



Serial DS-Link Technology For Disk Interconnect and Routing

X3T9.2 SCSI Committee

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Presented By

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SCB1 04/792



Who is SGS-THOMSON ?

- **Fifteenth-largest semiconductor manufacturer.
Second-largest in Europe.**
- **Number 1 world-wide smart power supplier.**
- **Number 3 world-wide EPROM supplier.**
- **Over 17,000 employees.
17 production locations.**

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SGS-THOMSON Experience with Disk Drive Silicon

- **Servo/Actuator control.**
 Combo chip that does both functions.
 Family of lower integration chips also available.
- **Read/Write channel chips.**
- **Embedded control microprocessors/microcontrollers.**
 ST8, ST9 & ST10 Microcontrollers (1 - 30 MIPS).
 ST18 DSP Microcontroller (10 MOPS).
 Transputer microprocessors with serial comms.

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SGS-THOMSON Experience with Serial Interfaces

- **20 Mb/S Link developed for T414 transputer in 1984.**
 Links provide interprocessor communication path.
- **Installed base of 1 million transputers worldwide.**
- **Links used in Mission-critical applications.**
 Tomahawk cruise missile.
 CERN Nuclear Lab data logging.
- **Links supported by family of crossbar and parallel adaptors.**
- **Experience put to work in the new DS-Link for the T9000 transputer.**

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DS-Link Overview

- Full-Duplex 200 Mb/S Point-to-Point Serial I/O Channel.
18.6 MB/ S unidirectional payload bandwidth.
32.8 MB/ S bidirectional payload bandwidth
- Multiple "Virtual Channels" can be multiplexed on single link.
- "Interval Routing" header allows:
32 x 32 dynamic crossbar switch for radial architectures.
Through-router in two-port interface for daisy-chain.
- Minimal Buffering requirements due to low-level flow control

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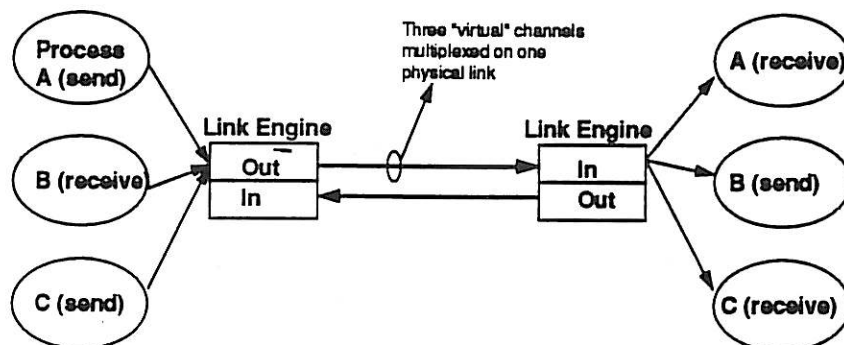


Virtual Channels

- Multiple channels can share a single physical link by interleaving packets from each active channel.
- Longer messages are split up into a sequence of 32 byte packets.
- A 1 or 2 byte header is prepended to each packet so the message can be reconstructed properly on the receiving end.
- Header values are statically defined for a given system.

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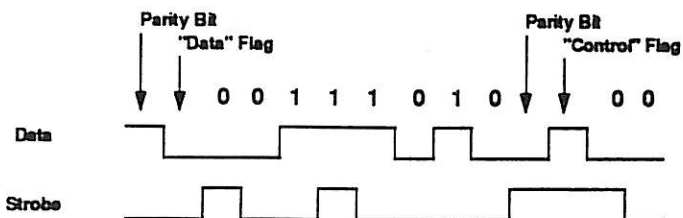
Virtual Channels Across Physical Links



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Bit Level Protocol

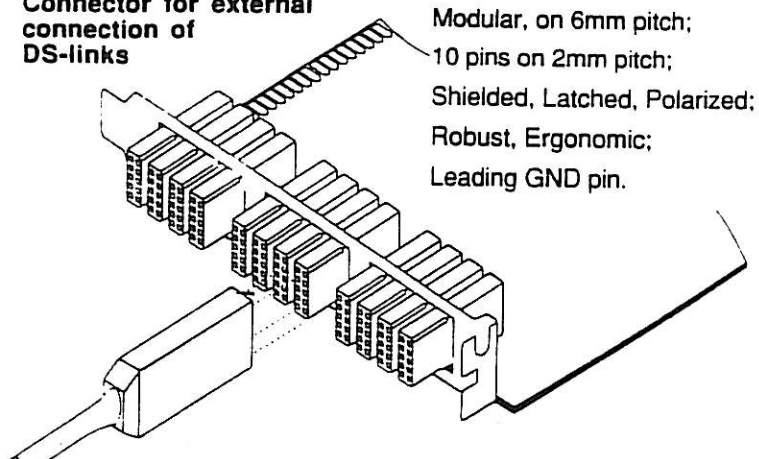
- Two signals in each direction, Data and Strobe. (DS-Link)
Strobe changes whenever Data does not.
- Receive clock is XOR of Data and Strobe.
Clock is 1/2 baud rate, giving full bit time for skew tolerance.
Receiving is Autobaud, no PLL needed.



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**Connector for external
connection of
DS-links**



Modular, on 6mm pitch;
10 pins on 2mm pitch;
Shielded, Latched, Polarized;
Robust, Ergonomic;
Leading GND pin.

Connectors being developed by AMP, Fujitsu, Harting and McMurdo,
with informal cooperation and original requirement spec. from INMOS.

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Routing Capabilities of SCSI DS-Links

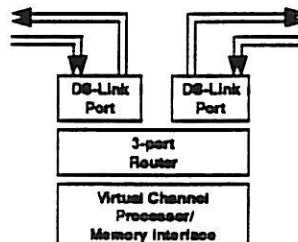
- Virtual channels cleanly separate communication between logical units of device.
- Can support both daisy-chain and radial topologies.
- Scalable number of drives or controllers without modifying architecture.
- Allows flexible system that can dynamically reconfigure upon failure or system upgrade.
- DS-Links could form routing core for other serial and parallel interfaces.

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Two-Port Through Routing Node

- Two link ports for redundancy or daisy-chain.
- Through router will pass packets from either direction not matching defined routing interval.
- Virtual Channel Processor will reconstruct packets into message stored in local memory.



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C104 Dynamic Crossbar Switch

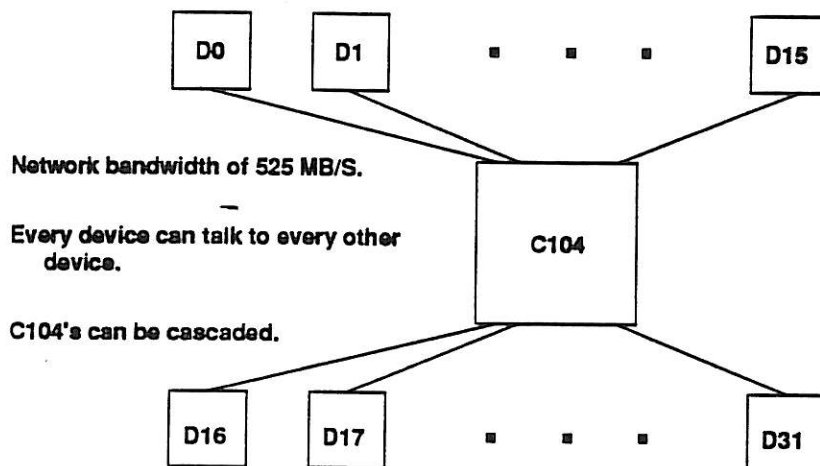
- 32 input links, 32 output links connected via full crossbar.
- Interval routing used to determine output link.
- 32 simultaneous packets possible.
Any number of active messages possible.
- Separate control link sets up intervals and other parameters.
- Wormhole routing avoids store and forward delays, large buffers.

Routing latency < 0.5 μ S.

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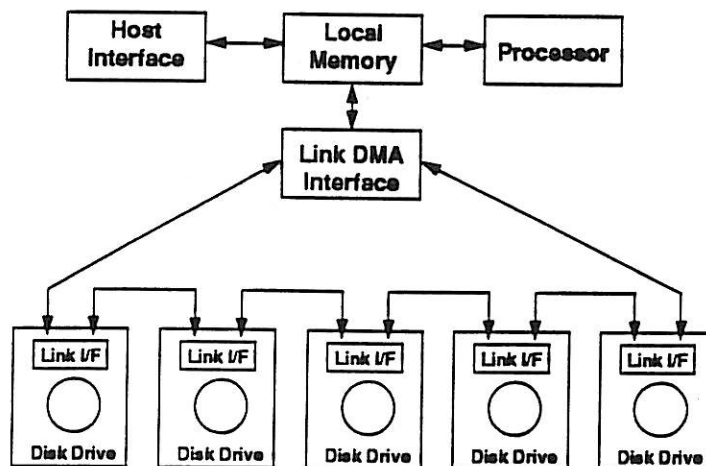
C104 Permits High Capacity, Fully Connected Networks



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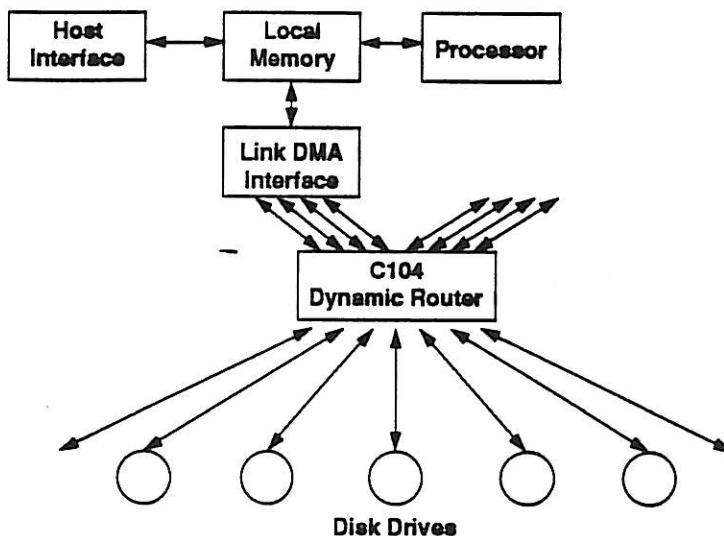
Low End Loop Disk Array



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Mid Range Crossbar Disk Array



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DS-Link Macrocell Implementations

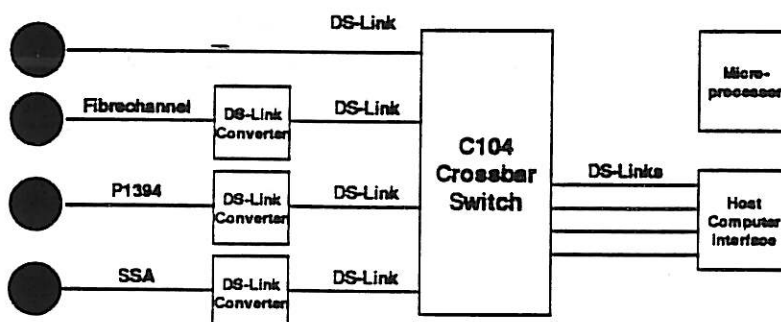
- Basic token-level DS-Link VHDL description available today.
Also available as macrocell.
- Several T9000 support chips being implemented in
SGS-THOMSON's ISB24000 channelless gate array.
- Possible Variants:
 - 16 x 16 crossbar.
 - Fixed 8 channel, 2 port, VCP and parallel memory I/F.
- Custom variants or design licenses encouraged.

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DS-Link as Routing Core for Serial SCSI

- Strengths are routing capabilities, low latency per message, and low port cost.
- Converter chips can be developed to connect to alternate physical layers, GPP will run across all.



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Licensing Strategy

- DS-Links are covered under US and British patents.
- SGS-THOMSON is currently entering into licensing agreements.

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Conclusions

- SGS-THOMSON has 10 years experience with serial interfaces.
- DS-Links can complement emerging serial standards.
Especially well suited for routing cores in serial I/O subsystems.
- SGS-THOMSON willing to produce silicon to support serial SCSI-3 and other serial standards.

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An Invitation

The INMOS Division of SGS-THOMSON

Invites you to see a demonstration
Of the New

200 Mbit/S Serial DS-Link Technology For Disk Interconnect and Routing

Monday, April 27, 9:00 PM - 10:00 PM, Royal Tern Room.
Tuesday, April 28, 12:00 PM - 1:30 PM, Message Center 2.
Wednesday, April 29, 12:00 PM - 1:30 PM, Message Center 2.
Other times by appointment.

Refreshments will be provided.

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