Adaptec AL3450 RAID Solution

Overview
Organizations, large and small, are challenged to manage an explosive growth of information with constrained budgets and resources. Businesses must achieve this balance without compromising data availability or system reliability. OEMs in turn, are challenged to deliver storage solutions that simultaneously deliver high performance, low cost of ownership and enterprise class robustness.

Adaptec addresses these challenges by providing RAID storage solutions that consist of industry-leading silicon devices, enterprise class RAID software and Reference Designs based on the breakthrough RAID Storage Processor (RSP) technology. These solutions provide storage system OEMs the building blocks they need to build a broad family of products based on a common platform that can be seamlessly integrated with their existing management software and user interface.

AL3450 UltraSlice MPx™
The AL3450 UltraSlice MPx™ is a key component of Adaptec’s RAID storage solutions. A third-generation device based on the RSP technology, the AL3450 integrates multiple RAID processing engines plus all popular host and disk protocols including Serial ATA (SATA), Serial Attached SCSI (SAS), Fibre Channel and PCI-X onto a single chip. It is designed to deliver enterprise class performance and reliability in a smaller footprint at lower power consumption. In addition to traditional external RAID storage, it is an ideal internal storage controller solution for emerging blade server platforms and high-end desktop applications.

Purpose-built programmable hardware engines within the AL3450 work in parallel to automate all time-critical functions, delivering performance levels unmatched by traditional interrupt driven microprocessor architectures. This unique architecture provides unprecedented flexibility, which allows the tuning of storage systems to provide maximum throughput as well as random performance in real world applications. With its automated data path, the AL3450 can perform operations such as drive rebuild, RAID initialization and RAID migrations faster than any traditional general purpose CPU-driven software solutions. With integrated support for a variety of host and disk protocols such as 3Gb/s SATA/SAS, 4Gb/s Fibre Channel and high-speed PCI-X, the AL3450 enables customers to build a wide range of storage solutions using a single underlying architecture.

Adaptec RAID Software
Adaptec’s powerful enterprise-class RAID software is designed to meet the unique requirements of a broad range of storage platforms. Its modular design enables solutions to be tailored for specific applications and market segments.

A base feature set is designed for entry-level applications, with proven enterprise-class reliability and robustness. Premium features can be added to accommodate mid and high-end storage system requirements.

Designed to work in concert with controllers built with Adaptec’s RSP devices, the Adaptec RAID software and Graphical User Interface (GUI), provides an easy-to-use storage management utility. The intuitive, easily customized GUI, enables simple configuration and monitoring, and early diagnosis of potential problems.

Benefits
- Necessary building blocks – silicon, software and reference designs – to significantly reduce development costs and accelerate time to market
- Enterprise-class performance and reliability in a small footprint with low power consumption.
- Support of 3Gb/s SATA/SAS and 4Gb/s Fibre Channel host and disk protocols and a PCI-X on a single chip.
- Double the number of host and disk ports providing greater connectivity with twice the throughput.
- Industry leading RAID software that delivers advanced functionality and provides a framework for customization of storage management capabilities.
- Scalability to build a common architecture across multiple product lines.

Applications
- Blade Server
- Server-based storage
- High-end desktops and workstations
- Entry level, mid-range & enterprise RAID Arrays
- Networked Attached Storage (NAS)
- RAID Host Bus Adapter Cards
- Disk-based Backup Storage
- Fixed-content Storage Systems
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AL3450 Feature Summary
At the foundation of AL3450 RAID is the RAID Storage Processor (RSP) engine, a collection of hardware engines that fully automate the data path and eliminate the performance bottlenecks found in traditional software RAID solutions. The small footprint and low power consumption of the AL3450 makes it ideal for power efficient, cost-effective high density storage applications.

Performance Enhancements
In addition to the features supported by AL3400, the previous generation Adaptec device, the AL3450 incorporates several enhancements:

- 6 interface ports deliver twice the host/disk bandwidth of the previous generation RSP.
- Dual XOR accumulators and custom hardware engine provide hardware RAID 6 functionality at line speed, eliminating any write penalty.
- Dedicated 4Gb/s custom mirror bus reduces latency on write cache operations and improves symmetric LUN performance.
- LUN performance is maintained for both controllers in a bound configuration via hardware streaming engines that maximize bus utilization.

Interface Processing
The AL3450 has integrated programmable protocol cores than can be configured at boot time to support either Fibre Channel or SAS/SATA. Each of the I/O interfaces is controlled by a dedicated internal RISC engine that provides complete network or bus protocol support at line speeds. The PCI-X interface may be used to connect an external microprocessor.

Interfaces Supported
- Host Interface: Two – 4Gb/s Fibre Channel or 3Gb/s SAS
- Disk Interface: Four – 4Gb/s Fibre Channel or 3 Gb/s SAS/SATA (via STP)
- Data/Control Port: 133 MHz 64-bit PCI-X 1.0

RAID Processing
Four dedicated RISC engines and the storage data paths perform RAID processing. These specialized engines and data paths ensure data integrity through parity and checksum support while delivering unparalleled RAID performance.

Supported Hardware RAID Operations
- Reads and writes to RAID volumes
- Reads and writes to cache
- Software-tunable caching algorithms
- Software-tunable RAID services
- Drive rebuilds
- Degraded reads and writes to disk
- Online initialization
- RAID level migration

Data Path Protection
- ECC protection of data in DRAMs
- Parity protection of data in internal SRAMs
- End-to-end parity protection of internal data paths
- End-to-end T10 data integrity field support
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Adaptec RAID Software
Adaptec RAID software is designed to work with the AL3450 device to provide enterprise-class solutions with high reliability and availability for storage users in all market segments. Adaptec RAID software integrates very tightly with the AL3450 to provide a high performance storage solution with maximum flexibility to fit into the OEM customer software environment with minimal customization.

Dedicated RISC engines in the AL3450 are used for all-time critical operations, eliminating the need for handcrafted code and enabling development of Adaptec RAID software in C++ running under Linux without sacrificing performance. The combination of C++, Linux and state of the art development tools results in unmatched code quality, code agility and robustness.

RAID Functionality
• Single and active/active controller support
  – Simultaneous symmetric LUN support
• Power fail and power restore operation
• Controller fail-over and rebinding
• Media errors and bad block support
• Battery backed-up cache support
• RAID volume services
  – Immediate online volume expansion
  – Online mirror creation
  – RAID level migration
  – Automatic RAID rebuilds with copyback
• Parity check and scrub
• Drive roaming support
• Controller firmware upgrade – non-disruptive firmware upgrade in redundant controller configurations
• Supported RAID Levels
  – RAID 0, 1, 0+1, 5 and 6
• Operating systems supported
  – Windows
  – Linux
  – VMware
  – AIX

RAID Management
Complementing the Adaptec RAID software is the Adaptec RAID Management GUI – simple to use, and intuitive to configure for monitoring and managing a RAID system. The RAID Management GUI is implemented in an embedded web server that runs locally on the RAID controller, can be accessed remotely using any standard Internet browser, and eliminates the need for server based management software.

RAID Management GUI Features
• Easy configuration of system parameters and RAID volumes via the GUI
• Detailed configuration information and failed drive location details in graphical or tabular form
• Password-protected access levels
• Automatic Email event notification of critical errors to any administrator provided address

OEM customers can use RAID Management GUI as is or personalized with their logo. Or, they can use their own system management GUI by interfacing directly to Adaptec SMI-S provider and management APIs.

Premium Features
Adaptec RAID software offers a number of premium features that allow OEMs to incorporate specific functionality needed for a given class of product or market segment. Upgrades or new features can be seamlessly added with zero downtime via an encrypted license key.

• Space efficient snapshot – Creates a point-in-time logical copy of a storage volume.
• Expanded Host/Disk support – Users with large configurations can increase the number of hosts and disks supported by the storage subsystem
• RAID 6 – RAID 6 increases the data protection capabilities of systems utilizing low cost SATA drives through its ability to sustain the loss of up to 2 drives in any RAID group.
• Statistics – Performance statistics provide data on the efficiency and performance of your storage system.