A Storage Area Network Should be

› Simple to install
› Easy to manage
› Fully interoperable
› Based on mature technology
› Provide the right features
› Available to everyone
› Affordable
IP SAN – Moving Intelligence into the Network

SANs

- Apps
- FC Switch
- Control & Management
- Storage
- In-band
- Out of band

In-band

Cluster of iSCSI-enabled Storage Controllers

Intransa

- Apps
- GigE Switch
- Control & Management
- Storage
- Out of band

Pool of IP Disks

IntraStor™ Architecture – Basis of Intelligent IP SAN

- Commodity Ethernet +
- Low Cost Disks +
- Enterprise Class SW +
- Breakthrough Architecture

- Virtually Infinite, incremental scalability
  - Enabled by IP addressing to the disk drive level

- Independently scales on capacity, performance and connectivity

- Single, virtual storage pool
  - 2x greater utilization
  - Higher availability
  - Easy to administer

- Automatic load balancing

- TCO dramatically lower
  - Policy management
  - Simple to use GUI
Leveraging Familiar Technology

- Host to switch to Controller is iSCSI
  - SCSI over IP - uses standard GigE
  - Host uses Standard NIC with Software iSCSI driver
    Or
  - HBA with driver
- Controller to Drive - ATA over IP

[Diagram of DE5200 Disk Enclosure, Host Server, Std GigE Switch, SC5100 Controller]

StorControl™ Simplifies Storage Management

- Easy to use Graphical User Interface
- Policy-based Management
- Volume Creation policies, optimized for application needs (availability & performance)
xBlock: ATA-over-IP Protocol

- Protocol design constraint
  - Easily implementable in hardware state machines

- Datagram transport protocol over IP
  - Initiator-target model
  - Optimized for fixed-sized payloads
  - Control and data transfer
  - Request-response
    - Except for streaming reads (single request, multiple responses)
  - Multiple outstanding requests w/ credit-based flow control
  - Retransmission of timed out requests
  - Protection of order-dependent operations during retransmission
xBlock Operation

Storage Controller

config rqst
config response
read rqst
read responses
write response
write rqst

IP Disk Controller

GbE Network

IPDC vs. PC – Write Throughput

Throughput MB/s

Transfer Size (KB)

IPDC

PC I/O Meter

4/21/2003
IPDC vs. PC – Read Throughput

![Graph showing IPDC vs. PC read throughput]

Multiple IPDCs Throughput Scaling

![Bar graph showing throughput scaling with different numbers of IPDCs]

- **Transfer Size (KB)**: 1 to 100
- **Throughput MB/s**: 0 to 40
- **Throughput (MBps)**: 0 to 140

- **PC I/O Meter**
- **IPDC**
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