

Seminar im Grundstudium: Datenbanken Storage Interfaces: SATA, SCSI, etc.

Serial ATA a.k.a. SATA: History

- successor to IDE
- SATA 1.0a was specified on the January 7th 2003 by Maxtor, Seagate, Dell, Intel and APT Tech.
- SATA II = SATA 1.0a- Revision 1.2, 27th August 2004, APT Tech. replaced by Vitesse Semiconductors as new participant

SATA: Features

- Serial Interface (IDE = Parallel)
- 4 Pin Data Connector
- Cables more flexible and thinner than PATA (IDE)
- Low Voltage
- Only one drive per cable, but supports Hotswapping and Native Command Queueing (SATA II)
- Centers around inside-storage

SATA: Performance

- SATA I : 150 MB/s, SATA II: 300 MB/s and NCQ

SATA: Applications

- Personal Computers, being easy to assemble, and relative low interface cost
- Used by most PC-mainboard manufacturers
- Entry Level Servers, because it has low cost per GB and good cost efficiency vs. speed

Small Computer System Interface a.k.a. SCSI: History

- SCSI began as SASI (Shugart Associates System Interface), developed by Shugart Associates (1979) and given to ANSI in 1981 who published SCSI (1) in 1986
- SCSI 2 was developed since 1985 and first published in 1990, recalled and in 1994 republished
- SCSI 3 since 1993 being developed- split into several part, otherwise being too huge to remain searchable- in 1996 the first parts have been SCSI 3 ratified

SCSI: Features

- Parallel interface
- 50 Pin Data Connector (later upgraded to 68 Pins), that need termination
- Low Voltage
- 8 (SCSI 1) and later 16 (beginning with SCSI 2) Devices, of which has an unique ID
- Hotswapping, Command Queueing
- was developed as bus for everything from HDDs, Tape drives, CD-ROMs to scanners and other external devices

SCSI: Performance

- SCSI I: 1.5 MB/s asynchronous, 5 MB/s synchronous
- SCSI II: 10 MB/s synchronous- double the clock rate of SCSI I
- Could be improved into Wide SCSI- doubling the bandwidth by going from 8 bit bus width to 16 bits
- Ultra SCSI did the same by doubling the clock rate -> later combined into Ultra Wide SCSI with 40 MB/s
- Ultra2 SCSI doubled it yet again to 80 MB/s, but was very soon replaced by Ultra 3 a.k.a.. Ultra 160 SCSI
- Ultra 3 SCSI developed into Ultra 320 SCSI- which is the most commonly used standard today
- Most HDDs are only capable of 100 MB/s- more than that is only achieved by configuration as a RAID system.

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SCSI: Applications

- High performance servers (fast seek times (< 4 ms)) , for good Speed (320 MB/s) and high quality of the disk drives resulting in good reliability
- Large storage servers, because of large amount of drives on one channel (combined with RAID) and again excellent reliability (quality of drives + RAID 1/5)
- Length of cable 3 meters opposed to 1m (SATA) or even less (IDE) making it ideal for Server Farms, although expensive

Fibre Channel: History

- Developed since 1988 as a simplification of HIPPI (High Performance Parallel Interface) at the CERN
- Primary goals where longer distances and to simplify the connectors
- Later, new protocols like SCSI, IP, ATM where implemented as was improved speeds up to 2 and 5 Gbit/s

Fibre Channel: Features

- Serial Interface
- Fiber optic or twisted pair cables
- 127 devices configured as FC-AL many more configured as FC-SW
- Hotswapping, multi pathing with FC-SW
- FC-AL has the topology of an token-ring network, where in FC-SW every device has a World Wide Name- which consists of a 64 bit hexadecimal name

Fibre Channel: Performance

- 1GFC (1997) 125 MB/s, 2GFC (2001) 250 MB/s, 4GFC (2004) 500 MB/s
- all speeds per port

iSCSI

- ratified on February 11th, 2003
- Uses the SCSI protocol over TCP/IP, so any device with a network port can be used as a storage device and easy to build because existing infrastructure can be used
- High overhead because of TCP/IP + SCSI used for each packet

Planned developments

- SATA 3 will introduce new features and speeds up to 600 MB/s, but still compatibility with SATA 2 (perhaps even SATA 1) is maintained
- Ultra 640 SCSI with speeds up to 640 MB/s is already available today exclusively in IBM servers. No drives are specified yet as Ultra 640 SCSI, but rather it uses several Ultra 320 SCSI drives to reach its 640 MB/s
- Fibre Channel has released 10GFC (1250 MB/s) in 2004, but it needs completely new hardware. 40GFC and 100GFC are planned to be released in 2008 and 2011 with speeds up to 12500 MB/s.

Source	Name	# Geräte	Kabellänge	MB/s	Adern	Jahr
	SATA I	1	1,00	150	7	2003
• http://www.wikipedia.org	SATA II	1	1,00	300	7	2004
• http://www.serialata.org	SATA III	1	1,00	600	7	2007
• http://www.intel.com	SCSI I	8	6,00	5	50	1986
• http://www.uni-mainz.de/~neuffer/scsi/	SCSI II	16	3,00	20	50	1989
	SCSI 160	16	12,00	160	68	1999
	SCSI 320	16	12,00	320	68	2003
	SCSI 640	16	12,00	640	68	2004
	1GFC	127	500-=<5000	125	NA	1997
	2GFC	127	500-=<5000	250	NA	2001
	4GFC	127	500-=<5000	500	NA	2004
	10GFC	127	500-=<5000	1250	NA	2004
	40GFC	127	500-=<5000	5000	NA	2008
	100GFC	127	500-=<5000	12500	NA	2011