StorageTek

OE/Fibers '90

Fiber Channel
The Next Standard Peripheral Interface And More...

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Introduction

- New industry standard being formulated by ANSI X3T9.3

- Wide industry participation - IBM (Rochester MN; Austin TX; Kingston, Poughkeepsie, Endicott and Yorktown Heights, NY), Amdahl, DEC, Sun Micro, Livermore and Los Alamos National Labs, etc.

Problems With Existing Channels

- Too large footprint - for small systems and peripherals

- Too short distances - for true distributed systems

- Too limited connectivity due to multidrop

- Too slow - large number required for high bandwidth

Fiber Channel Requirements

- Small footprint (for ruggedness means serial)

- 2 to 10 kilometer operating distance

- Up to 100 megabytes/s payload

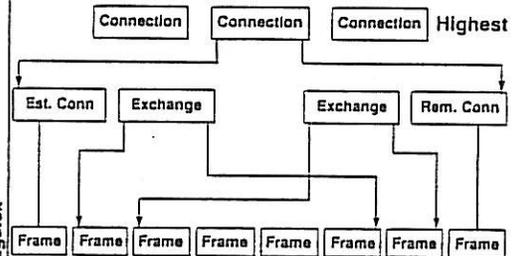- Support for interconnection fabric

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Fiber Channel Requirements (Cont.)

- New low-level protocol for efficiency over distance (not extender)

- Multiple cost/performance levels

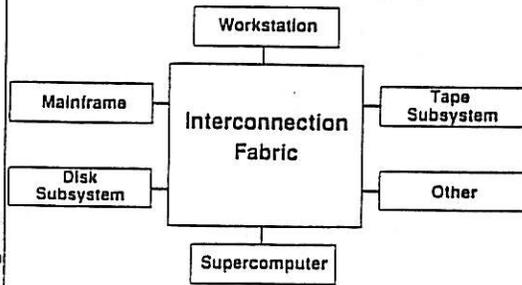- Carry existing interface command sets with few modifications (SCSI, IPI, etc.)

Fiber Channel Hierarchy

Fiber Channel Architecture

— is Fiber Channel

Fiber Channel Structure

FC-4	IPI-3	SCSI	HIPPI	Block Mux	Other
FC-3	Common Services				
FC-2	Framing Protocol				
FC-1	8B/10B Encode/Decode				
FC-0	Low-End	Mid-Range	High-End		
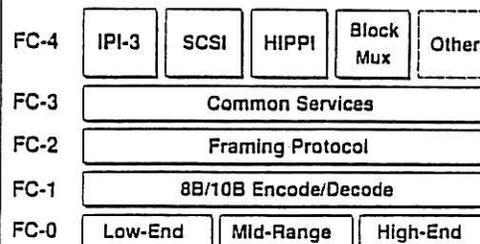
Fiber Channel Frame Structure

		54 - 2112			
4	16		4	4	Bytes
Idle	Start of Frame	Frame Header	Data Field	CRC	End of Frame	Idle

4	4	2	2	1	1	2	Bytes
Dest_Addr	Source_Addr	Type	CTL	Cmd	X_ID	Seq_Cnt	

Fiber Channel Physical Media

Range	Transmitter	Media	Performance		Distance
			mbaud	mbytes	km
Low-End	Red Led	Plastic	53	5	0.1
Mid-Range	Longwave Laser	Single Mode Fiber	265.65	25	2
	Longwave Led	Multimode Fiber			10
	Shortwave Laser	Multimode Fiber			2
					1
High-End	Longwave Laser	Single Mode Fiber	1052.5	100	2
					10
Intra-Cab	TTL/ECL	Coax	All	All	0.05

Fiber Channel Compared to FDDI

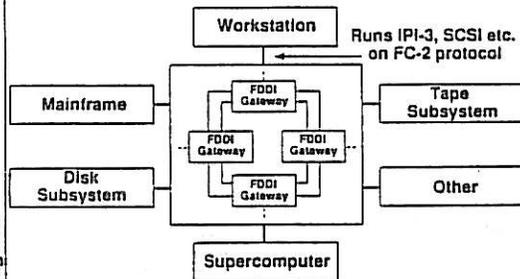| FIBER CHANNEL	FDDI
No topology considerations	Topology dependent
Premise of self-managing fabric	Station/Configuration mgmt. protocols
Frame size insensitive	Frame size sensitive
Hardware disassembly/reassembly	Protocol disassembly/reassembly
Speed relates to existing I/fs	Speed relates to PSNs

Fiber Channel Compared To FDDI (Cont.)

- Fiber Channel and FDDI <u>cannot</u> be one standard/implementation:
  - Different applications require different philosophies
  - Protocols have very different philosophies
- To Fiber Channel, FDDI is a fabric or a part of a fabric
- To FDDI, Fiber Channel is an interface inside a connected equipment

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FDDI "Hidden" Within Fabric

Runs IPI-3, SCSI etc. on FC-2 protocol

— is Fiber Channel

FC As "Host-Interface" To FDDI Node

Runs OSI protocol in FC-2 frames

— is Fiber Channel
--- is FDDI

Fiber Channel/FDDI Commonality

- Possible useful commonalities:
  - Transceivers (requires same baud rates to be defined)
  - Encode/decode hardware

Potential Fiber Channel Market

- Multi-million SCSI peripherals in 1990
- SCSI to be $7 billion market in 1992
- IPI growing to 1 million units/year by 1993
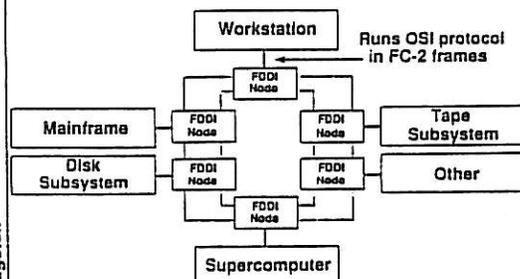- High-performance units at beginning of growth

Summary

- Fiber Channel could become "universal pipe" - mixing channel, comms traffic, etc. on single interface
  - All "computer outputs" at common speed
- Mix n' Match requests:
  - Channel requests for i/o
  - LAN requests for service
- Support functions in h/w for channel traffic which typically in s/w for comms i/fs
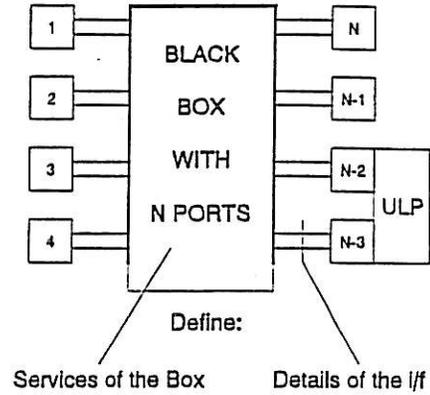- Connect to PSNs via bridges/gateways

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LOW-COST

DISTRIBUTED

FABRIC

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December 4, 1990

FABRIC DEFINITION

Define:

Services of the Box   Details of the I/f

## FABRIC SERVICES

- Three classes of connection:

  - Class 1   Dedicated Connection and Ports
    Guaranteed delivery
    Frames received in transmitted order

  - Class 2   Frame Switched
    Buffer-to-Buffer flow control
    Guaranteed delivery
    Receipt order not guaranteed

  - Class 3   Datagrams
    Delivery and receipt order not guaranteed

- Mechanisms for defining frame sizes, legal number of outstanding frames (credit) etc.

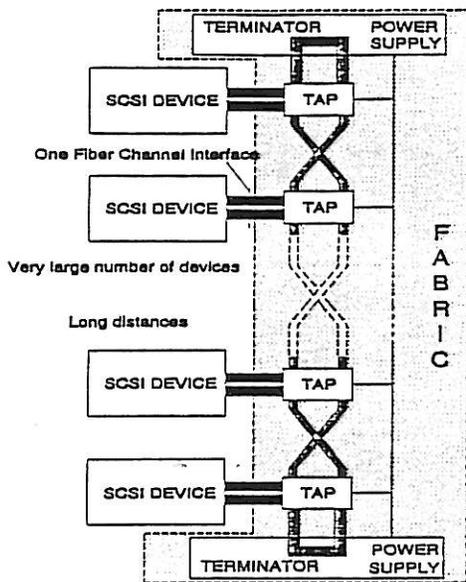- No definition of topology or implementation

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TODAY'S SCSI ARCHITECTURE

Up to 8 Devices Max.   6 meters length s/e
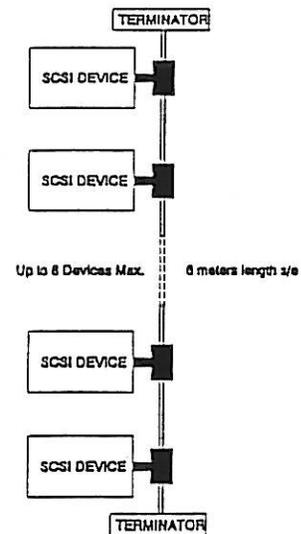
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LOW-COST DISTRIBUTED FIBER CHANNEL FABRIC

One Fiber Channel Interface

Very large number of devices

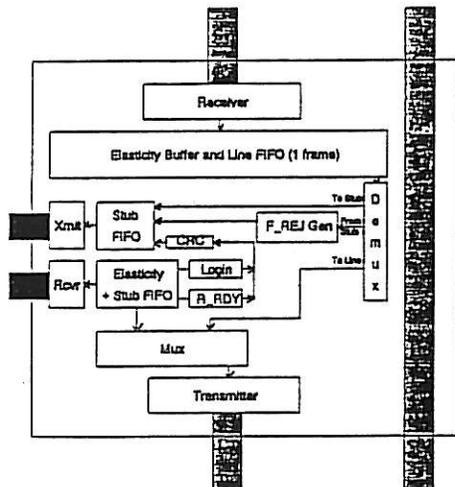Long distances

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WHAT'S IN A TAP?

NOT VERY MUCH!!

- A minimum of three 2148 byte FIFOs

- Two transceivers and sets of serial-parallel and parallel-serial conversion

- Some multiplexing and frame handling logic

- All logic should fit in medium-sized gate array

- Expect Tap to be packaged like an Ethernet transceiver

TAP DETAILS

CHARACTERISTICS AND ADVANTAGES

Fully functional Fiber Channel fabric:

- Supports Class 1, 2, 3 (Class 1 delimiters "freeze" Mux and Demux)

- Supports flow control mechanisms

- Fabric credit count of 1

- "To Stub" FIFO sized by Port Credit Count.

- Supports Login

- Only "Stub Interface" defined by Fiber Channel

- Stub and Line interface speeds may be different

Advantages:

- Allows SCSI devices to be removed or powered-off without halting channel traffic.

- High reliability due to simplicity of Tap and dual power-sources

- Removes limiting restrictions on:

  - Number of connected devices
  - Total operating distance of channel

- Line interface not defined - opportunity for multiple cost/performance levels and added value

- Painless migration to higher performance systems

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