



**GSN & ST:**  
*Keys to the High Performance  
Network Independent SAN*

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**GENROCO Europe**

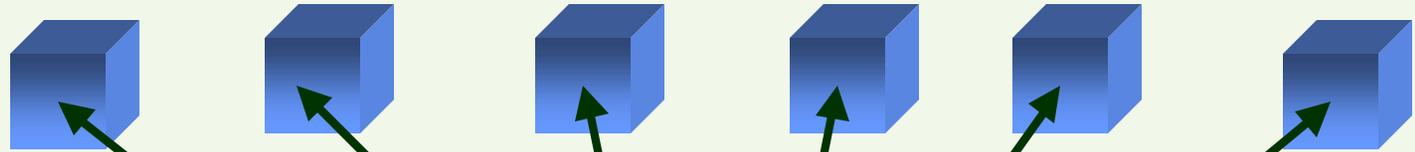
**HNF-Europe meeting**

Annecy, France

Monday, March 13th, 2000



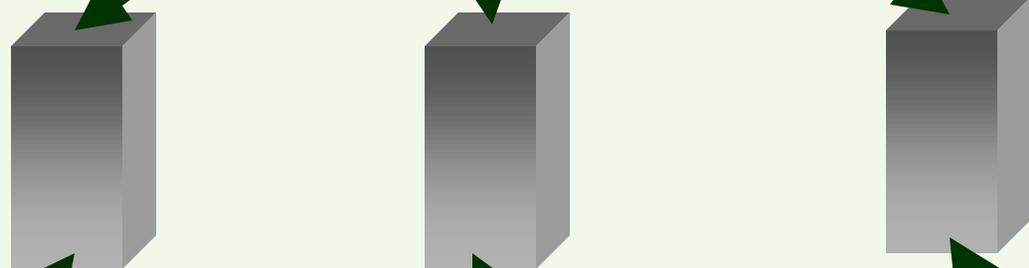
CLIENTS



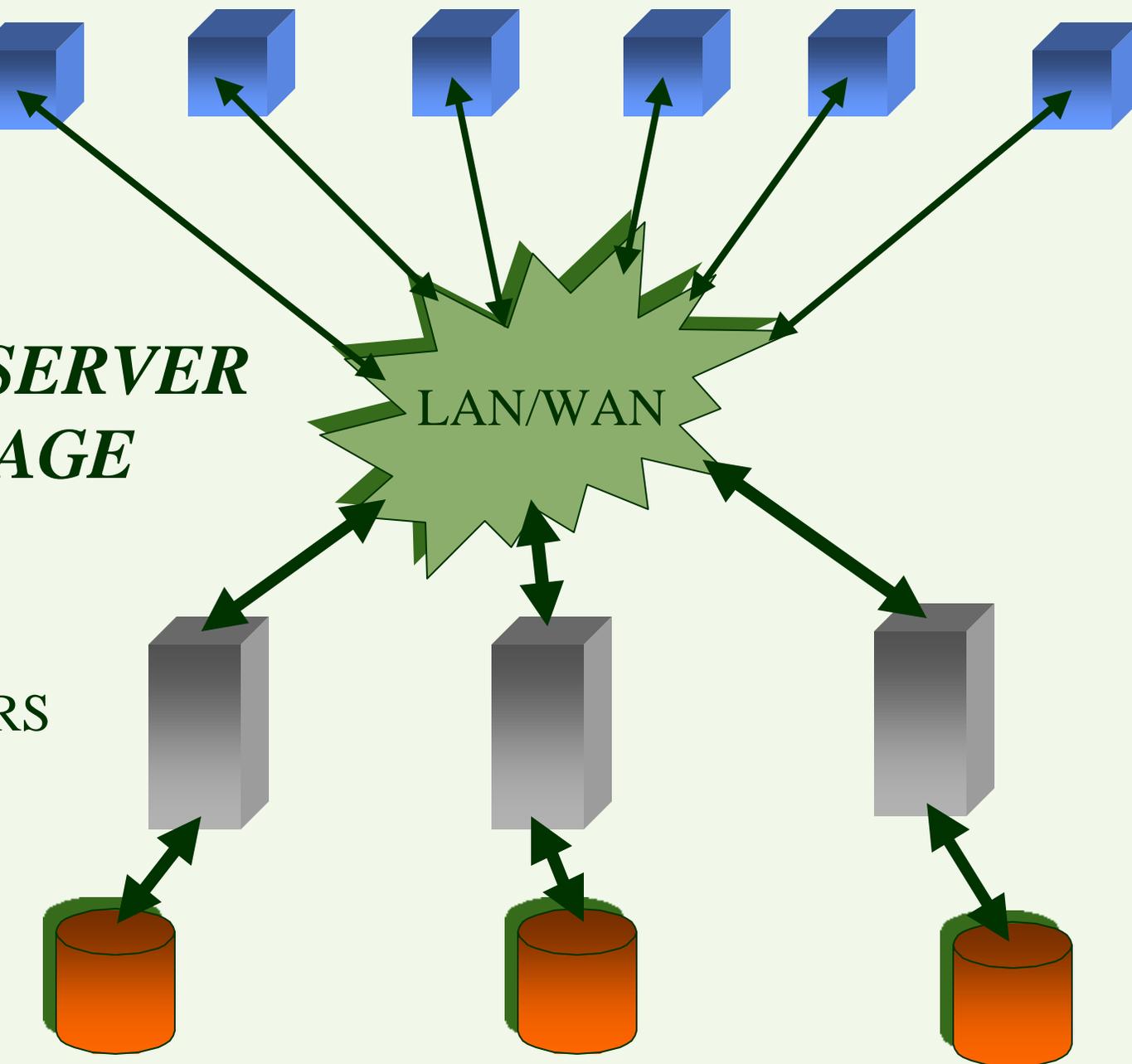
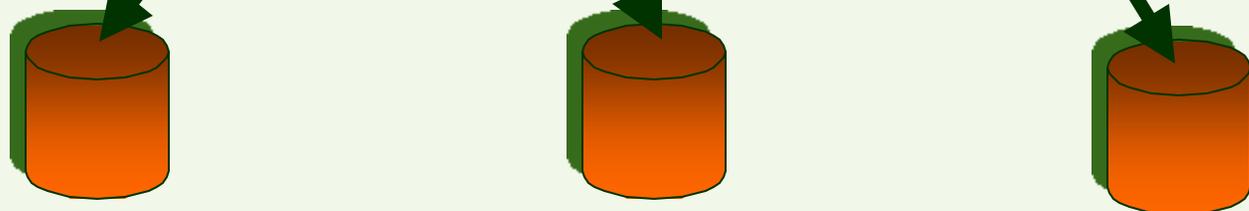
*CLIENT-SERVER  
STORAGE*



SERVERS



STORAGE



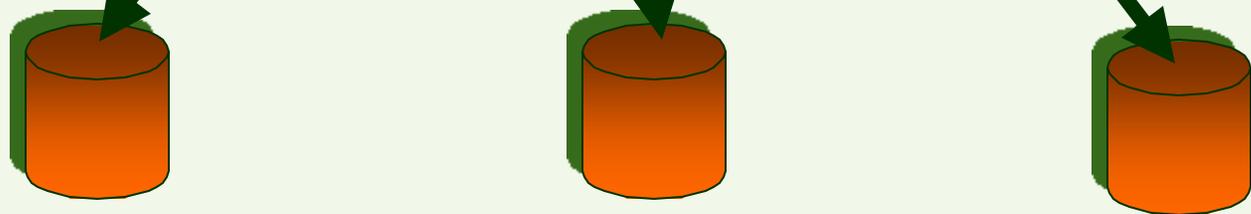
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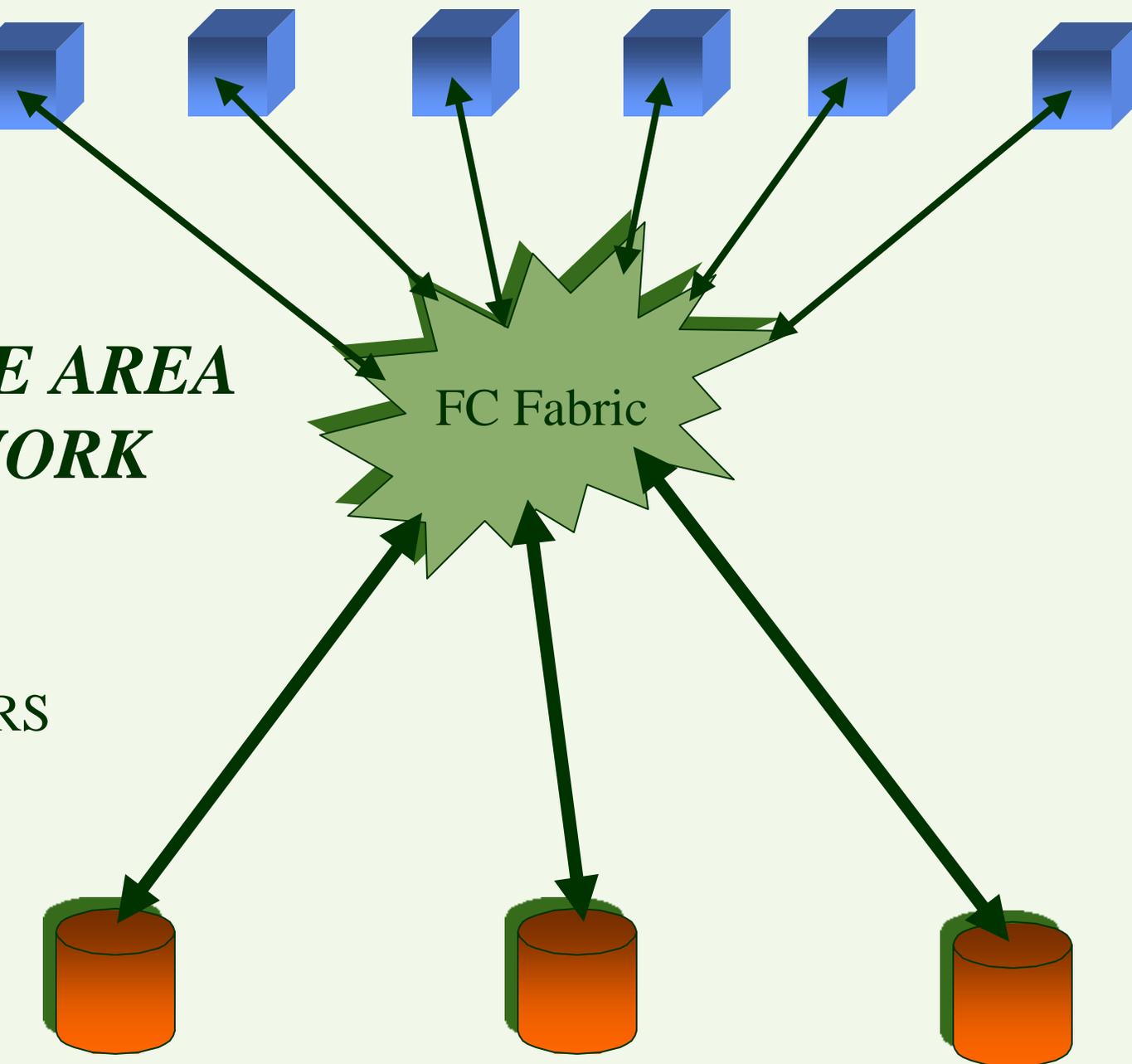
*STORAGE AREA NETWORK*



SERVERS



STORAGE



# SAN Benefits

- Allows any-to-any interconnection of servers and storage systems.
- Facilitates universal access and sharing of resources.
- Reduces bottlenecks.
- Simplifies and centralizes resource management.
- Improves information protection and disaster tolerance.
- Supports unpredictable, explosive information technology growth.



# SAN Shortcomings

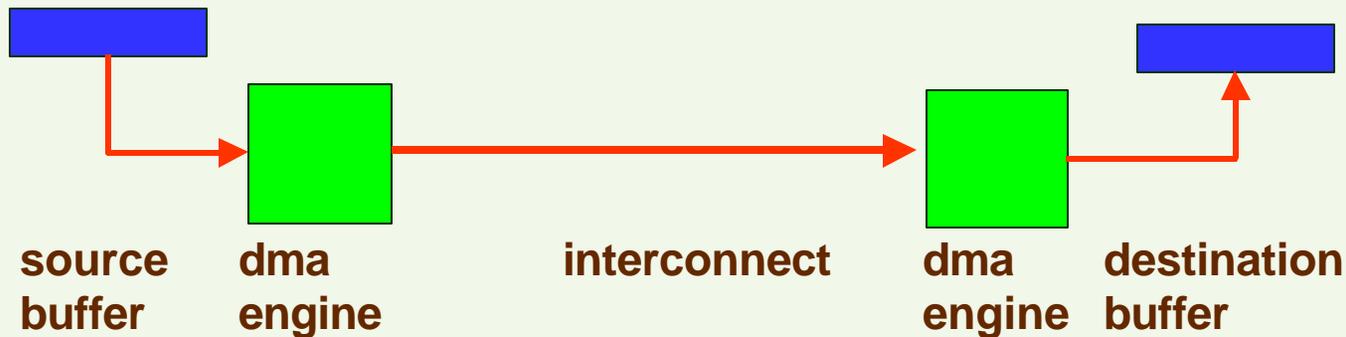
- Fibre Channel LAN support only -- i.e. no GigE or ATM
- Poor inter-system communication (TCP/IP)
- Requires distributed file system
- Limited bandwidth
- Expensive scaling

## *Solution:* **Scheduled Transfer Protocol**

- Can be thought of as an extension of Direct Memory Access (DMA) to the network
- Transaction based protocol for high bandwidth, low latency system area networking
- Rich set of operations supported
- Well defined API set and network mappings
- Can carry SCSI



# Scheduled Transfer



- **Schedule** the source and destination buffers
- Enable the DMA engines for concurrent execution
- **Transfer** the data from source to destination without further host intervention
- Data movement is equivalent to “Network DMA”

# GENROCO has learned how to:

- Map any network protocol to and from GSN backbone
  - Gigabit Ethernet
  - HIPPI
  - Fibre Channel
  - OC48 (in development)
- Run ST over any network
- Encapsulate SCSI over ST
- Route ST with IP headers



# ST Storage Results

- SGI O2000 with **ST accelerated XIO GSN HBA**
- GENROCO GSN Bridge with 8 FC blades
- 8 RAID boxes
- Compaq Alpha 4100 with **standard PCI GigE HBA**
- GENROCO GSN Bridge with one each FC & GigE blades
- single RAID box

**728 MB/s**

15% CPU

**47 MB/s**

100% CPU

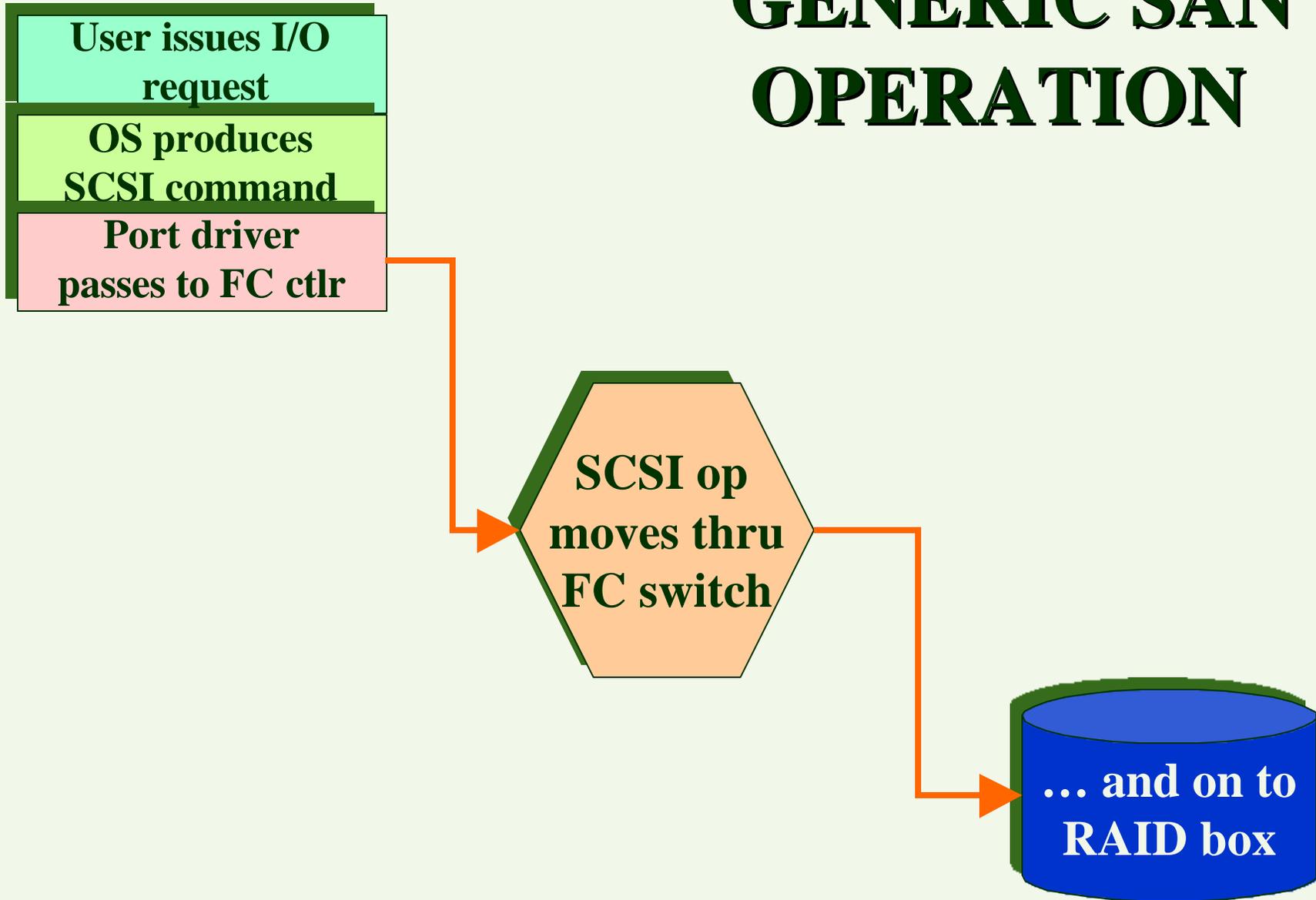


# GENROCO ST Product Development

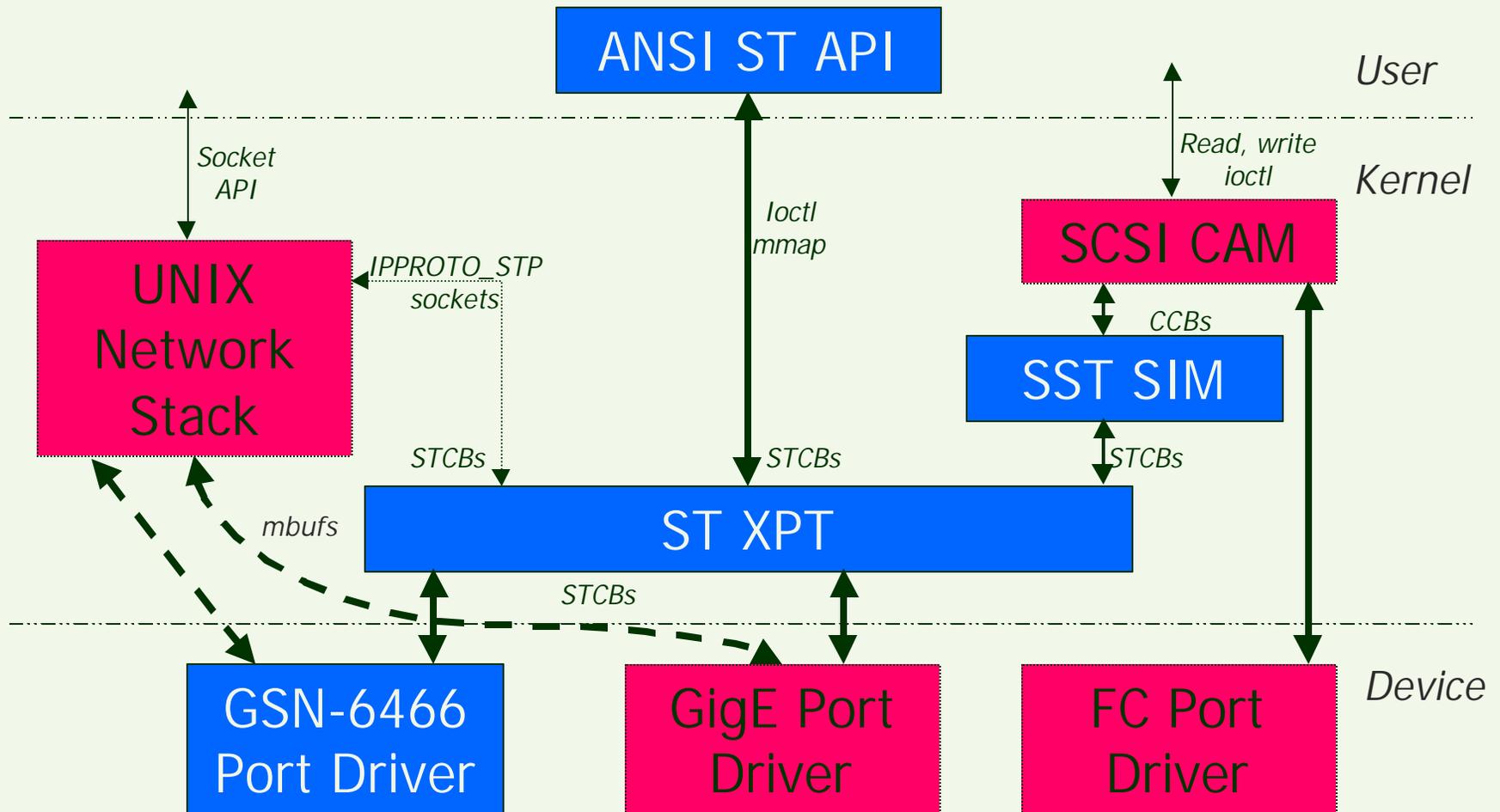
- Began ST development in 1998
- Showed FC-GSN using SCSI over ST at SC'98
- Developing ST layers for
  - Compaq Tru64 UNIX (shipping)
  - Sun Solaris (Q1 2000)
  - IBM AIX (Q2)
  - Linux (Q3)
  - Windows NT/2000 (Q4)



# GENERIC SAN OPERATION



# ST Software Layering



# GENROCO ST SAN OPERATION

User issues I/O request

OS produces SCSI command

Command is ST encapsulated

Port driver passes to GigE ctrl

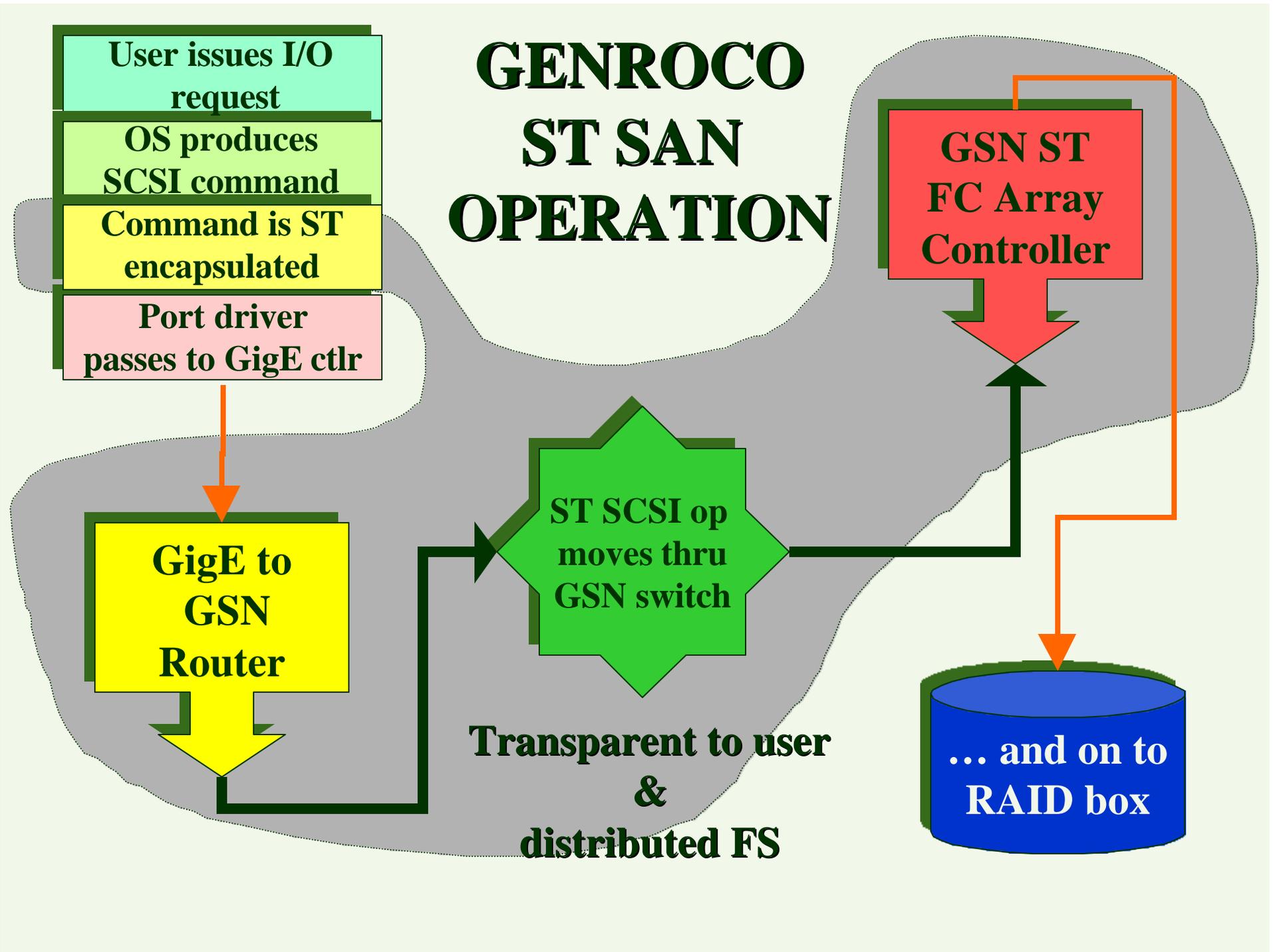
GigE to GSN Router

ST SCSI op moves thru GSN switch

GSN ST FC Array Controller

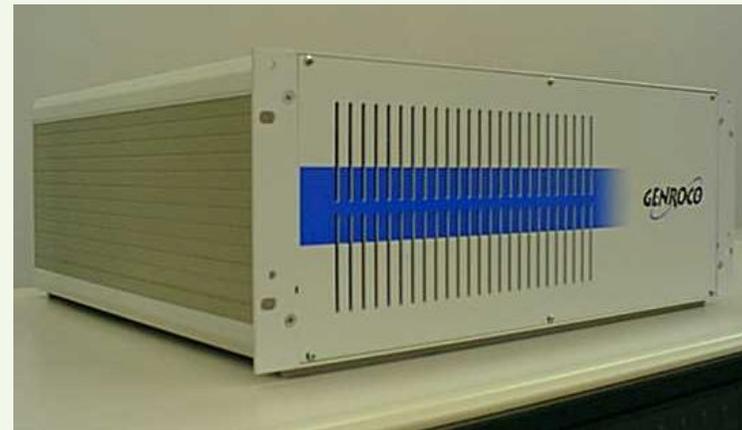
Transparent to user  
&  
distributed FS

... and on to RAID box



# *TURBO*fibres<sup>®</sup> GSN-Gigabit Network Gateway/Router

- First shown Apr '99
- Supports up to 4 pairs of blades:
  - **Fibre Channel**
  - **serial HIPPI-800**
  - **Gigabit Ethernet**
  - **OC48 ATM (July )**
- TCP/IP & ST protocol
- Shipping now



# *DataPropulsion*<sup>®</sup> GSN Backbone Crossbar Switch



- Up to 8 GSN or bridge ports
- **Non-blocking**
- **48 bit ULA**
- **Broadcast capable**
- **Automated path selection configuration**
- First demo October '99
- Shipping now



# *TURBOstor*<sup>®</sup> SST Storage Array

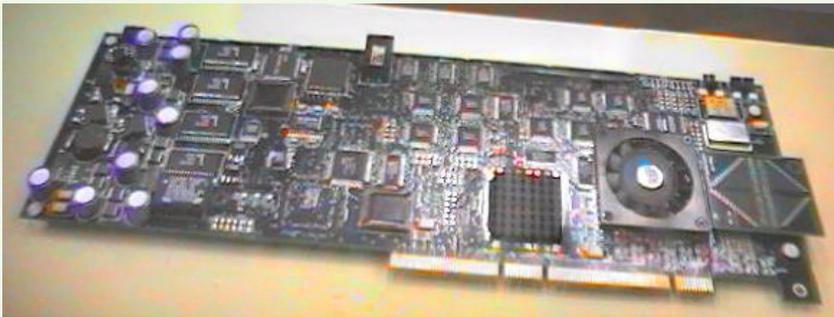
- Controller first shown Nov '98
- Controls up to 8 Fibre Channel JBOD loops or RAID boxes
- Over 2 Terabytes with 36GB drives
- SCSI over ST implemented in hardware
- **Can sustain up to 740 MB/s**
- Shipping Q1 2000



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# GSN-6466

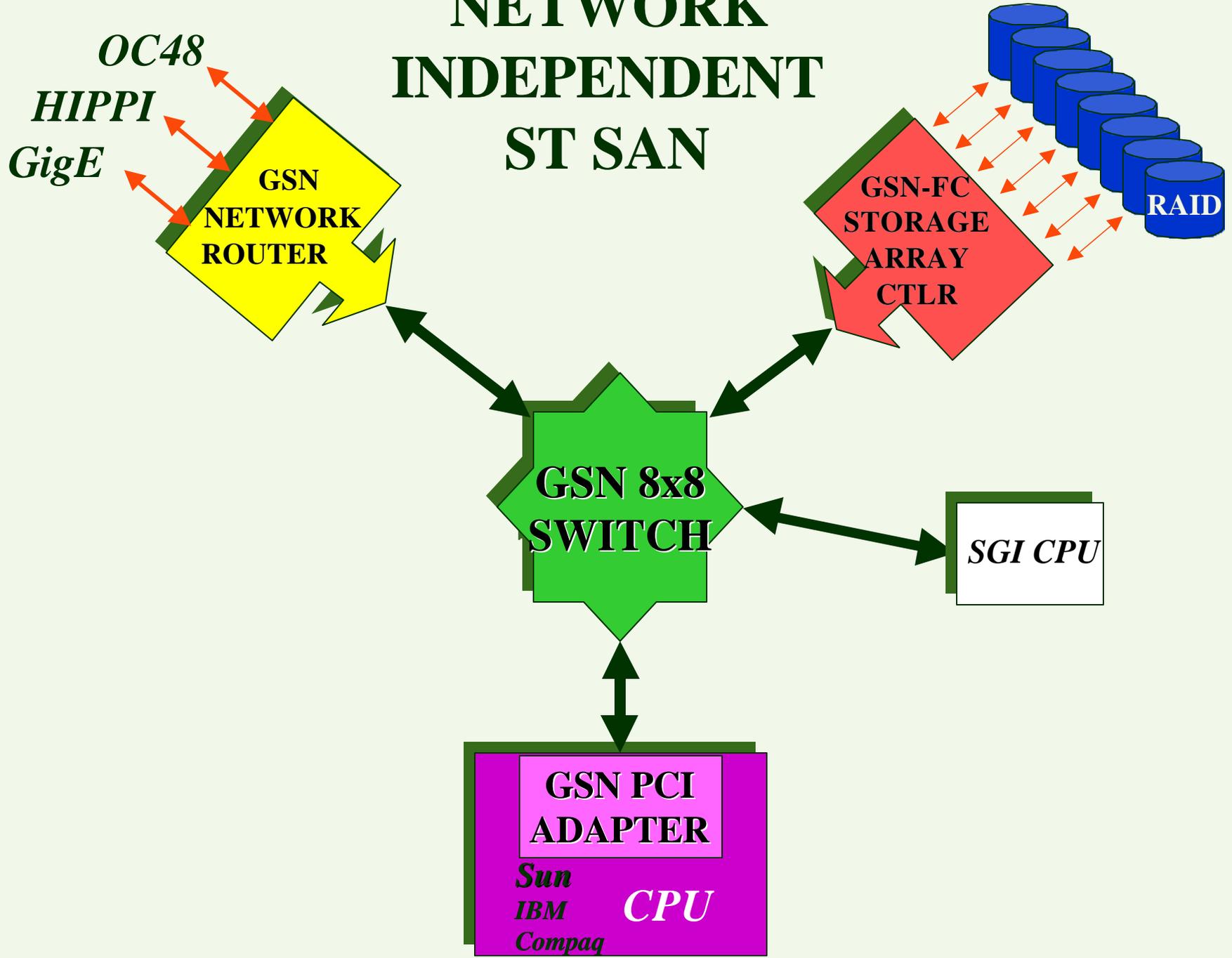
## 64 bit 66 MHz PCI GSN Adapter



- First prototype shown Oct '98
- Pre-production units Q2 2000
  - **Hardware ST acceleration**
  - **Paroli optical interface**
- 2 PCI model Q3 2000
- ST software for Compaq, IBM, Sun, Linux & NT

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# NETWORK INDEPENDENT ST SAN

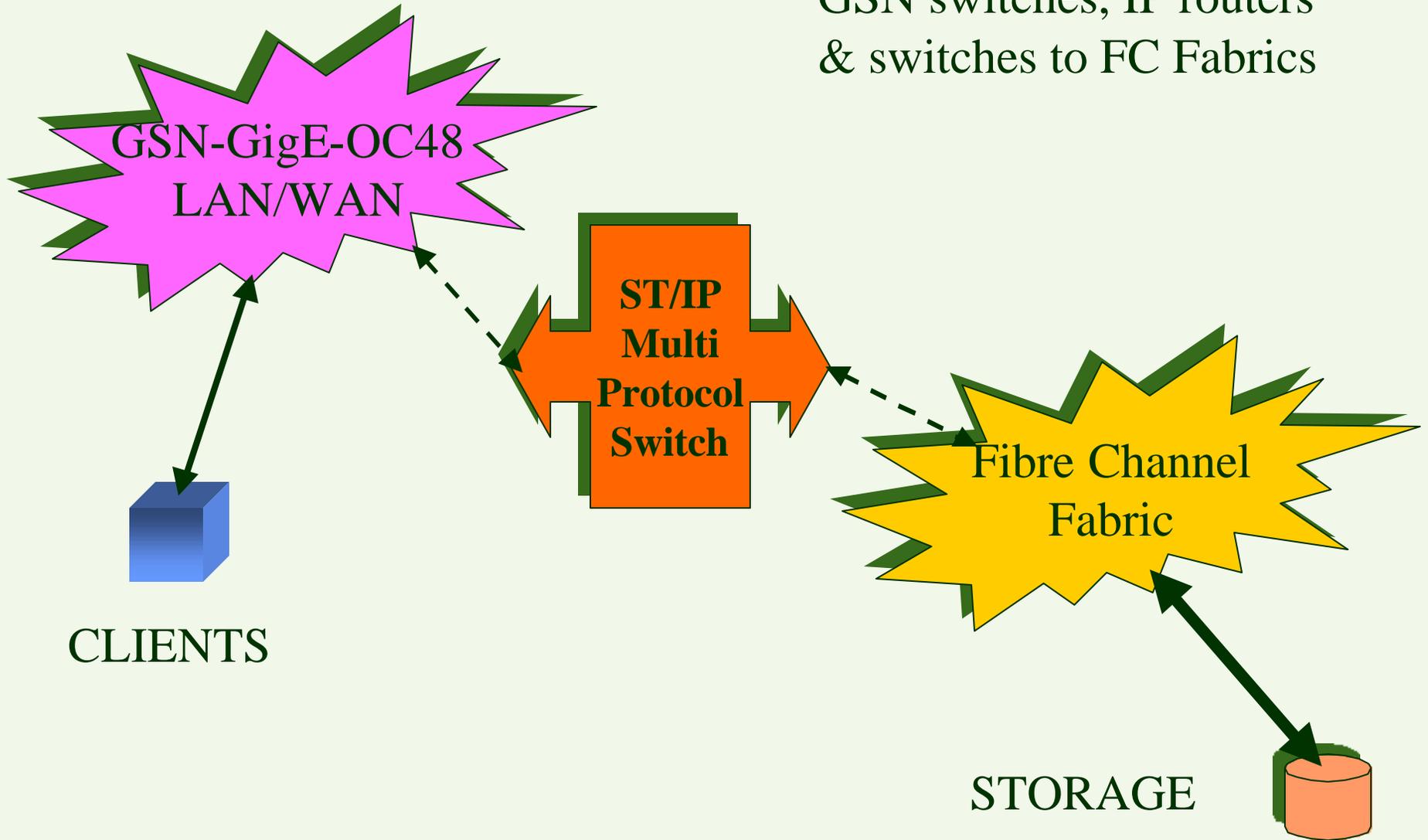


# Future Products

- Stand-alone GigE - FC TCP/ST/IP Bridge (Aug)
- Dual PCI GSN HBA (Sep)
  - PCI-X (2001)
- PCI ST Accelerated GigE HBA
- Bridge Port Card for Switch (Nov)
  - Fibre Channel
  - Gigabit Ethernet
  - OC48
  - HIPPI
  - Infiniband (2002)

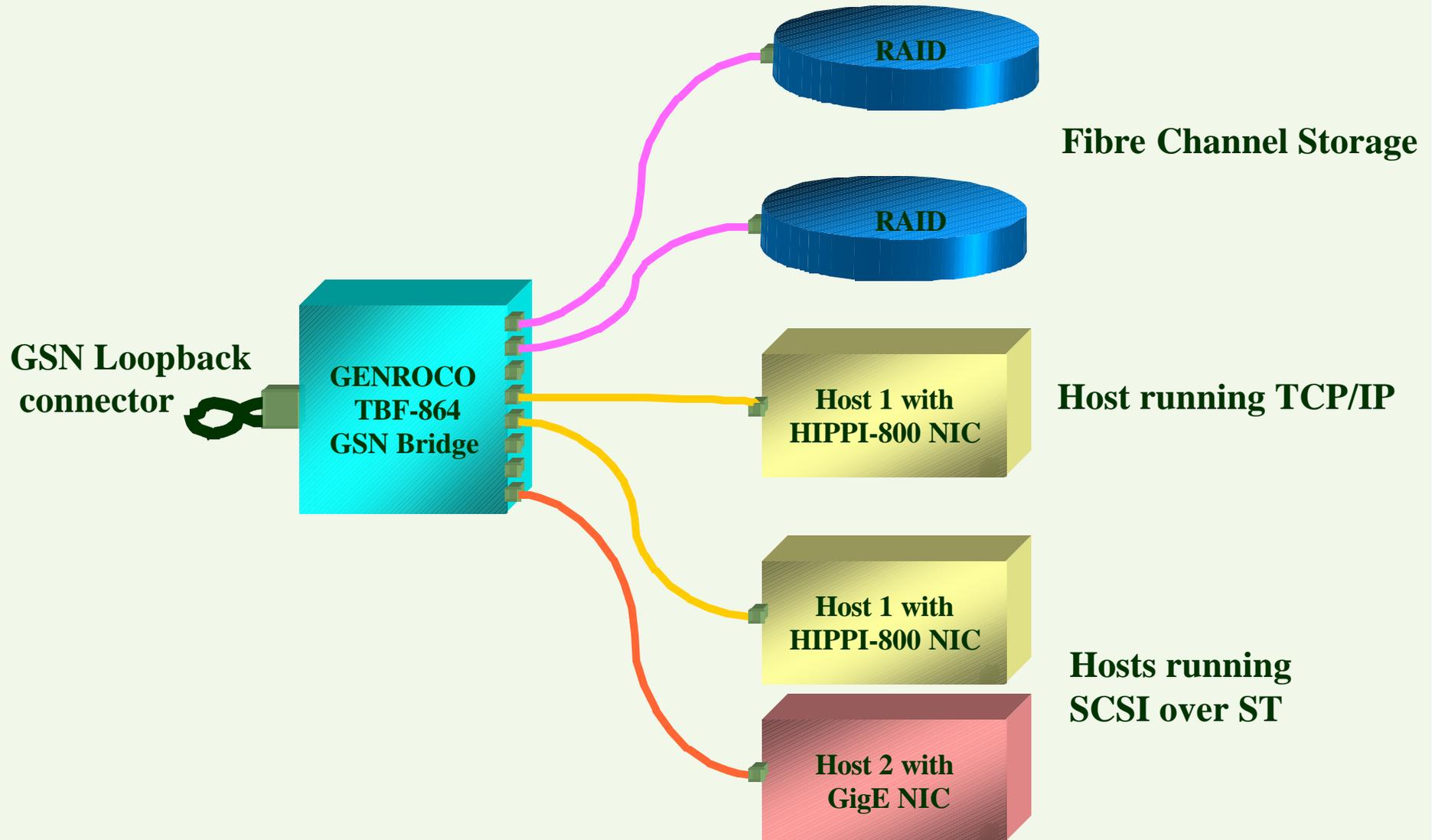


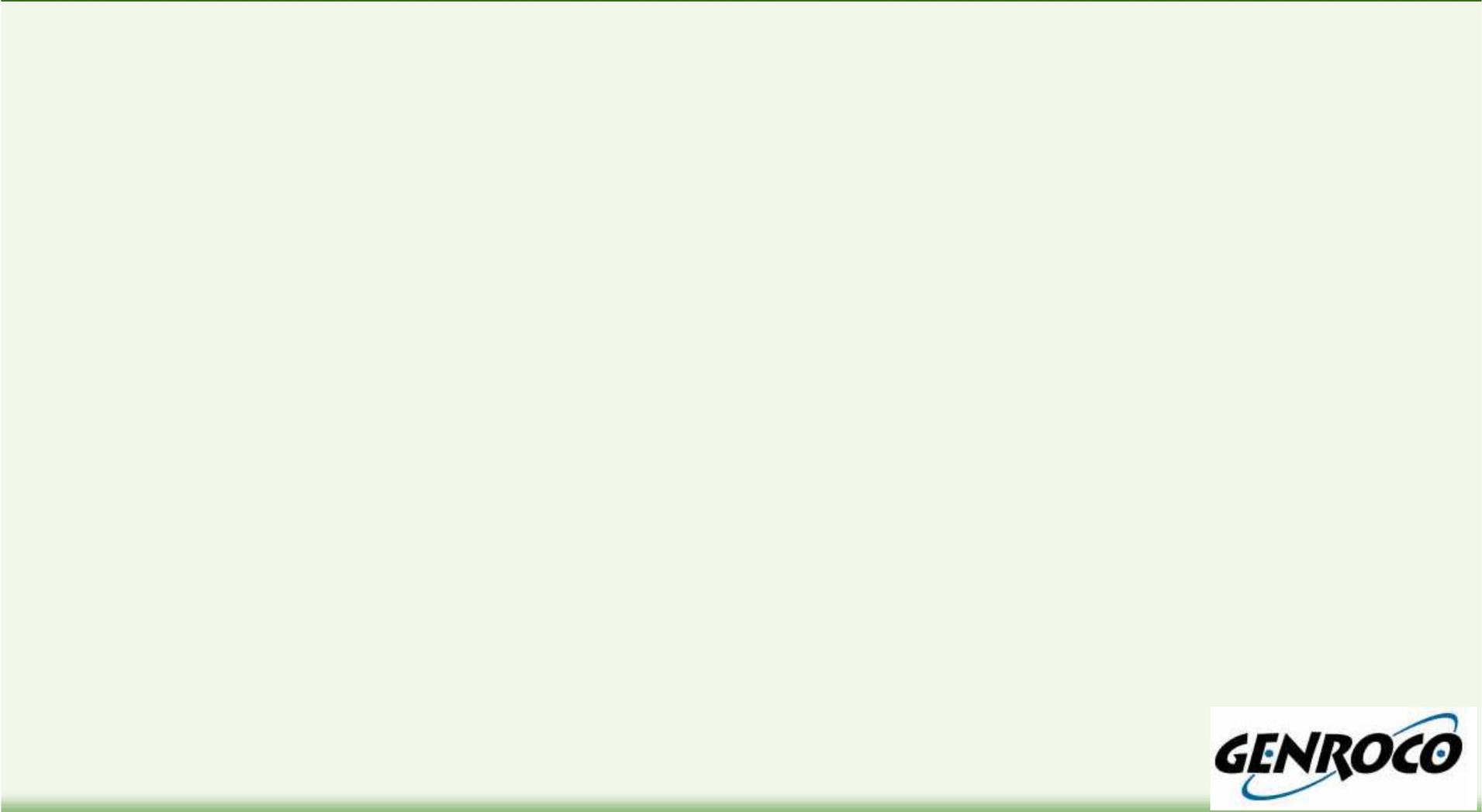
During 2000: Connect  
GSN switches, IP routers  
& switches to FC Fabrics





# SCSI over ST Demonstration





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