



HNF March 2000

Ciprico High Bandwidth Storage Solutions

Agenda

- **Bandwidth Storage Market**
- **Ciprico RAID Solutions**
- **Technology Trends**

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Corporate Objective

‘We will be the market-leading provider of intelligent high-performance storage and retrieval systems for high-bandwidth information systems.’

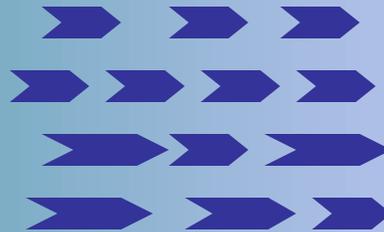


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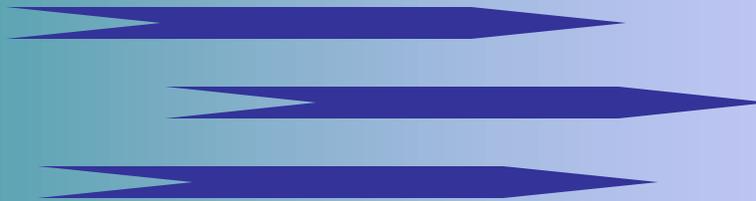
Storage markets

Transaction



Small requests

Streaming



Multiple concurrent threads

Bandwidth



Big data

Broadcast & Post Production

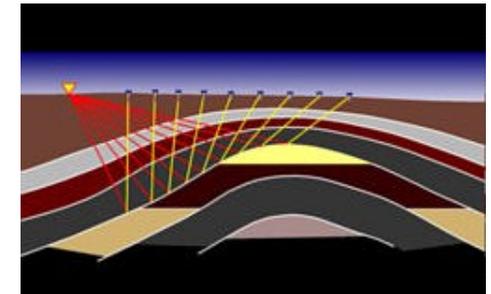
- *Real-time film-resolution playback of uncompressed CGI*
- *No performance reduction with single drive failure*
- *Fully fault tolerant, 24x7*
- *SAN compatibility*
- *Technical support relationship*



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Geophysical Survey

- *Survey vessels generate multiple TB's of seismic data*
- *Ciprico widely used in Surveying, Analysis and Visualisation*



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Medical Imaging

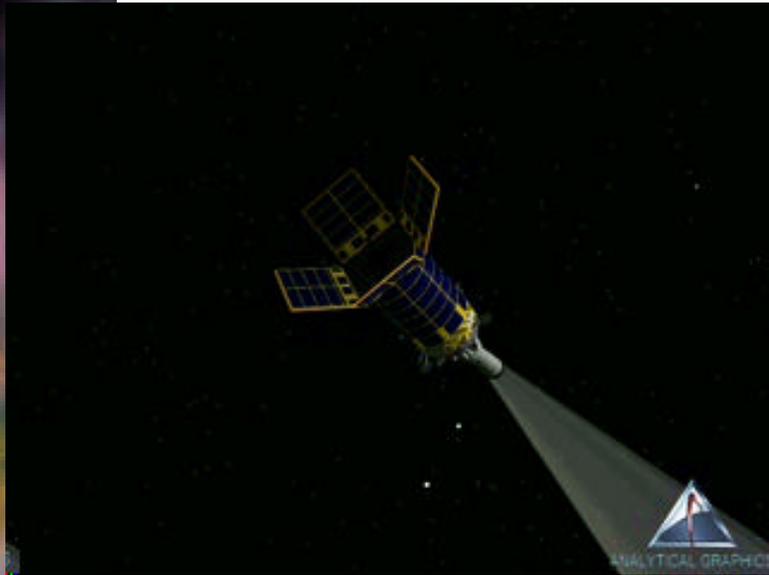
- ***PACS: Picture Archival and Communication System***
- ***Images from digitised X-ray, Radiography and MRI scanners stored and archived digitally***
- ***Images may be 2k x 2k x 24bit (~12MB)***
- ***SAN delivering higher performance***



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Geospatial Satellite



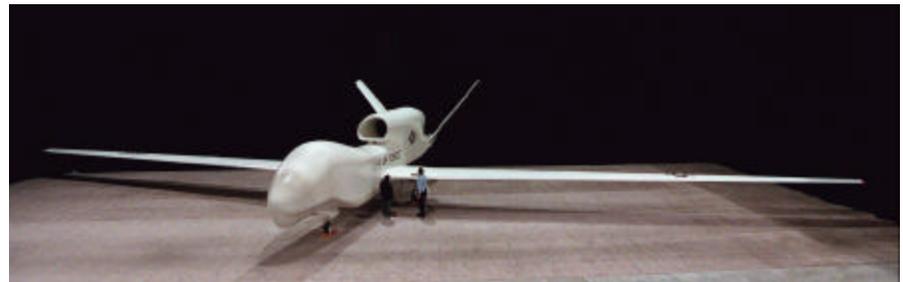
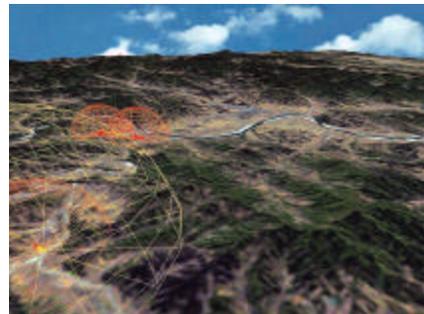
High capacity, reliability and bandwidth performance are mandatory

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Defence Imaging

- ***Ciprico storage widely used in mission planning, rehearsal, radar, satellite and UAV systems***
- ***Successes include ETRAC, CIP, Manifest, SAIP, TIS, PEG, JSAS, MIES, Joint STARS, EDOS, Landsat 7,***
- ***Mil-spec ruggedised product versions***



Product Overview

- **7000 Series** *Bandwidth*
- **FibreStore RAID** *Streaming*



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7000 Series

~240MB/s



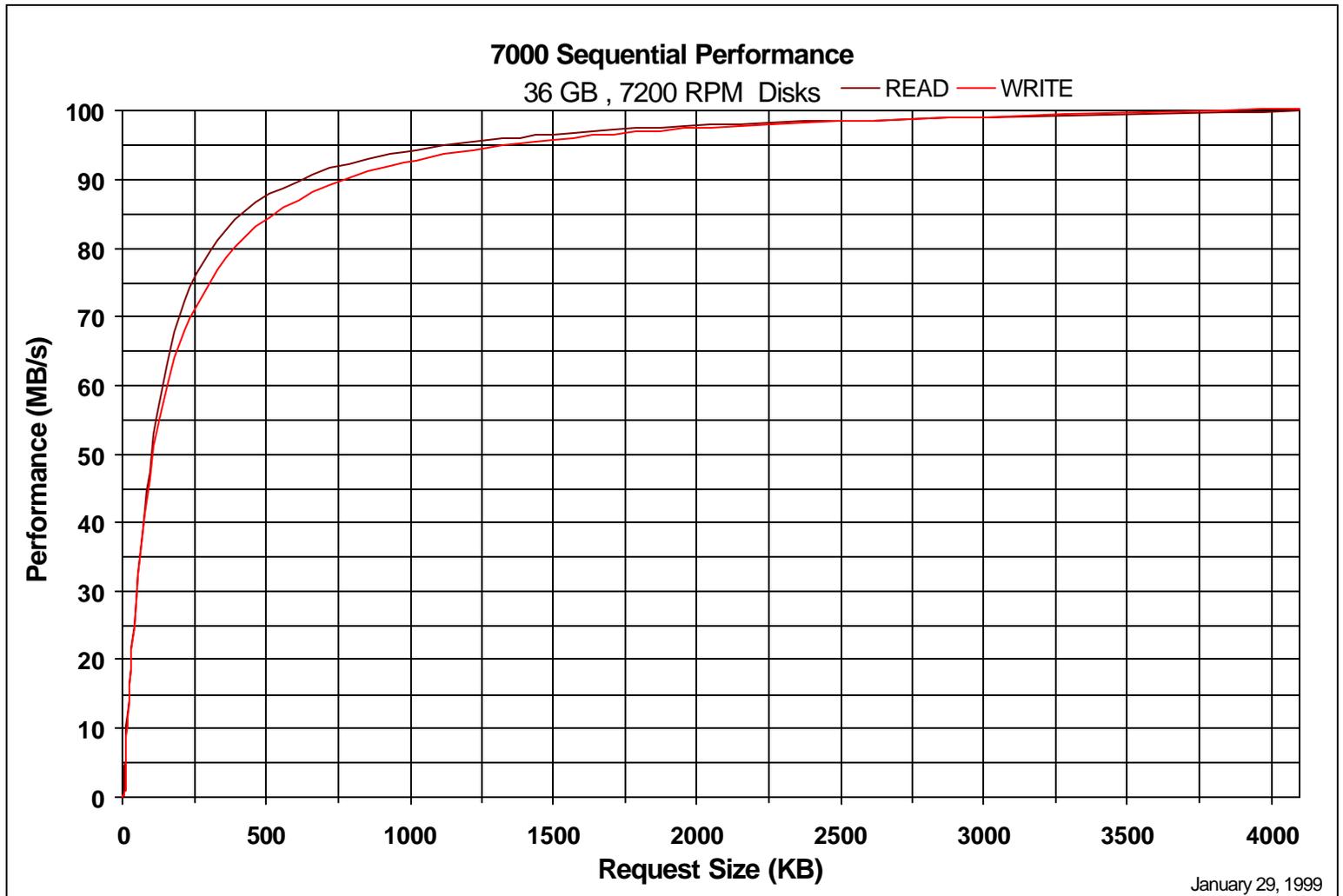
- The Fibre Channel RAID bandwidth leader
- Consistent performance across reads, writes and with a failed disk
- SAN tested hardware and software
- Hot swap disks, power, cooling
- 72 to 580GB / array, 95MB/S per unit
- Great fit for data acquisition, visualization systems

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7000 Performance Chart

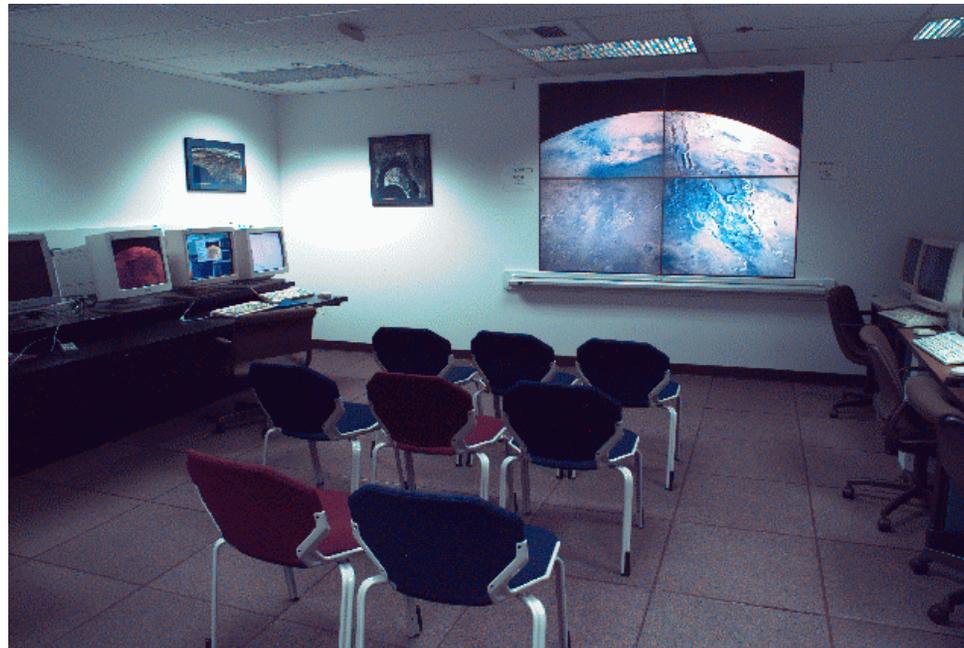


January 29, 1999



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Jet Propulsion Laboratory



- **SGI Powerwall Visualization**
- **8 x 7000 disk arrays striped to achieve 512 MB/sec playback data rate**
- **4 Megabyte Blocks of data**



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NEW



FibreSTORE[®] RAID Systems



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FibreSTORE[®] RAID Systems



- **Designed for streamed data applications**
- **Highly scaleable and flexible**
- **RAID-4 with advanced cache design for outstanding performance**
- **Exceptional reliability**



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High-Bandwidth Performance



Fibre**STORE**
RAID



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- ***Up to 95 MB/s per controller sustained for reads and writes across full capacity and with a failed disk***
- ***RAID-4 architecture with segmented cache gives high performance at medium request sizes***
- ***Optimised for multi-threaded streaming applications***

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Built-in Reliability

- Hot swap drive redundancy through RAID
- Dual Fibre Channel paths to each drive
- Global spare support
- Dual, redundant hot-swap power and cooling modules
- Dual, active-active, hot swap RAID controllers option; SGI Failover support



FibreSTORE
RAID



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Fully Scalable

- **Expand from 1 JBOD array to 4TB RAID in 7-enclosure rack**
- **Up to 16 independent 5 or 9-drive volumes**
- **Field expandable without affecting existing data**
- **LUN masking support**



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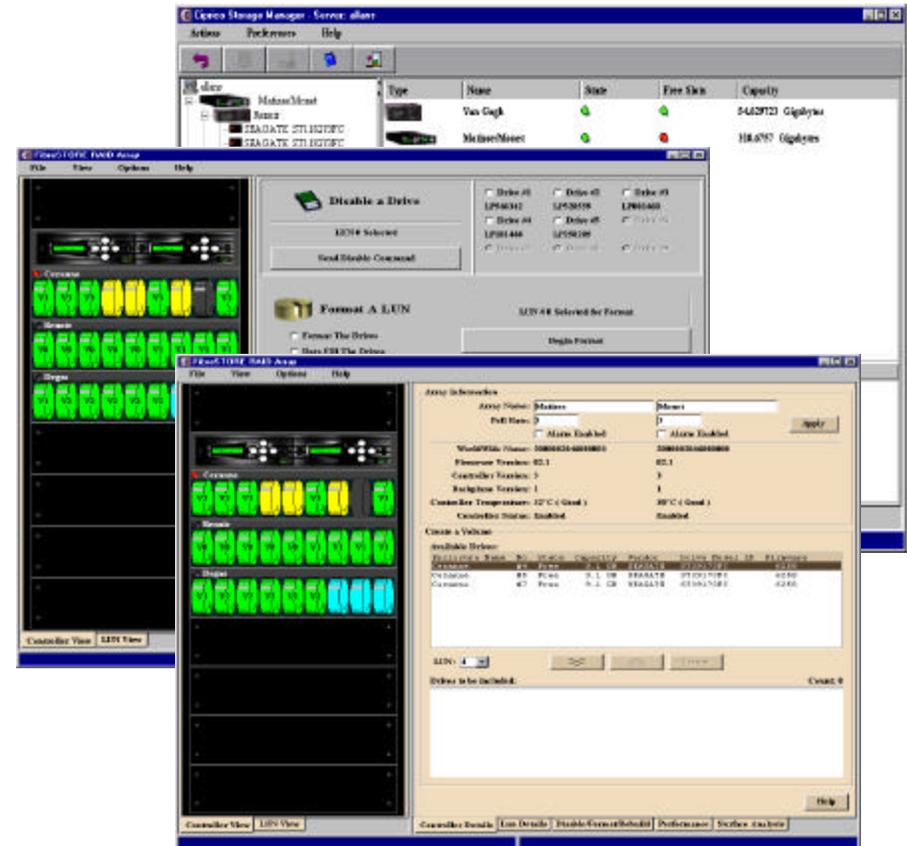
Storage Manager software

***Sun, SGI, NT
support with
common interface***

***Easy system
configuration***

***Can alert by email
or pager***

***Entire system
monitored***



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FibreStore RAID gives you...

Scalability

Performance



Reliability

Cost effective



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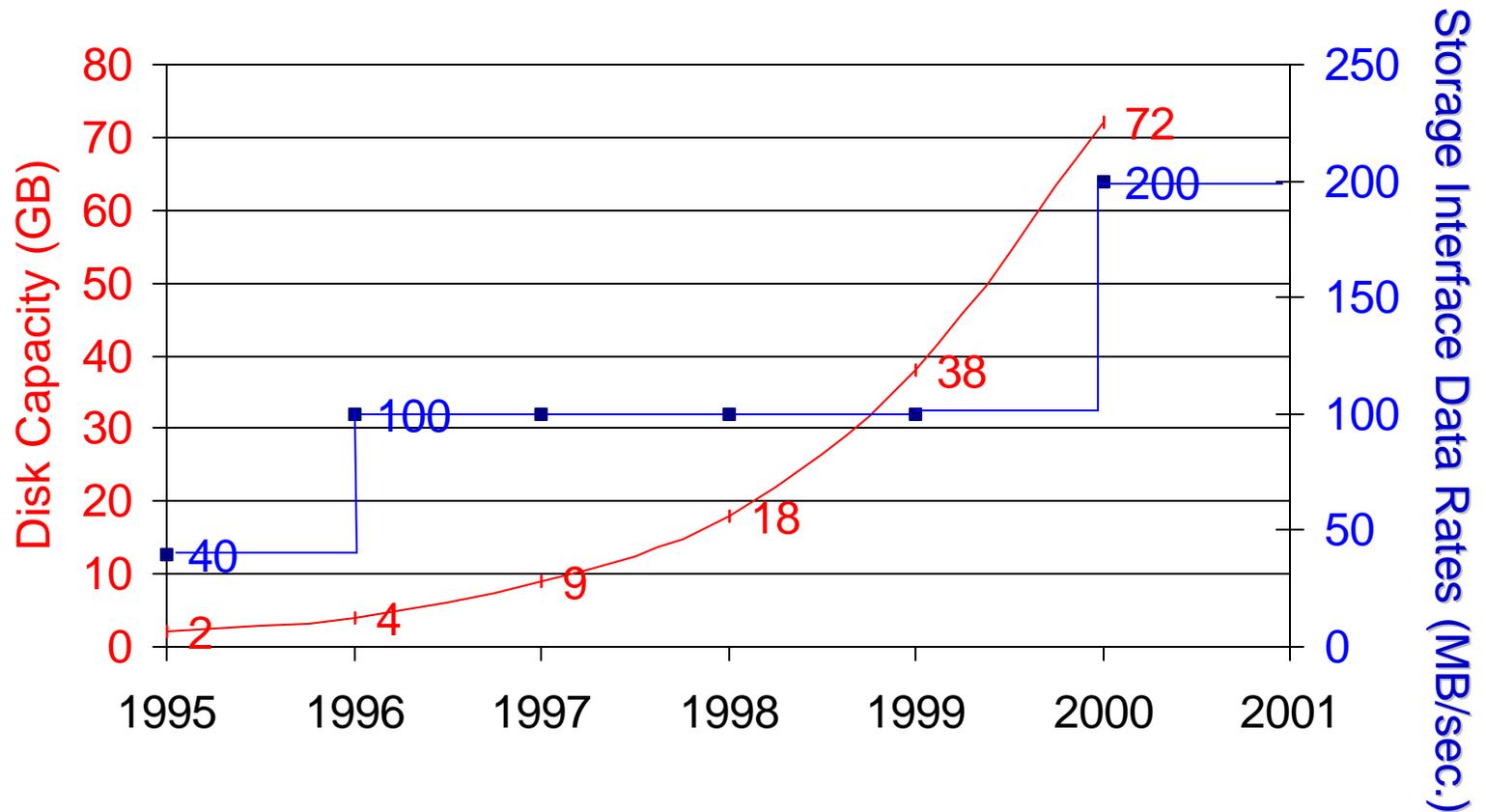
Technology Trends

Disk Drive Technology
GSN Bridges
Storage Area Networks



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Capacity Exceeds Bandwidth Growth



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Storage Area Networks

- **Ciprico experienced in several SAN technologies including:**
 - **ADIC CentraVision**
 - **SGI cxfs**
 - **GFS (Ciprico is the first company to implement device locks into a storage device)**
 - **Mercury SANergy**
 - **Transsoft FibreNet**



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CentraVision

- Outstanding performance for large block data
- Irix, NT, and Linux support (May, 2000)
- Great fit for High Bandwidth applications
- More details in ADICs presentation



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CXFS

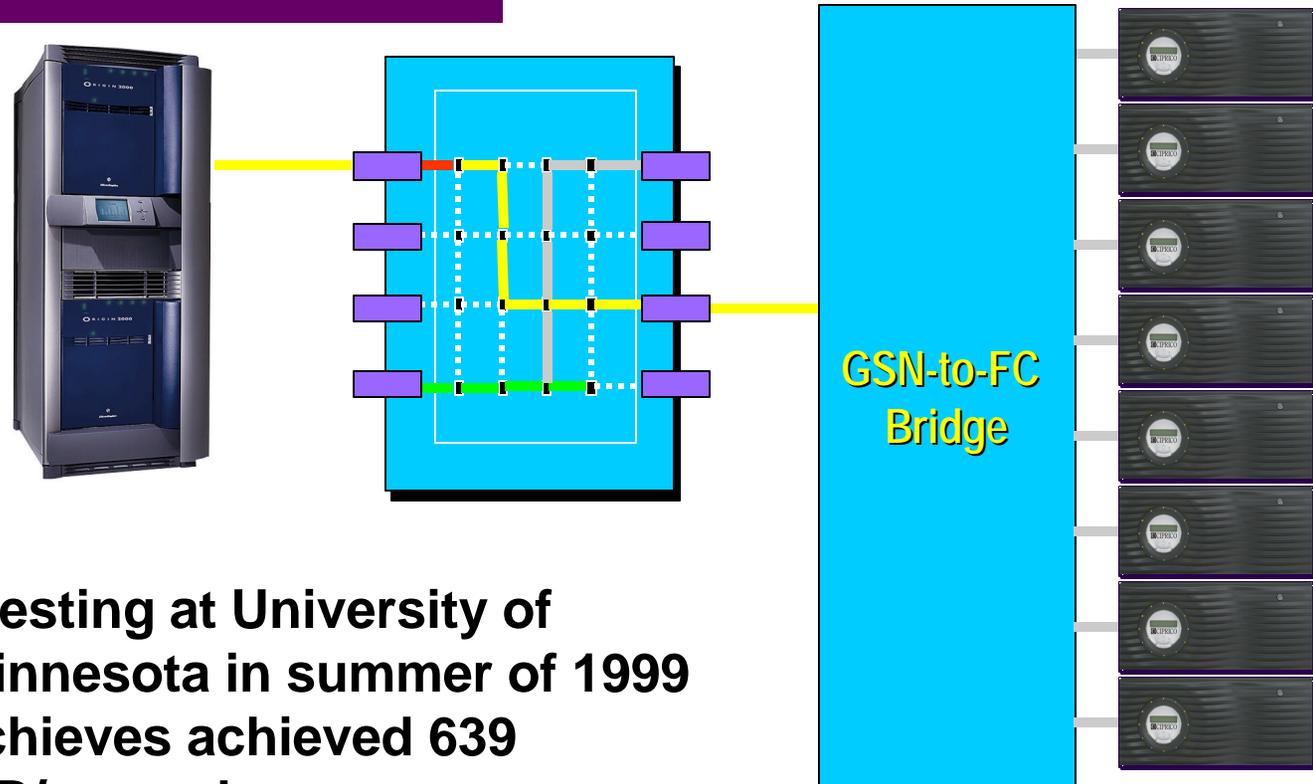
- **Testing completed at Lawrence Livermore Laboratories on performance comparison of XFS vs. CXFS**
- **Achieved 175 MB/second striped across two FC channels using CXFS.**
- **Results documented in white paper written by Tom Ruart, University of Minnesota.**



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GSN Bridge Technology



- Testing at University of Minnesota in summer of 1999 achieves achieved 639 MB/second
- Genroco planned improvements will increase this to over 720 MB/second.





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