FCoE: Storage & Network Convergence

Industry Report 2010
1. Executive Summary
Fibre Channel over Ethernet (FCoE) - Path to I/O Consolidation
Introduction
I/O Consolidation and Unification
Encapsulation Fibre Channel into Ethernet
Path to End-to-End Convergence
FCOE Benefits
Recommendations

2. Market Drives & Industry Dynamics
Fabric Requirements in a Virtualized Data Center
FCoE: Enabling Fibre Channel over Lossless Ethernet Fabrics
Data Center Ethernet Opens the Door to FCoE
The Unified Fabric Payoff
iSCSI: Game over
So what do you need iSCSI for, then?
Bad timing
Fibre Channel in Double-Time
Enabling today’s dynamic data center
A Simpler Approach to Unified Storage
Unified Storage Architecture
Performance Analysis
Cost Advantages FCoE vs. FC vs. iSCSI
iSCSI: Is the Game over
So why do you need iSCSI, then?
iSCSI dodges FCoE noose
Fibre Channel vs. IP vs. InfiniBand vs. FCoE
Converged Networks and the Standards Bodies
Meeting the Challenge with FCoE and CEE
CEE: Advancing Ethernet
Key Elements of Converged Ethernet
Putting It All Together: Converged Ethernet and FCoE
FCoE Benefits
Unified fabric in the data center
Cost and Power savings
Is FCoE our Savior or Another Empty Promise?

3. Market Segments & Product Requirements
Goodbye to physical Fibre Channel
Internal array Fibre Channel
FC Fabric
SAS and Ethernet

**iSCSI dodges Fibre Channel over Ethernet noose**
**VMotion and FCoE: A match made in admin heaven**
**Blade dishes loss-less Ethernet wonder**
**Goodbye to physical Fibre Channel**

Internal array Fibre Channel
FC Fabric
SAS and Ethernet

**FCoE vs iSCSI**
**VMotion and FCoE: A match made in admin heaven**
**Ethernet Storage to Morph Again with FCoE vs iSCSI**

**FCoE vs. iSCSI**
FCoE, iSCSI, and FCIP
FCoE Or iSCSI, Where does It Really Matter?
FCoE standards efforts
Case for iSCSI
Case for FCoE

**Converged Enhanced Ethernet– Good for iSCSI SANs**

**EXECUTIVE SUMMARY**
1 **INTRODUCTION**
2 **INTRODUCING LOSSLESS ETHERNET**
3 **CONCLUSION**

**Blade Platforms & Network Convergence**
The Blade Advantage
The need for network convergence
Benefits of Network Convergence
Ethernet as the medium for network convergence
Technology options for carrying storage traffic over Ethernet
FCoE
Network Convergence in High-Performance Computing
Conclusion

**iSCSI**

**VIRTUALIZED iSCSI SANS**
SERVER VIRTUALIZATION
STORAGE VIRTUALIZATION
Networked Enterprise Storage in VM Infrastructure
ESX SERVER AND iSCSI
HOW iSCSI ENABLES VIRTUALIZED SANS
EQUALLOGIC VIRTUALIZED iSCSI SANS
AUTOMATIC LOAD BALANCING
NON-DISRUPTIVE SCALABILITY
FUTURE DIRECTIONS
- QUICK, INTELLIGENT PROVISIONING
- AUTOMATED MANAGEMENT

**4. Market Demand Forecast & Shares**

**Brocade FCoE Server Connectivity Solutions**
A NEW ARCHITECTURE OPTION
ENABLING DYNAMIC DATA CENTER INFRASTRUCTURES
Extending Fabric Intelligence Throughout the Data Center
Benefits of Utilizing CEE
FCoE Migration Strategy Relies on Existing FC Infrastructure, Built-In Fabric Intelligence

Predicting FCoE Adoption: Taking into Account the Human Factor
The promise of FCoE, the reality of adoption

5 Technology

What is Fibre Channel over Ethernet FCoE?
The Converged Ethernet Fabric
Converged Enhanced Ethernet (CEE)
FCoE Protocol Stack
FCoE Objectives
FC over IP (FCIP) Example
Ethernet Frame with FC Packet (Concept)
Relative Framing Overhead
FCoE Frame Considerations
FCoE to FC Gateways
FCoE to FC Gateway
Lossless and Reliable Delivery
Bit Error Rate Considerations
Ethernet “Pause” Flow Control
Why Use Ethernet?
Why Maintain Fibre Channel Content?
Why not use iSCSI?
What About ATA over Ethernet (ATAoE)?
FCoE Timeline and Roadmap
Fibre Channel Standards Activity
Ethernet Standards
Product Development
Fibre Channel vs. InfiniBand vs. Ethernet
Technologies Defined
Managing Multiple Technologies

FCoE vs. iSCSI

Fibre Channel over Ethernet (FCoE)
Success of FC
FCoE Standards Initiative
One Big Network?
Maintaining the Channel
FCoE Switches
Avoiding Packet Loss
Mapping Fibre Channel to Ethernet
Redundant Pathing and Failover

Fibre Channel vs. InfiniBand vs. Ethernet
Technologies Defined
Managing Multiple Technologies

Unified Storage Architecture
IP-based storage protocols

- MFCP
- IFCP
- ISNS
- ISCSI

6 Competitive Positioning

Hardware vendors primed for FCoE Interoperability
FCoE enjoys major buzz at SNW 2010
Cisco, Dell Blogs Feud over FCoE vs. iSCSI
Hardware vendors primed for FCoE love-in
iSCSI for SAN virgins
FCoE driver code licensing
Fibre Channel in Double-Time

FCoE vs. iSCSI – Pulls & Pushes
FCoE a Diabolical Plot?;
iSCSI Crowd Feeling Threatened?
FCoE “and” iSCSI - Who cares? It’s all about Data Center Ethernet
iSCSI vendor EqualLogic takes on Fibre Channel over Ethernet (FCoE)
iSCSI, FCoE or InfiniBand for storage networking?
FAQs: iSCSI vs. Fibre Channel
Players

Emulex and Qlogic support emerging FCoE technology
Emulex releases new product line CNAs
Converged Network Adapters from Emulex and Qlogic
QLogic hypes ‘network consolidation’ with FCoE

EMC Introduces its First Switch for FCoE
EMC Connectrix Family of Switches and Directors
Converged Network Adapters from Emulex and Qlogic

Brocade unfurls FCoE roadmap, CNA and FCoE switch next year
Brocade Buys Foundry: A Boost for FCoE?

BLADE Network Teams w Emulex, NetApp for FCoE on Blade Servers
Network Blade Network’s loss-less Ethernet for FCoEN

NetApp First to Announce Support for Native FCoE Storage
EMC’s support for FCoE - Connectrix Family of Switches and Directors

Cisco Target Data Center Needs at SNW

7 Suppliers & Strategies

Industry Ecosystem – Storage, Servers, Networking, Blades, System Software

FCoE Suppliers

Components: Brocade, Fujitsu Limited, Intel, LSI, PMC-Sierra, Mellanox, Vitesse
Software: Neoscale Systems, VMWare
Testers: Finisar
Storage Subsystems: Blade Network Technology, EMC, Emulex, Hitachi Data Systems, NetApp, Qlogic
Systems: Cisco, Fujitsu-Siemens, Hewlett Packard, IBM, Sun Microsystems

Strategic Product Positioning
Go-to-Market Plans
Financials
8 Channels
FIVE TESTS FOR DETERMINING IF YOU'RE BUYING UNIFIED STORAGE
General considerations before deploying 10G Ethernet for Convergence
Choosing a Fibre Channel array or iSCSI SAN storage for SMBs
IP SAN services fertile ground for SMBs
What iSCSI weaknesses should you consider when developing iSCSI services offerings?

9 Recommendations
FCoE: Extending FC Into the Future
Industry Status & Recommendations for
- Channel Players
- System Integrators, VARs
- Users - CIOs & DataCenter Managers
- Financial Investors – VCs, Wall Street

10 Appendix
A Primer on FCoE
Lossless Ethernet
Ethernet Standards Activities
FCoE and CEE: A technical perspective
FCoE Framing
FCoE Switch
FCoE in the Brocade Data Center Fabric Architecture
Brocade Working with IEEE to Develop FCoE Standards
Ethernet Congestion Management (ECM)
Priority-based Flow Control (PFC)
Enhanced Transmission Selection (ETS)
Summary
Connecting Microsoft Windows machine to Storage Area Network (SAN).
Key Benefits:
Key Features: