The Epic Struggle

SCSI vs. IDE

Christopher R. Hertel
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History

SASI

SMD-E

ATA

ESDI

IDE

ST506

SCSI

History

- **PC Revolution of the 1980's**

  Several disk drive interfaces make their debut:
  - SMD, SMD-E
  - ESDI
  - ST506 ==> IDE

  As these evolved, Controller functionality was moved from the Host Adapter to the Drive.

  Standards lead to interoperability.

  - SASI ==> SCSI

- **SCSI & IDE...**

  are managed by the same standards body:
  - SCSI ==> T10
  - ATA ==> T13

  IDE = Integrated Drive Electronics
  ATA = AT Attachment
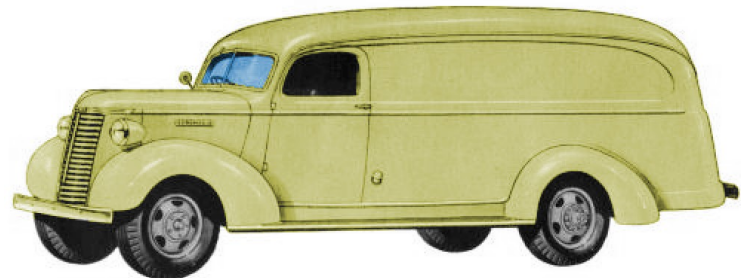 SCSI = Small Computer Systems Interface

IDE (ATA) only supports disk drives

- One-bit bus address space (master/slave)

SCSI has a wider command set

- Bus address space depends on SCSI version (minimum 4-bit)
- Multiple Logical Units (LUs or LUNs) per target
- Support for:
  - CD-Rom Drives
  - Tape Robots and Drives
  - More stuff

History

Just to confuse things:

ATAPI = ATA with Packet Interface
- SCSI commands can be wrapped inside ATAPI commands
- Devices other than disk drives can be controlled
  (e.g., ATAPI CD-ROM/DVD drives)

This brings up an interesting point:

ATA and SCSI commands carried over other transports
- Fibre Channel   == SCSI over Fiber (T11)
- iSCSI   == SCSI over TCP/IP (IETF)
- ATAoE   == ATA over Ethernet (Coraid Corp.)

☞ The current ATA specification is ATA/ATAPI-7.
☞ The current SCSI specification is SCSI-3.

The Differences

Difference: Marketing

Personal Storage

- Consumer Prices
  - "Low cost dominates the design[2]"
- Commodity Parts
  - Simple to buy and to replace
- Individual operation
  - Generally used one at a time, not in groups

Enterprise Storage

- Enterprise Prices
  - Customers willing to pay for higher reliability and performance
- Multiuser / Multi-disk environments
  - Server Farms and Disk Arrays
- I/O tends to be more random
  - Small chunks of larger objects

Difference: Performance vs. Capacity

Higher rotational speed means lower latency

- Smaller platter sizes support faster spindle speeds & lower seek time
- More platter mass means more energy used

More platters provide higher capacity

- Increased spindle mass requires more power to spin
- Increased actuator mass slows down seeks

Higher bus bandwidth improves throughput

- Increased complexity to disk-side electronics

There are always trade-offs.

Difference: Reliability

Environmental Hazards

- Servers and Large Arrays
  - Adjacent drives annoy one another with vibrations
  - Heat
  - 24x7 operation
  - "Hot spindle" rebuilds

- Desktop Systems
 - On/Off operation

- Laptops
  - Shock

Harsher environments create a requirement for higher-quality parts in order to maintain reliability.

Difference: Protocol

SCSI vs. ATA Command Sets

- SCSI
  - Supports many devices (including graphics!?)
  - Designed for many-to-many operation
  - Robust Diagnostics

- ATA
  - Handles disk drives only
  - Very limited address space (master/slave, no LUNs)
  - Designed for one-to-one or one-to-two operation
  - Limited Diagnostics
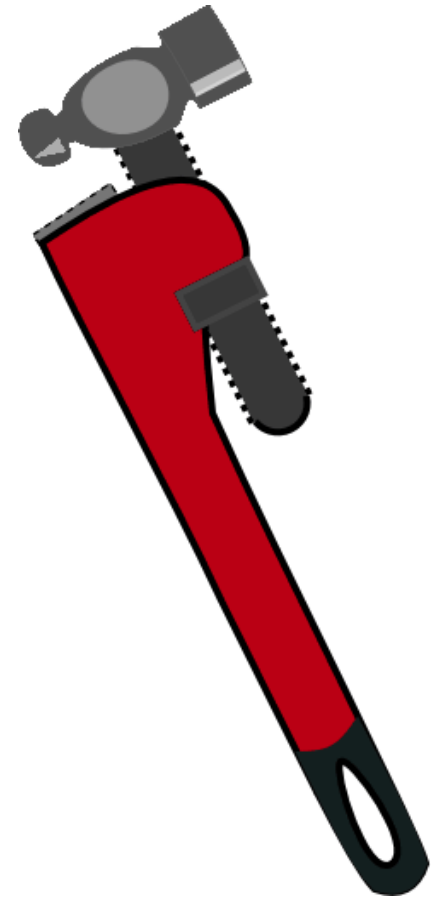
It's all about choosing the right tool for the job.

Difference: Price

- ## Enterprise Drives
  - More expensive electronics
  - Lower capacity, higher performance
  - Better protected (against heat, vibration)
  - Longer-lasting parts
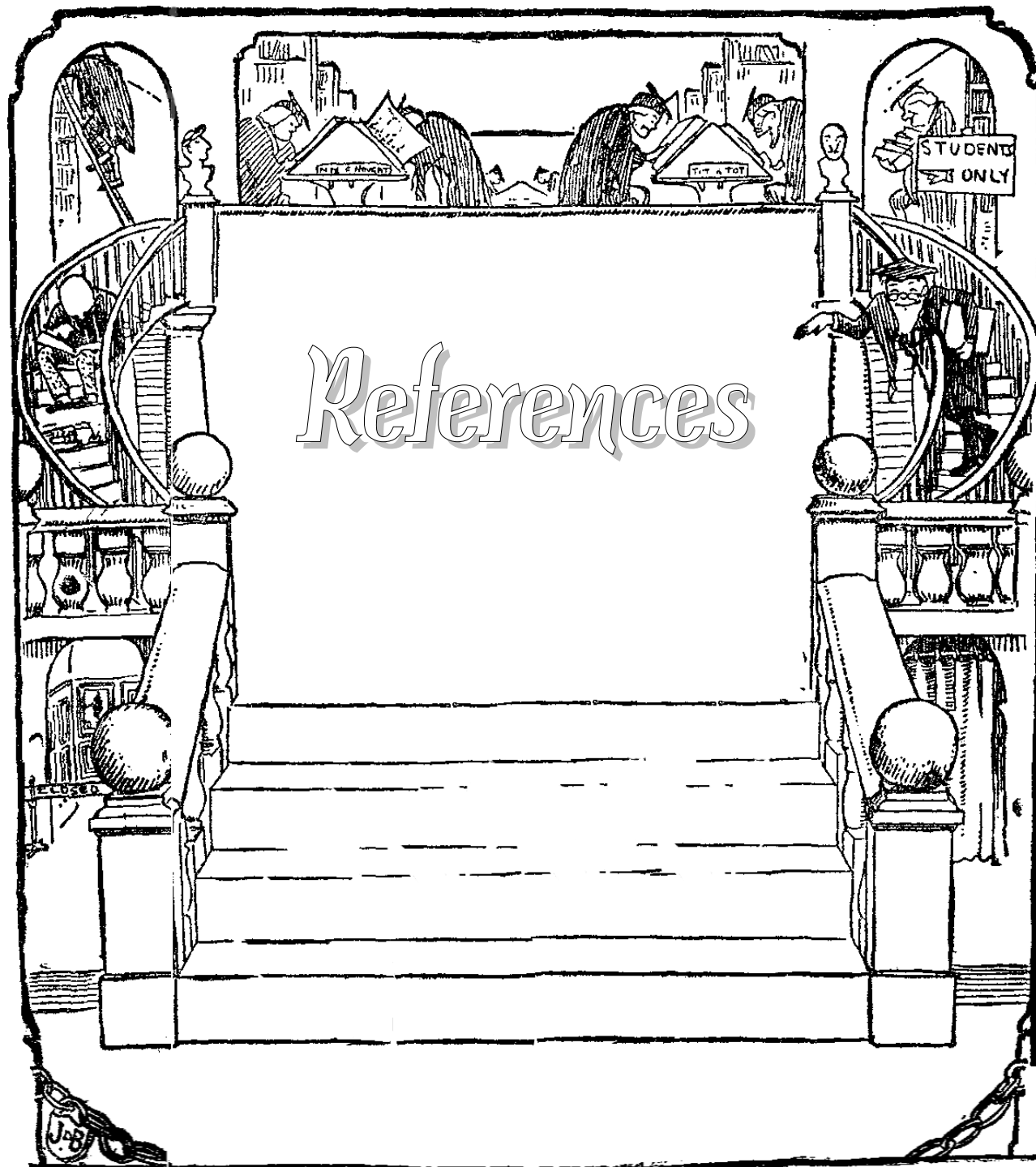 - New features introduced to meet customer demand

- ## Personal Drives
  - Cheap electronics
  - Higher capacity, lower performance
  - Commodity parts
  - Trickle-down technology

The interface is only one difference.

(my cat)

References

References

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