

Can I do More for Less?

or “Ethernet Storage Trends and Overview”

By Patrick Khoo

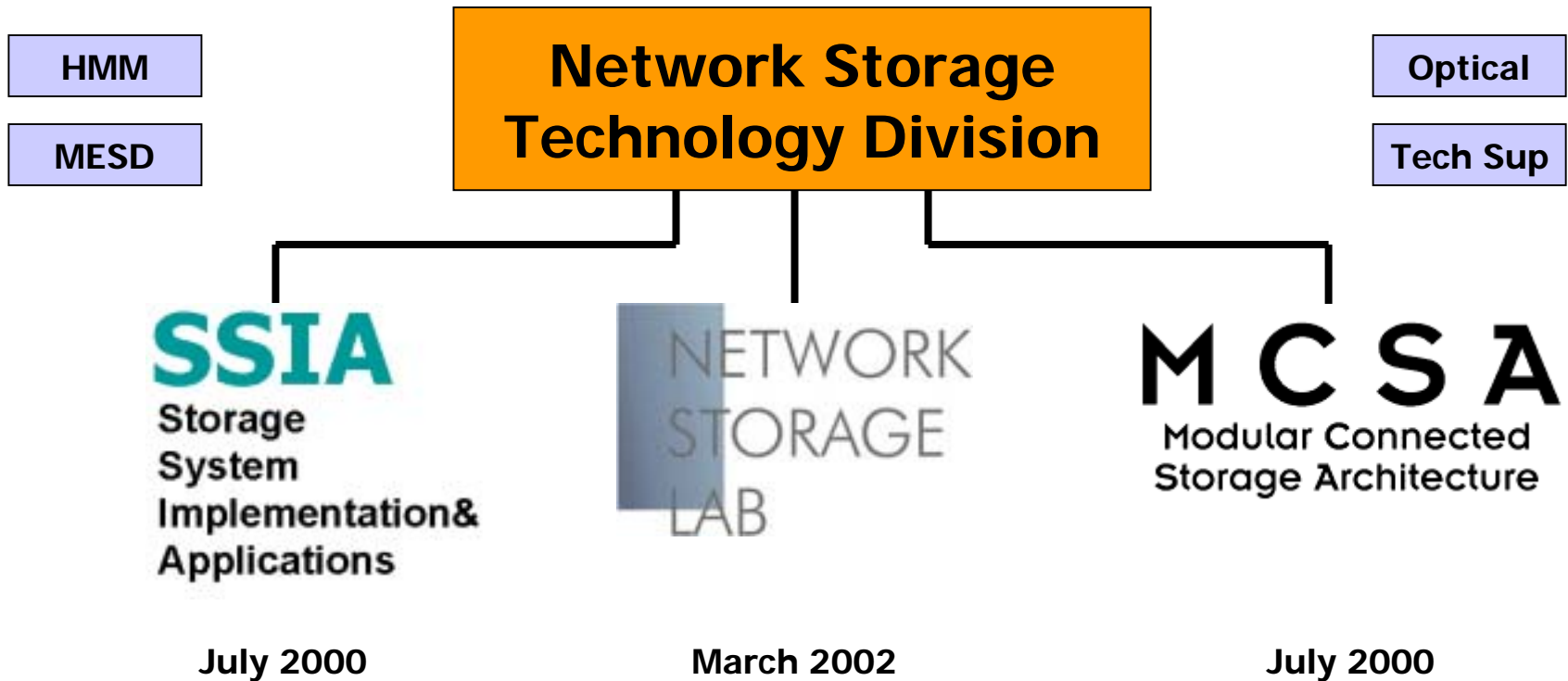
Program Manager

Modular Connected Storage Architecture Group

Network Storage Technology Division

Data Storage Institute

About DSI and NST Division



DSI is a nationally funded non-profit R&D institute focusing on data storage technologies and industries

Can I do More for Less?

- University of California at Berkeley - 2001
 - 12 Exabytes in mankind's history to date
 - 12 **more** Exabytes in next two and a half years alone!



115
Video
Tapes

100Gbit/in²
(2002)

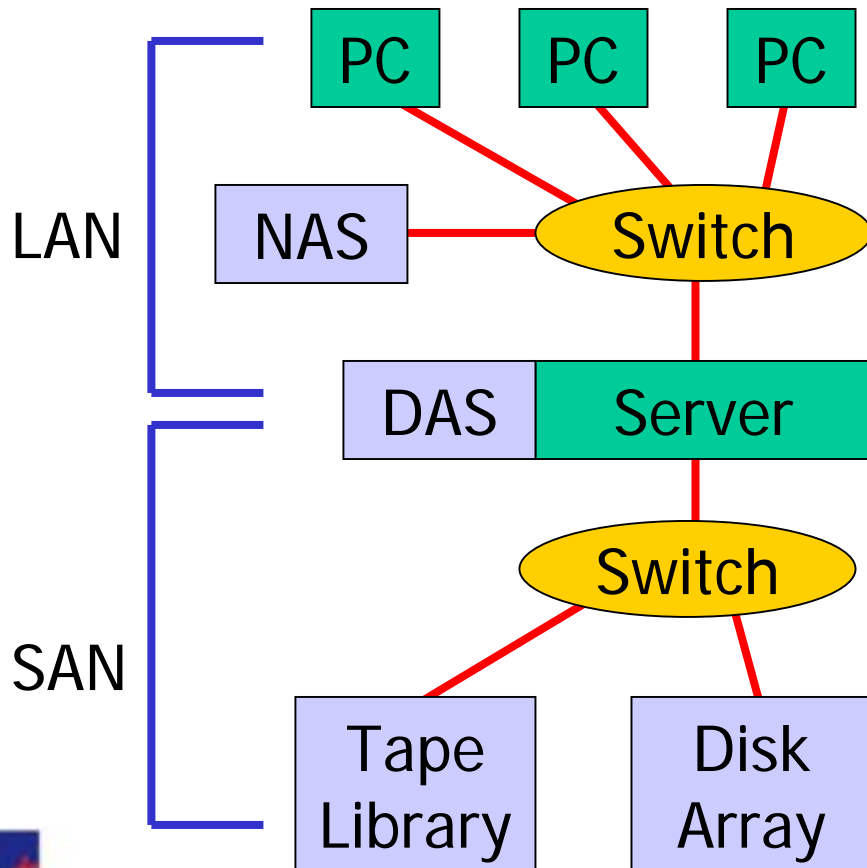


1 HDD

250 hours of video
or
80,000+ songs

Network Storage to the Rescue!

But Does Network Storage **REALLY** Help?



Definitions

LAN - Local Area Network

DAS - Direct Attached Storage

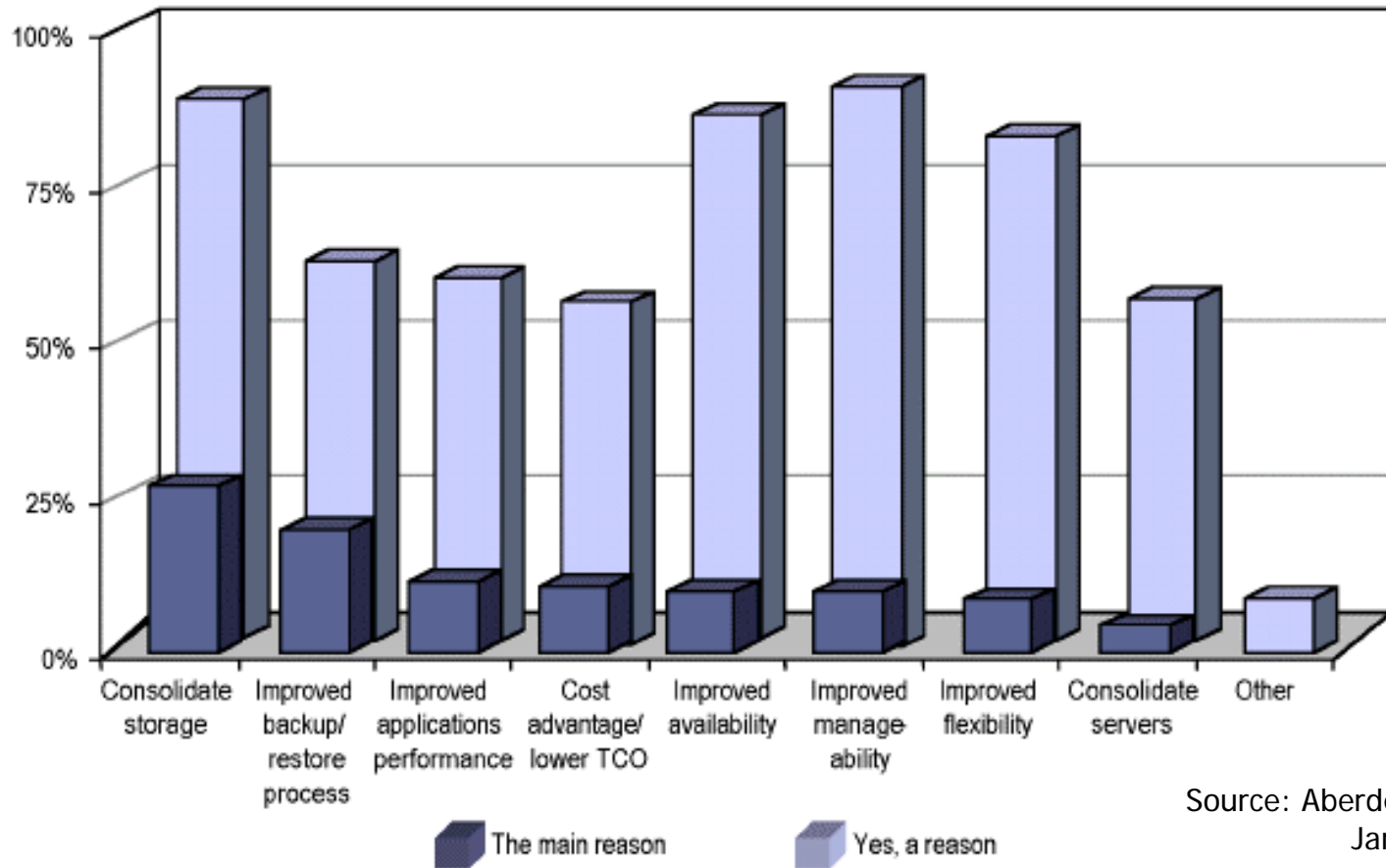
NAS - Network Attached Storage

SAN - Storage Area Network

Components

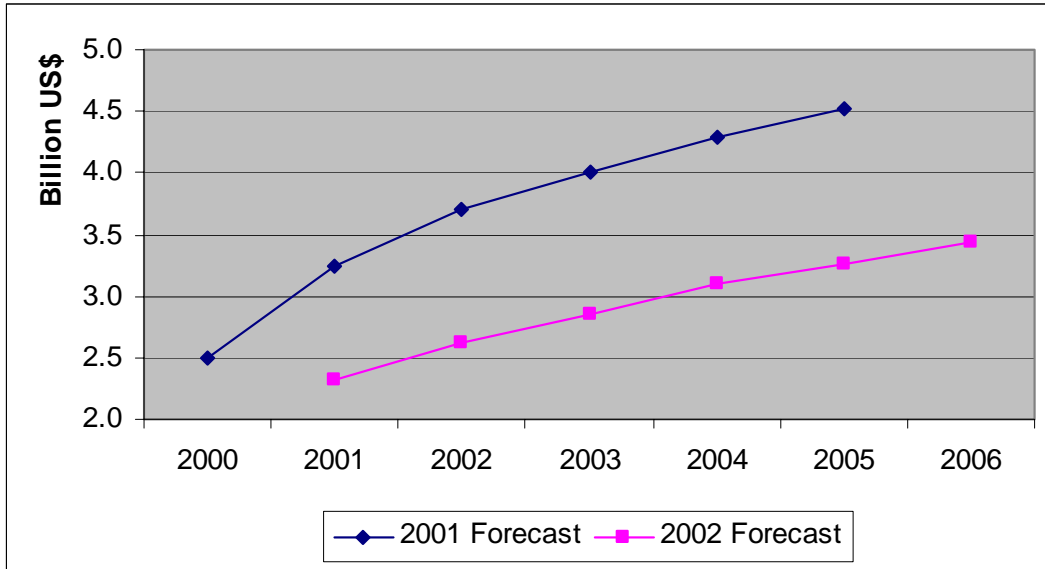
- Servers
- Storage systems (eg. disk arrays, tape libraries, etc)
- Interconnect technologies (eg. fibre optic cables, switches etc)
- Host-bus Adapters (HBA), Network Interface Cards (NIC)
- System and Data Management Software

Why Build a SAN?



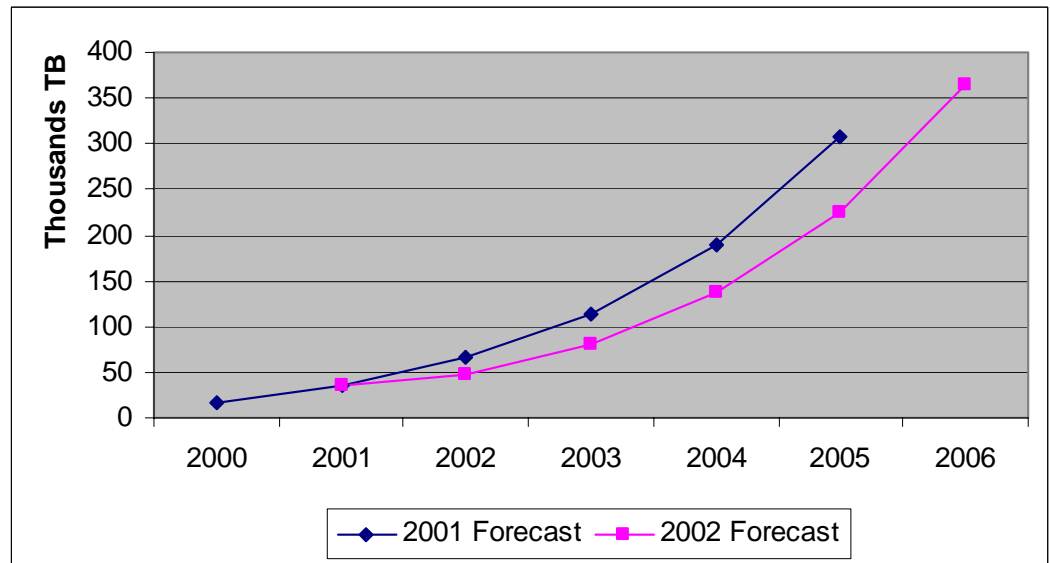
The truth is, there is **NO** killer app, so stop waiting for one!
But there are plenty of reasons to adopt Network Storage!

Industry Forecasts – Comparisons



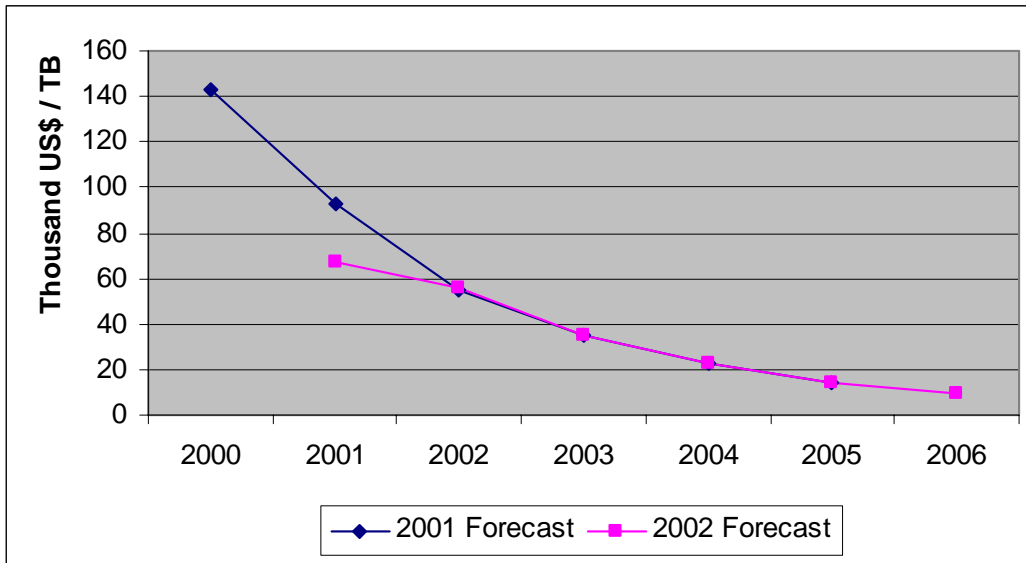
Asia/Pacific Disk Storage Revenue, 2000-2006

Source: IDC Asia/Pacific, 2001, 2002



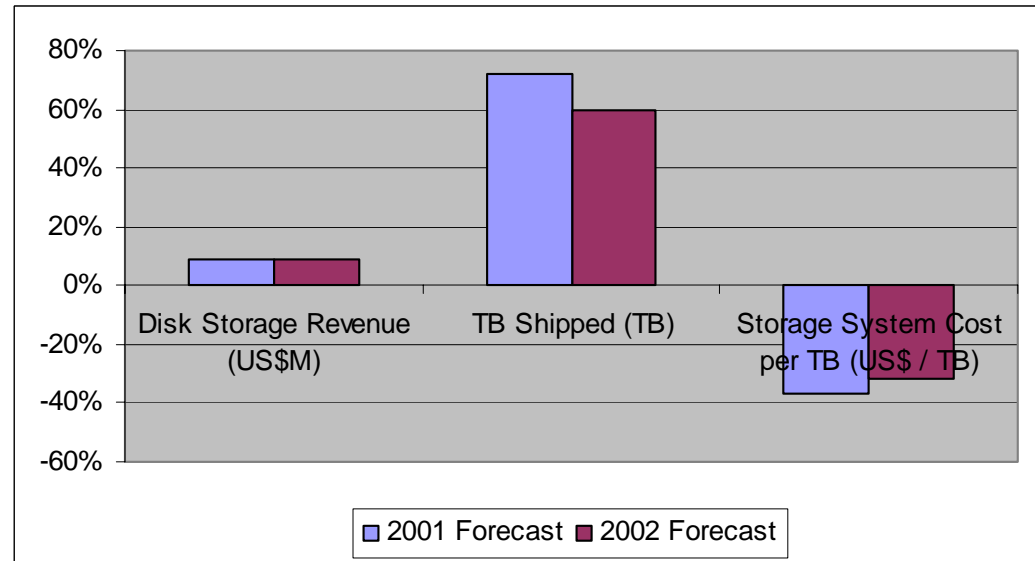
Asia/Pacific Disk Storage Terabyte Shipments, 2000-2006

Industry Forecasts – Comparisons



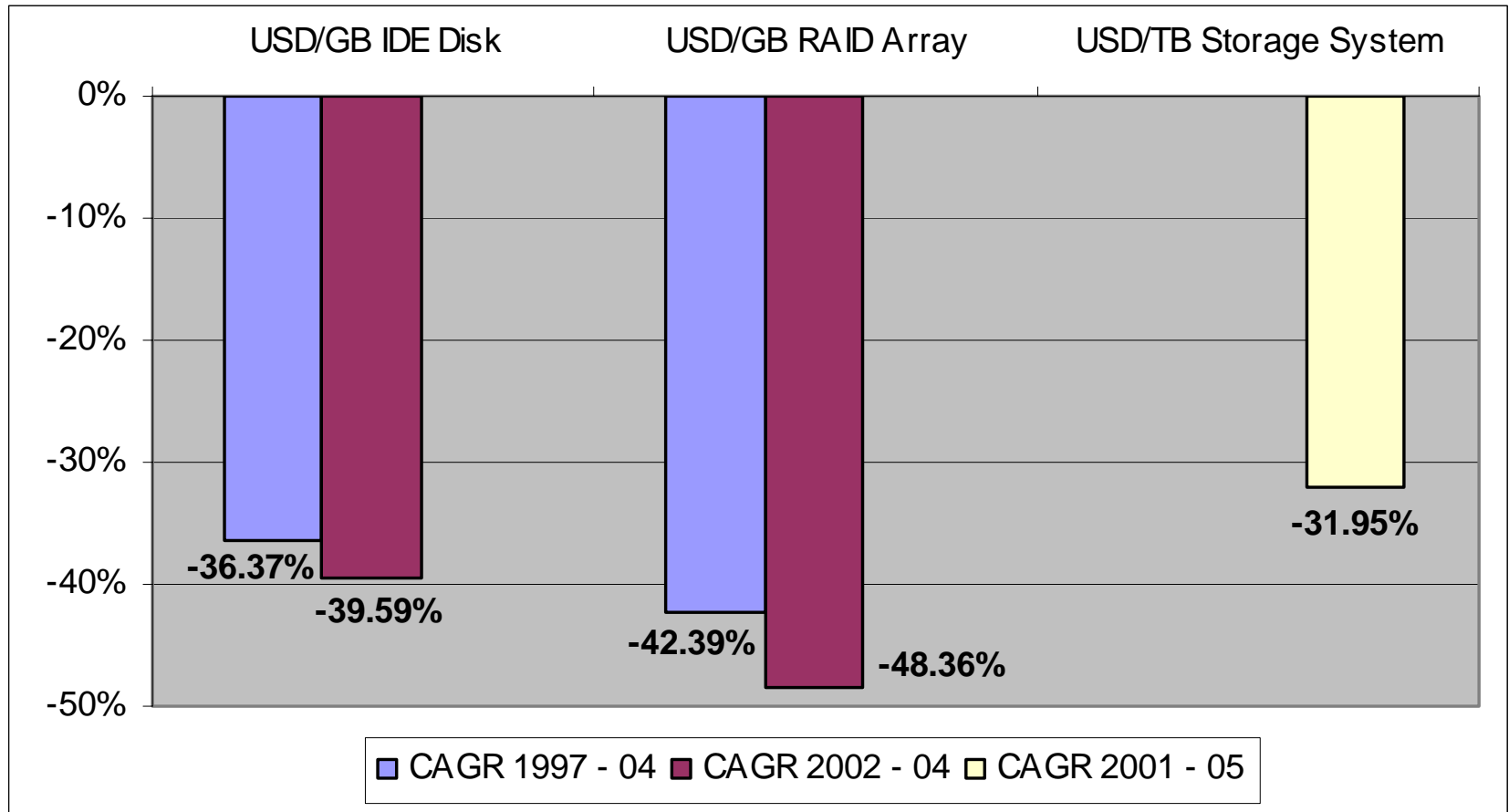
Asia/Pacific USD/TB Storage System Costs, 2000-2006

Source: IDC Asia/Pacific, 2001, 2002



Asia/Pacific CAGR Forecasts, 2001-2005

Trends in Storage Price Erosion



Source: IDC Asia/Pacific, 2002

Industry Forecasts – The Difference

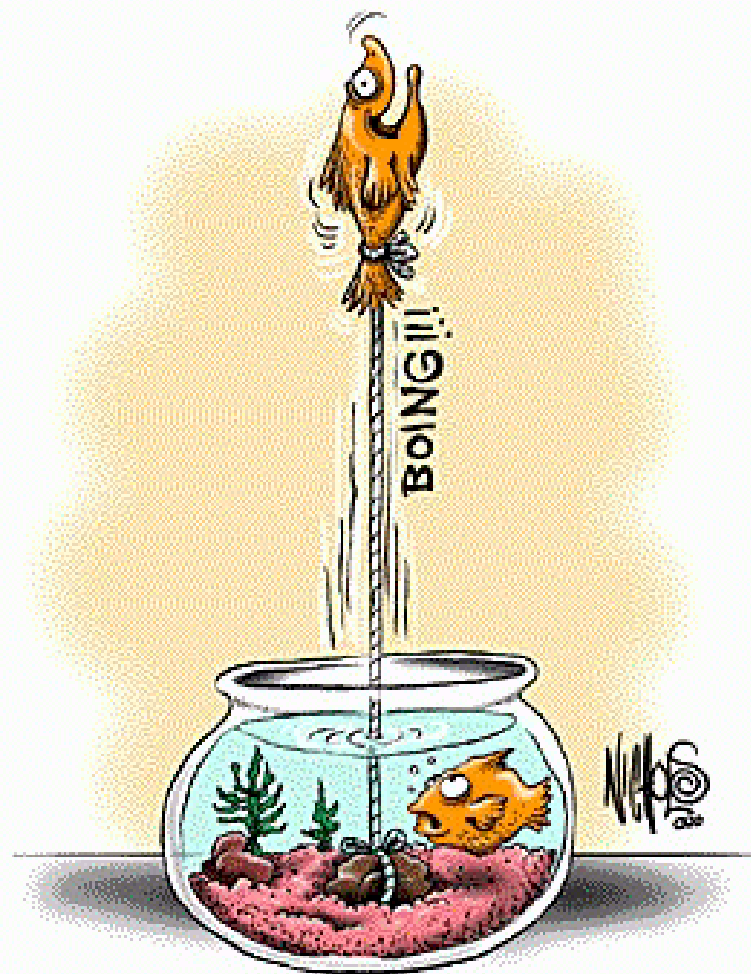
- What is the effect of the current economic climate on the storage business?
 - Storage growth has not been halted, merely delayed (by about one year)
 - At the same time, the cost of storage is dropping about 35% per year but will still stabilise over the long term [IDC Asia Pacific 2002]
- Conclusion: The cost of storage systems has not really dropped (other than due to newer high density HDDs) – some kind of technological advancement is needed

So How?

Innovate!

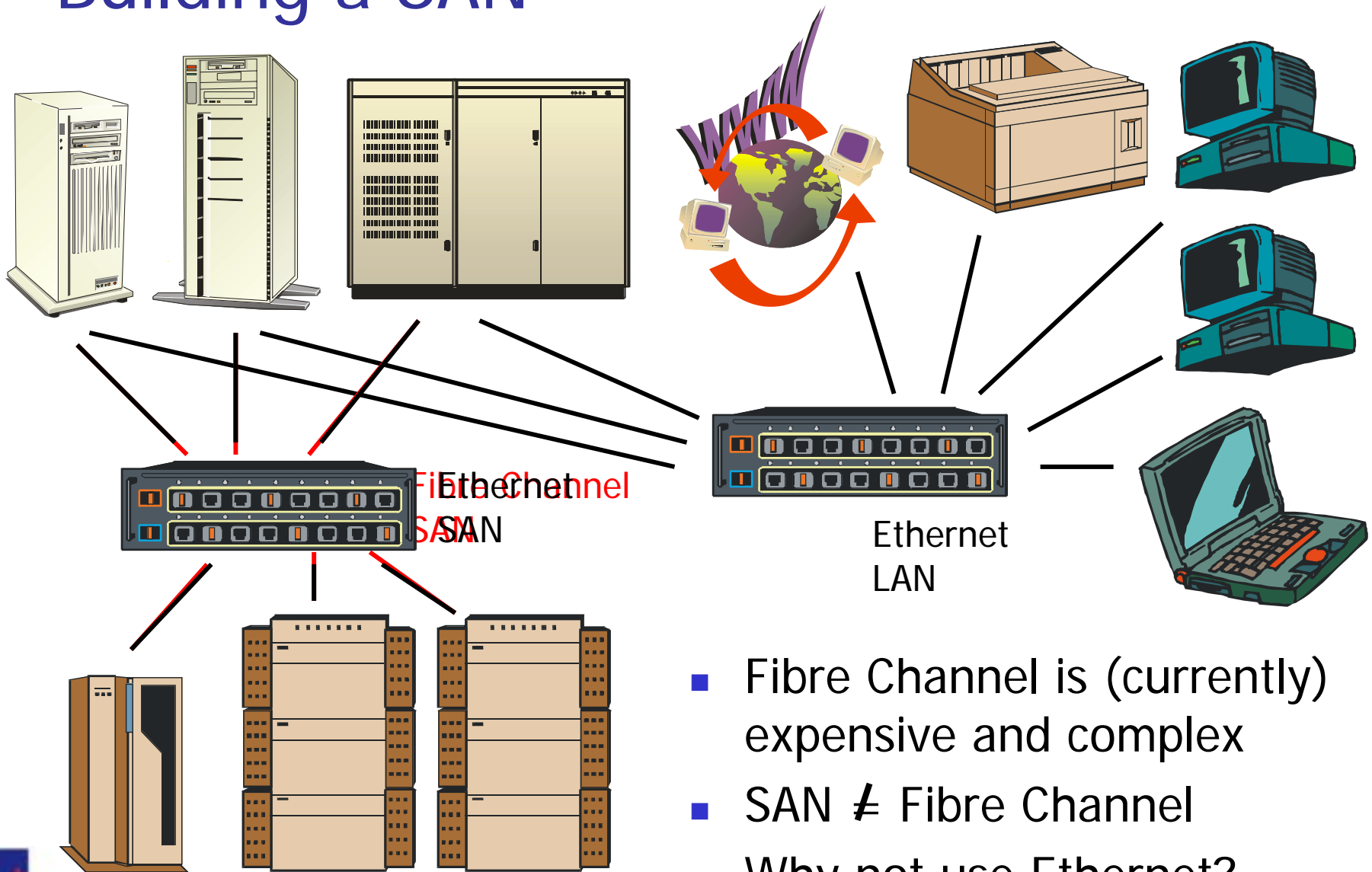
. . . and think of
new ways to do
old things.

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When fish bungee jump.

Building a SAN



- Fibre Channel is (currently) expensive and complex
- SAN \neq Fibre Channel
- Why not use Ethernet?

“Ethernet the World!”

End-to-End Ethernet Connectivity

Ethernet in the Campus

Ethernet Access to MAN

10 Gigabit Ethernet
enables End-to-End Seamless
LAN-MAN-WAN Integration

Wide Area
Optical Network
(OC-192)

Ethernet in the WAN

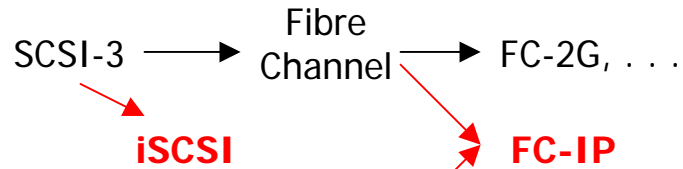
Ethernet in the PoP

Ethernet in the MAN

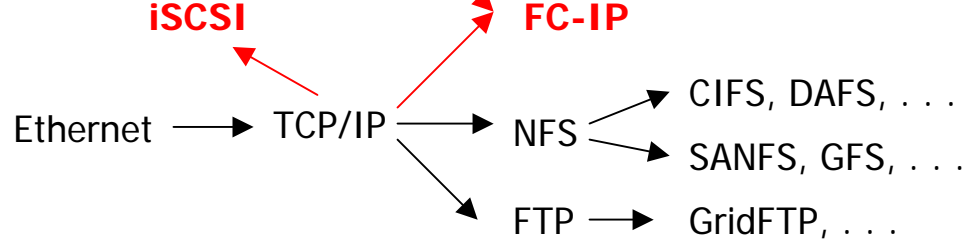
NORTEL
NETWORKS

Combine Two Worlds . . .

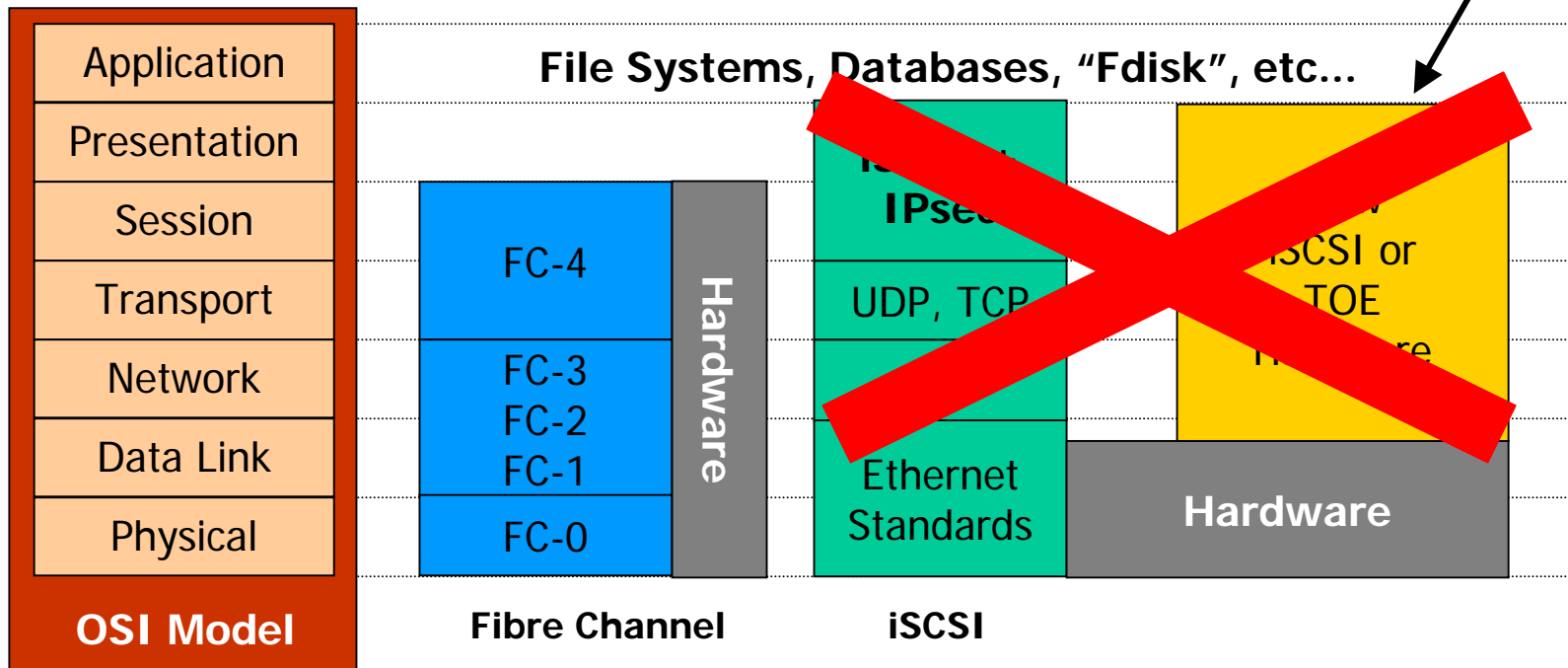
Storage



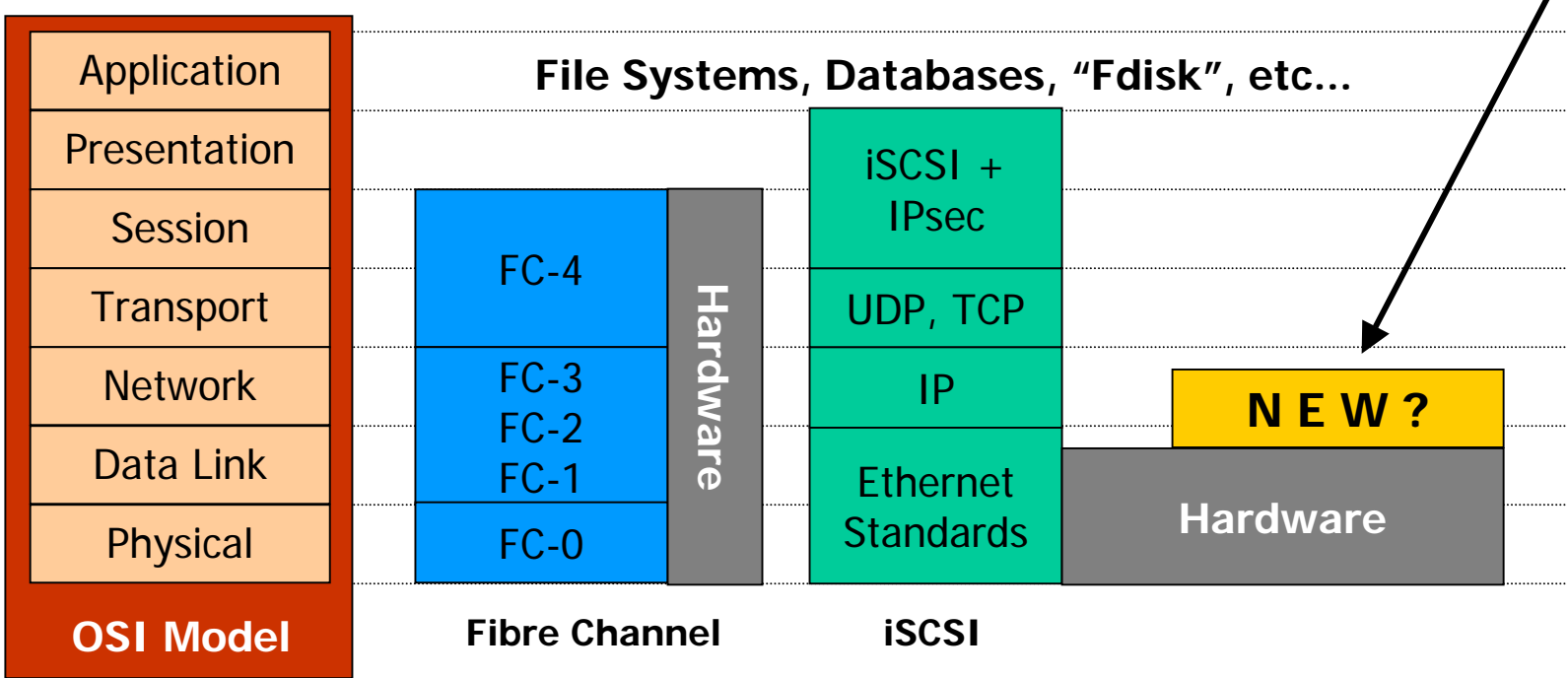
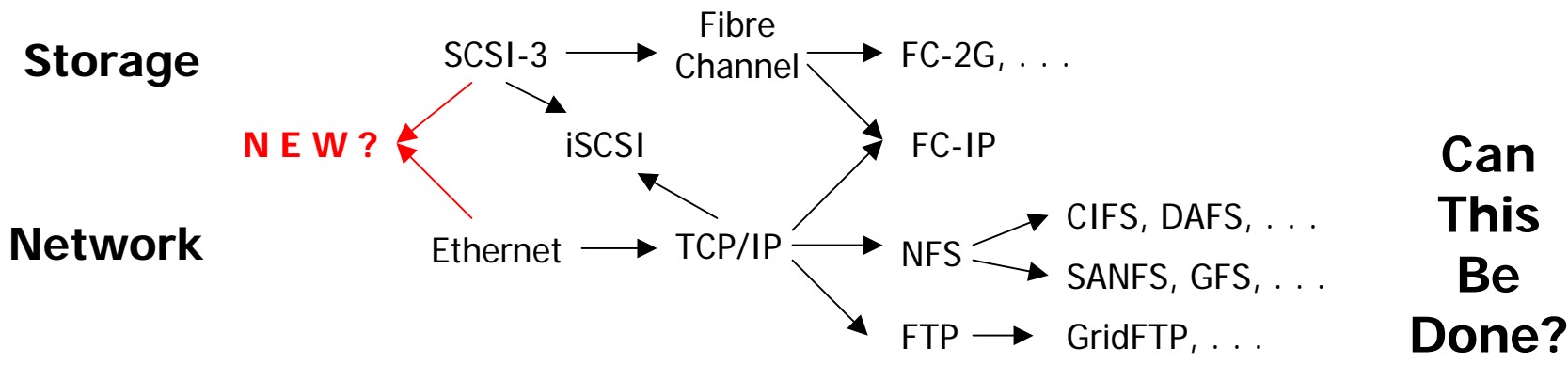
Network



But Why?



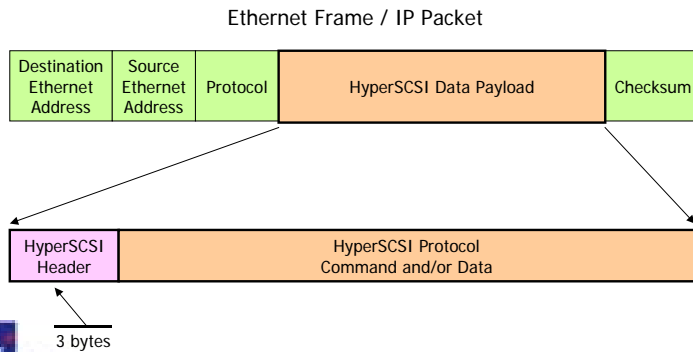
... And Think Out of the Box



Yes, It Can Be Done!

HyperSCSI

The transmission of SCSI commands & data across a network and multi-technology device support

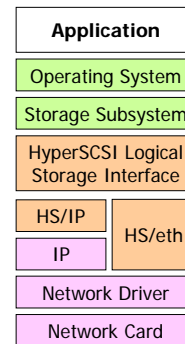


Access storage
over a network

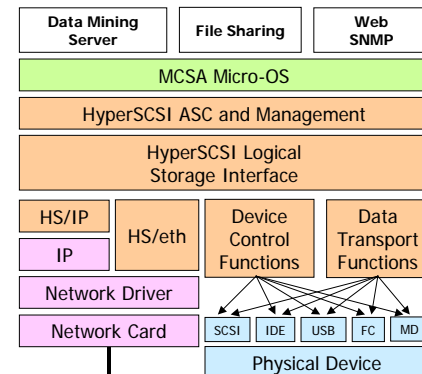
- **HyperSCSI** is a new Network Storage Protocol
- Transmit SCSI commands and data over a network
- High performance, secure, simple, low cost solution
- Runs directly on Ethernet (No TCP/IP!)

HyperSCSI Architecture

HyperSCSI Host
(Application Server)



HyperSCSI Target (Disk Array)

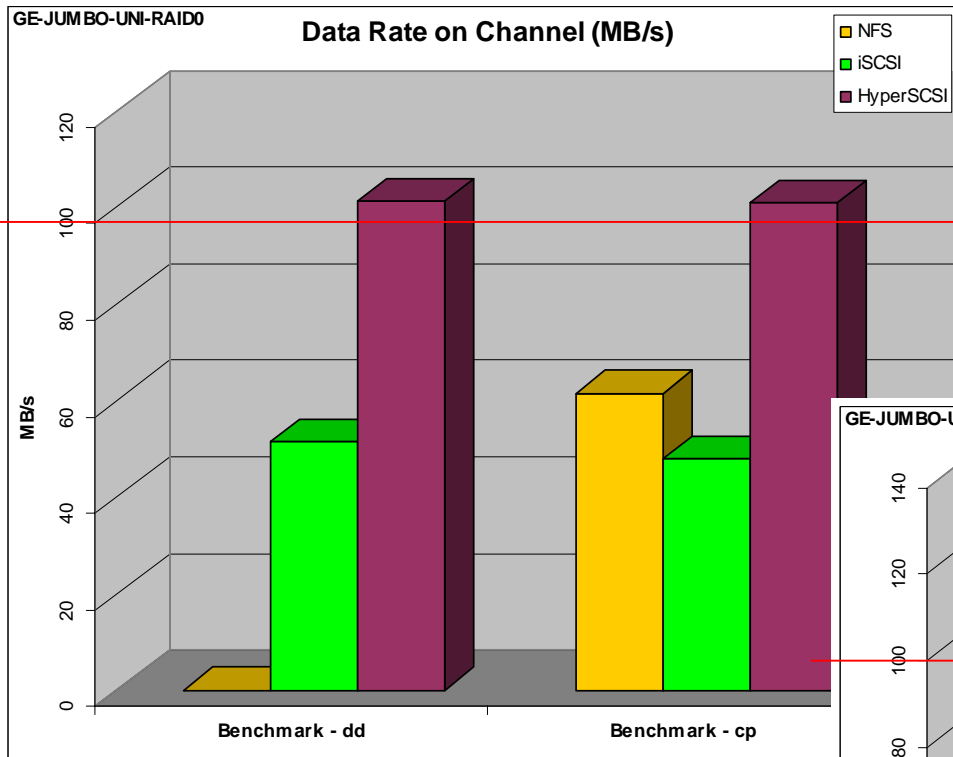


Multi channel load-balancing fault-tolerant
Wireless / Fast / Gigabit Ethernet Network

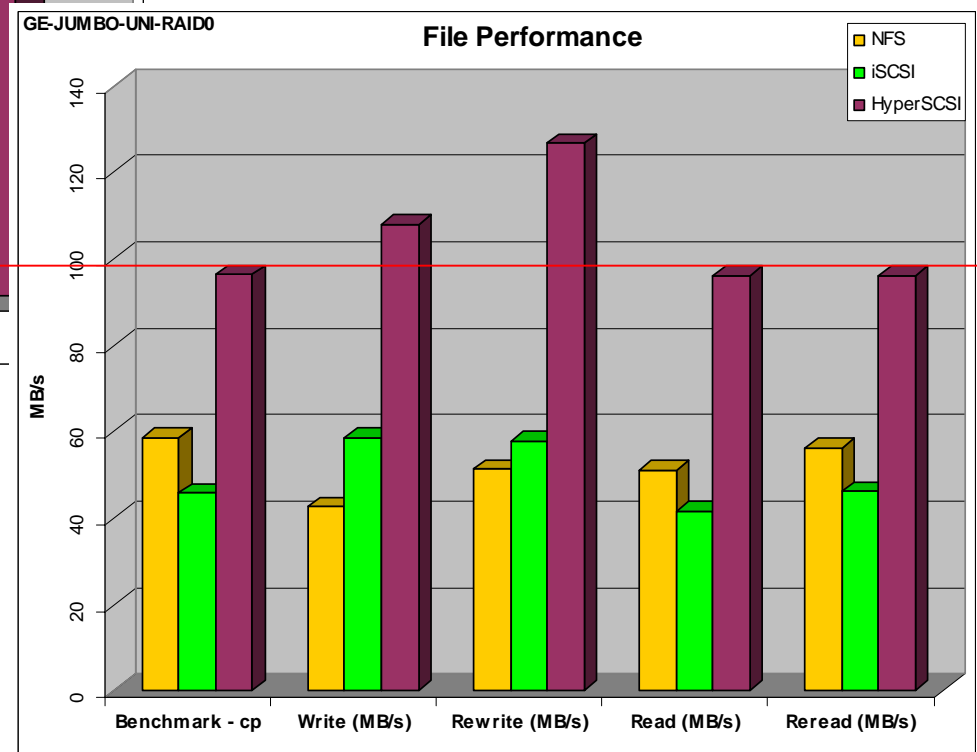


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High Performance

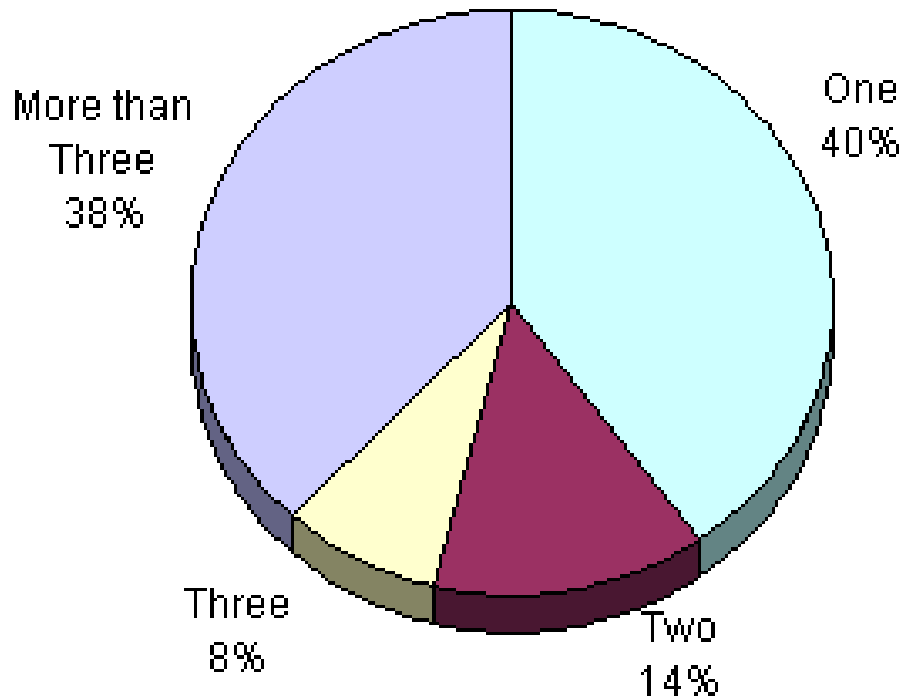


100MB/s sustained data transfer speeds for both block and file, more than 60% faster than NFS and iSCSI protocols in comparative benchmark tests



Tests conducted on a clean Gigabit Ethernet network with Jumbo frames, single initiator and target, 8 hard disks configured in RAID0 and using only common off-the-shelf hardware and software without special tweaks or optimisations.

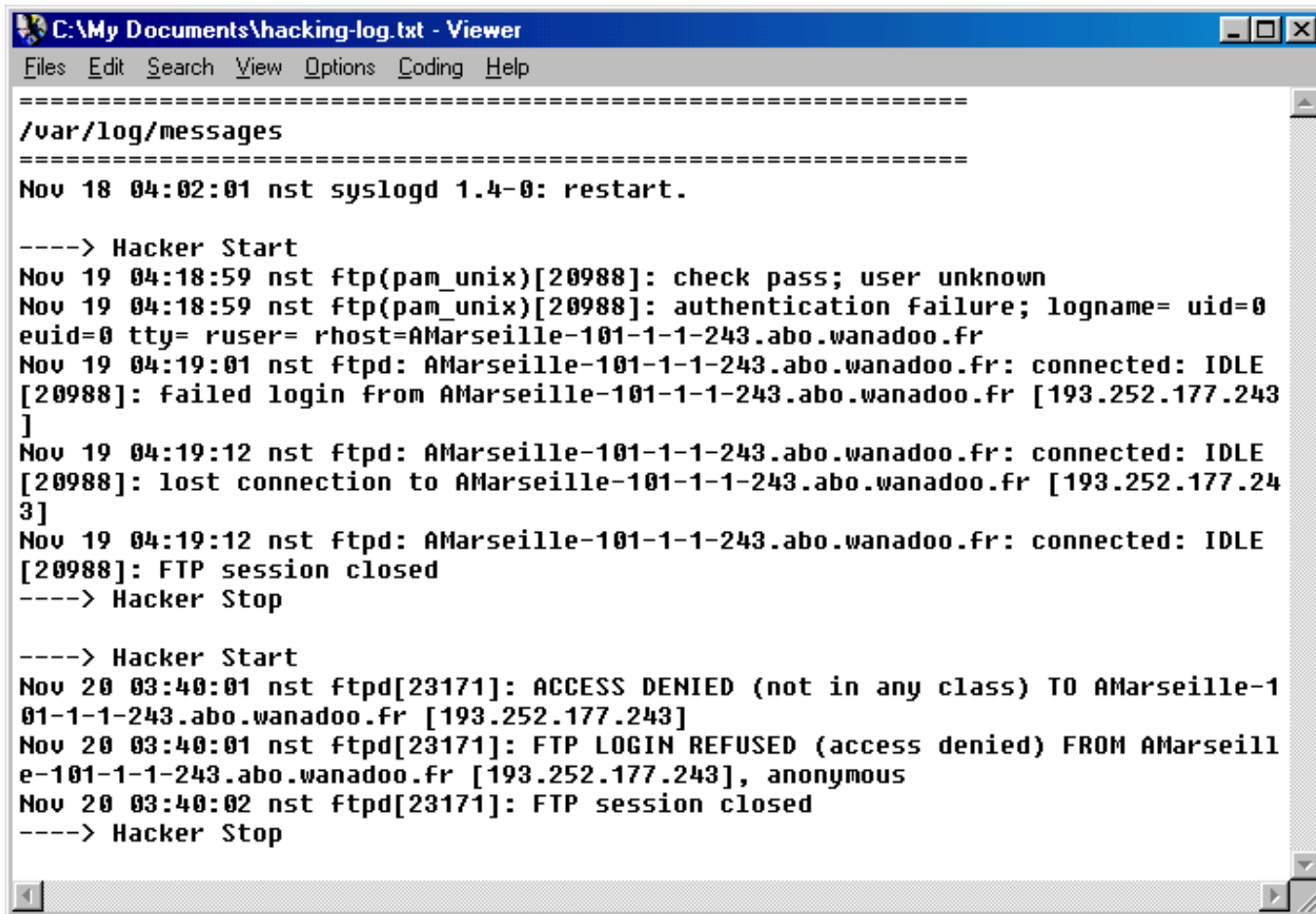
SAN Islands are a Reality



Number of SANs Deployed in Respondents' Organizations

- Most organisations preparing or considering implementing SANs, should take into account adding new "independent" SANs in the future
- Most SANs are "Local" in nature
- Why do you need IP to go long distance? (for most people anyway)

Secure Storage



```
C:\My Documents\hacking-log.txt - Viewer
Files Edit Search View Options Coding Help
=====
/var/log/messages
=====
Nov 18 04:02:01 nst syslogd 1.4-0: restart.

----> Hacker Start
Nov 19 04:18:59 nst ftp(pam_unix)[20988]: check pass; user unknown
Nov 19 04:18:59 nst ftp(pam_unix)[20988]: authentication failure; logname= uid=0
euid=0 tty= ruser= rhost=AMarseille-101-1-1-243.abo.wanadoo.fr
Nov 19 04:19:01 nst ftpd: AMarseille-101-1-1-243.abo.wanadoo.fr: connected: IDLE
[20988]: failed login from AMarseille-101-1-1-243.abo.wanadoo.fr [193.252.177.243]
]
Nov 19 04:19:12 nst ftpd: AMarseille-101-1-1-243.abo.wanadoo.fr: connected: IDLE
[20988]: lost connection to AMarseille-101-1-1-243.abo.wanadoo.fr [193.252.177.243]
]
Nov 19 04:19:12 nst ftpd: AMarseille-101-1-1-243.abo.wanadoo.fr: connected: IDLE
[20988]: FTP session closed
----> Hacker Stop

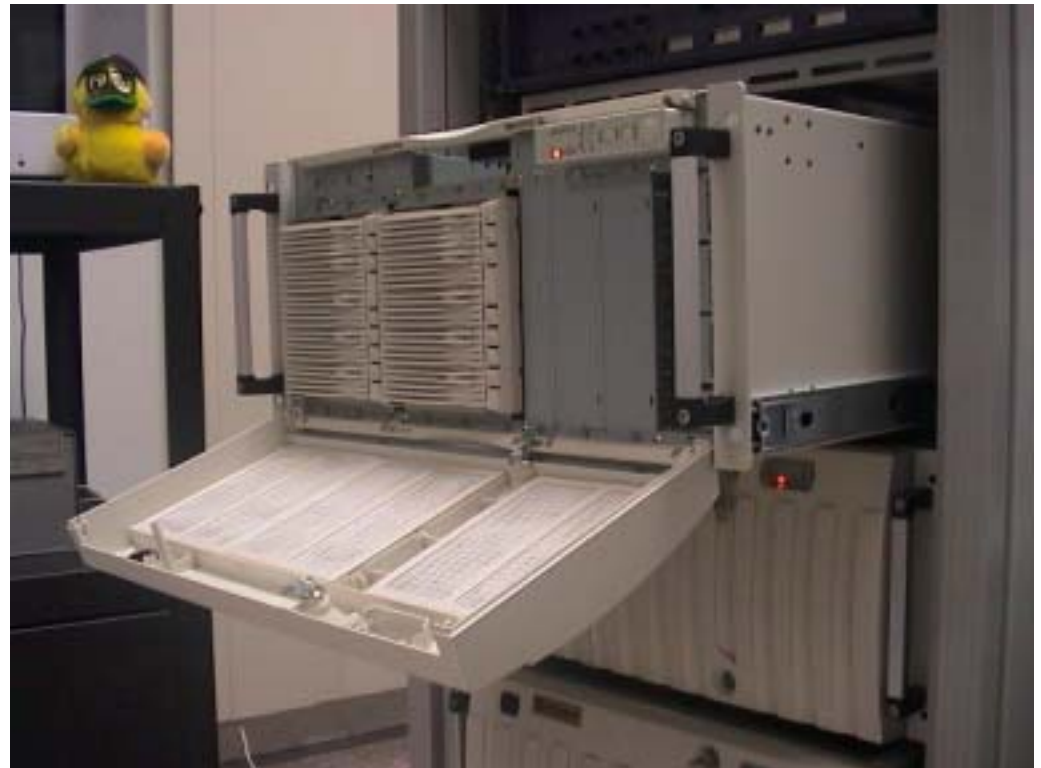
----> Hacker Start
Nov 20 03:40:01 nst ftpd[23171]: ACCESS DENIED (not in any class) TO AMarseille-1
01-1-1-243.abo.wanadoo.fr [193.252.177.243]
Nov 20 03:40:01 nst ftpd[23171]: FTP LOGIN REFUSED (access denied) FROM AMarseill
e-101-1-1-243.abo.wanadoo.fr [193.252.177.243], anonymous
Nov 20 03:40:02 nst ftpd[23171]: FTP session closed
----> Hacker Stop
```

This can't happen to your storage, **IF** your storage doesn't have TCP/IP

Is This for Real? Yes for Corporates!



- Storage Area Networks (SAN) and Network Attached Storage (NAS)
- Information Continuance, Performance, Security and Reliability



Is This for Real? Yes for Consumers!



- Wireless Network Storage
- Personal and Home Networks
- Consumer Electronics
- Entertainment and Content Distribution



Conclusion

- Some key points:
 - New Technologies like HyperSCSI, iSCSI, TOE, iSCSI HBA, blah, blah, blah
 - New applications for Network Storage like Wireless LAN, Home Networks, Personal Networks
 - Lower costs, ease of use, network storage for everyone!

Ethernet Storage is **NOT** coming,
It's already here!

And yes, you **WILL** get more for less

Thank You

<http://nst.dsi.a-star.edu.sg/mcsa/>