

MAJOR FEATURES

Improves reliability **15%** with a field-proven solution

Improves availability **20%** by reducing field service time

Lowers in-field service costs **15%** with advanced diagnostics and statistics tools

Increases overall storage system performance up to **3x** while scaling

Automatic trunking improves overall storage system performance up to **5x** while scaling

Reduces time to market **6 to 18 months**

Reduces product cost/MB **20%** by increasing the viable number of drives per controller

InSpeed™

Model 350

Embedded Storage Switch

Enabling New Levels of RAS & Performance In Back-end Storage Designs

Switch From Shared

The InSpeed™ Embedded Storage Switch Model 350 is the only storage switch specifically designed for embedded root switch storage system applications. Unlike in-house development efforts that use port bypass circuitry, InSpeed Embedded Storage Switches are designed as a drop-in solution to deliver 6 to 18 month time to market advantage for storage system suppliers who want to improve the Reliability, Availability and Serviceability (RAS) and performance of their systems. And unlike traditional complex fabric switches designed for front-end SAN applications that are too big, too expensive and consume too much power, InSpeed Embedded Storage Switches are specifically designed to meet the compatibility and cost-effectiveness that back-end root switching applications require.

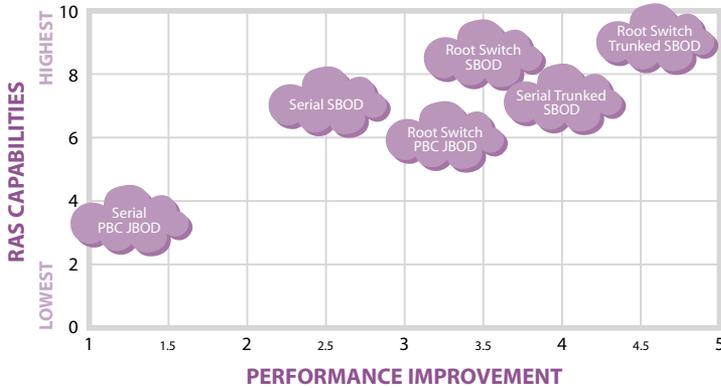
Despite the numerous advances made in storage system drives and controllers, the back-end connectivity designed into many of today's storage systems is still shared loop technology. While the severe limitations associated with shared connectivity are broadly acknowledged, the expense and complexity of implementing high performance switching technology into the back-end storage arrays was prohibitive and physically impossible. Emulex's InSpeed technology has changed all that.



InSpeed Model 350

Available to OEMs only

Benefits Comparison Between Shared and Switched Infrastructure Options



Shared Back-end Storage Architecture: Unexpected Failures, Difficult Servicing, Data Availability at Risk

As drive density and rotational speeds increase to accommodate the exponential growth of end-user storage capacity requirements, the risks and difficulties associated with existing storage system RAS levels also increase. Additionally, performance bottlenecks during system scaling due to shared loop connectivity in the back end introduce new points of system latency. And the lack of management, statistics and diagnostics capabilities in shared bus architectures renders the fundamental process of predicting, troubleshooting and identifying drive problems an inefficient and costly undertaking that often entails bringing entire arrays offline or requires onsite servicing.

How InSpeed Helps

With the introduction of Emulex's InSpeed technology, most leading storage OEMs are now eliminating the latency and inherent reliability problems associated with shared connectivity. As a drop-in solution InSpeed enables a cost-effective and easy conversion to a 2Gb/s switched back-end architecture that improves system RAS characteristics, facilitates much-needed diagnostics capabilities and enables linear performance growth as the system scales. InSpeed decreases OEM's in-field service costs and the MTTR of their solutions, while insuring the integrity of their customers' data is maintained throughout the life of the storage solution.

InSpeed: A Unique & Disruptive Technology

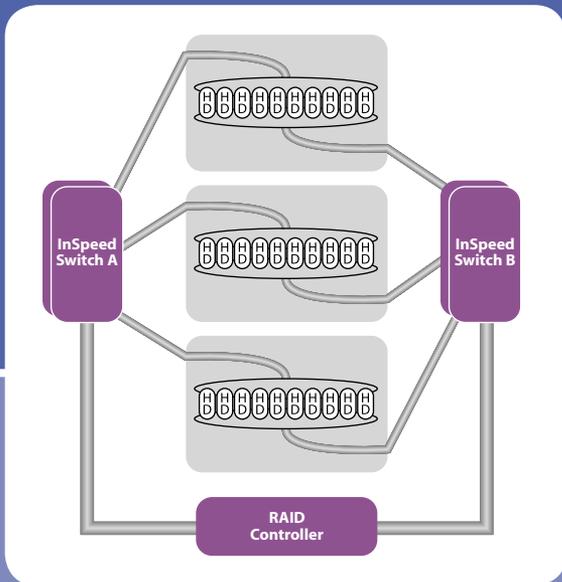
The underlying core technology behind Emulex's line of Embedded Storage Switch products is called 'InSpeed'. Designed for performance, simplicity and compatibility, InSpeed technology is an advanced switching architecture coupling a non-blocking Crossbar switch with unique port logic and embedded SERDES resulting in a single, highly-integrated switch-on-a-chip (SOC), capable of multiple concurrent conversations between Fibre Channel device ports. Praised by renowned storage industry analysts and solutions providers, and tested or deployed by 9 of the 10 largest storage companies, Emulex's award-winning InSpeed technology makes it possible to truly address embedded storage system requirements for the very first time.

Improved Reliability

InSpeed Embedded Storage Switches improve storage system reliability 15% by delivering an off-the-shelf, field-proven back-end switching solution that integrates functionality required by numerous custom-configured discrete components. When implemented in a redundant Root Switch configuration, InSpeed Embedded Storage Switches deliver failure-independent A & B data paths directly to disk drive drawers.

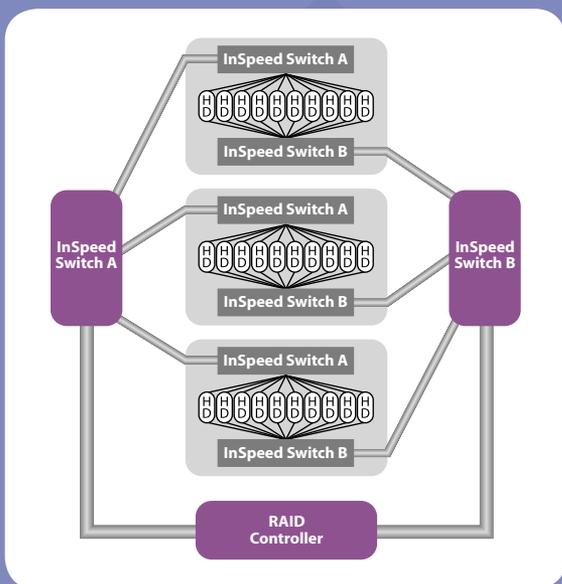
The InSpeed Embedded Storage Switch Model 350 is a 1U, half-rack form factor 12-port non-blocking switch that is ideal for:

Embedded Root Switch In Disk Storage Systems



Root Switch implementations place switched connectivity between the storage controller (or NAS head) and drive shelves within a disk array for enhanced RAS capabilities and up to 3x performance while scaling improvements.

Fully Switched Infrastructure of Root Switches & SOC-based SBODs



Fully Switched Infrastructures implement a Root Switch in conjunction with Emulex InSpeed SOCs in SBODs to obtain maximum RAS and up to 3x performance while scaling improvements, and up to 5x with the use of Automatic Trunking.

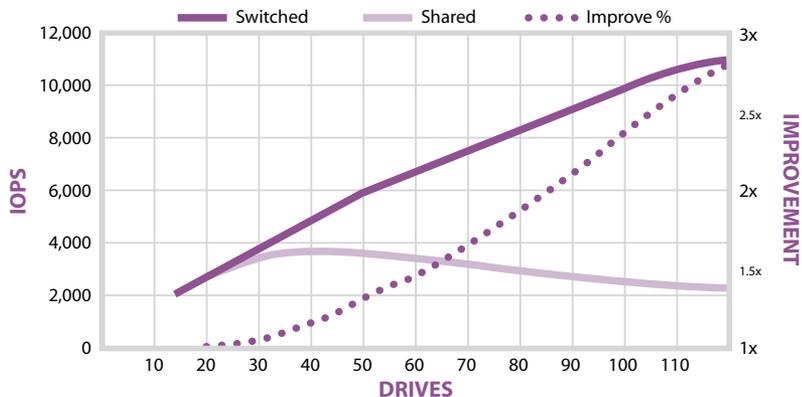
Higher Availability

InSpeed Embedded Storage Switches improve system availability 20% by delivering a very rich set of features designed to keep storage systems active. These capabilities are invaluable right from system setup by performing intelligent pretest of drive drawers and devices before they are inserted into the system to eliminate situations where newly added devices can disrupt a stable system. And their intelligent health and performance monitoring is continually collecting vital statistics to predict failures and take automatic corrective action to remove problem devices from the system before they affect overall system health; error types that affect as much as 50% of known device failures.

Maximum storage system stability is achieved with InSpeed's unique Stealth Intelligent Change Manager that gives unprecedented control over embedded network interruptions caused by health or configuration changes sent by initiator and target devices. OEMs can now pre-configure ports at the factory to appropriately protect them from system interruptions in their most effective manner. And, InSpeed's One-Step Zoning can be evoked for flexible, dynamic hardware-protected isolation between groups of ports within the storage system; an important capability for applications that require an additional level of isolation from each other, whether temporarily or permanently.

InSpeed Embedded Storage Switches Deliver Up to 3x Performance While Scaling Improvements As a Root Switch

2Gb, back-end storage switch (SOC 320)/JBOD vs JBOD, 15 drives per shelf, 4 outstanding IOs 1 initiator, active-passive, Seagate ST336752FC (36.7GB, 15000 RPM), mixed load – single channel



Improved Serviceability

One of the greatest problems with legacy loop-based architectures is the ability to quickly isolate and diagnose problems. This situation is now eliminated with InSpeed's built-in advanced diagnostics and statistics tools. Problems can now be identified more quickly and while storage systems are still active to end users, minimizing system downtime and lowering field service costs. Furthermore, InSpeed Embedded Storage Switches deliver hot-pluggable interface ports that make removing and replacing drive shelves a simple effort, as opposed to having to go through the significant rewiring efforts loop-based architectures require. Overall, InSpeed-based storage switches can reduce the total cost to service storage in the field by as much as 15%, and allow less sophisticated personnel to perform system diagnosis for faster repair.

Higher System Performance While Scaling

Another primary benefit to storage system switched back ends is the ability to scale the number of disk drive spindles behind an individual storage controller and not encounter performance degradation. InSpeed Embedded Storage Switches deliver up to three times the performance of shared loop architectures as the storage system scales to higher numbers of drives. The number of IOPs per MB of storage can now stay constant, regardless of drive and capacity scale. Based on a wire speed non-blocking Crossbar switch core that dynamically handles multiple simultaneous conversations at 2 or 1Gb/s performance across all ports, the switch has a total bandwidth of 48Gb/s. Because

InSpeed delivers multiple direct port-to-port connections, congestion typically found in shared loop architectures is eliminated and performance is made consistent especially as storage systems scale to additional drives and capacities, and when storage systems are running advanced processes like remote mirroring, remote replication, remote backup or rebuilding activities.

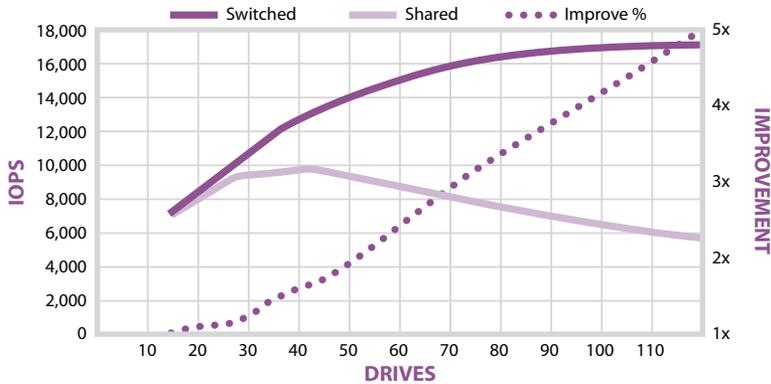
InSpeed Embedded Storage Switches are packed with standard advanced performance while scaling enabling features. Fairness and Prioritization ensure devices communicating with each other have guaranteed access to all devices in the system, or explicitly gives prioritized access over other devices. And Automatic Trunking fully multiplies load-balanced bandwidth between InSpeed Embedded Storage Switches and/or InSpeed SOCs in fully switched infrastructures and provides dynamic path failover protection. Up to 5x performance while scaling improvements over shared loop infrastructures are possible.

Faster Time to Market

InSpeed Embedded Storage Switches deliver a 6 to 18 month time to market improvement over proprietary in-house developed architectures using port bypass circuits because InSpeed is a drop-in solution that has been tested and field deployed by numerous leading storage system providers. Testing and validation has been performed in numerous configurations using InSpeed storage switches to ensure they are fully reliable and market ready.

InSpeed Embedded Storage Switches Deliver Up to 5x Performance While Scaling Improvements In a Fully Switched and Trunked Infrastructure

2Gb, back-end storage switch (SOC 320)/JBOD vs JBOD, 15 drives per shelf, 4 outstanding IOs
2 initiators, active-passive, Seagate ST336752FC (36.7GB, 15000 RPM), mixed load, 2 trunks – single channel



Reduced Product Costs

Most importantly, InSpeed Embedded Storage Switches reduce the total cost per MB as much as 20% of the storage offering to end users by reducing the number of storage controllers required to maintain equal or greater performance as capacity is added to each controller path. Total cost of ownership is further reduced because storage system management is simplified with the advanced RAS and performance monitoring capabilities InSpeed provides.

Switch From Shared

Now you can see why Emulex’s InSpeed Embedded Storage Switches have become the standard used by most leading storage system providers within their storage systems. The InSpeed Embedded Storage Switch Model 350 exclusively delivers improved RAS capabilities and greater performance while scaling over legacy shared loop-based architectures by providing the dynamic switching capability required in today’s storage system environments.

SPECIFICATIONS

STANDARDS

Fibre Channel Protocols:

FC-AL, FC-AL2, FC-PH, FC-PH2, FC-PH3, FC-PI, FC-PLDA, FCP

Interoperability:

connects to any FC_AL compliant device and any vendors fabric via FL_Port

ARCHITECTURE

Fibre Channel Ports:

12

Physical Interface:

hot-pluggable industry-standard optical SFP transceivers at all ports

Scalability:

up to 8 switches and 126 devices

¹Trunking:

automatic trunking fully multiplies inter-switch bandwidth with failover pathing and device prioritization

Zoning:

one-step zoning is port- or ALPA-based overlapping and port-based non-overlapping

Stability:

Stealth Intelligent Change Manager automatically eliminates state and configuration change notification disruptions—zone and port-based management

Integration:

Emulex InSpeed SOC 320 with integrated SERDES

Redundancy:

resident backup firmware copy

PERFORMANCE

Port Speed:

2.125 or 1.0625 Gb/s bi-directional (400MBps per port, full duplex)

Switch Latency:

less than 1µSec with no contention, cut-through routing at 2Gb/s

Performance:

full wire-speed switching

Aggregate Bandwidth: 48Gb/s

Switch Core:

non-blocking Crossbar switch core dynamically delivers multiple concurrent port-port connections

¹Fairness & Prioritization:

ensures all devices have guaranteed access to all other devices, or explicitly have prioritized access

PHYSICAL ATTRIBUTES

Dimensions:

8.5" w x 1.57" h x 16" d
(21.6cm x 4cm x 40.6cm)
half-rack width, 1U height

Weight:

7.0 lbs (3.2 kg)

Mounting:

rack mount or tabletop

MANAGEMENT

Standard Management Software:

Intuitive Integrated Management Web Server with Smart Settings

Access:

TELNET, http Web Server, SNMP MIB

Physical Interface:

10BaseT Ethernet (RJ-45), RS-232 serial port

DIAGNOSTICS

Continuous Diagnostic Operations:

power on self test, port test before insertion, traffic & utilization monitoring, continuous link health monitoring, clock delta monitoring, pinpoint detection of drive problems, trend monitoring of device behavior, preventative action before failure, automatic bypass for rogue and unused ports

Diagnostic Troubleshooting Tools:

CRC error monitoring & counting, ordered set detectors, counters on every port, ordered set capture, ordered set transmit

POWER REQUIREMENTS

Nominal:

universal auto-sensing 100-240 VAC, 50/60 Hz, 0.5-0.3 amps

ENVIRONMENTAL CONDITIONS

Operating Temperature: 0° to 40° C

Storage Temperature: -40° to 80° C

Humidity: 5-95% non-condensing

Operating Altitude: up to 15,000 feet

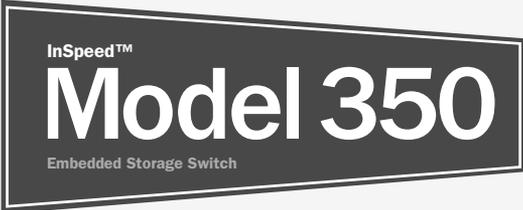
Storage Altitude: up to 35,000 feet

Operating Shock: 5g, 11ms 1/2 sine

Storage Shock: 30g, 11ms 1/2 sine

Operating Sine Vibration: 1g, 5-500 Hz

Operating Random Vibration: ISTA 2A



²AGENCY APPROVALS

United States:

Safety: NRTL, EMC: FCC Class A

Canada:

Safety: NRTL, EMC: ICES-003 Class A

Europe:

Safety: EN60950, EMC: EN55022, EN55024, CE

Japan:

Safety: IEC60950, EMC: VCCI Class A

Australia:

Safety: AS/NZS 3260, EMC: AS/NZS 3548, Class A

International:

Safety: IEC60950, EMC: CISPR22, CISPR24

OPTIONS & ACCESSORIES

The base model 350 ships with a US power cord, serial cable and Quick Install Card. The Users Guide is available for download through a weblink within the embedded web management interface.

Rack mount kit and SFP transceivers are sold separately.

¹ Patent pending

² All agency approvals given with optical SFPs only

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