

Seminar im Grundstudium: Datenbanken

Storage Interfaces: SATA, SCSI, etc.



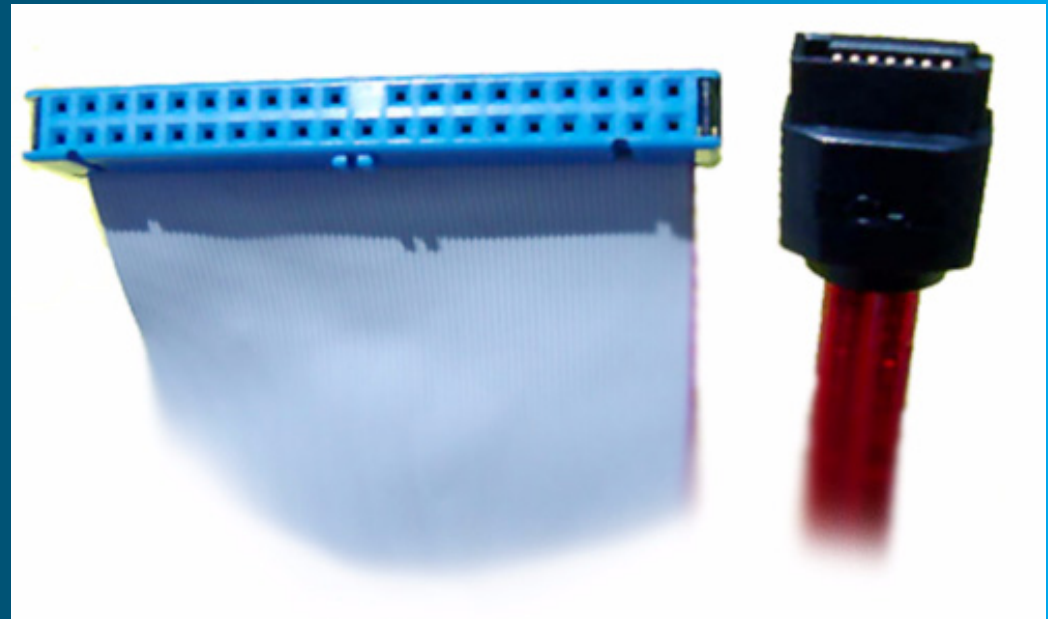
Goal of this presentation

- To give you a general overview of the interfaces used in professional and semiprofessional storage
- Explain the pros and cons of every interface- as well as the features that are specific for every interface



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. being replaced by Vitesse Semiconductors as new participant





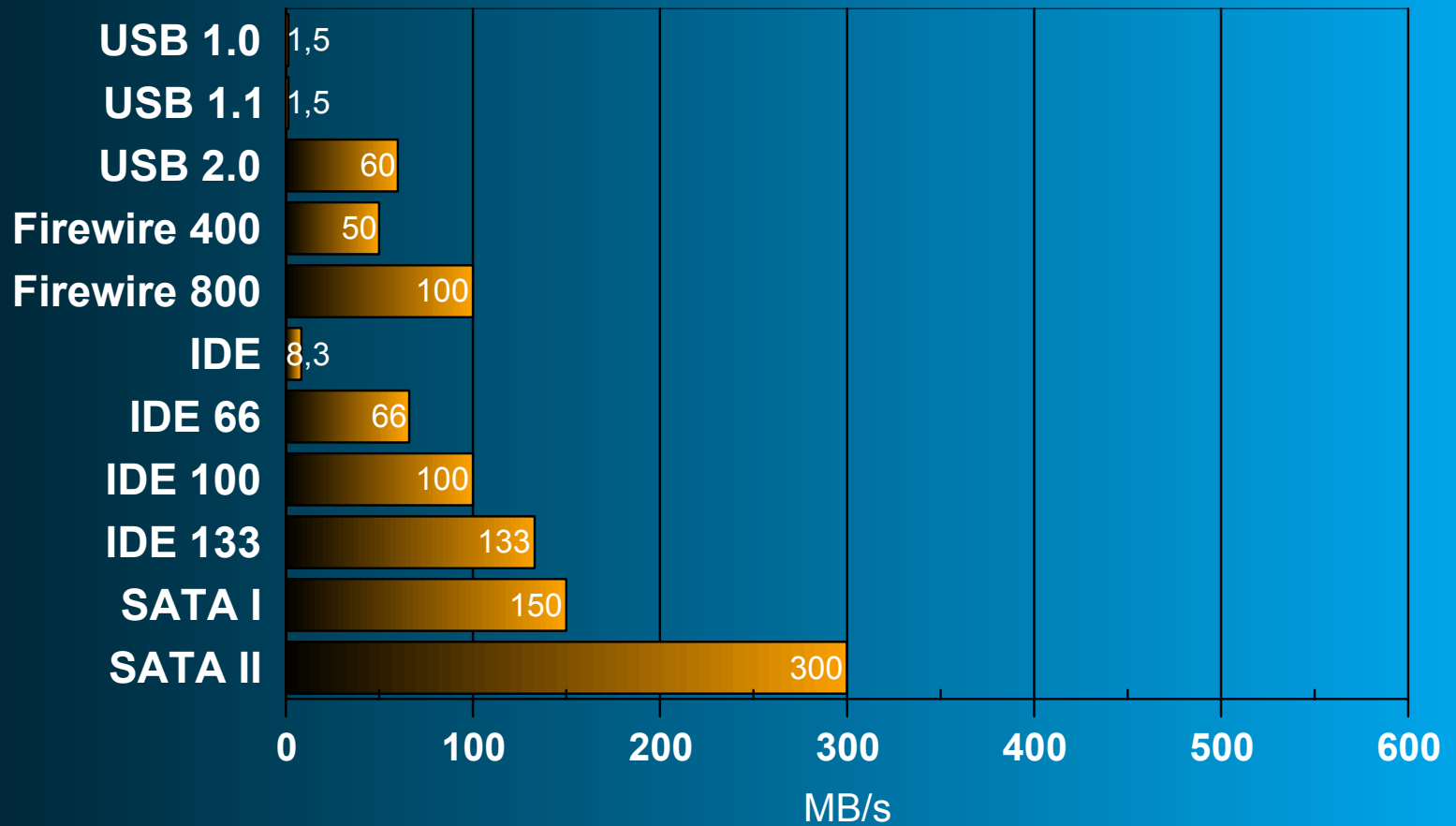
SATA: Features

- Serial Interface (IDE = Parallel)
- 4 Pin Data
- Cables more flexible and thinner than PATA
- Low Voltage
- Only one Drive per Cable
- Centers around inside-Storage
- Supports Hotswapping and Native Command Queueing (SATA II)



SATA: Performance

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





SATA: Applications

- Personal Computers
 - Easy assembly
 - Relative low interface cost
 - Used by most PC-mainboard manufacturers
- Entry Level Servers
 - Low Cost per GB
 - 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)
- SCSI was give to ANSI in 1981 who published SCSI (1) in 1986
- SCSI 2 was developed since 1985 and first published in 1990, called back 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)
- Low Voltage
- 8 (SCSI 1) and later 16 (beginning with SCSI 2) Devices
- Hotswapping, Command Queueing
- needs termination
- each device has a ID
- was developed as bus for everything from HDDs, Tape drives, CD-ROMs to scanners and other external devices



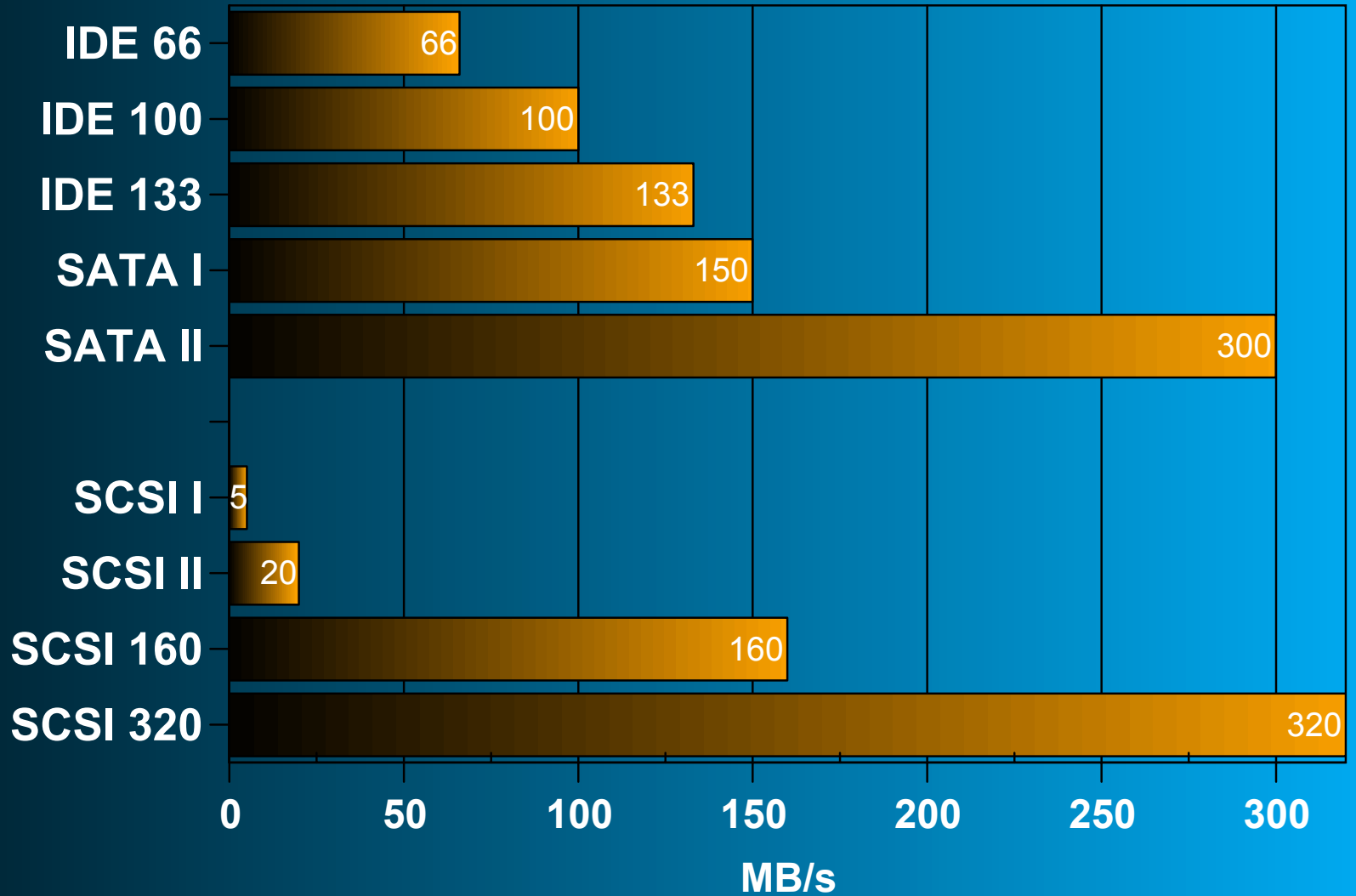


SCSI: Performance

- 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.



SCSI: Performance II





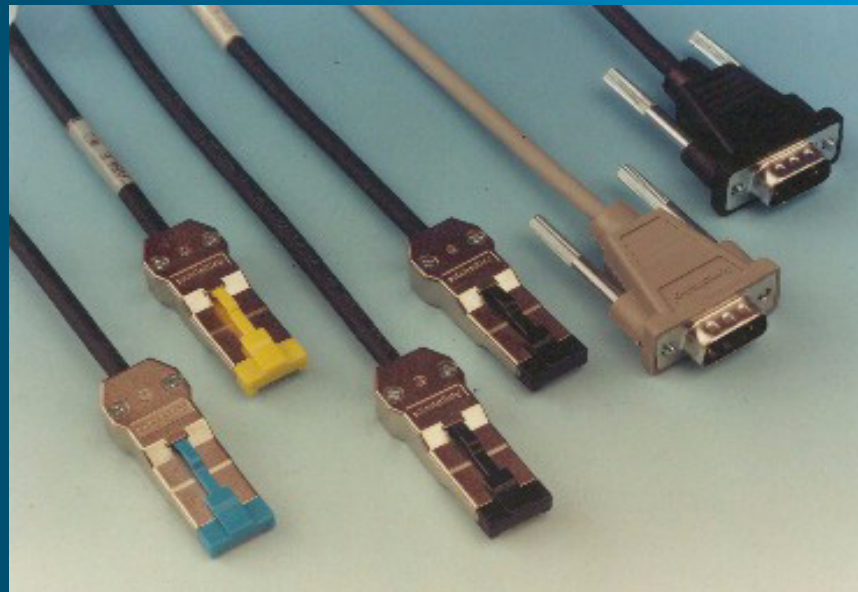
SCSI: Applications

- High performance servers
 - Good Speed (320 MB/s)
 - High quality for disk drives resulting in
 - Good reliability
 - Fast seek times (< 4 ms)
- Large storage servers
 - Large amount of drives on one channel (combined with RAID)
 - Excellent reliability (quality of drives + RAID 1/5)
 - Length of Cable 3 meters opposed to 1m (SATA) or even less (IDE)
- Server Farms
- Rather expensive



Fibre Channel: History

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





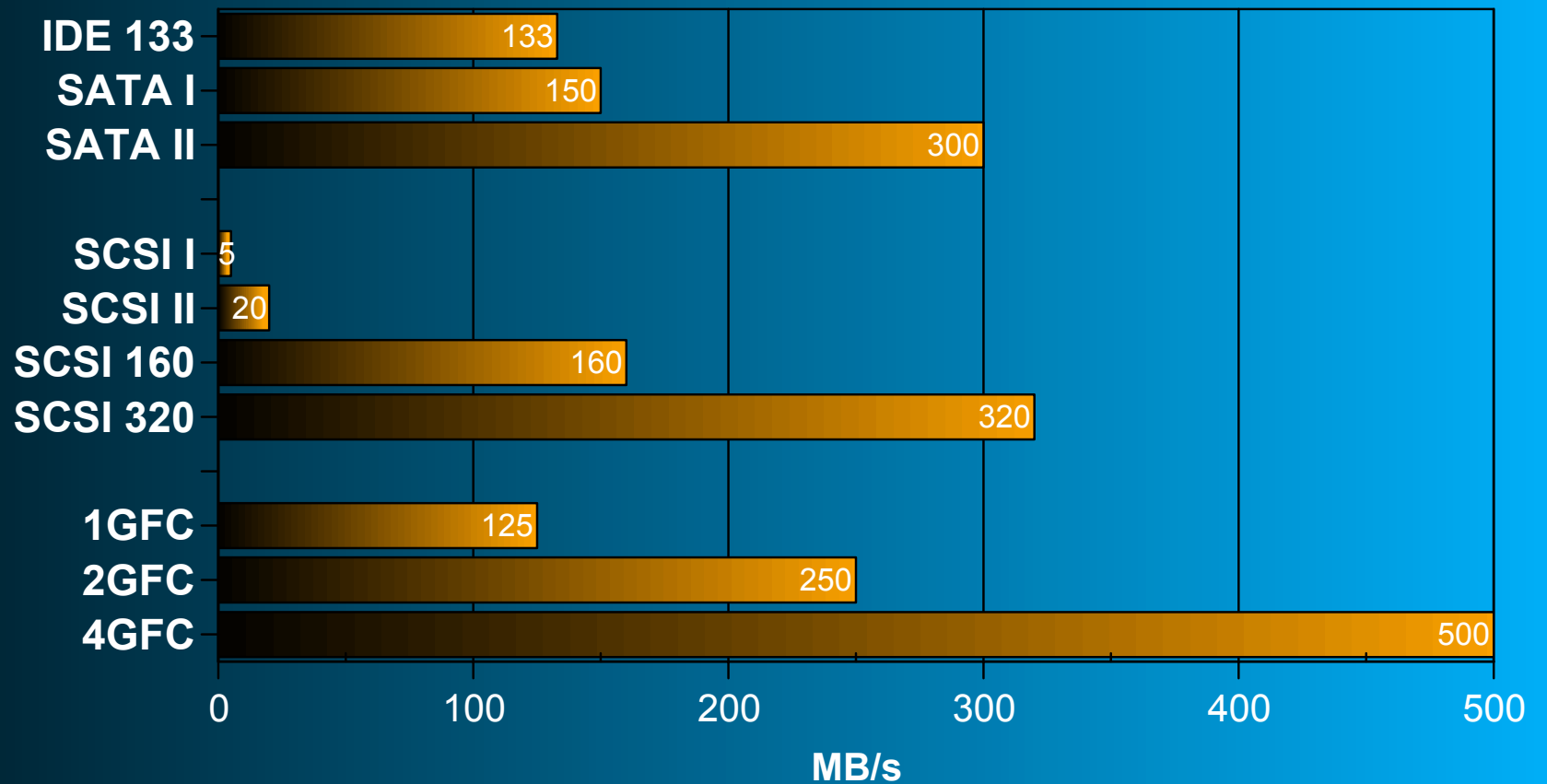
Fibre Channel: Features

- Serial Interface
- Fiber optic or twisted pair cables
- 127 devices configured as FC-AL many more as FC-SW
- Hotswapping, multi pathing
- FC-AL has the topology of an token-ring network
- 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
- Any device with a network port can be used as a storage device
- High overhead because of TCP/IP + SCSI used for each packet
- Easy to build because existing infrastructure can be used



Planned developments

- **SATA 3**
 - new features
 - compatibility with SATA 2 (perhaps even SATA 1)
 - speeds up to 600 MB/s
- **Ultra 640 SCSI**
 - speeds up to 640 MB/s
 - already available today
 - exclusive in IBM servers
 - no drives yet that are specified as Ultra 640 SCSI
 - today uses several Ultra 320 SCSI drives to reach its 640 MB/s
- **Fibre Channel**
 - 10GFC (1250 MB/s) has been released in 2004 but needs completely new hardware
 - 40GFC and 100GFC are planned to be released in 2008 and 2011 with speeds up to 12500 MB/s



Sources

- <http://www.wikipedia.org>
- <http://www.serialata.org>
- <http://www.intel.com>
- <http://www.uni-mainz.de/~neuffer/scsi/>