hp **storage**

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invent

strategic brief

ENSAextended: putting you in control

executive summary

Today's hyper-competitive business climate and challenging economic times are placing heightened pressure on organizations to cut costs, increase revenues, and deliver value to shareholders. Business leaders today consider their IT (information technology) infrastructure an invaluable asset—and a critical part of their day-to-day operations. Consequently, IT managers are faced with a growing demand to build and maintain an infrastructure that is cost effective, highly reliable, and predictable—yet still adaptable to change. Added to this mix are IT infrastructures that are so complex and difficult to manage that IT managers must gain greater control over their environment just to stay competitive. The stakes are high.

This paper describes ENSAextended, an extension of the HP Enterprise Network Storage Architecture (ENSA). The blueprint for the adaptive storage infrastructure, ENSAextended puts businesses in control of their storage environment, allowing them to control complexity, uncertainty, and risk. With this control, they gain efficiency, confidence, effectiveness, and—ultimately—business agility. Although ENSAextended is a forward-looking blueprint, it is important to note that it builds on years of successful innovation and consistent delivery of network storage solutions to the market. The original ENSA was revolutionary; ENSAextended is the evolution of the storage utility vision.

today's challenges

Today, every organization faces economic realities that pose a potential threat to viability.

- **volatile business world**—markets and customers are unpredictable
- **more competitive pressure**—new competitors emerge every day to challenge an organization's market position
- **IT budgets and resources react to business pressures**—opportunities for business expansion conflict with IT budget constraints

A survey by the Giga Information Group reveals that today's CIOs are most concerned with the following issues:

- cutting/stabilizing costs
- aligning IT investments with business directions
- building strong IT service delivery
- selective outsourcing
- managing resources
- security
- enterprise architecture
- integrating systems
- boosting credibility of the value of IT services
- planning in order to prioritize IT investments

The needs of CIOs are clear: cut IT costs, reduce IT complexity, and maximize IT resources (hardware, software, network, and human capital). It's time for the storage industry to deliver a blueprint that can address these needs.

the solution: build on the storage utility

Introduced in 1998, ENSA described a revolutionary vision for a storage utility: IT would deliver the right information anywhere, anytime. Realizing this vision would require a fundamental shift from a direct-attached storage (DAS) infrastructure to a networked environment in which storage could be configured and managed as a consolidated resource for the entire computing environment. In 1998, networked storage was still a radical idea. Since then, it has become widely accepted, and the industry is rapidly developing it.

The ENSA blueprint specified that network storage must be modular, scalable, and highly available. These three guiding principles drove the development of numerous solutions that changed the industry, including the following:

- 1998—Disk and tape on the same SAN (storage area network); SAN-based backup and recovery
- 1999—SAN-based data replication
- 2000—SAN-based storage management; SAN storage allocation reporting; metro-wide SAN data movement
- 2001—Open SAN supported solutions; DtS (DAS-to-SAN) technology; storage utility management; VersaStor virtualization technology in the Enterprise Virtual Array; and key concepts such as the global replication network and universal network storage

ENSAextended: extending the storage utility

Delivering the storage utility continues to be the guiding vision for HP storage. Now that the key foundational elements of network storage defined in the original ENSA blueprint are widely deployed, a new blueprint is required to bring development efforts even closer to the storage utility vision.

ENSAextended is the blueprint for HP storage development over the next three to five years. As the name suggests, ENSAextended builds upon the work we've already accomplished over the last half-decade, bringing us to the next phase of network storage—the adaptive storage infrastructure.

adaptive storage infrastructure

For the customer to implement a storage utility, there must be a comprehensive infrastructure in place—one that is transparent to the customer yet able to manage the details essential to delivering the required level of service. In today's competitive environment, businesses require a closer alignment between their operations and their IT, which must be able to rapidly adapt to the business's ever-changing needs. Changes associated with managing growth, deploying new product offerings, and streamlining and upgrading operations place increasing pressure on the technology infrastructure to respond quickly and flawlessly, but with limited resources. The adaptive storage infrastructure will allow businesses not only to quickly respond to these challenges but also to outpace them in the future.

An adaptive storage infrastructure must be:

- **controllable**—easily and centrally manageable, with the ability to monitor and measure performance, delivering pervasive automation driven by business rules defined by the administrator, and offering control over Quality of Service (QoS) requirements
- **resilient**—highly reliable and predictable, with automated recovery and features including self-healing and self-tuning
- **extensible**—modular in design, and scalable in geography, capacity, and performance, with universal interoperability and the ability to extend from storage to business applications (application-aware)

example: *As a business nears the end of its fiscal year, orders, sales, expenses, and profit analysis become paramount, placing significant stress on the IT infrastructure. Using rule-based management, the critical applications associated with these functions can be given a higher priority and dynamically moved to higher performing resources, and greater capacity can be dynamically allocated to adjust to this part of the business cycle—thanks to the adaptive storage infrastructure.*

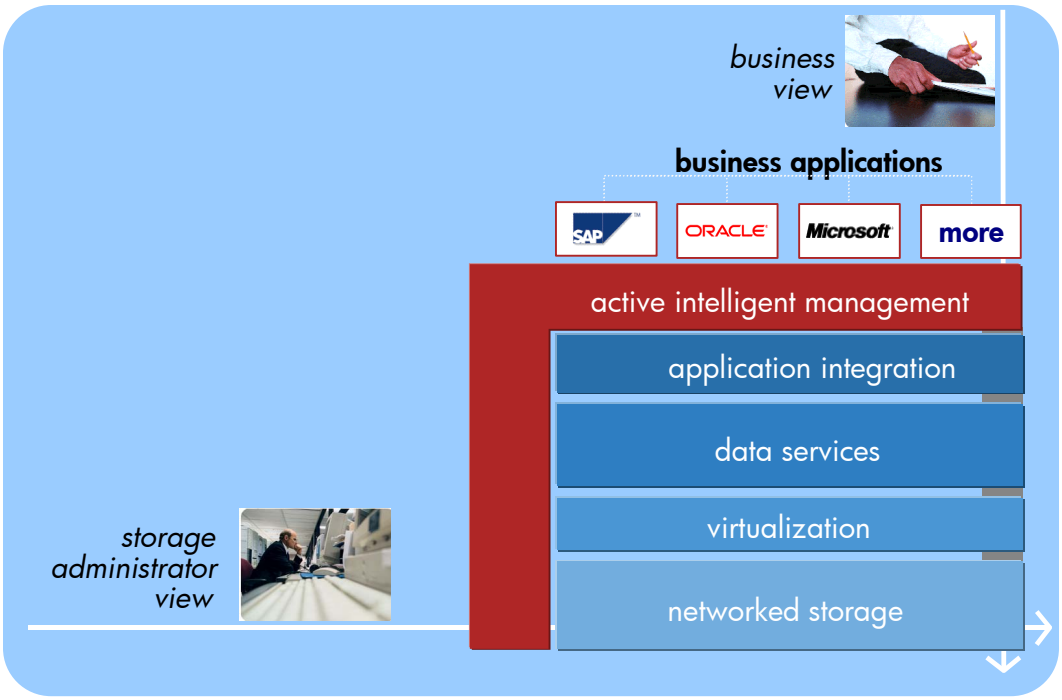
ENSAextended architecture

Figure 1 shows the high-level blueprint of the ENSAextended architecture. It shows the primary building blocks that will drive the development of HP StorageWorks hardware and OpenView storage software in the years to come. As the following discussion will reveal, this is not only a blueprint for the future—it also builds on the many successful network storage products that HP has delivered in the past.

views

ENSAextended introduces two customer "views" or perspectives of the storage infrastructure: a system administrator view and a business application view. Typically, storage vendors pay close attention to the needs of the system administrator, but little, if any, attention to the needs of the application user. Enhancing HP's already robust offering of system administrator tools, ENSAextended will also focus on delivering an adaptive storage infrastructure that is application-aware for true end-to-end storage to business application solutions. There will be further discussion of the views of the storage infrastructure in the active intelligent management section of this paper.

figure 1. ENSAextended architecture



foundational elements

At the core of the adaptive storage infrastructure are three foundational elements: networked storage, virtualization, and data services.

Networked storage includes storage arrays, network-attached storage, tape libraries, network switching, and host bus adapters, which are the physical components of the adaptive storage infrastructure. HP has a comprehensive offering of these network storage solutions today. In the future, these foundational elements will be enhanced by "self-diagnosing" and "self-healing" capabilities that will further enhance their resiliency. Self-diagnosing and self-healing hardware and software ensure high availability with minimal manual intervention

example: IT designers can create the amount of redundancy and managed resiliency required for each business application. The self-repairing capability of networked storage is transparent to applications, and administrator involvement—only required to replace failed or worn components—can be accomplished in a planned manner rather than a reactive one.

Virtualization, a storage abstraction, vastly improves storage capacity utilization and simplifies storage management. It unifies heterogeneous arrays in the SAN and provides a single large storage pool. This pool is accessible by all the servers and applications that are part of the network, enabling higher utilization of available disk space and offering the flexibility to choose and deliver QoS parameters, such as performance, availability, and protection. Today, HP offers the most comprehensive offering of virtualization solutions in the industry. As the ENSAextended architecture diagram (see figure 1) suggests, in the future virtualization technology will permeate the entire foundation of network storage products.

Data services contribute significantly to overall resiliency and data service–level delivery. Today, HP offers a leading portfolio of solutions in this area, including data replication

and migration, data protection and archiving, and multi-pathing failover. HP will soon be announcing an on-demand, self-service storage allocation application—also known as provisioning—which will automate the process of storage allocation for application use, improving productivity and reducing the administrative time required. This allows IT—and the storage administrator specifically—to shift focus from completing routine tasks, such as continual user-by-user allocation, to monitoring overall storage utilization and conducting more critical and strategic operations, such as adding infrastructure (storage systems, switches, and backup devices) to enable applications.

example: *The administrator pre-allocates or "provisions" capacity—characterized with attributes such as availability and performance—to individual users and applications. Users can draw additional capacity up to their prescribed limits. This allows the administrator to shift focus from watching individual users to monitoring overall storage utilization—and adding infrastructure as needed.*

Even the most reliable storage system will need to be taken offline eventually. In an adaptive infrastructure, application data can be migrated from the storage system to a new system without any application disruption—and it can be migrated to higher-performing systems during key business cycle times.

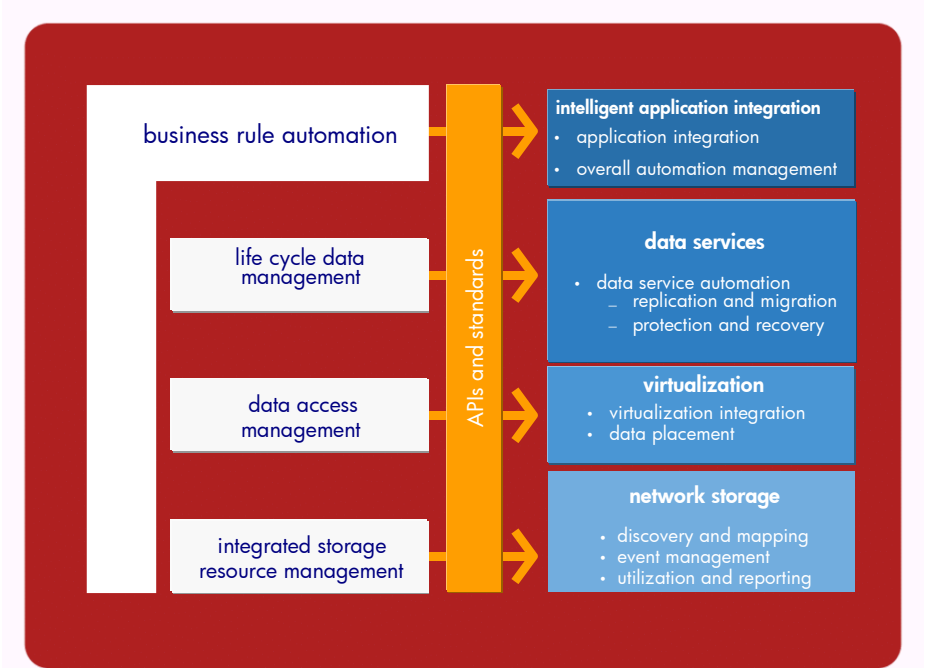
extended technologies

In addition to the foundational elements of networked storage, virtualization, and data services, the adaptive storage infrastructure requires the use of active intelligent management and intelligent application integration.

active intelligent management

Active intelligent management gives storage administrators the tools necessary to consolidate and simplify the management of storage resources and information. It performs these services in direct alignment with business objectives—from storage-to-the-application, through policy management and QoS goals and metrics that enable service-level agreements. The key elements of active intelligent management—integrated storage resource management, data access management, and lifecycle data management—are described below.

figure 2. active intelligent management



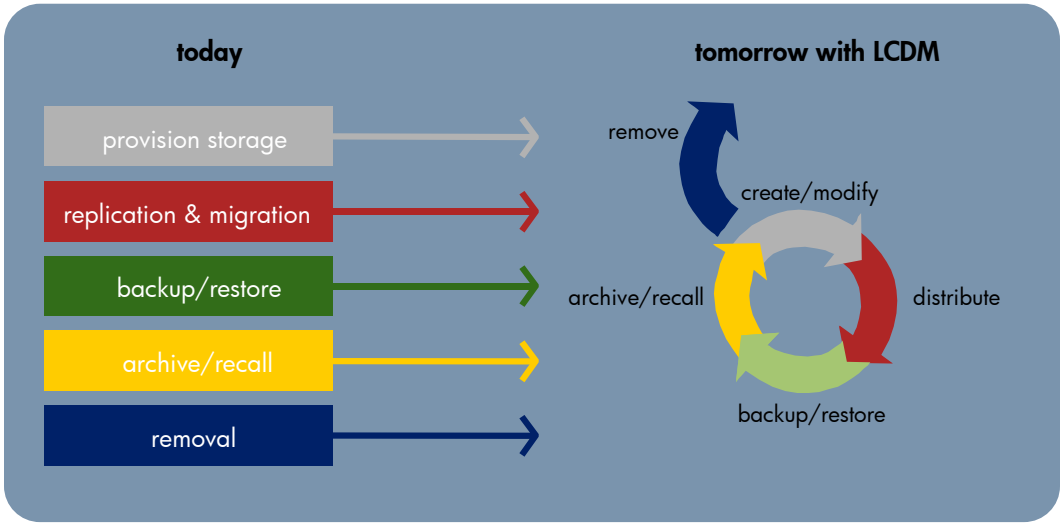
Integrated storage resource management (iSRM) provides the management tools for the products in the ENSAextended Network Storage foundational elements, as well as storage and storage networking devices from other vendors. Much like the dashboard in a car serves as the car's command center, these tools serve as the dashboard for the storage network, performing fundamentally important tasks such as device discovery and mapping, monitoring and event management, and reporting on resource utilization.

Data access management manages the virtualization layer and controls important functions, such as data placement and the management of attributes that drive the virtualization engine. This helps ensure uninterrupted access to data, regardless of where the data resides or when the data is needed. Access time, protection levels, recovery speeds, and more are managed transparently and without downtime when rule-based applications drive tasks. This allows administrators to selectively move application data to storage systems within the utility that provide the level of service needed by that application. The administrator or rule-based application, therefore, is able to move the data to either a higher performing or lower performing portion of the storage utility, changing the level of protection or speed of recovery with no downtime—transparently to the application. Virtualization offers the flexibility to use the storage available in the storage utility and its underlying technologies cost-effectively.

Life Cycle Data Management (LCDM) offers the management tools to automate the data services component of the architecture. LCDM is the management of data based on its changing business relevance and usage requirements. This cycle begins when data is created, and LCDM governs data access, distribution, retention, and disposal according to customer-defined policies. These policies specify service levels, such as availability, protection, recovery speed, performance, security, geographic location, and cost. The key values offered by the HP approach to Life Cycle Data Management will be maximizing the availability of information while minimizing the total cost of infrastructure and the cost of ownership, and utilizing a service-level management approach to maximize efficiency and minimize the administrative staff burden in maintaining this storage environment.

example: *Your marketing organization commissions a customer research project to determine the viability of a proposed new product. A telemarketing company is hired and will use your facility. Because the calls will be in real time with a bank of telemarketers, the storage needs to be high availability and high performance. After the data is collected, marketing analysis is performed and various reports are generated. Approximately six months later, the data no longer needs to be easily accessible, but it must stay easily retrievable. Six months beyond that, the data can be archived. During this time, based on business-based policies, active intelligent management can automatically move this data from high-performance, high-availability storage (in your heterogeneous storage environment) to medium-performance, good availability storage and, eventually, to bar-coded tape—all on the basis of the policy-based attributes you established for this data using active intelligent management.*

figure 3. life cycle data management



Business rule automation is included in figure 2 to indicate that effort will be made not only to automate the other components of the active intelligent infrastructure but also to tie in to the application integration layer to provide end-to-end integration between the storage environment and the applications.

example: *A CIO will be able to set a policy that all mail will be retained for seven years, confident that the LCDM storage management systems will maintain and ensure data protection. Setting business rules—rules that are automatically and transparently implemented—is at the heart of intelligent automation.*

APIs and standards provide integration points for the universal interoperability of storage hardware, software, and applications. These standards include specifications such as the Desktop Management Task Force Common Information Model (CIM) and Web-Based Enterprise Management (WBEM) standards, and the Storage Networking Industry Association's Storage Management Initiative (SMI) to develop the Bluefin specification. Where a standard interface is not available, HP has negotiated partner Application Program Interface (API) agreements with leading storage hardware vendors, including EMC, Hitachi Ltd., and IBM. HP is the only storage software or hardware vendor to offer industry-standard APIs and selected API agreements with these leading enterprise hardware vendors.

application integration

Application integration is the component of ENSAextended that considers the needs of business applications and focuses on creating an adaptive storage infrastructure that is application-aware in order to create unsurpassed storage solutions that directly align with the needs of the business. Business-critical applications such as Enterprise Resource Planning (ERP) software, Customer Relationship Management (CRM) software, sales and order systems, e-commerce applications, and e-mail systems are the backbone of enterprise operations. Each of these applications require high levels of service as well as individual administration. Applications that suffer from poor response time or disruption of service can significantly impact business.

An adaptive infrastructure that is application-aware allows greater responsiveness to changing requirements such as point of access, access speed, and throughput, all of which can impact performance and, ultimately, revenue. In addition, an adaptive infrastructure simplifies management by providing centralized views to diagnose, plan, and

automatically serve applications the appropriate storage needs. This saves administration time, reduces downtime, and mitigates the risk of error. HP has a long history of working closely with companies such as Oracle®, SAP, Microsoft®, and others to better integrate with their business applications. Looking ahead, HP will take partnerships such as these to a new level in order to achieve true end-to-end storage to application integration.

Application integration will provide a far more controllable environment for customers. For example, the forthcoming HP OpenView SMART Plug-Ins (SPIs) for applications such as Exchange, Windows®, Oracle, and SAP will allow storage area management software and other management applications to monitor and manage applications. The combination of APIs and SPIs integrated with arrays, switches, and host bus adapters (HBAs) will allow much closer management of these components and bring them into a powerful, cohesive relationship between the application and the adaptive storage infrastructure. The management information for each component plus the QoS and performance requirements for each application allow the management tools to make decisions that will maximize the operation of each application.

Application integration will offer a more resilient environment. Administrators will be able to assign each application a level of service that reliably executes the policies to ensure automatic, efficient delivery of data. This QoS can include data availability, data protection, recovery speed, and security. The combination of data availability, the backup window (the allowable application disruption for data protection operations), and data recovery time can be considered "productive uptime." The HP ENSAextended adaptive storage infrastructure utilizes "fit for purpose" storage (the right media for the right purpose), allowing flexible conformance with the backup window and recovery requirements, and ensuring that QoS requirements are met in the event of data loss.

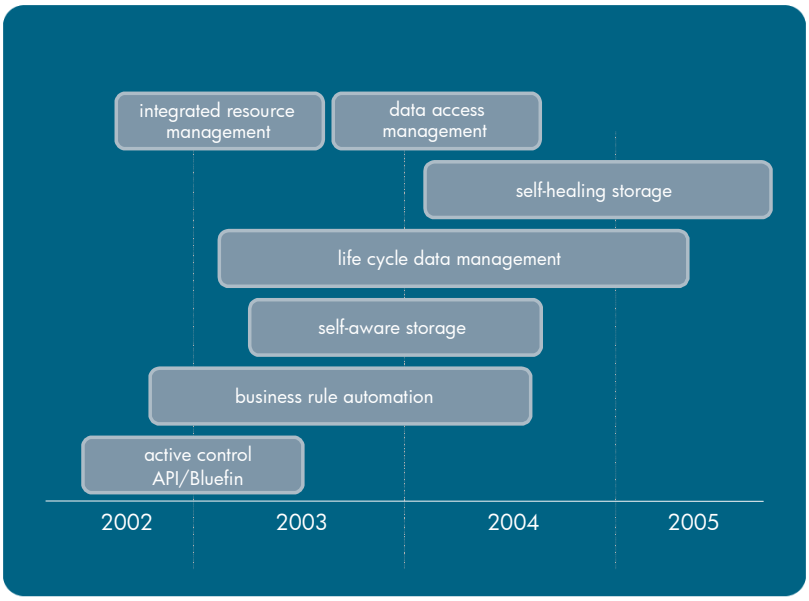
Application integration will also offer a more extensible environment. Based on the application's availability, data protection, and performance requirements, virtualization technology enables the application's data to be moved to storage systems within the utility that provide the level of service currently required by the application. Copies can also be made of an application's data for testing or data mining purposes, or they can be placed in local areas to increase the speed of access.

example: *An integrated Oracle database application crosses a capacity threshold as its size nears the capacity of the pre-allocated volume for the database. The database sends a message to the management software, which follows a pre-established set of rules for this application, and dynamically expands the size of the Oracle database, sending a message to inform the administrator of the adjustment—all without administrator intervention. The Oracle database application adjusts its internal pointers to accommodate its larger size, and the application continues with no user interruption.*

how we get there from here

Figure 4 provides high-level guidance on how HP will deliver many of the key components of ENSAextended. HP will publish more detailed information on each component in the near future.

figure 4. ENSAextended roadmap



delivering value

ENSAextended is all about delivering business value to customers according to the three attributes of the adaptive storage infrastructure—it is controllable, resilient, and extensible.

controllable—ENSAextended will deliver an adaptive storage infrastructure that is easy to manage using an integrated set of tools that are accessible from virtually anywhere. By simplifying the administration of the infrastructure, significant efficiency is gained and cost savings are realized by enabling administrators to effectively manage far more than they otherwise could.

resilient—The adaptive storage infrastructure will ensure that customers recover quickly, correctly, and transparently from any disruptive event. It will easily adapt to changing operational needs, mitigating the risks of implementation and reconfiguration, and it will provide greater business agility to improve revenue opportunities.

extensible—The adaptive storage infrastructure will be one that can easily span multiple dimensions. It will extend across geographic and technological boundaries, offering customers unparalleled scalability and interoperability, which will translate into significant cost savings. It will also integrate with business applications to provide true end-to-end solutions, ultimately translating into both cost-saving and revenue-enhancement opportunities.

you're in control

By automating storage management tasks, HP takes storage to the next level by driving out complexity and the cost of maintaining storage and growing your IT resources. Simplifying the administrator's role shifts attention from day-to-day issues to more strategic and business-related issues. Now you're in control, with lower management costs, higher employee productivity, and greater application uptime. Better service with fewer resources and lower costs. ENSAextended.

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