 128 heterogeneous open systems servers. Each server has its own secure storage partition and bootable LUN0 through Host Storage Domains. This capability simplifies the storage network infrastructure, eases management, and enables large-scale consolidation, resulting in lower total cost of ownership (TCO).

Network Attached Storage

For many applications, especially Web, design, and medical, the concern is not bandwidth but file access response time. Hitachi offers a range of NAS connectivity, enabling cost-efficient storage utilization across the enterprise.

Common Storage Management

Common storage management is achieved through standards-based rich management tools that provide IT executives with a single point of control for both application and infrastructure requirements. To fully benefit from Application Optimized Storage solutions, all of these elements, including business continuity characteristics, storage system performance, and network fabric, need to be defined, managed, and mapped to what business requires from the applications in order to optimize delivery of value to the business.

Common storage management is perhaps the most important component of Application Optimized Storage solutions. Rather than provide end users with disparate interfaces for disparate platforms, essentially resulting in multiple islands of storage and inaccessible information, Hitachi Data Systems provides the same software, the same management interfaces, and the same tool sets to manage all heterogeneous storage systems from a single console.

The storage management software tools offered by Hitachi Data Systems include:

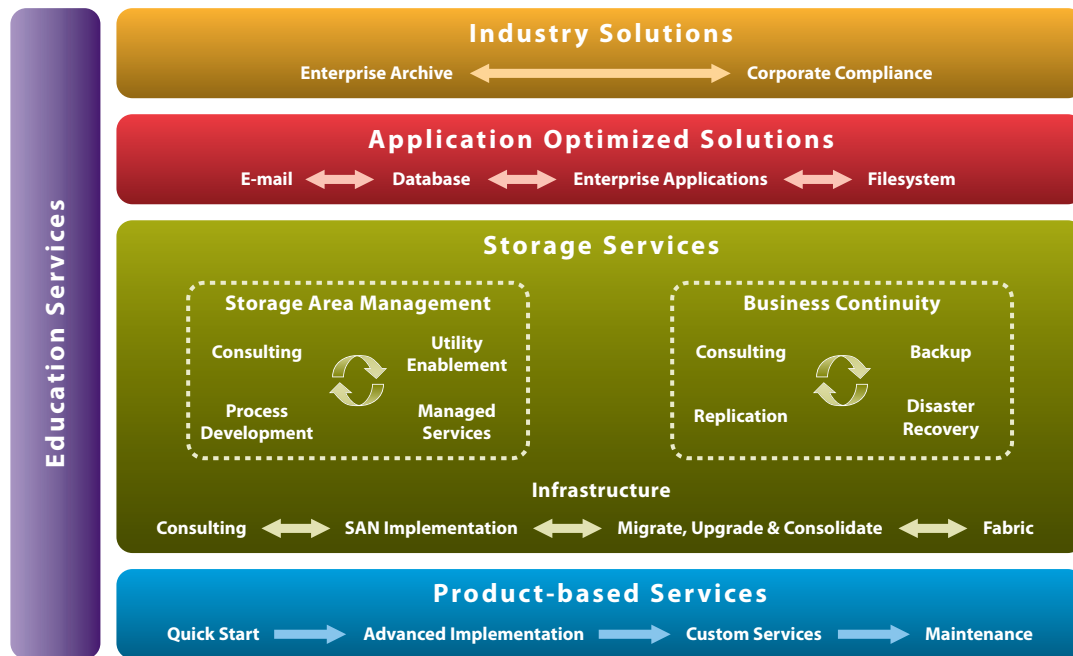
- :: HiCommand Storage Services Manager
- :: HiCommand Device Manager
- :: Hitachi Resource Manager™ utility package
- :: HiCommand Dynamic Link Manager™ path manager
- :: Hitachi Performance Maximizer storage system optimization package

With a powerful hardware foundation and sophisticated software for managing, protecting, and moving data, Storage Services deliver the ability for customers to choose the appropriate storage system for the data value and/or move data across tiers of storage as data value changes over its lifecycle.

Services and Best Practices

The final key components of Application Optimized Storage solutions are Services and Best Practices. To ensure organizations maximize their investment in Application Optimized Storage solutions, Hitachi Data Systems offers a comprehensive suite of technology, storage, education, and professional services, as illustrated in Figure 5.

Figure 5. Hitachi Data Systems Global Solution Services Offerings



Delivering industry solutions and providing professional and technology services, as well as education, the Global Solution Services organization ensures that customers get the highest return on their storage investment.

Global Solution Services consultants can help you plan, design, implement, integrate, manage, and optimize storage infrastructure solutions that meet your needs. Areas in which our consultants can assist you include:

- :: **Industry Solutions**—including application solutions that incorporate hardware, software, and professional services to address your business and regulatory compliance requirements
- :: **Application Optimized Solutions**—bridging the gap between business applications and IT's ability to precisely deliver service levels with strategic consulting, design integration, and robust deployment capabilities
- :: **Storage Services**—applying proven best practices along with appropriate tools and training to help with all stages of your storage infrastructure—from planning to maintenance
- :: **Product-based Services**—providing implementation, simplification, and optimized ROI and TCO for Hitachi Data Systems and select third-party products
- :: **Education Services**—helping you to improve your staff efficacy and efficiency in implementing and supporting multivendor storage solutions

Application Optimized Storage Solutions in Action: Corporate Governance

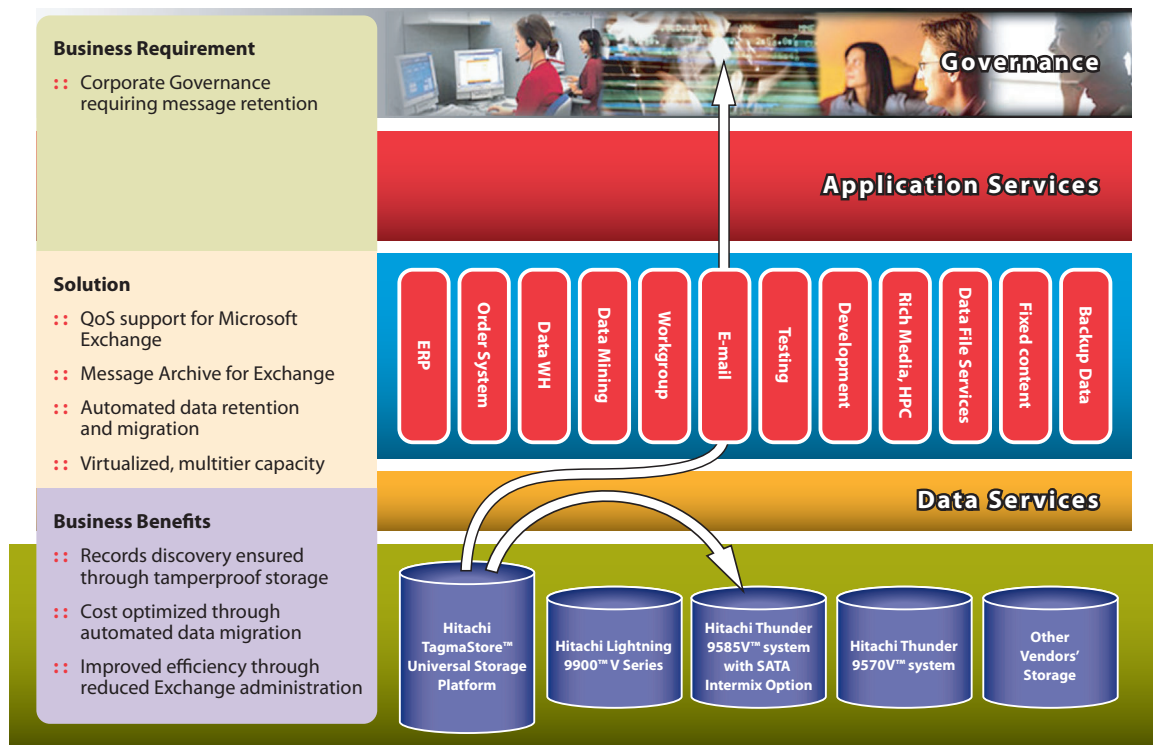
Now let's put all the pieces together and illustrate an example of an Application Optimized Storage solution.

Business Problem: In most enterprises, e-mail is now a mission-critical application, not only because it enables external and internal communications but also because it is used as a file system, holding much of their intellectual property. Furthermore, recent legal cases reveal the vulnerability and potential liability that businesses face as a consequence of the information stored on their storage systems—especially on e-mail systems. For many enterprises, government mandates require message retention while IT policies require that e-mail data be placed on fast-response storage systems.

Solution: Using HiCommand QoS for Microsoft Exchange, administrators are able to extend HiCommand software's integrated SAN management, storage resource management, and storage operations management capabilities inside Microsoft Exchange. This allows IT to ensure the availability, performance, and retention of messaging and collaboration data and to respond more efficiently to help desk calls, while planning for effective disaster recovery.

As shown in the color coding in Figure 6 relative to the e-mail data, this Application Optimized Storage solution first allows e-mail data to be placed on the fast-response, highest availability Universal Storage Platform.

Figure 6. Application Optimized Storage Solutions in Action: Corporate Governance



An e-mail application can take advantage of Hitachi storage platforms to maintain data on the most cost-effective platform while ensuring compliance with government and industry regulations.

Leveraging the universal replication services that underlie Application Optimized Storage solutions, an e-mail application can take advantage of Hitachi storage platforms to maintain data on the most cost-effective platform. Therefore, when e-mail “ages” it can be moved to an existing Thunder 9585V™ ultra high-end modular system that was upgraded with the SATA Intermix Option and attached to the Universal Storage Platform. Using this SATA storage and the Hitachi Message Archive for Compliance solution combined with Hitachi Data Retention Utility software, administrators can further optimize their e-mail systems and retain an unalterable archive of e-mail and instant messages for the fixed period of time mandated by SEC Rule 17a-4, the Sarbanes-Oxley Act, Basel II, and other regulatory requirements.

The Continuing Evolution of Application Optimized Storage Solutions

The addition of the Universal Storage Platform to the Application Optimized Storage solutions portfolio establishes a new paradigm that enables you to think about storage and storage management in new ways. Leveraging the capabilities of the Universal Storage Platform, you can now more effectively manage and optimize all your application storage requirements with a set of common storage and data services for heterogeneous environments. You can now logically partition storage resources, both internal to the Universal Storage Platform and externally attached, to create independent, separately managed Private Virtual Storage Machines that can be dedicated to particular servers or applications. These resources can be tuned to meet a particular application’s service-level requirements. Private Virtual Storage Machines can also enable the creation of a Storage Utility environment, making it easier to charge back storage usage by department, achieve more efficient storage management processes, and even provide storage on a metered basis.

However, not all organizations will need the power or functionality of a Universal Storage Platform. With the Application Optimized Storage solutions approach, smaller enterprises can be assured that their storage infrastructure has both the capabilities and flexible application-centric management to best support application requirements. For example, a solution might use the new Thunder 9585V ultra high-end modular storage system for a standalone I/O-intensive research application while supporting archiving of critical fixed content to the SATA Intermix Option on a Thunder 9570V high-end modular storage system. Or, the solution might even use a single Thunder 9585V system to implement data lifecycle management “in a box” by intermixing Fibre Channel and SATA drive trays within the same rackmounted cabinet.

In any of these cases, you can leverage the flexibility, scalability, and management of Application Optimized Storage solutions to address your storage requirements and achieve closer alignment between IT and business objectives. Application Optimized Storage solutions from Hitachi Data Systems will evolve as advances in hardware and software continuously improve the ability to more effectively optimize IT infrastructure to meet all application storage requirements.



Corporate Headquarters

750 Central Expressway
Santa Clara, California 95050-2627
U.S.A.
Phone: 1 408 970 1000
www.hds.com
info@hds.com

Asia Pacific and Americas

750 Central Expressway
Santa Clara, California 95050-2627
U.S.A.
Phone: 1 408 970 1000
info@hds.com

Europe Headquarters

Sefton Park
Stoke Poges
Buckinghamshire SL2 4HD
United Kingdom
Phone: + 44 (0)1753 618000
info.eu@hds.com

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