

# Choosing the best architecture for data protection in your Storage Area Network



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## Introduction

The business need for reliable data protection continues to increase. While several options exist for customers to deploy disk-based data protection solutions, tape libraries with removable cartridges still provide the most complete, comprehensive, and effective means to protect enterprise-wide data.

Today, the majority of enterprise backup and recovery solutions are deployed in a storage area network (SAN). A SAN-based solution provides the most consolidated, cost-effective, and scalable means for most enterprise customers.

SAN backup and recovery solutions have introduced many new customer requirements. Organizations have leveraged the SAN to consolidate backup and recovery operations requiring 24x7 operations. As a result, backup and recovery operations are taking place around the clock, making reliability and availability of these systems absolutely crucial.

Reliability and performance of high-end tape drives have improved with each generation. Today, tape drives offer both traditional parallel SCSI, as well as native Fibre Channel (FC) connectivity. Many customers want to adopt native FC tape drives going forward with the expectation that this will provide them a more efficient, higher performance, and more reliable SAN backup solution.

However, factors affecting the reliability of backup solutions in a SAN extend far beyond a single tape drive. The important question for enterprise customers is not which tape drive interface to deploy, but what is the best architecture to deliver current and future requirements for reliability, functionality, and performance at a reasonable cost?

## SAN solution reliability

SAN tape backup solutions have introduced more complexity into the IT environment than tape libraries attached directly to servers. As a result, these configurations often suffer from solution-level reliability issues, which impair the ability of customers to provide adequate data protection for their environments.

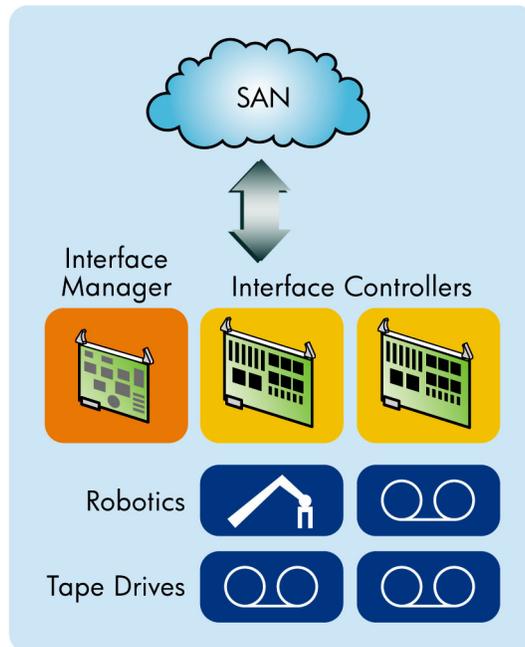
Several factors contribute to the lack of reliability in SAN-based backup solutions:

- Large enterprise SANs often experience network conflicts and errors, which can cause backup and recovery operations to fail.
- Because of the complexity of enterprise SANs, a large administrative effort can be required to not only deploy these solutions, but maintain them as well.
- When problems do occur, it can be challenging to collect all the relevant information and isolate issues in a complex enterprise SAN. Troubleshooting issues often requires a significant level of effort and expertise.
- Frequent changes in an enterprise SAN, such as the addition of storage devices or hosts, introduce configuration conflicts and incompatibilities and create instability in the SAN solution.

## A controller-based architecture for tape libraries

The HP StorageWorks Extended Tape Library Architecture introduces next generation architecture for tape libraries in enterprise SAN environments. The architecture is aimed at meeting the high reliability and interoperability requirements by incorporating intelligence and advanced capabilities into the tape storage subsystem.

Figure 1.



The Extended Tape Library Architecture takes the next step in the evolution of tape libraries to make them fully network capable.

The architecture adds a layer of intelligence between the tape drives and the SAN by incorporating a set of Interface Controllers similar to the array controllers in a disk array. The controllers provide the network interface for the tape library to the SAN while they connect internally to either Fibre Channel or SCSI tape drives. These controllers manage the shared network access, providing much of the reliability and security required.

The brain of the architecture lies in the HP StorageWorks Interface Manager, which provides a central point of knowledge for the tape library and the SAN environment. This knowledge extends the intelligent management capability of the architecture to enable the storage subsystem to become truly self- and network-aware. The Interface Manager also enables a rich remote and integrated management capability in the SAN.

## Advanced features

Investment by many enterprise customers for data protection is significant. As business demands continue to increase, customers must realize more value from their data protection solutions.

A controller-based architecture can deliver several important advanced functional areas. The following section covers some features that are available today and provides a discussion on possible functionality available in the future.

### Security

Access controls are a key element for providing reliability in an enterprise SAN. They provide the ability to specify access to the tape libraries or tape drives for specific hosts or host bus adapters (HBAs). Access is typically controlled by specifying a set of WorldWide Names (WWNs) for each tape drive or library. The controller then verifies a host login or I/O request against the WWNs for the target tape drive. Because specification of access controls for a large tape library and SAN environment can be tedious, proper management tools are critical.

Access controls also enable users to protect data in a tape library from unauthorized access in the SAN. This ability becomes more of a business requirement as SANs grow to be large and possibly extend outside of the data center. Physical access becomes more difficult to control. Unauthorized hosts can obtain a physical connection and have access to sensitive data stored in unprotected tape libraries.

Another important capability for providing security is the ability to provide library partitioning. This capability enables customers to divide large tape libraries into two or more logical storage systems. Each library partition can be given separate access controls or could even be connected to separate SANs such that media or tape drives cannot be accessed between them.

Customers can segregate different departments or business-sensitive data to provide better protection and security. In other cases, a service provider might need to separate access from different end-user customers being hosted in their environment.

### Availability

Availability is another important requirement in today's enterprise SAN environments. Several features commonly provided by high-end disk arrays can be delivered through a controller-based architecture for tape libraries.

One of these is path-failover. This feature provides the ability to fail over to an alternate path between a host and the tape library in a SAN. Because tape position is an important attribute in providing error recovery for sequential access tape devices over disk, additional logic and protocols are required to properly provide this capability. A controller-based architecture can provide the additional intelligence required to deliver this capability.

Probably the most common failure in enterprise backup solutions is with the tape media and tape drive. While high performance tape drives continue to make significant strides forward in reliability, tape media and drives wear out because of continuous use in 24x7 operations. Another common problem is when performance is not optimized in the environment, tape drives are not being streamed at a sufficient rate, and excessive start-stop or shoe-shining of the tape drive is occurring, causing premature degradation of the drive mechanism and media.

Disk arrays provide the ability to survive mechanism or media failure without interruption of services through redundant use of disk mechanisms and the ability to fail over between them.

A controller-based architecture can also provide a tape mirroring capability, which can split a single backup stream from the host to multiple tape drives. When a failure with the tape drive or tape media occurs, the backup can still complete successfully, using one of the remaining tape drives without disrupting the backup operation.

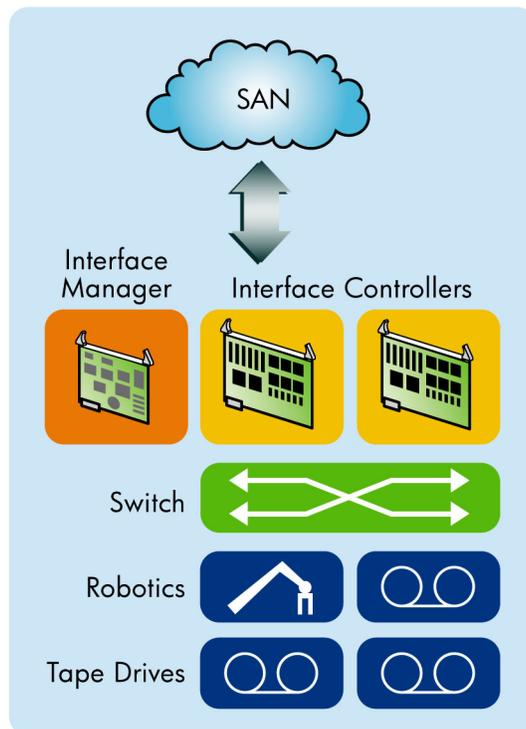
A similar function is the ability to automatically replace a failed tape drive or one taken offline with a hot-spare. Referred to as tape drive sparing, a controller can map a spare tape drive into the same physical location as the offline drive. The change is transparent to the backup application and does not require any reconfiguration.

## What about native Fibre Channel tape drives?

Several high performance tape drives offer native FC interfaces instead of parallel SCSI. Many customers can consider deploying these tape drives in their enterprise SAN environments. Native FC tape drives connected directly to the SAN do not provide as many of the benefits as a controller-based architecture. However, a controller-based architecture can utilize native FC tape drives to provide additional value and functionality.

The Extended Tape Library Architecture incorporates native FC tape drives by providing an intelligence layer of Interface Controllers between the drives and the enterprise SAN.

Figure 2.



The architecture provides all the same benefits of reliability, interoperability, and advanced functionality over a native FC tape library without controllers.

The architecture also provides the option of incorporating switching technology between the interface controllers and the tape drives to offer additional functionality. This feature provides the benefit of better flexibility and bandwidth utilization, allowing the customer more configuration options and the ability select the price and performance needed to meet their requirements.

This architecture also enables more functionally advanced capabilities, including tape mirroring, partitioning, and failover. With a switched back-end architecture, these features can span the entire

tape library without limitations caused by controller boundaries. This architecture also provides the ability to fail over between controllers for a higher degree of availability.

A switched back-end architecture also enables the development of advanced data protection techniques, including the ability to integrate disk with tape into the data protection subsystem as mentioned in the previous section.

## HP StorageWorks ESL E-Series tape library

The HP StorageWorks ESL E-Series tape library has been designed around the Extended Tape Library Architecture.

Fully integrated into the Extended Tape Library Architecture, the ESL E-Series tape library provides self-aware tape storage designed specifically for the SAN. ESL E-Series libraries and the Extended Tape Library Architecture offer customers with enterprise SANs superior reliability, interoperability, and advanced functionality. The ESL E-Series tape library with the Extended Tape Library Architecture offers remote management of the entire library system from a single pane of glass, including complete, unobtrusive management and control of the entire library system, including robotics, drives, Interface Controllers, and the Interface Manager card. The Extended Tape Library Architecture eases complexities and eliminates errors in configuring, installing, and managing the entire tape library system within a SAN.

The new ESL E-Series tape library enterprise tape automation offers best-in-class drive and cartridge density. ESL E-Series tape library cartridge capacity scales to 712 LTO or 630 SDLT cartridges and up to 24 drives in a single library frame. Offered with both HP StorageWorks Ultrium 460 and HP StorageWorks SDLT 320 tape technology, the ESL E-Series tape library offers best-in-class storage density with 14.2 TB of storage per square foot, compared to 9.5 TB per square foot on the ADIC i2000, 7.65 TB per square foot with STK L700, and 4.8 TB per square foot on the IBM 3584.

The ESL E-Series tape libraries also support native FC LTO Ultrium 460 drives and, in the future, will support additional capabilities, such as media partitioning, licensed capacity upgrades, and multi-unit scalability.

## Summary

There are several important criteria for selecting a solution for data protection in an enterprise SAN environment. Of these, the most critical is how well the architecture delivers solution-level reliability and interoperability in these large, complex network configurations. Additionally, data protection solutions must provide more value and a better return on investment than they historically have, given customers' increasing business requirements.

A controller-based architecture for tape libraries is designed to best meet these requirements in enterprise SANs. The architecture does this through incorporating more intelligence into the tape library to manage network access and issues. Controllers also serve as a platform to provide advanced functionality to deliver more value with tape libraries to enterprise customers.

The introduction of the Extended Tape Library Architecture defines the next generation of tape libraries in enterprise SAN environments. The architecture evolves tape libraries to the next level to make them fully network capable. Parallel to that of disk arrays, the architecture incorporates a layer of intelligence between the tape library and the SAN to offer increased levels of data protection and the foundation for businesses to transform into adaptive enterprises that manage storage as a utility.

## For more information

HP StorageWorks Extended Tape Library Architecture overview

<http://www.hp.com/go/ETLA>

Shahzada Sufyan

[shahzada.sufyan@hp.com](mailto:shahzada.sufyan@hp.com)

Alan Sarikelle

[alan.sarikelle@hp.com](mailto:alan.sarikelle@hp.com)

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