

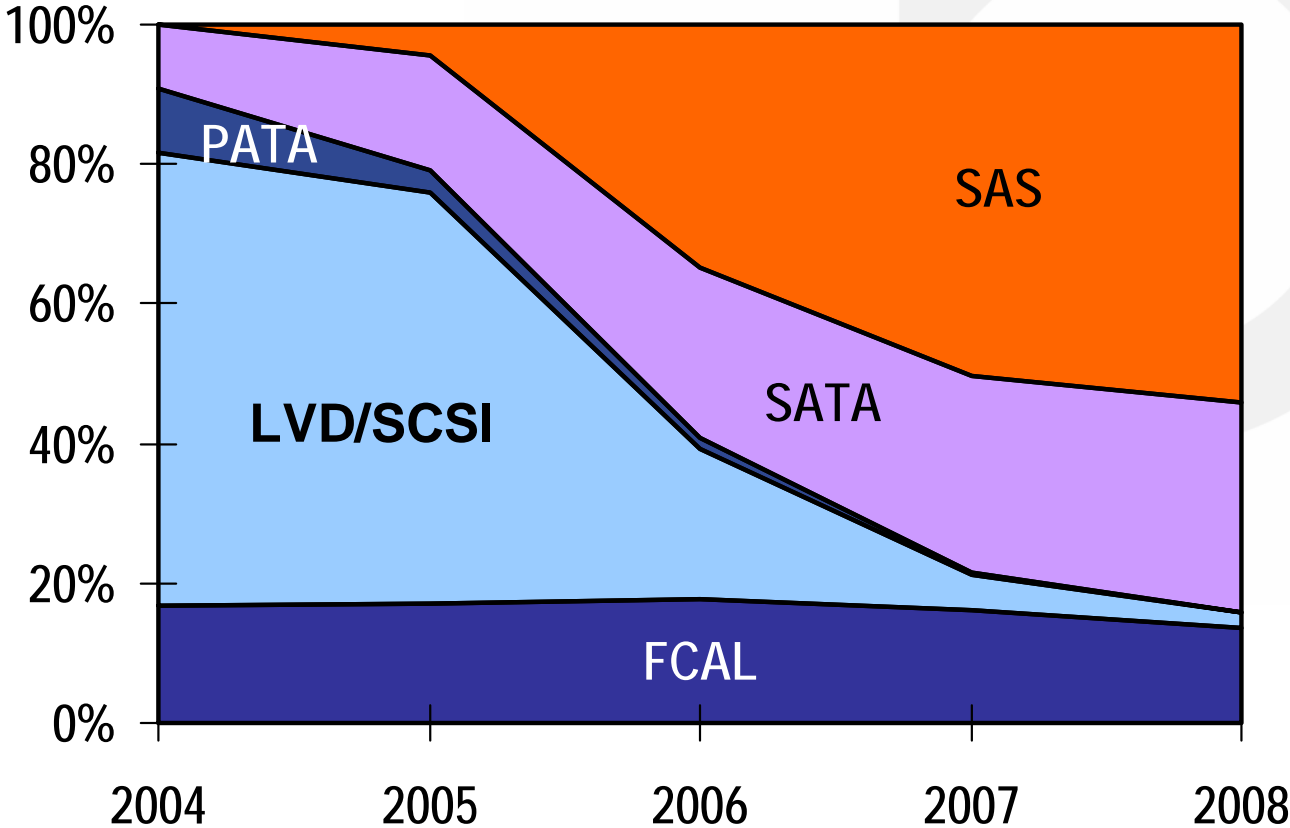
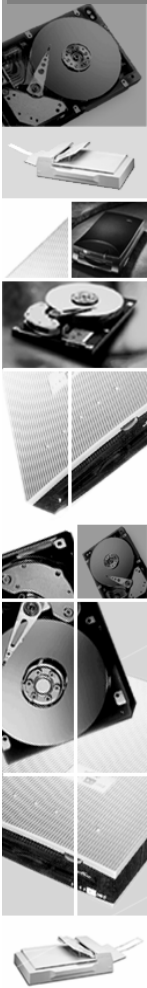
SAS vs. SATA



THE POSSIBILITIES ARE INFINITE

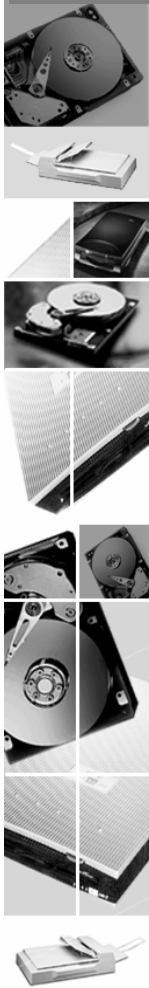
Fujitsu Confidential & Proprietary

Enterprise Class HDD Interfaces

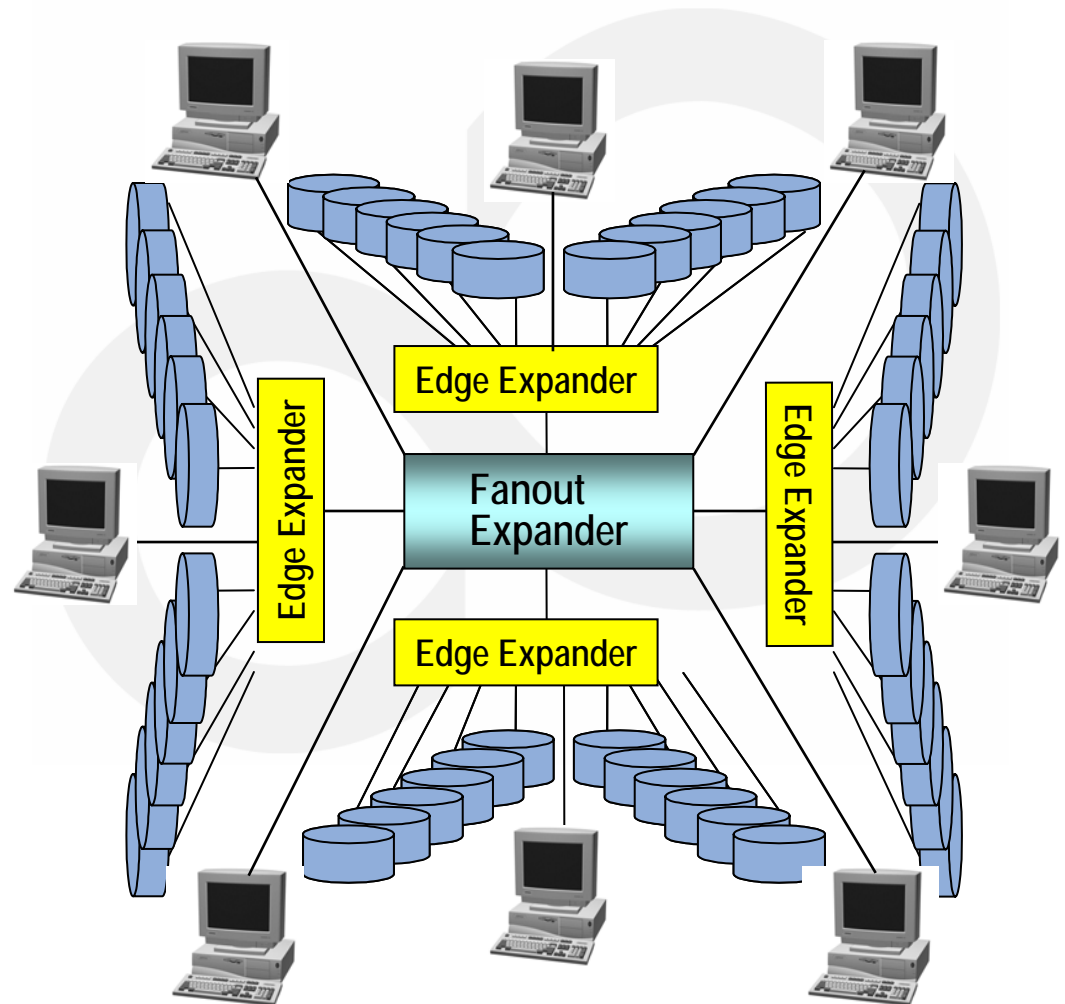


Source: Fujitsu

SAS is Exceptionally Scalable

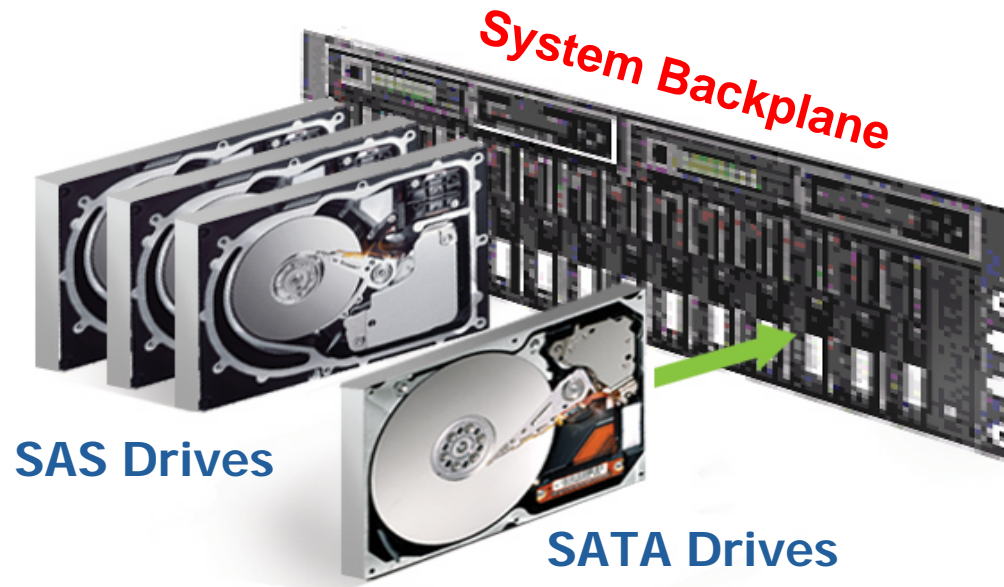


- SAS supports up to 16,384 devices in a single domain Greatly improving on 16-device limit of Parallel SCSI Bus
- Each device is assigned a unique World Wide Name (WWN) as well as FCAL Making SCSI Bus IDs no longer necessary
- Smaller connector size enables Small Form Factor (SFF) HDDs for increasing drive density and spindle count



Serial Technology Enables Choice

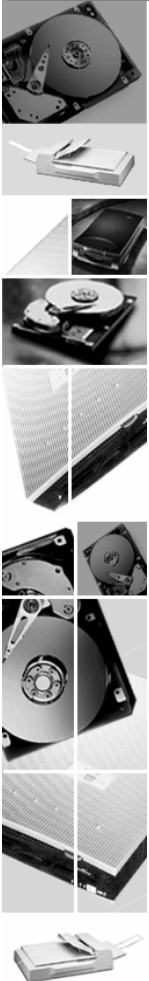
One backplane accommodates either SAS or SATA HDDs



- High-performance & highly reliable serial attached SCSI disk drives are suitable for mission critical and performance oriented applications
- High capacity SATA drives can be used for disk enhanced backup or reference data

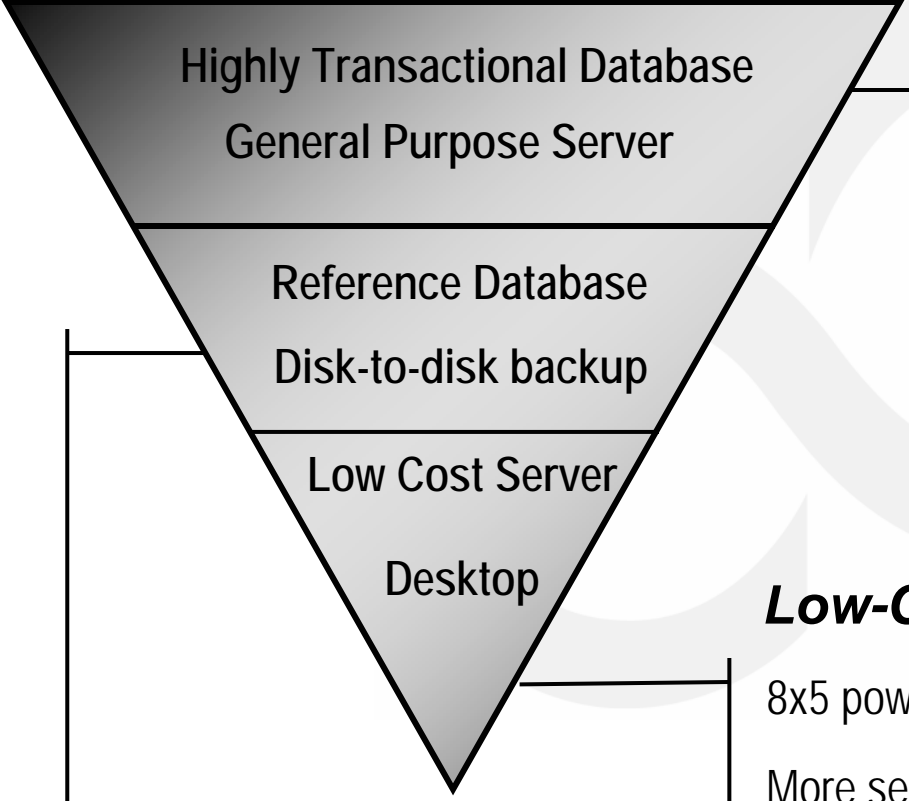
FUJITSU

Difference on System Requirements (1/2)



Near-line

- 24x7 power-on hours
- Highly random
- Low IOPS
- Low duty cycle



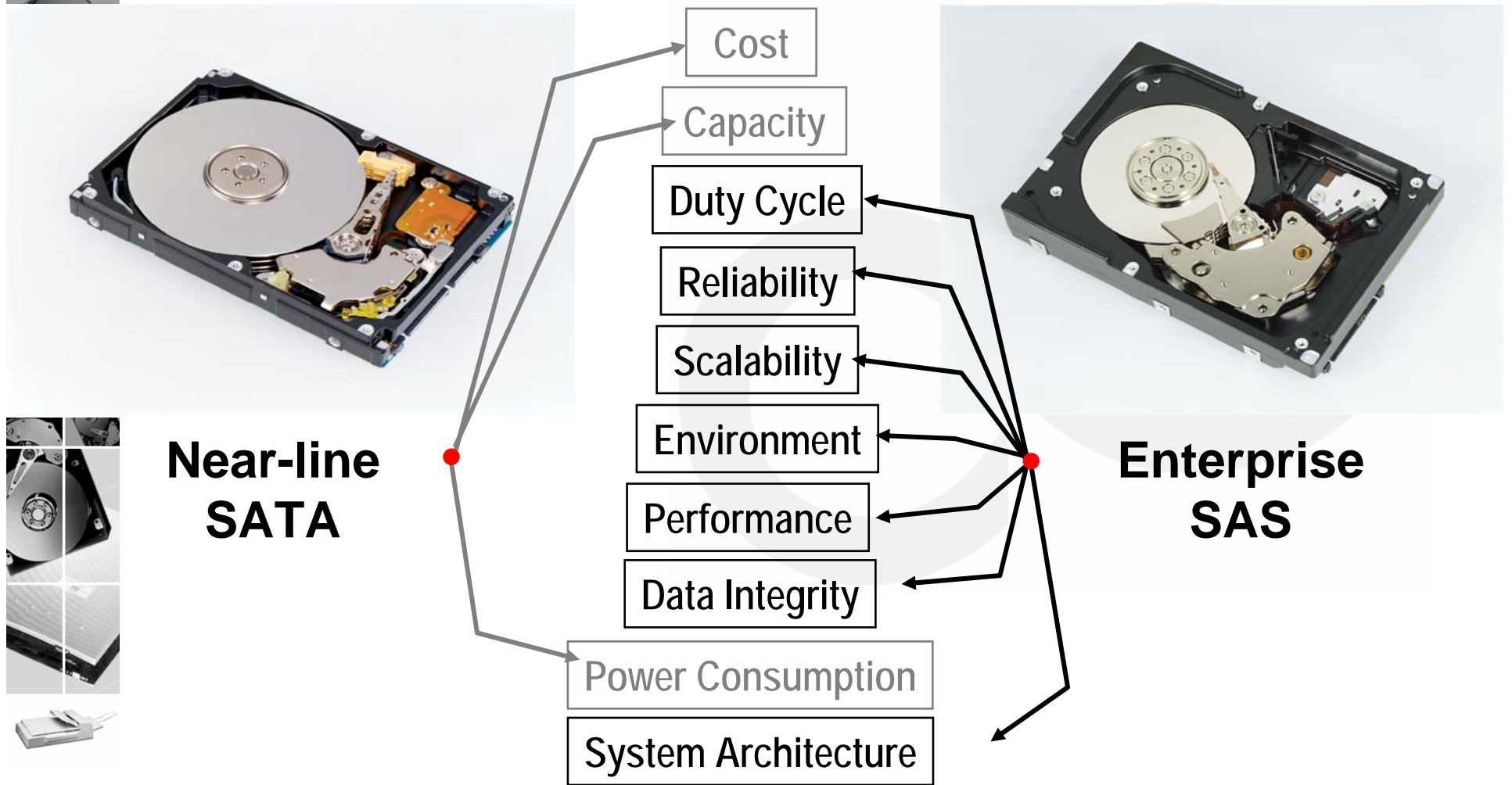
Online

- 24x7 power-on hours
- Highly random
- High IOPS
- High duty cycle

Low-Cost Server

- 8x5 power-on hours
- More sequential (Low random)
- Frequent start/stop (Low IOPS)
- Low duty cycle










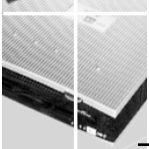
Difference on System Requirements



Each application gets parameters it needs



Key Decision Factors

| SATA | | SAS |
|--|---|----------|
|   | <p>▪ <u>Highest performance capability</u></p> <ul style="list-style-type: none"> ▪ Full duplex, higher bandwidth, port aggr.. extensive command queuing, rich command feature set | <p>✓</p> |
|   | <p>▪ <u>Lowest cost per gigabyte</u></p> <ul style="list-style-type: none"> ▪ Low acquisition cost | <p>✓</p> |
|   | <p>▪ <u>Best performance for transactional data</u></p> <ul style="list-style-type: none"> ▪ High frequency immediate random-access type data ▪ Database, on-line purchase, bank transactions, CRM etc. | <p>✓</p> |
|   | <p>▪ <u>Most cost effective for reference and sequential-type data</u></p> <ul style="list-style-type: none"> ▪ Low frequency access, streaming and sequential data ▪ File-sharing/Email/Web/Nearline/Backup and archival data | <p>✓</p> |
|   | <p>▪ <u>Greater Scalability</u></p> <ul style="list-style-type: none"> ▪ Greatest physical device addressing range ▪ Connection to out-of-box storage, long (8-meter) cable length | <p>✓</p> |

Note: This matrix reflects the inherent capabilities of the interface, not vendors' product features











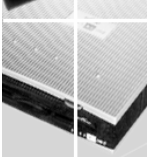

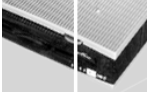




Source: STA

Fujitsu Proprietary and Confidential

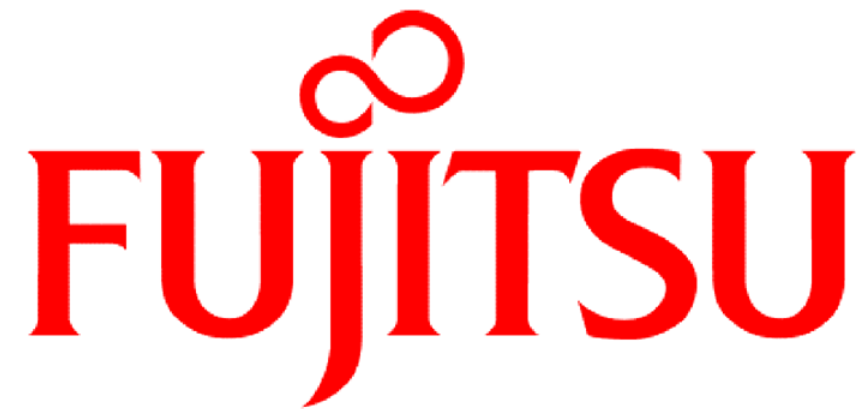


THE POSSIBILITIES ARE INFINITE

Key Decision Factors

|  | SATA | SAS |
|--|---|---|
|     |  <ul style="list-style-type: none"> ▪ <u>First to volume disk interconnect</u> <ul style="list-style-type: none"> ▪ Specification completed in 2001 ▪ Products started shipping in 2002 | <div data-bbox="1228 454 1690 633" style="border: 1px solid black; padding: 5px; background-color: #4b0082; color: white; text-align: center;"> <p><i>Note: This matrix reflects the inherent capabilities of the interface, not vendors' product features</i></p> </div> |
|   | <ul style="list-style-type: none"> ▪ <u>Highest reliability and availability</u> <ul style="list-style-type: none"> ▪ More extensive error recovery techniques ▪ Multi-initiator (simultaneous access) + Dual-active port support |  |
|   |  <ul style="list-style-type: none"> ▪ <u>Simplest configuration setup</u> <ul style="list-style-type: none"> ▪ Ubiquitous drivers – No requirement for vendor drivers ▪ Motherboard chipset integration | |
|   | <ul style="list-style-type: none"> ▪ <u>Greatest device flexibility</u> <ul style="list-style-type: none"> ▪ Support for Serial Attached SCSI and Serial ATA devices |  |
|  |  <ul style="list-style-type: none"> ▪ <u>Power management</u> <ul style="list-style-type: none"> ▪ Saves power by automatically powering-down when not in use | |

Source: STA



FUJITSU

THE POSSIBILITIES ARE INFINITE