
The Value of Quantum|ATL's High Availability Libraries

If data is critical to the mission of your organization, it must be adequately protected. RAID arrays are often the first line of defense. However, RAID cannot accommodate important objectives, such as recovering deleted, virus infected or corrupted files. To achieve these goals, a fault tolerant, highly available automated tape library solution is needed.

Because access to your data is important, an automated tape library must maintain the same level of availability and fault-tolerance found in RAID units. For example, if you need to restore a file, the library must perform on demand and backups must be reliable. A high end automated tape library, such as a P2000, P3000 or P6000 from Quantum|ATL, provides the high availability found in RAID arrays, assuring that your information assets will be there when you need them most.

Functional Advantages of an Automated Tape Library

Beyond obvious business benefits, including improved availability of information and faster recovery in emergencies, a high availability library offers the following functional advantages:

- **Reliable, Unattended Backups:** Automated libraries eliminate the cost of an administrator swapping tapes in and out of tape drives. In addition, a highly reliable library is able to increase the life of tape drives and process massive amounts of data without any human interaction, freeing IT staff to focus on other matters.
- **Virtually No Library Downtime:** When mechanical components – such as fans or tape drives – fail, another device is prepared to take over without interrupting on-going library operations.
- **Non-Disruptive Service:** Planned down time is costly to your business and customers. A high availability library enables on-line servicing, keeping data available continuously.
- **Investment Protection:** As new technology evolves, a library that expands to accommodate new features and functions protects your investment.
- **Increased, On-Demand Throughput Performance:** The ability to add additional tape drives and upgrade internal technology assures the flexibility to accommodate the changing needs of your organization.
- **Ensured Availability When Required:** Storing and retrieving critical data requires the combination of redundant components and a highly reliable design to maximize uptime.

High Availability Library Features

Only the best libraries have the high availability features demanded by today's growing enterprise. They include:

Inherent Reliability: The ability to continue to operate for extended periods of time. In most libraries this is a function of quality robotics and a stabilized internal environment. The robotics mechanism should pick and place cartridges with extreme precision and should avoid dragging cartridges along any surfaces – which can contaminate the tape drive and cause it to fail. In addition, the frame of the library should be fully welded to minimize vibrations, which could negatively impact robotics accuracy.

Redundant Components with Fail Over: The presence of dual primary components capable of taking over the tasks of their counterparts when a failure occurs. Common redundant components include fans, power supplies and power cords. Less common redundant components that offer fail over include tape drives and data ports.

Hot-Swap Components: The ability for a user to remove a component and insert a replacement while the library remains on-line. True hot-swap components do not interrupt any library operations when they are serviced, including data throughput on a single common SCSI bus. Crucial hot-swap components include tape drives, fans and power supplies.

System Monitoring and Notification: The process of probing a library to make sure all critical components are fully operational and to notify users of errors as they occur, in real time via web-based monitoring or an SNMP based application. Notification methods often include e-mails, pages and user terminal reporting. In addition, some monitoring can predict failures before they occur, empowering administrators to act proactively.

User Selectable Levels of Tolerance: The ability to select thresholds of redundancy or fault tolerance. This is commonly manifested in the choice of extra tape drives and of redundant power supplies.

Quantum|ATL's Enterprise Prism Series (P-Series) Libraries¹

P-Series library solutions from Quantum|ATL are the best backup devices to meet demanding availability needs of the global enterprise. The revolutionary design of the P-Series has set the standard for tape library availability. Extensive component redundancy and quality construction make a P-Series library the best option for protecting valuable enterprise backup data.

In addition, the P-Series library robotics has been proven to exceed 1 million swaps without failure assuring continuous uptime. Another unique feature of the P-Series library is its built-in Prism Storage Architecture™, designed to accommodate future high availability options and other features by simply adding cards. Overall, no other library is better equipped to handle your high availability needs – both today and in the future.



Component Redundancy

P-Series tape libraries include many fault tolerant features found in their first cousins, e.g., disk arrays. Similar to RAID, when important components within a high availability P-Series library fail, the library continues its backup operations unabated. The virtual elimination of single points of failure means a P-Series library will continue to be available for backup and restore operations. In addition, the need to bring the library offline for servicing is virtually eliminated.

Configuring a P-Series library with extra drives adds resiliency because most backup applications can automatically skip a failed drive and use a good drive in its place. Although this is a normal practice with libraries based on SCSI or Fibre Channel interfaces backing up standard servers, it is often not true of network attached storage (NAS) backup as drives are often dedicated to individual NAS filers. With the Quantum|ATL Gigabit Ethernet (GbE) based Centaurus solutions, however, applications such as Veritas NetBackup™ can skip a failed drive and allocate any other available drive in the P-Series library to a particular backup job.



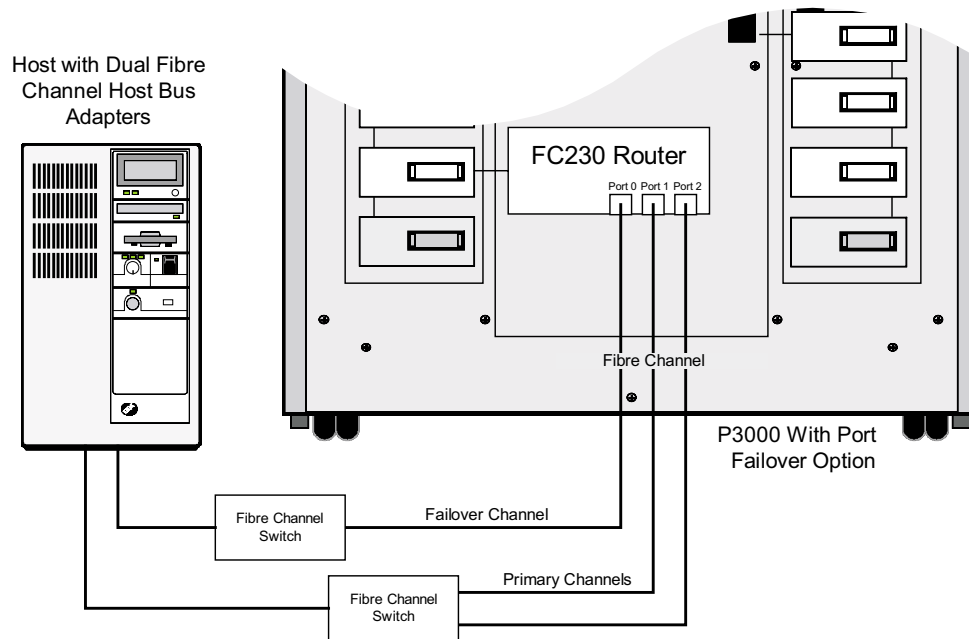
Advanced libraries, such as the P-Series, include multiple levels of redundancy. With a P-Series library, mechanisms most likely to fail can be configured redundantly (e.g., tape drives, ports, power supplies and fans).

Redundant Ports with Fail Over Capabilities

The P-Series libraries take an additional and uncommon measure in increasing availability and fault tolerance of tape libraries in switched fabric Fibre Channel environments. An extra port on the internal

¹ The Enterprise P-Series refers to the P2000, P3000 and P6000 libraries.

Fibre Channel router enables the Prism Port Failover™² feature. If a port on the router fails, or the communication channel to one of the ports fails, the extra (fail over) port takes over operations. The redundant port assumes the identity of the failed port, transparently to the host, and the administrator is notified via E-Mail Home. With an extra switch in place, the library can accommodate a complete failure in the primary Fibre Channel switch. The net result of the redundant port feature is increased overall availability and fault tolerance through the elimination of ports and switches as single points of failure. The P-Series are the only libraries capable of taking part in a fully redundant storage area network.



This illustration shows Port Failover, where a spare port is configured on the internal Fibre Channel router (FC230) for increased high availability.

Redundant Power Supplies and Fans: Traditionally, tape libraries include just enough power and fans to satisfy the minimum requirements for operation. This can often expose a library to failure if, for example, a single power supply were to fail. If the library ceased functioning, a service call would be required before it could return to normal operations. In environments that are sensitive to equipment uptime, there are multiple levels of redundancy that can keep the library on-line in case of a power supply or fan failure.

N+1 Redundancy: The "N" stands for the minimum number of power supplies and fans required to operate a tape library. N+1 is the addition of one extra power supply or fan that is bused together with its similar components. Should a power supply or fan fail, the extra component shares the load, eliminating the downtime that would have otherwise been caused by the failure. The downed component can then be replaced at a convenient time.

² Future feature, please contact your Quantum|ATL representative for availability.

2N Redundancy: Again, "N" stands for the minimum component configuration required to operate the library. 2N is the doubling of the base components. In some environments, it is necessary to eliminate as many points of failure as possible. Fully redundant, a 2N system includes a complete backup power system and/or cooling system. In 2N configurations, fans, power supplies, power distribution boards and power cords are duplicated for complete redundancy.

Summary

The following list summarizes Quantum|ATL's P-Series High Availability Features.

Inherent Reliability: With a proven 1 million swaps+ before failure, P-Series libraries have the industry's highest reliability. This is a direct result of Quantum|ATL's patented IntelliGrip™ robotics mechanism and a unibody fully welded frame. This reliability translates into increased data availability - an essential benefit of an enterprise class library.

Hot-Swap Components: Each P-Series library includes cable-less, hot pluggable, user replaceable, hot-swap drives that do not interrupt any library operations, including data throughput on a single common SCSI bus. Additional hot-swap components include fans and power supplies.

Scalable Performance: The P3000 library can be configured with four to sixteen DLTtape drives. Native performance throughput rates of up to 346 GB/hour can be achieved with DLT8000 tape drives. Plug-compatible support for new high performance technologies such as Super DLTtape™ and LTO Ultrium™ assure extreme performance scalability, up to 864 gigabytes per hour or more. Fibre Channel connectivity is also internally supported for increased performance over a storage area network (SAN)

Highly Reliable Tape Drives: Super DLTtape and LTO Ultrium tape drives offer better levels of reliability through new, more robust designs. For example, Super DLTtape's new buckling mechanism prevents detached leaders. And Super DLTtape's new tape cartridge design provides wear resistant material to reduce debris generation, a circular wall is added to reduce damage during drop, and ribbing is added to decrease creep deflection.

Scalable Capacity: With a P3000 library, organizations can house up to 326 DLTtape™ cartridges for 11.4 terabytes of native storage capacity. Support for new tape drive technologies such as Super DLTtape™ and LTO Ultrium™ further increase the native storage capacity within a single library to 36 terabytes. Additionally, multiple libraries can be linked together with the Prism scalability option (pass-through mechanism) and still act as one library for massive storage requirements.

System Monitoring: The P-Series library offers the most comprehensive monitoring tools of any enterprise class library. Prism ALERT Notification enables the ability to centrally monitor and manage the library. The Prism Management Card (PMC) is an intelligent server card that plugs directly into the library and is the enabling element for many Prism options. Included with the PMC, is Quantum|ATL's Management Console, an easy-to-use, yet powerful Web-based interface that enables authorized IT staff to configure and manage all Prism options from behind a firewall or remotely from anywhere on the internet. Quantum|ATL software options include the Prism Management Card option and Quantum|ATL's Management Console. ALERT Notification further simplifies library management by interfacing with major network management applications, which allows the use of Simple Network Management Protocol (SNMP) to manage the library with all of the other information processing elements of the enterprise.

Fault Notification: A P-Series library with the Prism ALERT (Active Library Event Reporting Tool) Notification feature is able to report faults in real time via E-Mail Home, via an SNMP agent to a remote network management console, or via e-mail or over the airwaves to a pager.

Library Partitioning: The Prism Library Partitioning option is an optional embedded management card and partitioning software that can divide the library into multiple virtual libraries each of which can be utilized by unique hosts.

Disaster Recovery: Quantum|ATL's libraries provide the ideal solution for off-site disaster recovery. The library can be maintained and monitored from a remote location via any Web-based browser and enables

the user to remove media from the library's load port and store off-site. Quantum|ATL offers a remote vaulting configuration with Fibre Channel via ATM, SONET or dark fiber; or through our GbE-based Centaurus solution which enables NAS filers to directly target a backup session to a remote library over IP/Ethernet.

A P-Series library is the world's most resilient, scalable, high availability library. For enterprises that treat their data like gold, only a P-Series library provides the availability and reliability to keep data on-line all the time. The P-Series library has the ability to incur multiple, simultaneous failures yet still operate at full performance. For example, a P-Series library could have a failed power supply; a bad fan, a failed port and a drive failure while backups are still in process. The P-Series library would notify the system administrator that service was required and the library could be fully repaired within minutes, all without interrupting the backup already in progress. The result - no library downtime because of common types of failures and increased data center productivity and efficiency.

The P-Series library is the industry's most scalable library, enabling cartridge, drive, technology and feature enhancements all within a single cabinet. Step up your enterprise to its fullest potential with the advanced storage capabilities of a P-Series library - the high availability leader.