Fibre Channel Blazing New Trails

An Introduction and Exploration of Future-Proofed Storage

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Agenda

• What’s so exciting about Fibre Channel?
• Some Fibre Channel basics
• Why does Fibre Channel dominate in storage?
• Blazing new trails
  • Feeds and Speeds
  • Security
  • FC-BaseT
  • Native SATA Tunneling over FC
• Simplified Configuration and Management
• Other
• Summary
There’s nothing exciting about FC…

…it’s too complex and difficult to learn!
…it’s too expensive!
…it’s only for big businesses!
…it’s only for storage!
…there’s nothing new coming along!
…Ethernet is going to replace FC!
…SAS and SATA are going to replace FC!
…and Sasquatch is real!

The myths keep evolving.
Fibre Channel Basics

- Fibre Channel Standards development began in 1989
- Fibre Channel Arbitrated Loop standards development began in 1992
- First plugfests in 1996
- SANMark developed between 1998 and 2000
- Multi-vendor Fabric Configurations demonstrated in 1999
- Arbitrated Loop products stable by 2000
- 2GFC plugfest took place in 2002
  - Successful in a single plugfest
- 4GFC plugfest took place in 2005
  - Successful in a single plugfest
Evolution of Fibre Channel Technology

- Private Loop
- Public Loop
- Switched Loop
- Tiered Storage
- Fabric Switches
- Basic Zoning
- Management & Enhanced Zoning
- Security
Fibre Channel Terminology

- Frame – Basic unit of data transported
- Source/Destination Address – 24 bit address contained in the Frame
- Arbitration – Process to allow each device attached to a loop to gain access to the loop
- ARB – Primitive used to accomplish arbitration
- Loop Circuit – Connection established between two devices on a loop
- Loop Tenancy – Time from the beginning of a Loop Circuit to the end of a Loop Circuit
- OPN – Primitive used to establish a Loop Circuit
- CLS – Primitive used to end a Loop Circuit
- Credit – Permission to send one frame
- R_RDY – Primitive used to allocate one buffer of credit
- NL_Port – Port (device) attached to a loop
- FL_Port – (Fabric Loop Port) Fabric Port attached to a loop
Private Loop
Initial Implementations
• Servers and Storage shared a single loop and the associated bandwidth
• Arbitrated for access to the available bandwidth
• Did not utilize any fabric services for discovery
• No access control
**Public Loop**

- Storage shares multiple loops connected to a Fabric where servers are directly connected
- Storage shares bandwidth of loop, but servers have full link bandwidth available
- Servers utilize fabric services for discovery and access control through zoning.
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What are the factors driving Fibre Channel’s market dominance?
Established, Trusted and Ubiquitous

- Designed from the beginning for high throughput mission-critical applications with minimal latencies, maximum data integrity and guaranteed delivery
- Supports all storage connections from disk drives to datacenters to campuses to 100 km remote sites
- *The* trusted and deployed technology in Fortune 500 for Mission Critical storage applications
- Innovating through initiatives like FC-SCM to bring enterprise-class capabilities to the SMB SAN market
- Thousands of proven reference designs

*The Safest Storage Implementation*
Fastest Speeds

- **2GFC Dominates current shipping SANs**
  - Twice 1 GbE speeds and more efficient

- **4GFC Fibre Channel solutions**
  - Fastest storage interconnect available today

- **8GFC Under development**
  - Active development of 8GFC, focusing on low cost, fast time-to-market

- **10GFC Deployed today for Inter-Switch Links**

- **16GFC Fibre Channel on the horizon**

**A Roadmap All the Way to 128GFC**
Backward and Forward Compatibility

- Automatically enables intermixing 8GFC, 4GFC, 2GFC & 1GFC technologies without slowdown in any point in the system
- Unparalleled ability to seamlessly scale
  - Capacity
  - Performance
  - Reliability, Availability and Serviceability (RAS)

Investment Protection
Future Proofing Your Storage

• Provides investment protection for already installed infrastructures
  – Preserves existing, extensive software and hardware base

• Meeting customers’ evolving needs
  – Speed continually doubling
  – Bandwidth/Cost leader over other protocols
  – Solution enhancements
  – Lower cost solutions
  – Simplified solutions (Plug-n-play)
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Storage Explosion!

• Whether through targeted messaging or tormented screams in IT rooms, businesses everywhere are waking up to the fact their data needs are doubling each year

• The need to manage, store, backup and retrieve data is pushing and will further push the limits of IT staffs
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Need for Tiered Storage!

• The amount of information handled by each IT employee will explode over the next few years.

• I don’t want to pay a premium for rarely accessed data.

• Without tiered storage, chaos will reign.
ILM Requires Tiered Storage

The SNIA Data Management Forum (DMF) definition for ILM reads:

“Information Lifecycle Management (ILM) is comprised of the policies, processes, practices and tools used to align the business value of information with the most appropriate and cost effective IT infrastructure from the time information is conceived through its final disposition. Information is aligned with business processes through management of policies and service levels associated with applications, metadata, information and data.”

Matching Data To The Most Appropriate Storage Type Is The ILM Enabler

- **Enterprise-Class Disk Drives**
  - High Performance & Reliability

- **Nearline Optimized Hard Disks**
  - Nearline & Temporary Retention

- **Tape Backup**
  - Long-Term Storage
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Fibre Channel satisfies...

The need for **SPEED**

The need for **RELIABILITY**

... and *Today’s Fibre Channel* is Easy to Manage, Simpler, Scaleable and Affordable
The Gold Standard for Business

• A clear dominance in 80%+ of storage
• Proven complete SAN solutions
  – Performance, security, management
  – Reliable, scalable
  – Many established suppliers for components
• EXCELLENT performance / $ properties
  – Costs less than other technologies for same performance – may be the only way to get required performance

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The **Gold Standard** for Storage Interconnects

- Open industry standards
- Technical foundation for multiple protocols
  - Basis for other interconnect technologies
- Emphasis on interoperability
  - Specifications apply at multiple connector interfaces
- Comprehensive modeling methodologies
  - Focused on high speed transports

*Unparalleled Maturity*
Continuous SAN Market Growth

Source: Gartner External Controller Based Disk Storage WW 2005-2009
29 September 2005 – FICON included in FC
Continuous Back-End Market Growth

External Storage System Revenue By Drive Interface*

Source: Gartner, September 2005

* External Storage means storage arrays only
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Complementary to iSCSI

- iSCSI
  - Did not take off as originally envisioned
  - “no one expects to make a killing” *

- Still, iSCSI is a complementary alternative to Fibre Channel
  - iSCSI has its place in certain markets
  - Fibre Channel, like the F16 Falcon, is the best multi-role fighter

* T. Georgens, CEO Engenio, July 2005
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Complementary to SAS as DAS

SAS beyond DAS
- *I want my, I want my,*
  *I want my SATA drives…*
- Scaling: Theory vs. Reality
- Still, good on the server

DAS
- Will always be there
- The reason for SANs
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Innovations

• The FCIA is helping to extend the FC protocol through close cooperation with the T11 Standards Organization in multiple areas:
  – FC-BaseT
  – FC-SATA
  – FC-SCM
  – …more
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Innovations – FC-BaseT

• FC-BaseT is based on simplified 10GBase-T technology
  – Will offer 1GFC, 2GFC, and 4GFC

• Being in development, the first designs of the technology will support Fibre Channel

• Targets lower-end markets

• FC may allow a 10GBase-T incremental development
  – 1\textsuperscript{st} generation: 1G, 2G and 4G FC-BaseT
  – 2\textsuperscript{nd} generation: 8G FC-BaseT
  – 3\textsuperscript{rd} generation: 10GBase-T and 10G FC-BaseT
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**Innovations – FC-BaseT**

**FC-BaseT Distance Capabilities**

<table>
<thead>
<tr>
<th>FC Data Rate</th>
<th>Cat 5e Reach(^a)</th>
<th>Cat 6 Reach(^a)</th>
<th>Cat 6a Reach(^a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1GFC-BaseT</td>
<td>100m</td>
<td>100m</td>
<td>100m</td>
</tr>
<tr>
<td>2GFC-BaseT</td>
<td>60m</td>
<td>70m</td>
<td>100m</td>
</tr>
<tr>
<td>4GFC-BaseT</td>
<td>20m</td>
<td>40m</td>
<td>100m</td>
</tr>
</tbody>
</table>

\(^a\) Cat 5e, Cat 6, and Cat 6a are sometimes referred to as Class D, Class E, and Class Ea.
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Innovations – FC-SATA
SATA Tunneling Over Fibre Channel

The Challenge…

• Tiered storage systems are becoming the standard
  – Performance tier is predominantly Fibre Channel
  – Nearline tier has chosen SATA

• SATA and Fibre Channel disk drives are not easily integrated into Fibre Channel based storage systems
  – Costly to replace and/or re-architect existing FC systems
  – Requires high engineering effort
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Innovations – FC-SATA

SATA Tunneling Over Fibre Channel

Advantages Over SAS Expanders with STP

- FC-SATA Leverages existing investments in Fibre Channel infrastructures
  - Faster deployment of lower cost SATA drives to market

- FC infrastructure provides electrical and optical variants to 100 km

- FC infrastructure meets TIA-942 distance requirements for Datacenters and Computer Rooms

- No need for a new limited interconnect based on SAS expanders
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Innovations – FC-SCM
Simplified Configuration & Management

• Certification
  – Testing and certification of basic operation
  – Qualifying interoperable configurations

• Reduce certification to a **limited set of standard features**

• Maintain High Availability

• Bring Enterprise Capabilities to Smaller Organizations
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Innovations – FC-SCM
Simplified Configuration & Management

• Certification
  – Leads to a logo program
  – Leads to true plug-n-play capabilities
  – Perfect for remote sites that can’t have dedicated storage or even IT personnel
  – Connects to core fabrics
  – Limits scalability purposefully to keep it simple
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Innovations – Progress Check

• FC-BaseT Connects the World
  – Surfing the 10GBase-T wave
• FC-SATA Offers Native Tiering
  – Extends FC lead in offering SATA today
• FC-SCM
  – Based on a reduced set of mandatory functionality
  – Defines a “Plug-n-Play Fibre Channel” brand
  – Certification program to ensure it stays simple
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Other Innovations
• FC-SP
• FAIS
• QSFP
• NPIV
• Fibre Channel Continuing Strengths
  – Compliance
  – Archiving
  – Backup
• and more…
Fibre Channel Blazing New Trails

- Dominates the SAN market
- Best performance – 4GFC now + 8GFC in work
- Easy to learn, use and implement
- Protects storage investments
- Future-proofs storage
- Provides comprehensive solutions
- Vision for extending into additional markets
- Continuous speed and Bandwidth/$ improvements

Fibre Channel: Unchallenged in Storage
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Thanks!

Questions?

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