

SQL Server on Integrity Failure is not an Option

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Senior Database Engineer

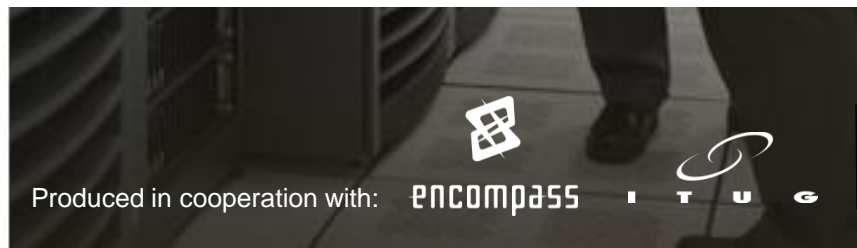
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SQL Server on Integrity: Agenda

- The Mission
- The Solution
 - Standards
 - Zero data loss
 - High Availability
 - Scale Up
- Daily Business
- Reporting and BI



SQL Server on Integrity: The Mission

- Zero data loss
- 99.99x% availability @ 24 x 7
- 450.000+ SQL statements per second



SQL Server on Integrity: The Solution

- Standardize everything
- Work by the book
- Have some clever guys at hand in case the book runs out of pages to write some new pages...

SQL Server on Integrity: Standardizing

- Operating System

- Version
- Edition
- Service Pack
- Patch Level



SQL Server on Integrity – Standardizing

- Operating System
- File System / Disks

File System Sample

- C:\
- C:\Windows
- C:\Install
- C:\SQL01
- C:\SQL01\BIN
- C:\SQL01\TEMPLOG01
- C:\SQL01\TEMPDATA01
- C:\SQL01\LOG01
- C:\SQL01\LOG02
- C:\SQL01\DATA01
- C:\SQL01\DATA02
- C:\SQL01\DATA03



File System settings

- Stripe size 64/128/256 kB
depending on storage
- Partition alignment 64/128 kB
depending on storage
- Cluster size 64 kB
- 100% write cache
- 0% read cache

SQL Server on Integrity – Standardizing

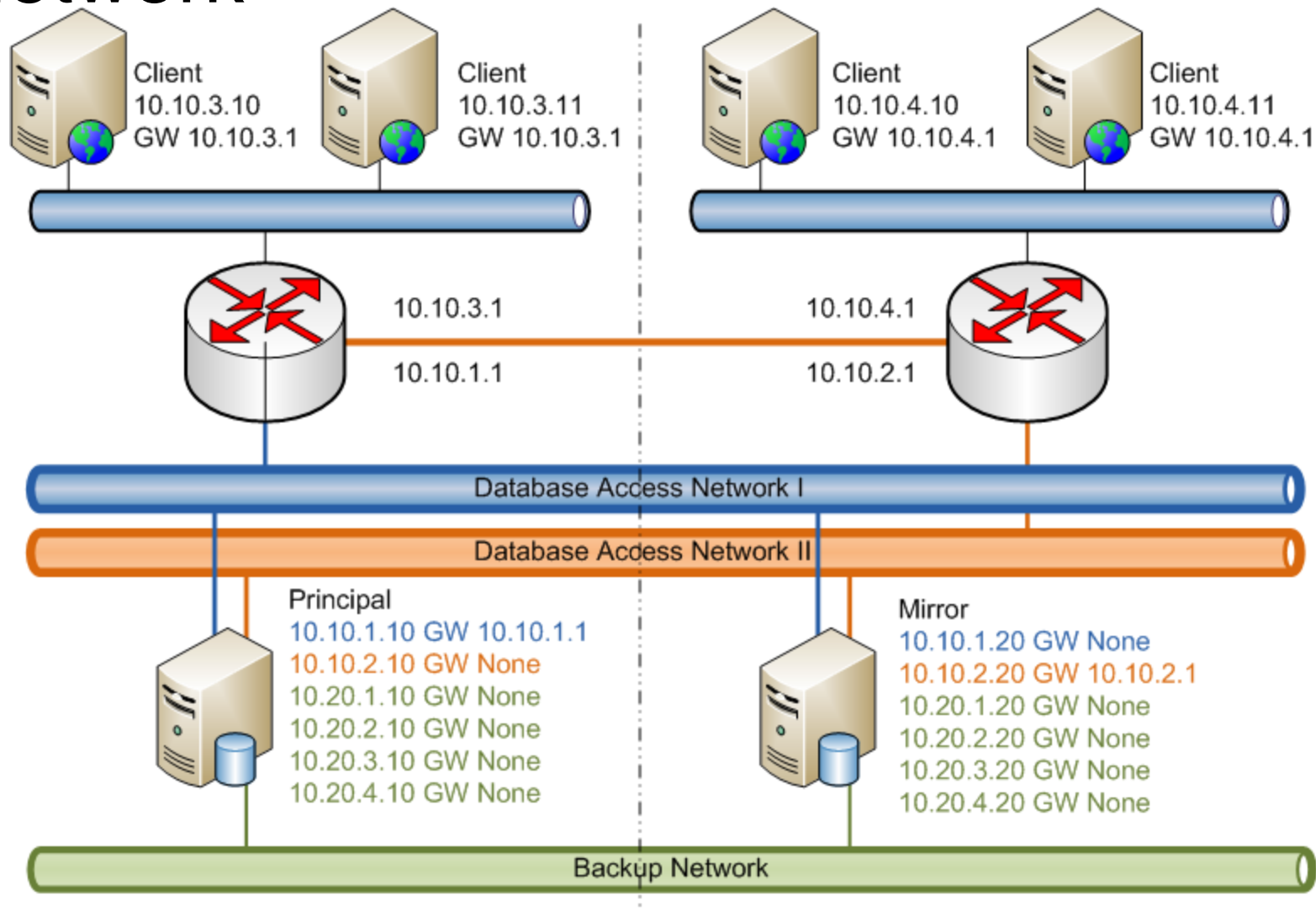
- Operating System
- File System / Disks
- SQL Server
 - Version
 - Edition
 - Service Pack
 - Patch Level
 - Configuration Options



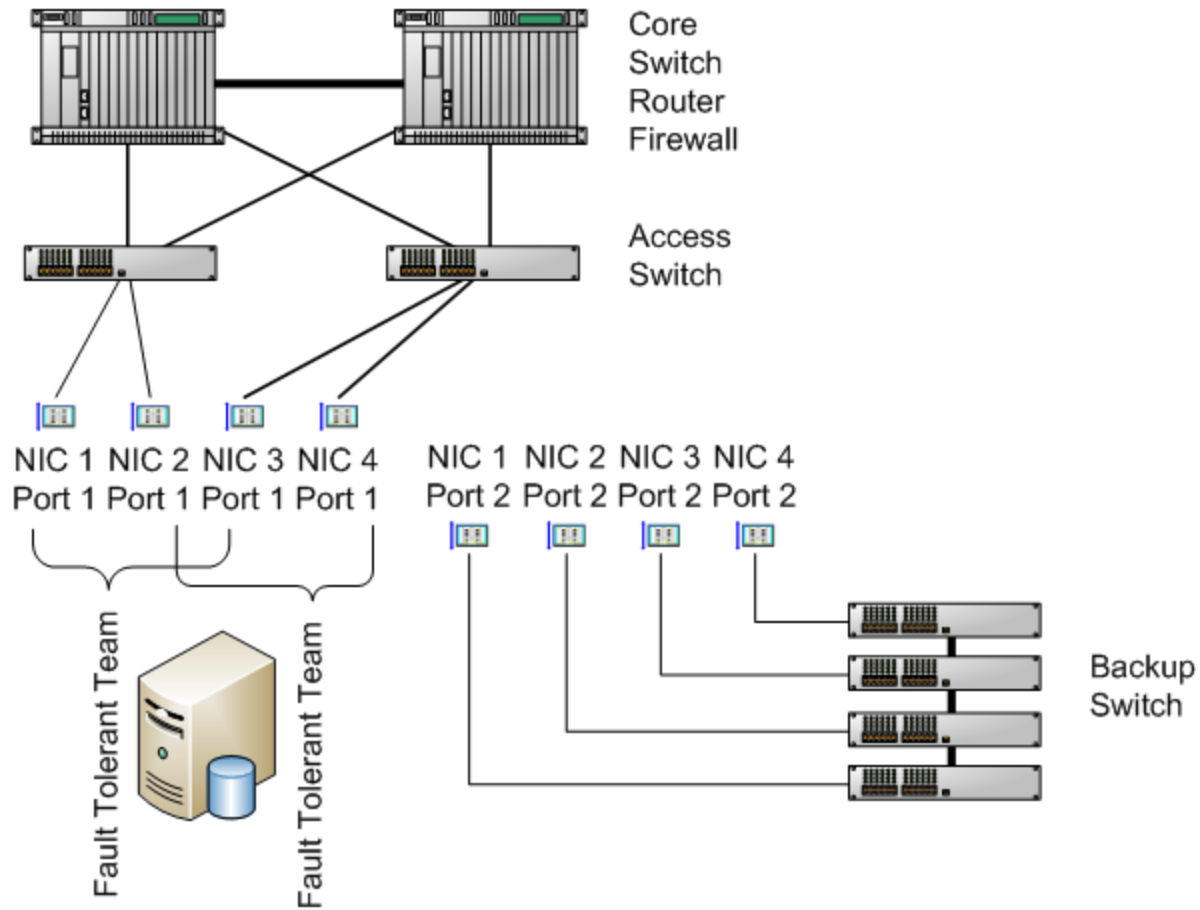
SQL Server on Integrity: Standardizing

- Operating System
- File System / Disks
- SQL Server
- Network
 - Separate Networks for data and backup
 - IP schema

Network



Network



SQL Server on Integrity – Standardizing

- Operating System
- File System / Disks
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 - Separate Networks for data and backup
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SQL Server on Integrity: Standardizing

- Operating System
- File System / Disks
- SQL Server
- Network
- Documentation



SQL Server on Integrity: Zero data loss



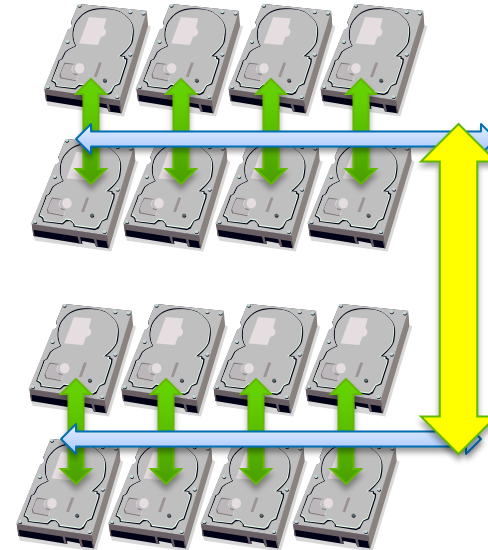
- Redundant NIC
- Redundant Power Supply
- Data files on SAN
(RAID 1/0 Multipath/2 Fabrics)
- Transaction log files on RAID 101

SQL Server on Integrity: RAID 101



RAID Controller

RAID Controller



- HW RAID 1 +
- HW RAID 0 +
- SW RAID 1

SQL Server on Integrity: Zero data loss

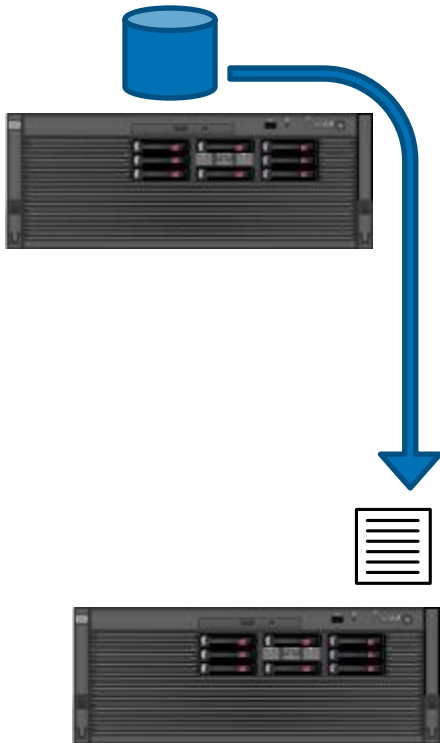


- Redundant NIC
- Redundant Power Supply
- Data files on SAN
(RAID 1/0 Multipath/2 Fabrics)
- Transaction log files on RAID 101

Availability: 0,00%

Data loss: 100,00%

SQL Server on Integrity: Zero data loss

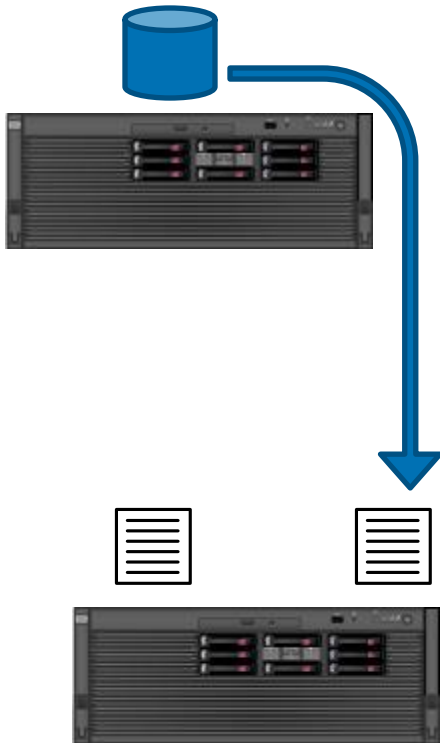


- Full backup every 24 h

Availability: 0,00%

Data loss: 100,00%

SQL Server on Integrity: Zero data loss

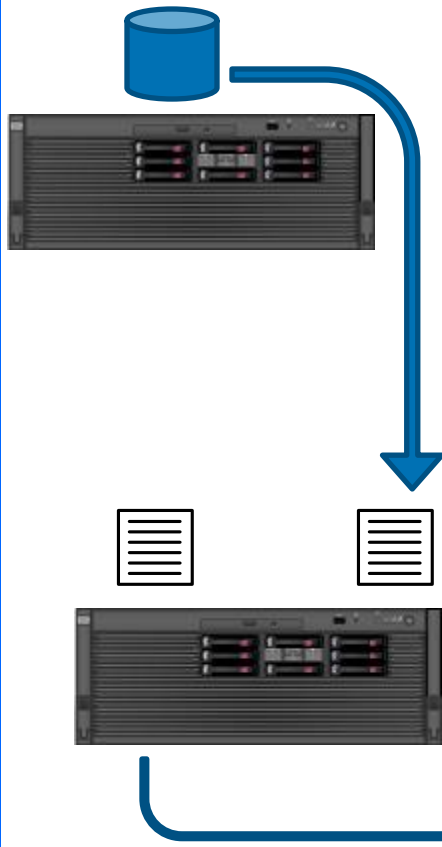


- Full backup every 24 h
- Alternating files

Availability: 0,00%

Data loss: 100,00%

SQL Server on Integrity: Zero data loss

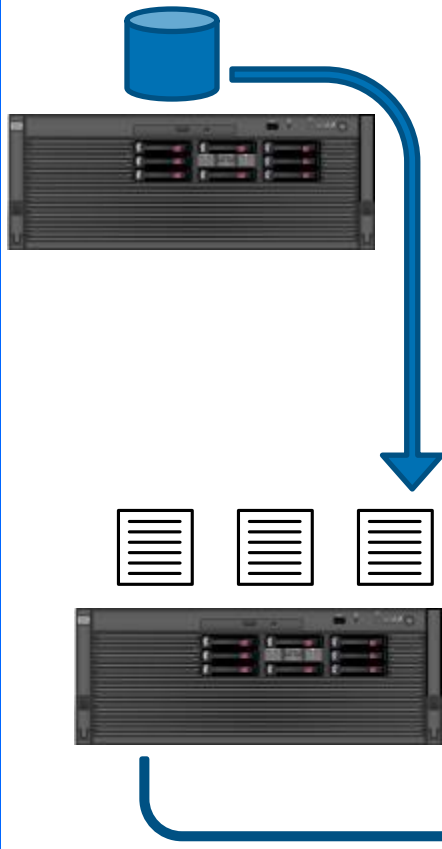


- Full backup every 24 h
- Alternating files
- Transfer of files to tape in second location

Availability: 0,00%

Data loss: 100,00%

SQL Server on Integrity: Zero data loss

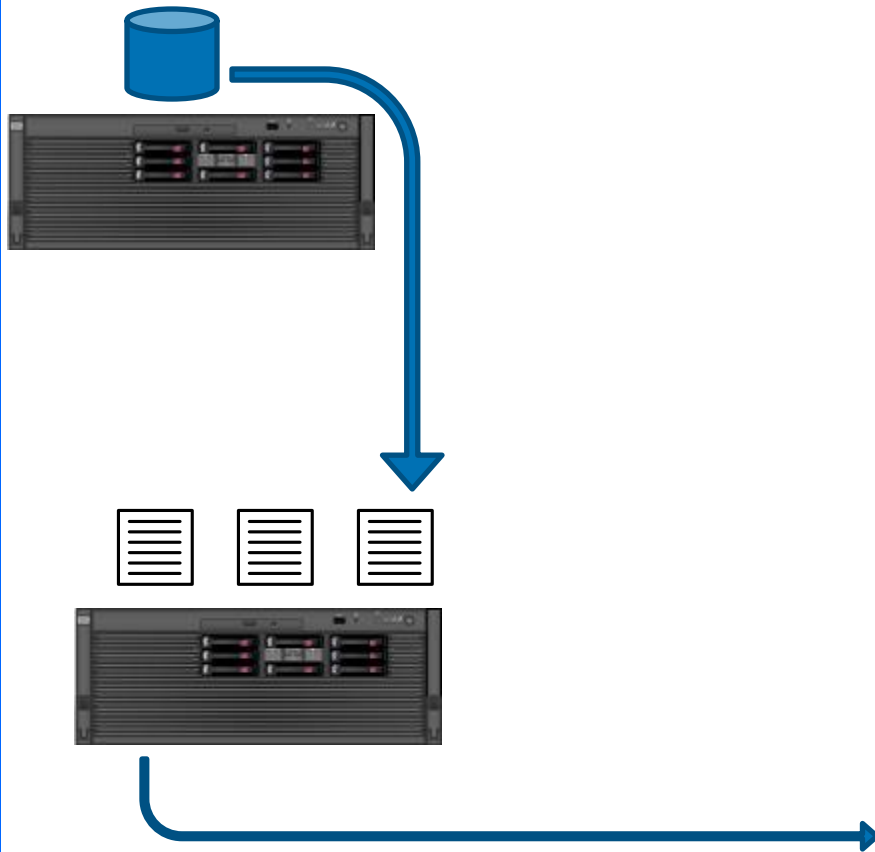


- Full backup every 24 h
- Alternating files
- Transfer of files to tape in second location
- Verify backups daily

Availability: 98,00%

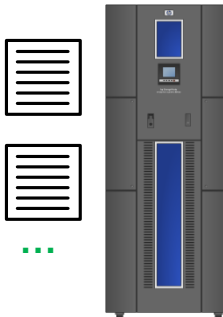
Data loss: 100,00%

SQL Server on Integrity: Zero data loss

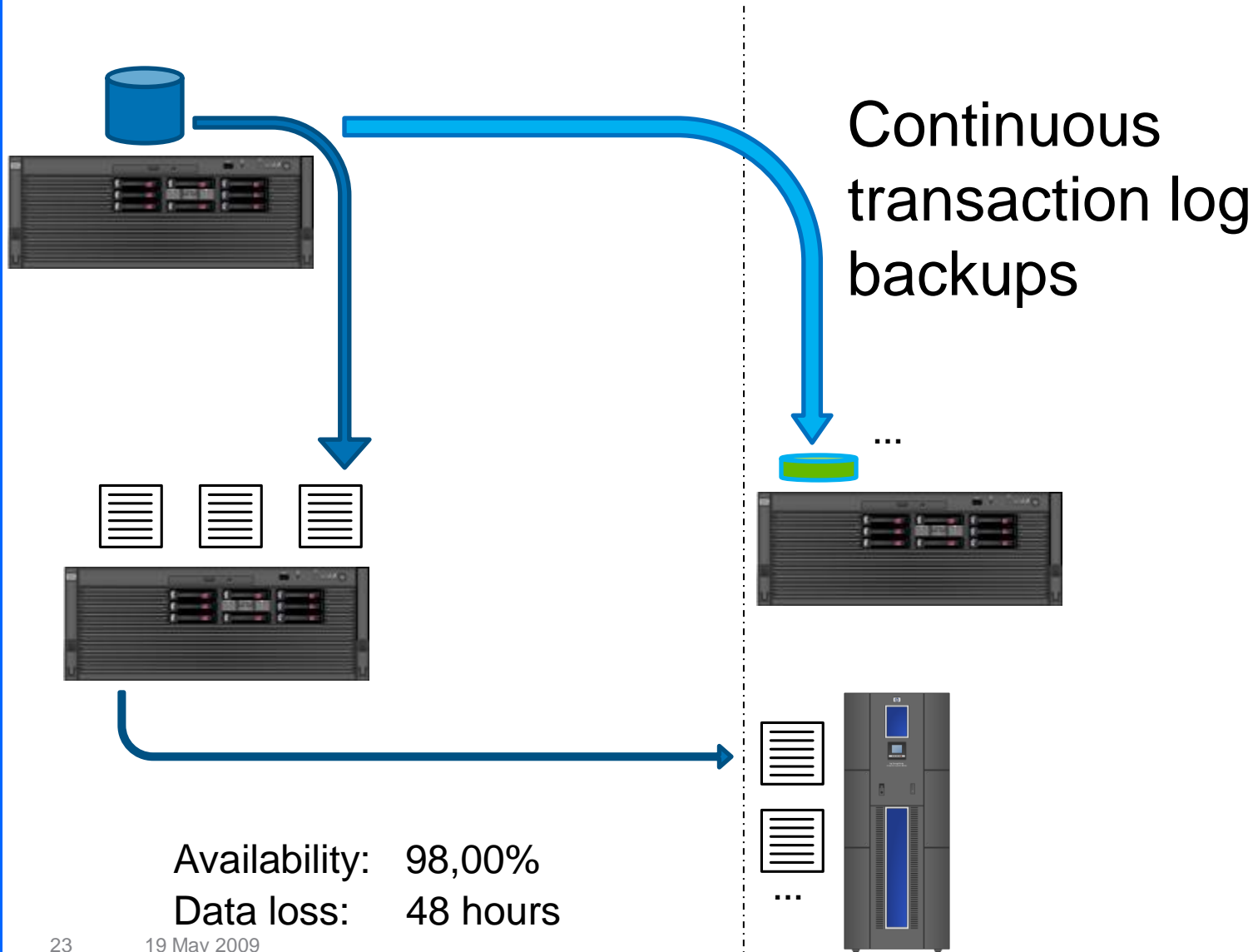


- Full backup every 24 h
- Alternating files
- Transfer of files to tape in second location
- Verify backups daily
- Verify tapes

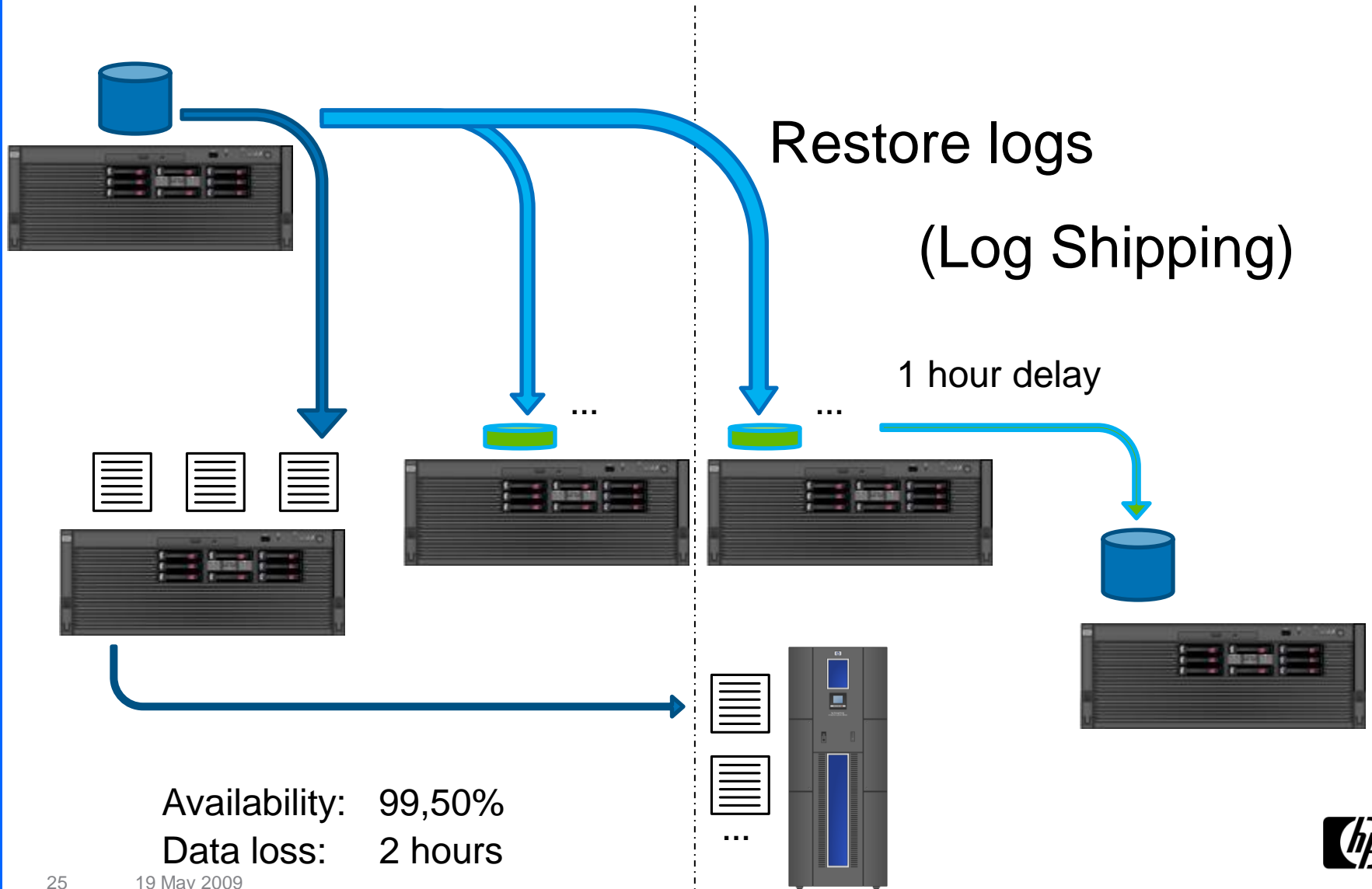
Availability: 98,00%
Data loss: 48 hours



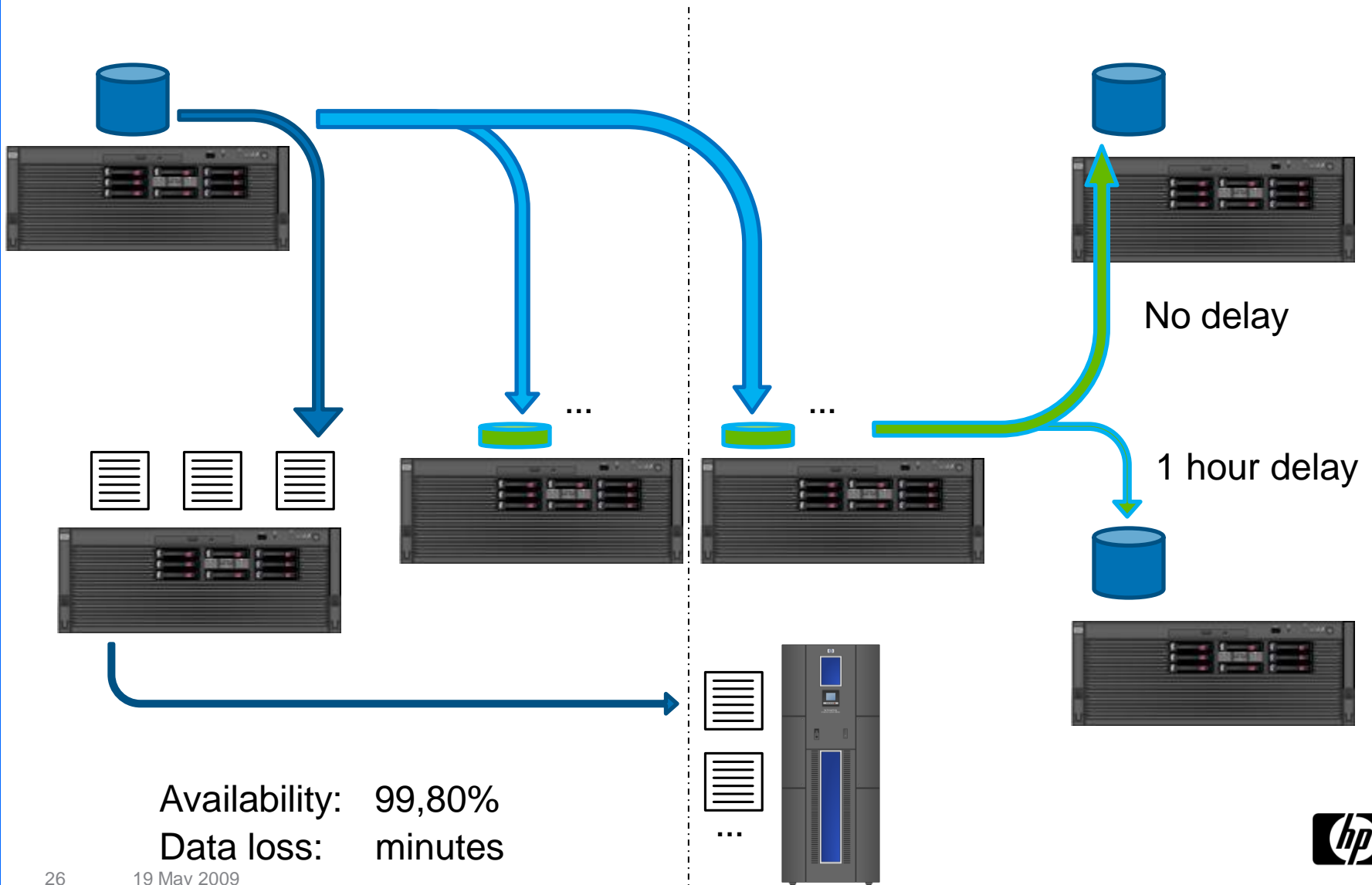
SQL Server on Integrity – Zero data loss



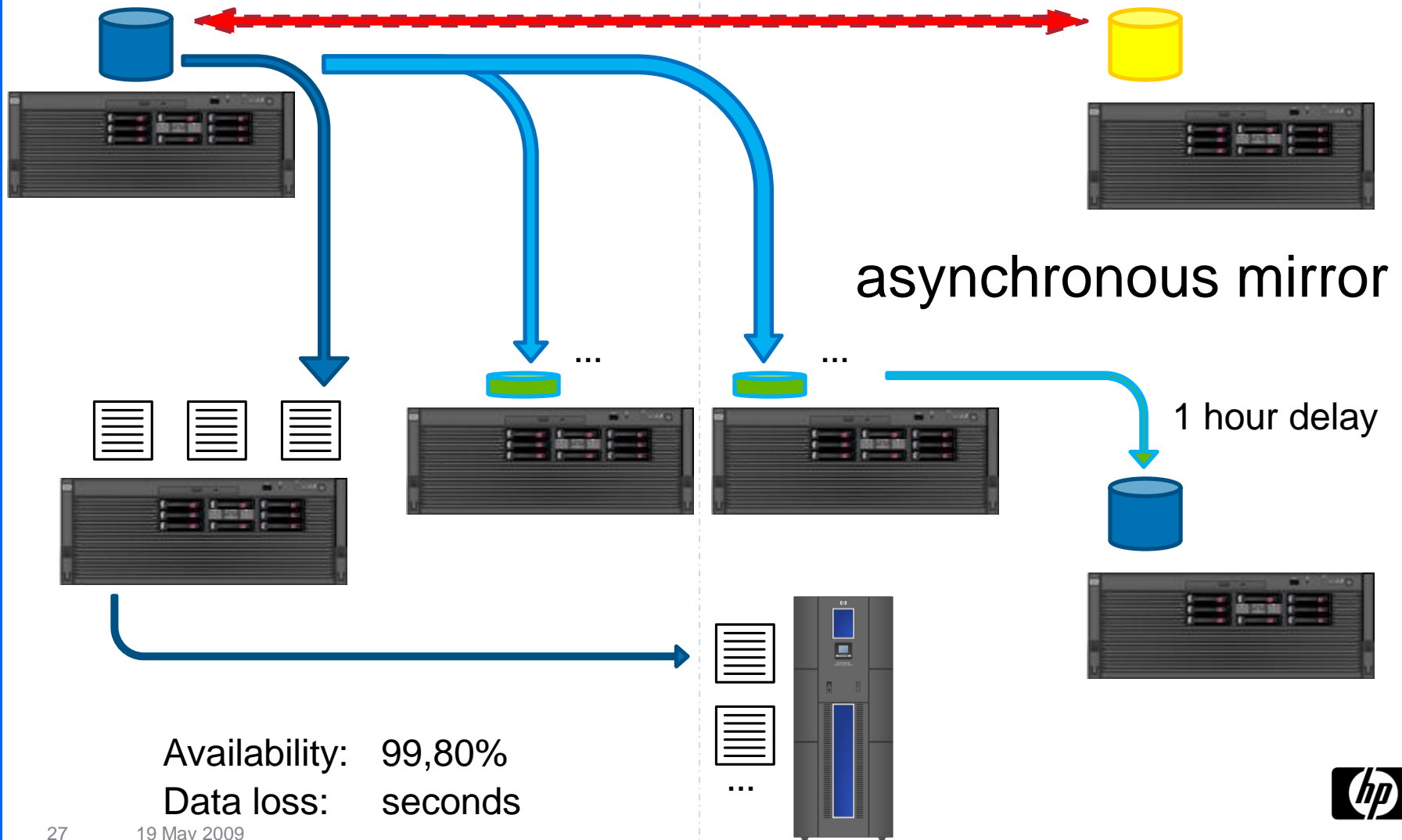
SQL Server on Integrity – Zero data loss



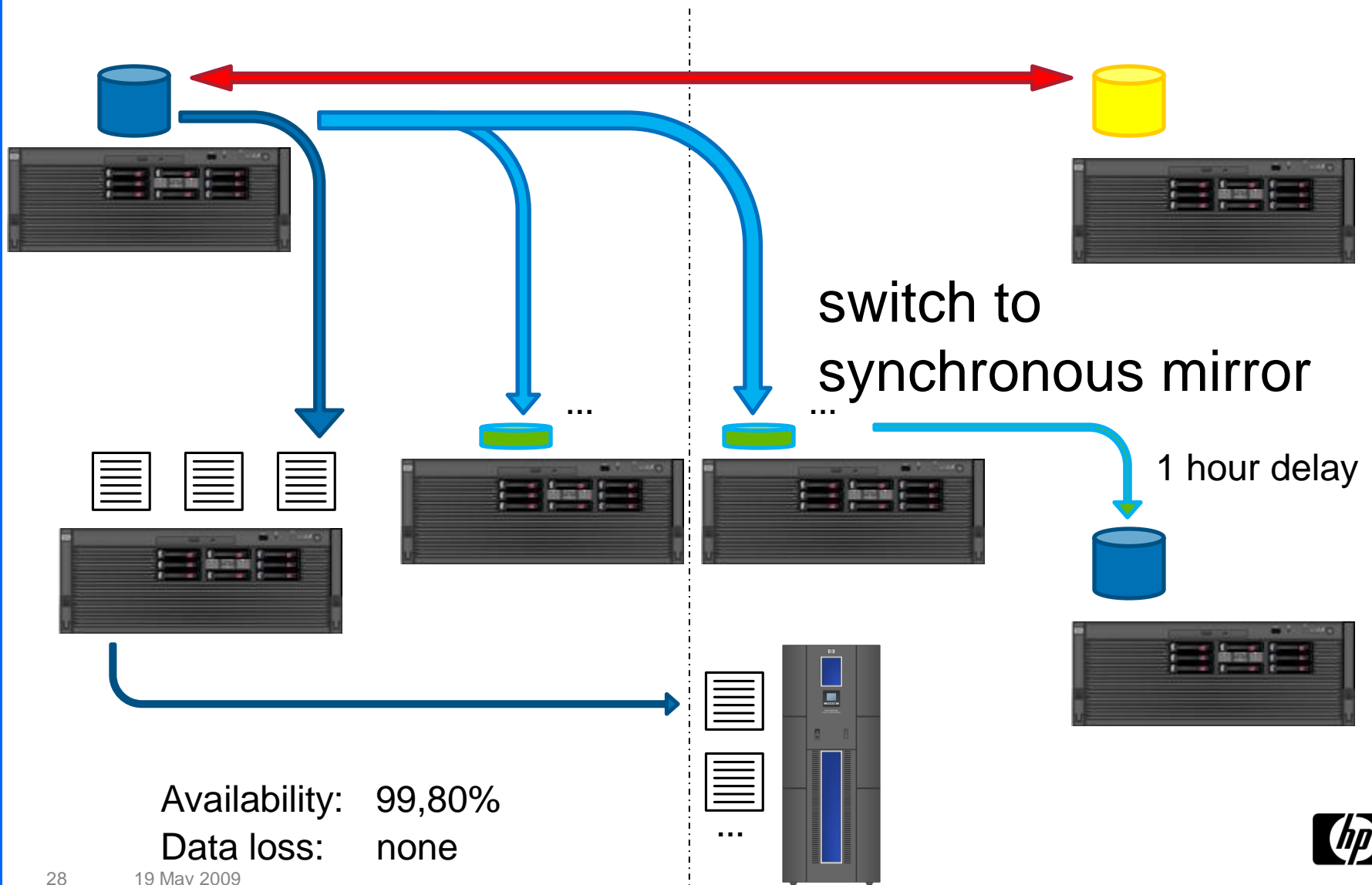
SQL Server on Integrity: Zero data loss



SQL Server on Integrity: Zero data loss



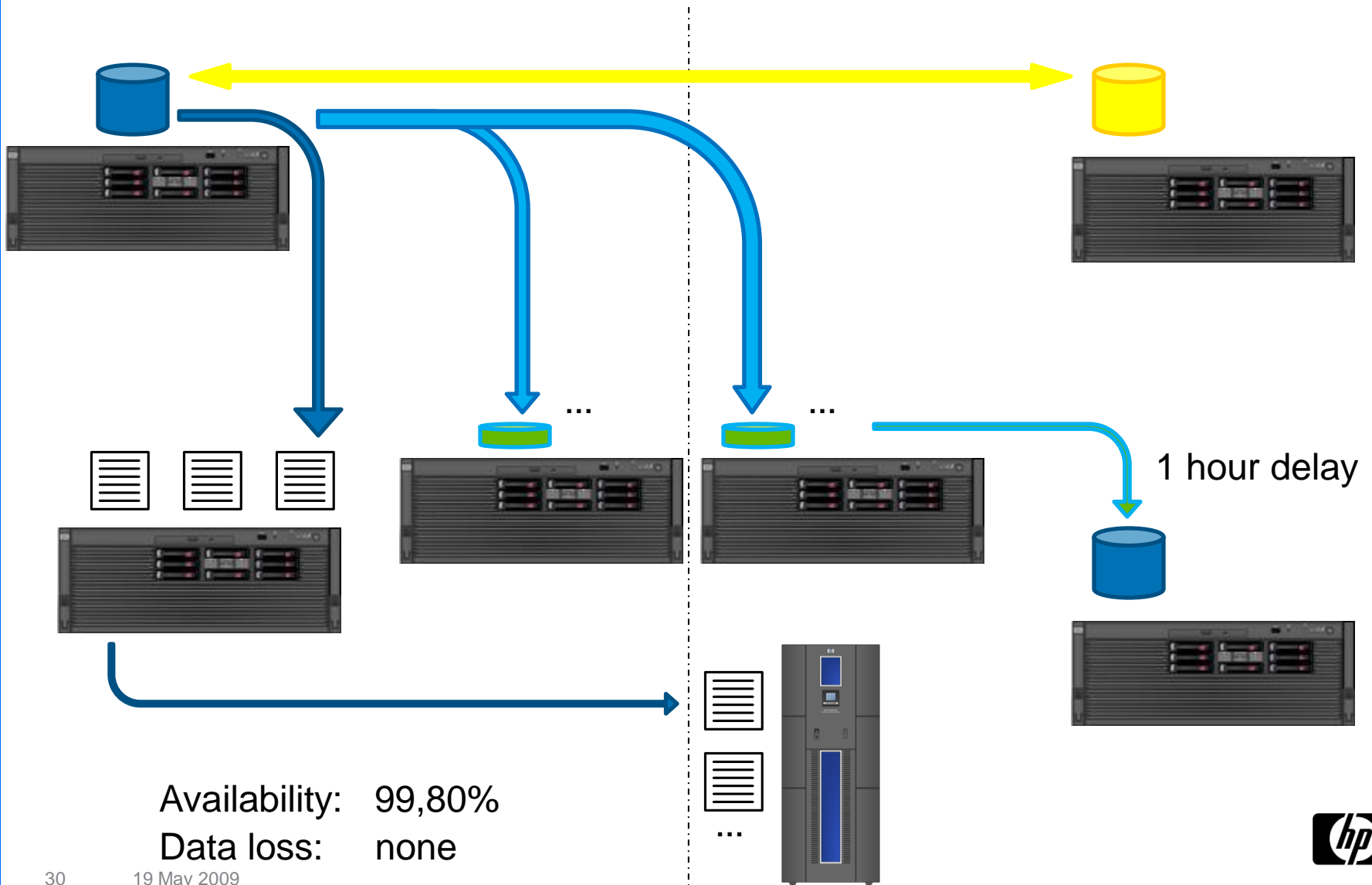
SQL Server on Integrity: Zero data loss



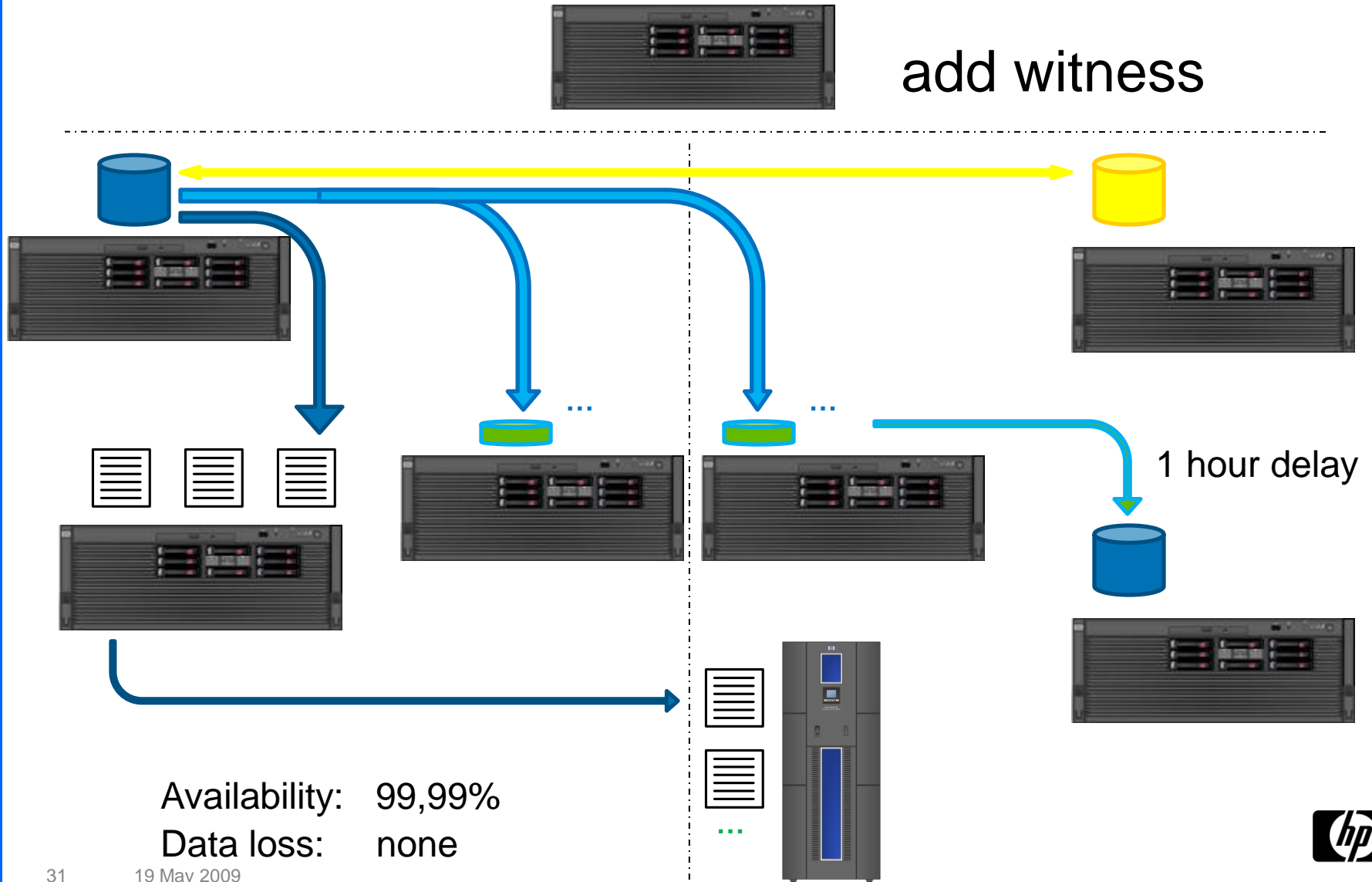
SQL Server on Integrity: Availability



SQL Server on Integrity: Availability



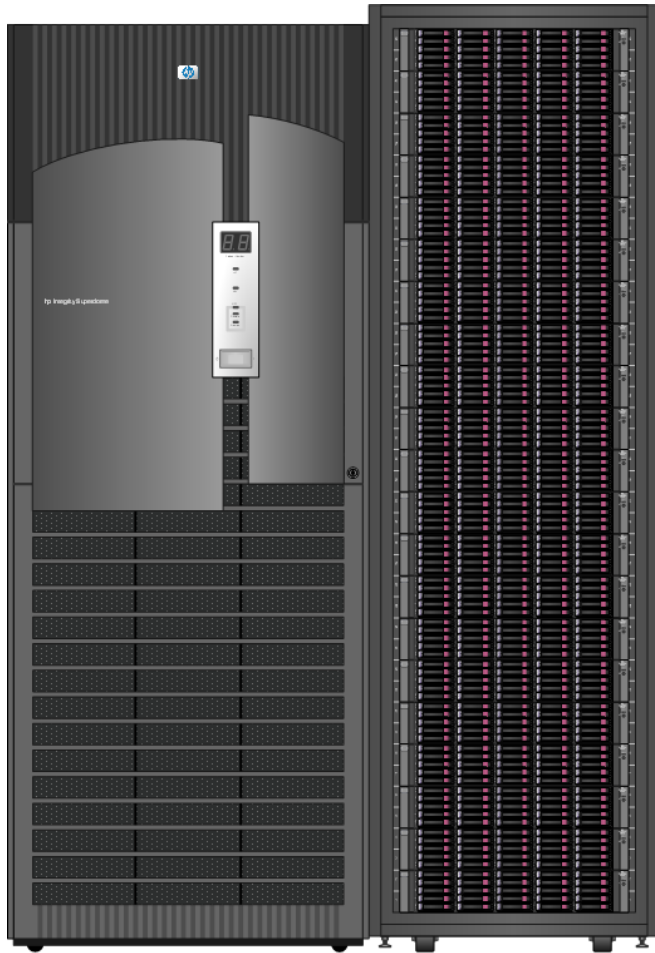
SQL Server on Integrity: Availability



SQL Server on Integrity: Scale Up



SQL Server on Integrity: Scale Up



- Huge server
- Lots of memory
- Lots of disk storage
- Very fast network



SQL Server on Integrity: Scale Up

- NUMA node basic configuration
 - 4 dual core ITANIUM 2 CPUs with 24 MB cache
 - 64 GB memory
 - 4 x dual port 1 Gb/s network card
 - 2 x dual port HBA (4Gb/s)
 - 2 x P800 RAID controller
 - 2 x MSA70
 - 50 x 72 GB 15kRPM SAS disks



SQL Server on Integrity: Scale Up

1 NUMA Node Server (rx6600)

- 1 x NUMA node basic configuration

plus

- 2 x P600 (512MB cache)
- 16 x 72 GB 15kRPM SAS disks

SQL Server on Integrity: Scale Up

2 NUMA Node Server (rx7640)

- 2 x NUMA node basic configuration

SQL Server on Integrity: Scale Up

4 NUMA Node Server (rx8640)

- 4 x NUMA node basic configuration

plus

- 2 x single port 10 GE network card

SQL Server on Integrity: Scale Up

8/16 NUMA Node Server (HP Superdome)

- 8/16 x NUMA node basic configuration

plus

- 2 x single port 10 GE network card

SQL Server on Integrity: Scale Up

HP Superdome as principal and mirror servers

8 NUMA Nodes

- 4 dual corer IA64 CPU's / 24MB cache
- 64 GB Memory
- 2 HBA / 2 x 4 Gb/sec
- 2 RAID Controller / 1 GB/sec
- 4 x 1GB NIC

TOTAL

- 64 Cores / 768 MB cache
- 512 GB
- 16 HBA / 16 GB/sec
- 16 RAID Controller / 16 GB/sec
- 32 NIC / 8 GB/sec

Additional

NODE 1+3 (SQL Core Node)

- 1 x 10GE NIC

- 2 NIC / 2 GB/sec



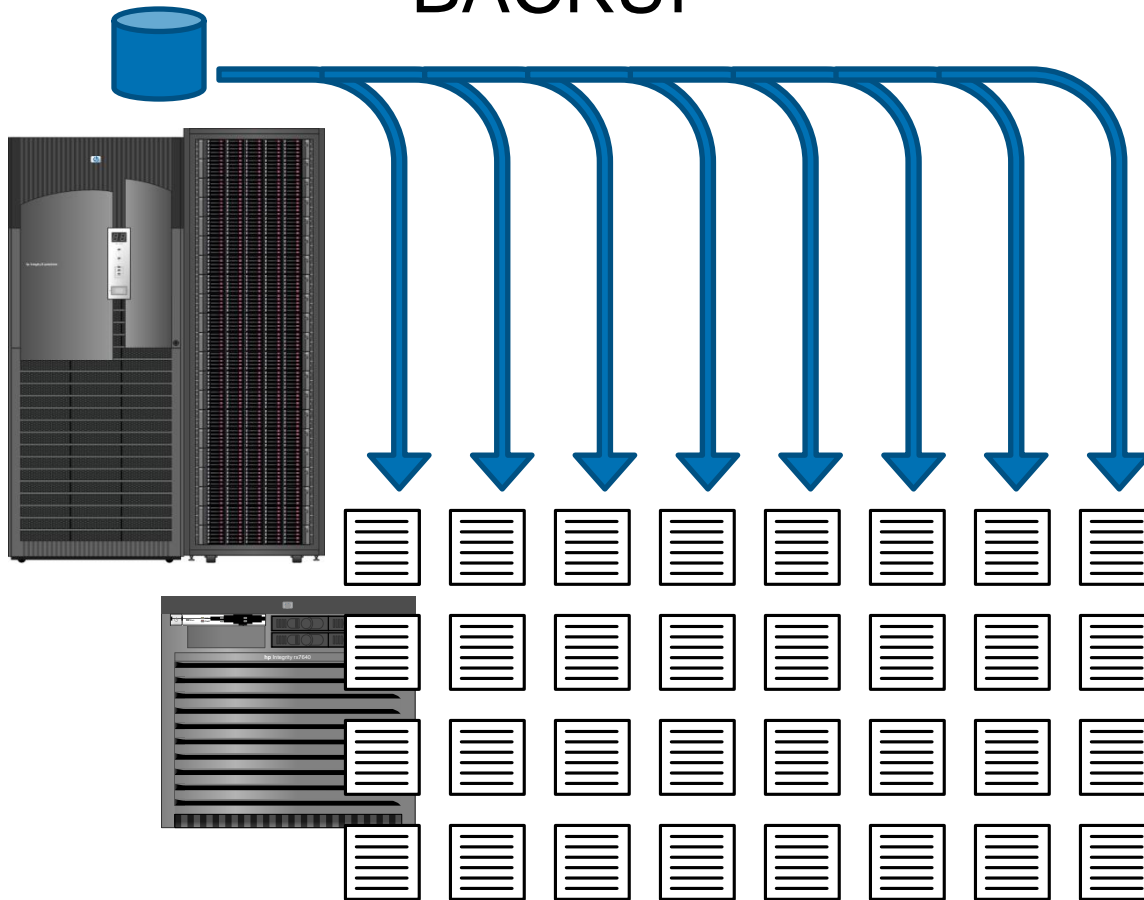
SQL Server on Integrity: Scale Up

SAN configuration

- 2 Fabrics (4Gb/s based)
- 16 LUNs
- 16 exclusive 4Gb/s ports on the SAN BOX
each LUN mapped via 8 paths to SAN BOX
(4 required for performance)
- each LUN (512 GB) is build from 64 exclusive spindles (146GB 15kRPM) with short stroking
- 256 GB cache on SAN BOX

SQL Server on Integrity: Scale Up

BACKUP



- Use eight parallel one GB/s sec network interface cards (one physical network, eight subnets)

- Use 32 parallel backup files each on a separate set of spindles with aligned partitions

- Transfer four files per network interface card

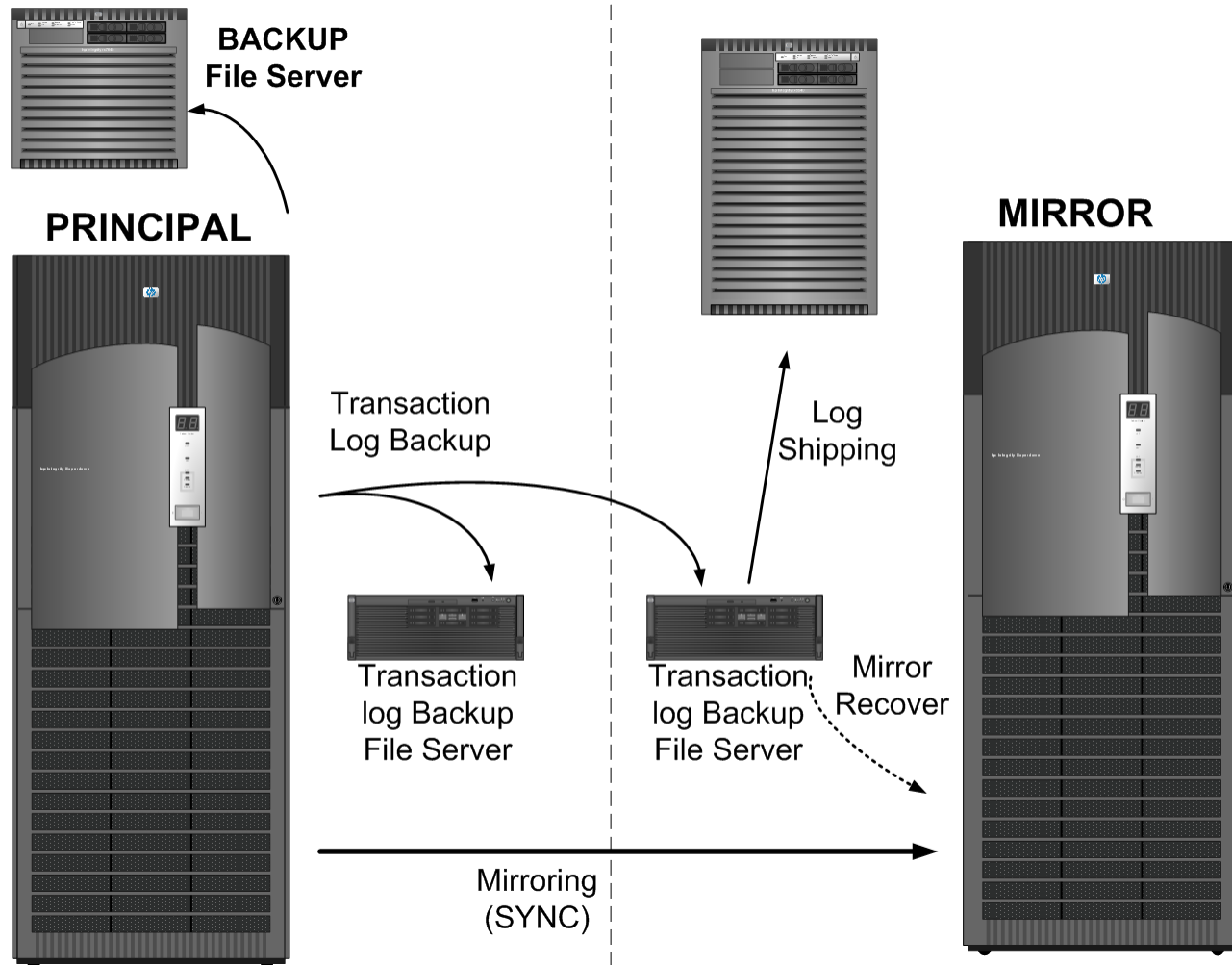
SQL Server on Integrity: Maintenance

- Index defrag and index rebuilds: NONE
- Rollouts one per day
- Planned downtimes two per year
each lasting about one hour

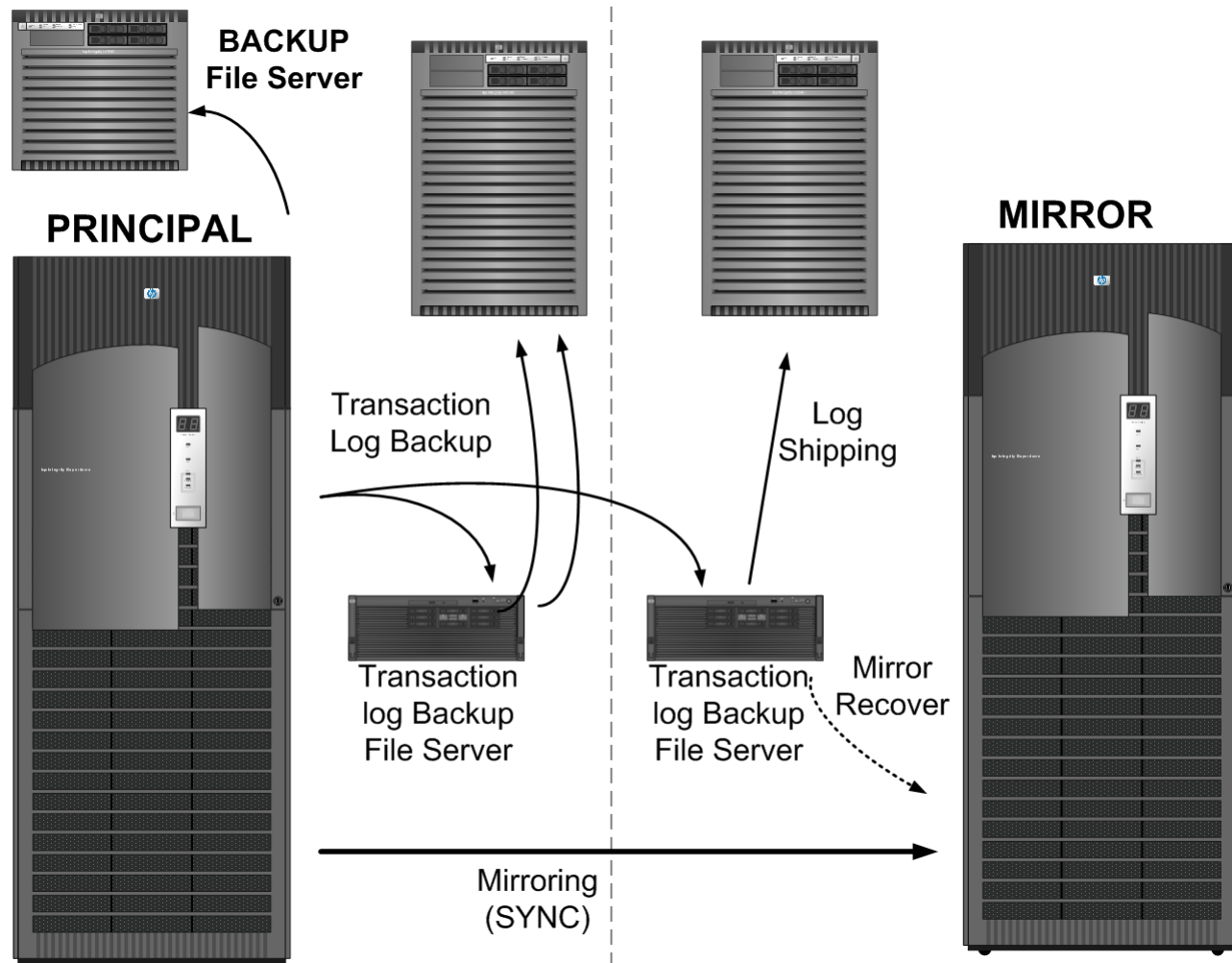
SQL Server on Integrity: Reporting & BI



SQL Server on Integrity: Reporting & BI



SQL Server on Integrity: Reporting & BI



SQL Server on Integrity: Questions

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