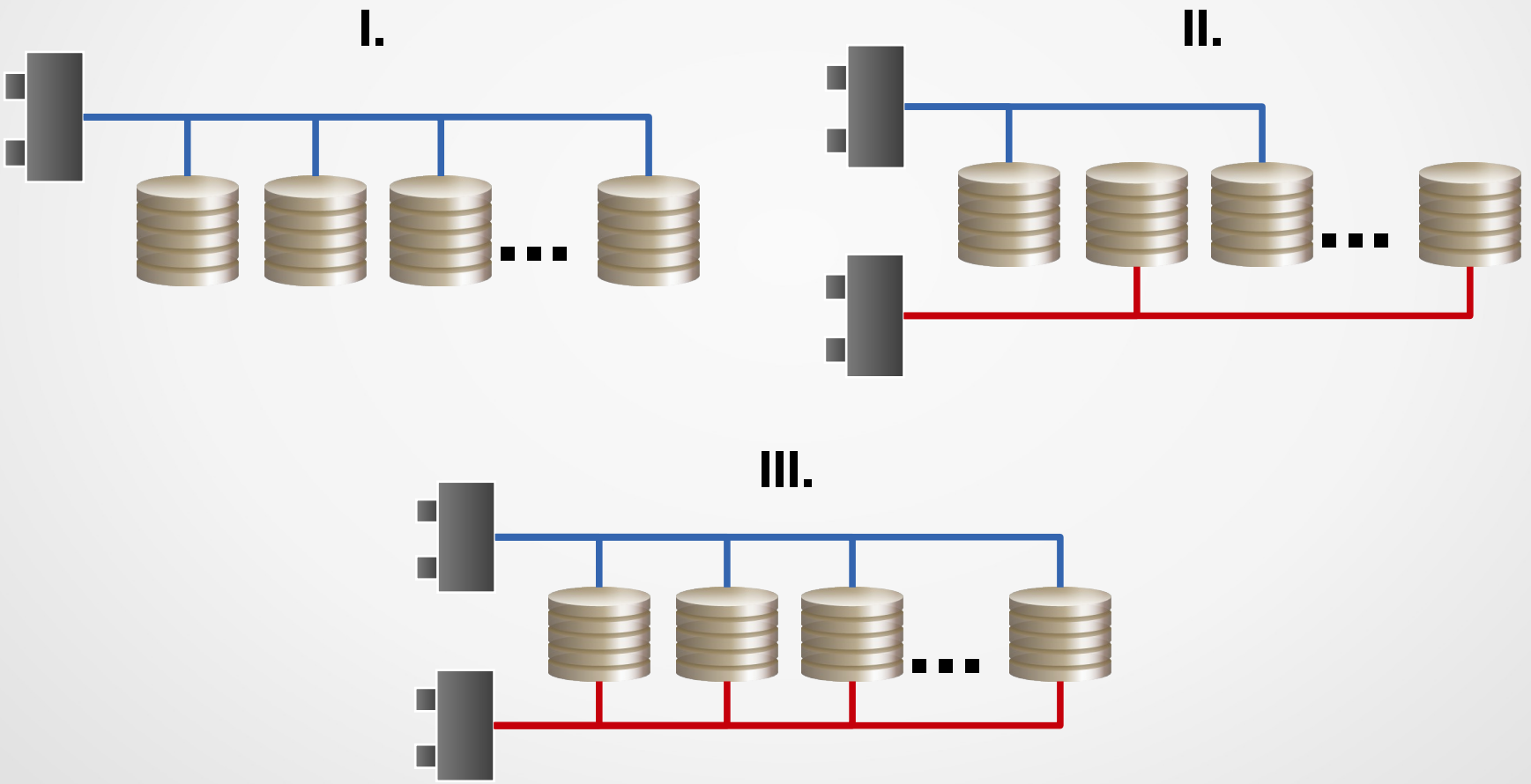
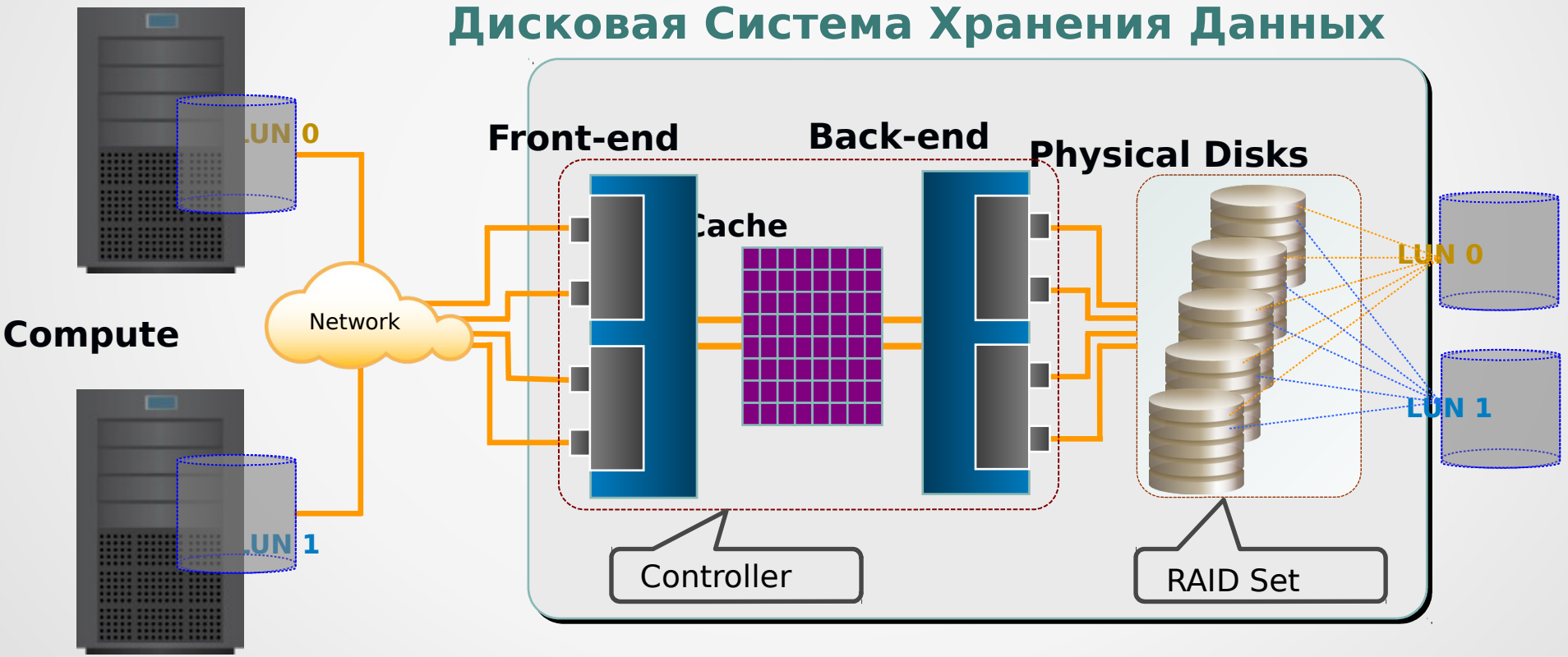
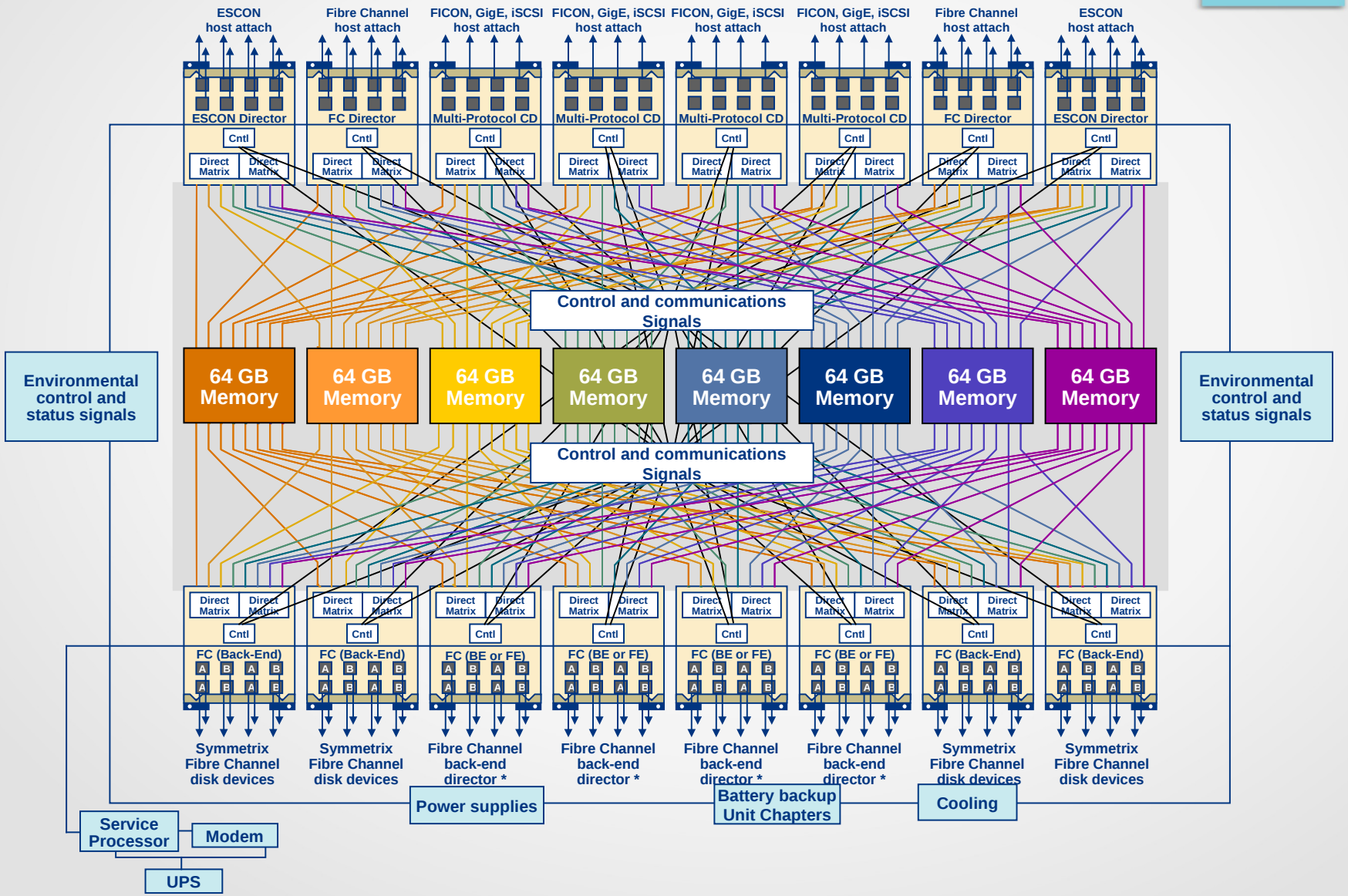
Дисковая полка

JBOD (от англ. Just a bunch of disks)

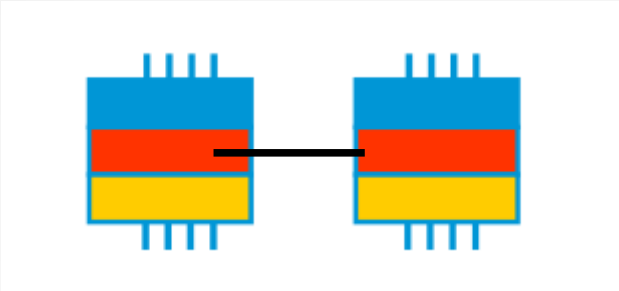


Дисковая Система Хранения Данных

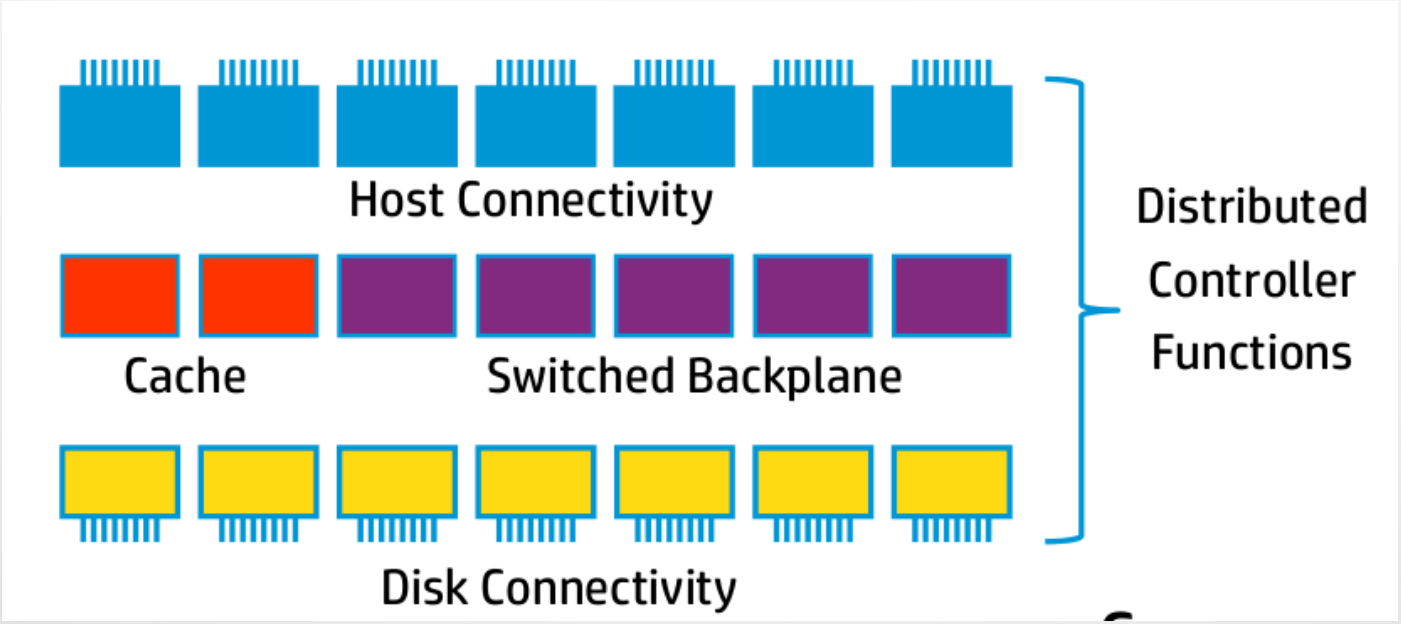



ESCON host attach
Fibre Channel host attach
FICON, GigE, iSCSI host attach
FICON, GigE, iSCSI host attach
FICON, GigE, iSCSI host attach
FICON, GigE, iSCSI host attach
Fibre Channel host attach
ESCON host attach
ESCON Director
FC Director
Multi-Protocol CD
Multi-Protocol CD
Multi-Protocol CD
Multi-Protocol CD
FC Director
ESCON Director
Cntl
Direct Matrix
Control and communications Signals
64 GB Memory
Environmental control and status signals
Environmental control and status signals
Control and communications Signals
FC (Back-End)
FC (BE or FE)
FC (BE or FE)
FC (BE or FE)
FC (BE or FE)
FC (Back-End)
FC (Back-End)
Symmetrix Fibre Channel disk devices
Fibre Channel back-end director *
Fibre Channel back-end director *
Fibre Channel back-end director *
Fibre Channel back-end director *
Symmetrix Fibre Channel disk devices
Symmetrix Fibre Channel disk devices
Power supplies
Battery backup Unit Chapters
Cooling
Service Processor
Modem
UPS

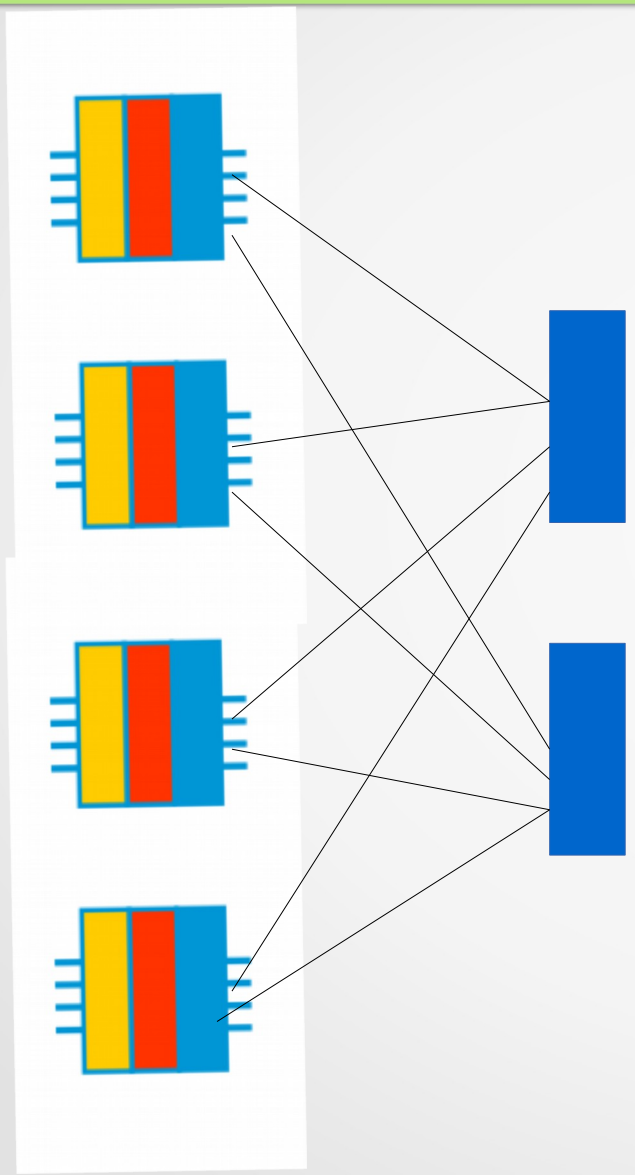
Модульная Архитектура

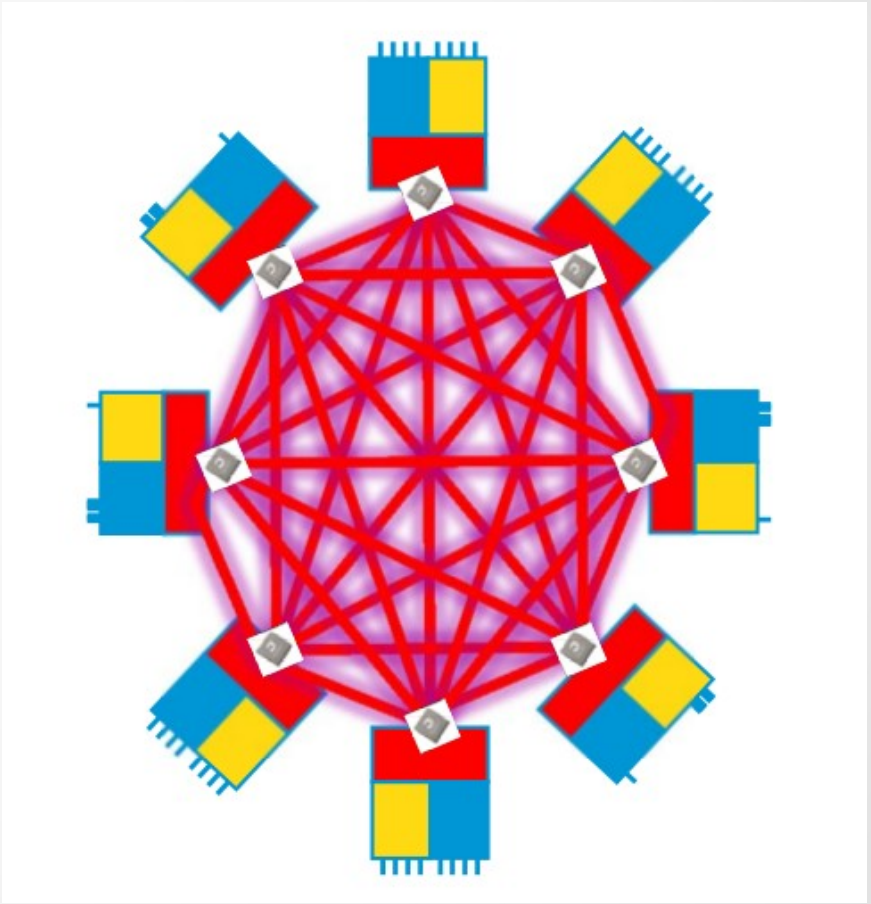


Монолитная Архитектура



Кластерная Архитектура



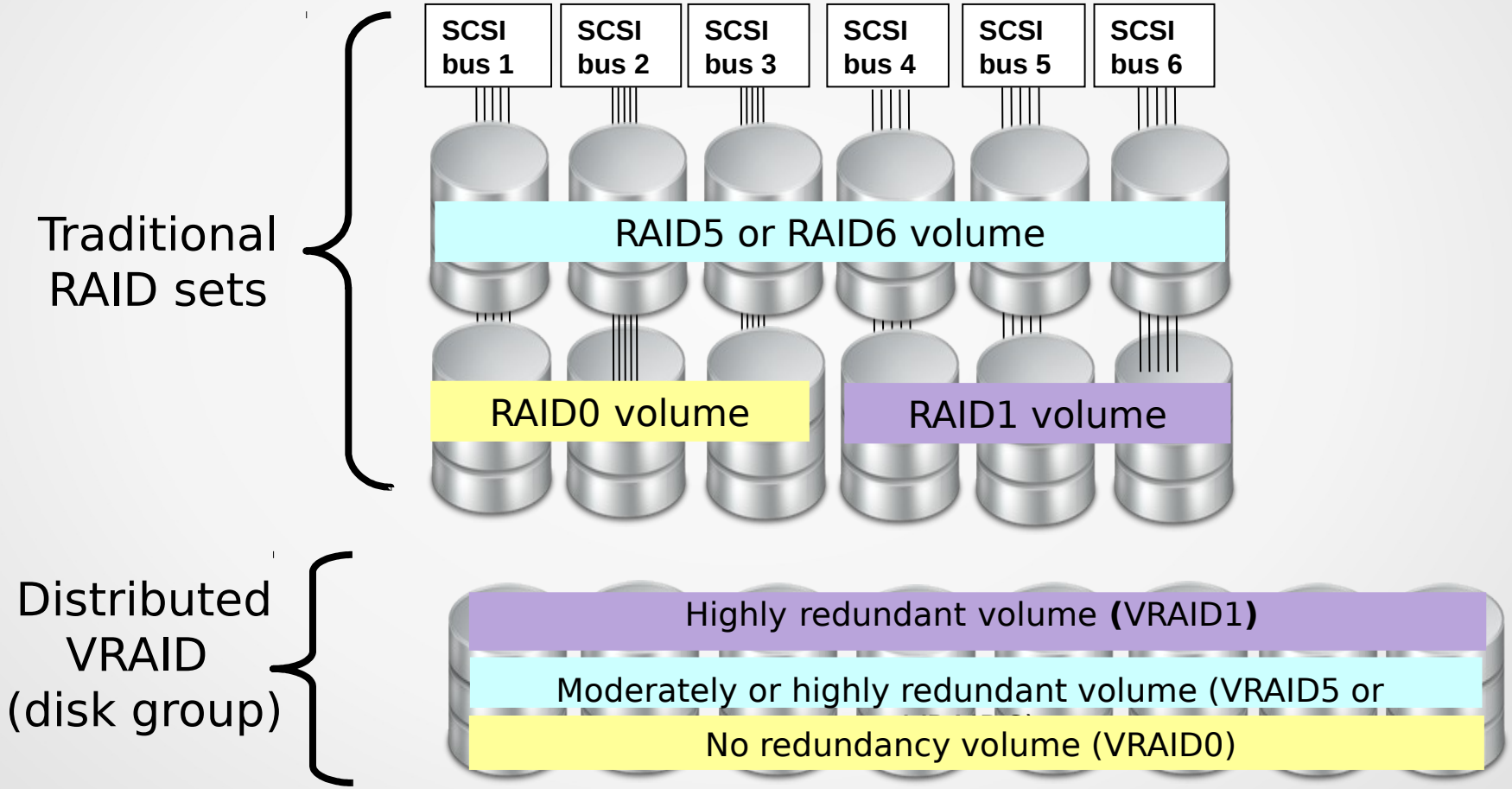


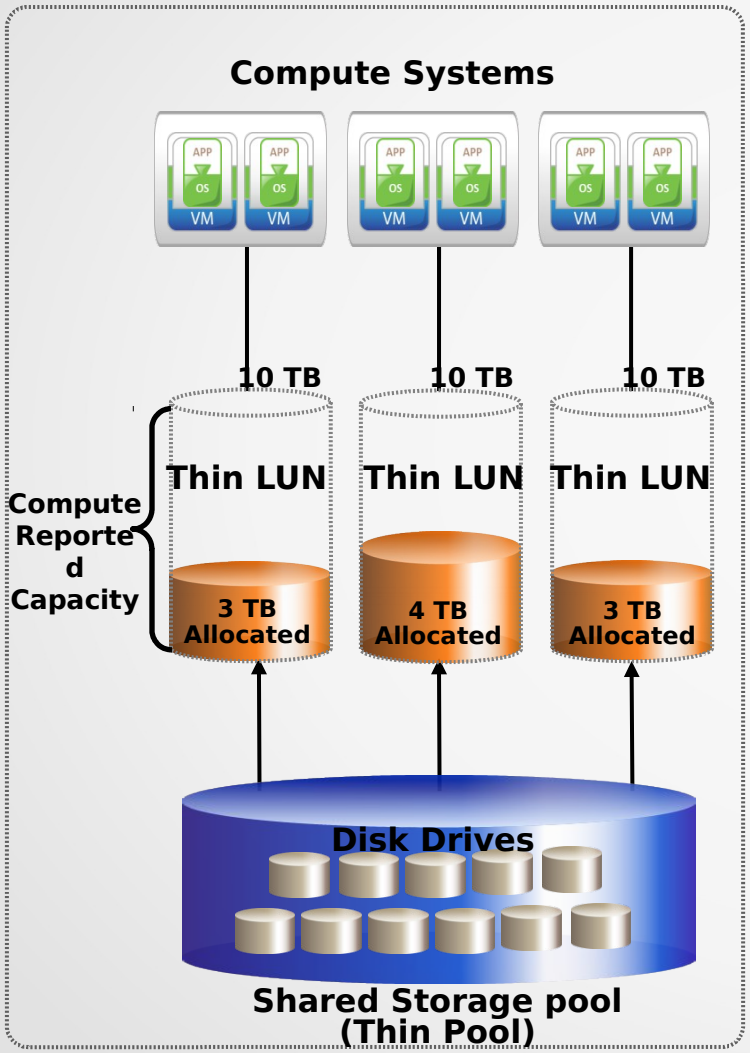
Виртуализация СХД

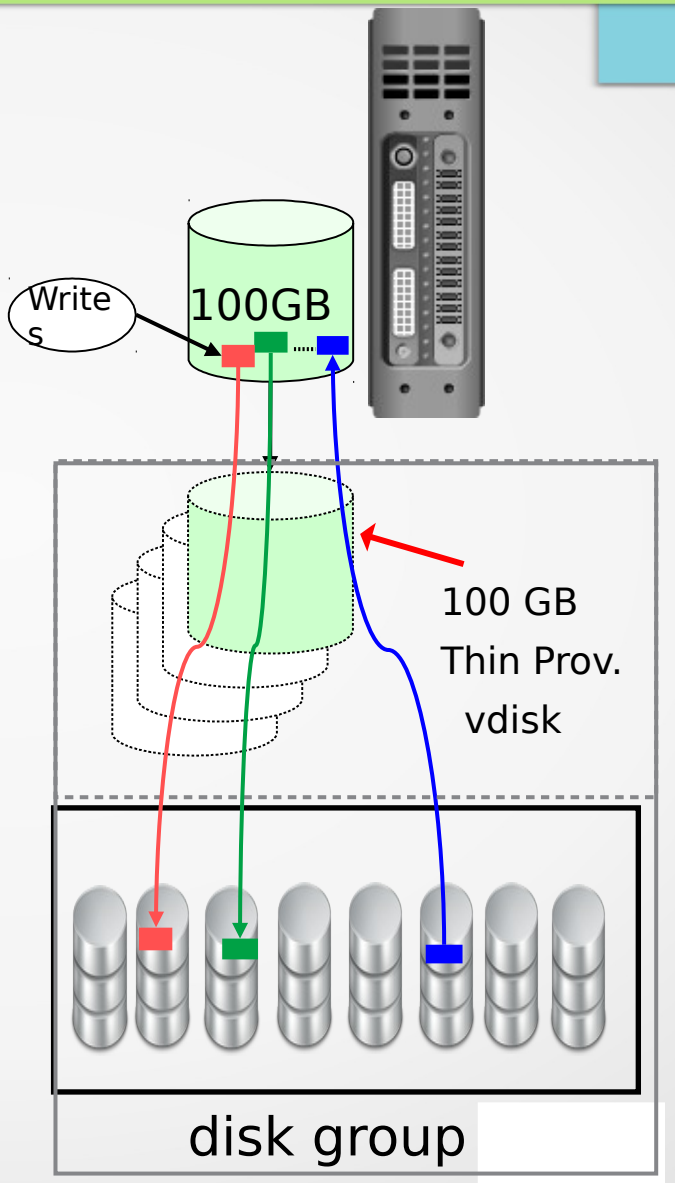
- Отображение логических хранилищ (дисков, томов) на физические, через слой виртуализации.
- Абстрагирование от аппаратных адресов и идентификаторов дисков
- Создание пула хранения на разных системах хранения данных
- Виртуальные тома создаются из ресурсов пула дискового пространства и ассоциируются с сервером

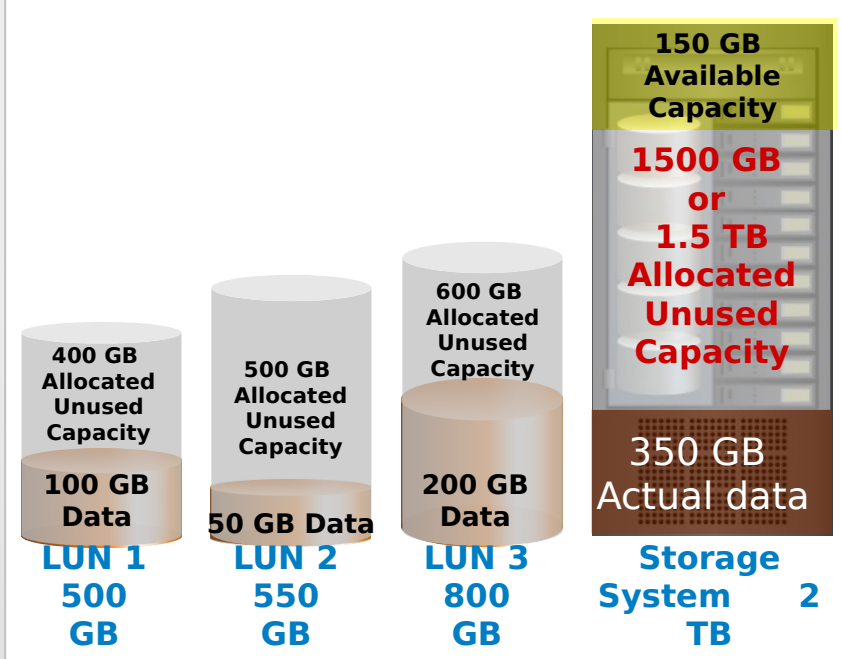
Виртуализация Систем Хранения позволяет

- Добавлять и удалять физические тома без простоя ввода вывода
- Эффективно утилизировать ресурсы системы хранения и уменьшить стоимость владения (TCO)
- Обеспечить миграцию между системами хранения без остановки ввода вывода приложений
- Поддерживать разнородные системы хранения разных производителей
- Упростить управления хранением данных

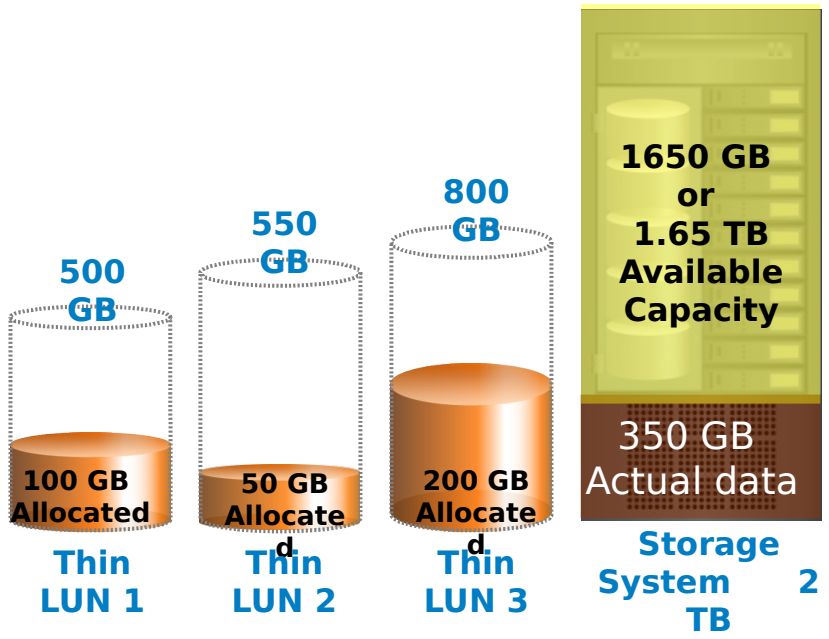

Traditional
RAID sets
SCSI
bus 1
SCSI
bus 2
SCSI
bus 3
SCSI
bus 4
SCSI
bus 5
SCSI
bus 6
RAID5 or RAID6 volume
RAID0 volume
RAID1 volume
Distributed
VRAID
(disk group)
Highly redundant volume (VRAID1)
Moderately or highly redundant volume (VRAID5 or
No redundancy volume (VRAID0)


Compute Systems
APP
OS
VM
10 TB
10 TB
10 TB
Thin LUN
Thin LUN
Thin LUN
Compute Reported Capacity
3 TB Allocated
4 TB Allocated
3 TB Allocated
Disk Drives
Shared Storage pool (Thin Pool)


Write s
100GB
100 GB Thin Prov. vdisk
disk group



Traditional Provisioning



Virtual Provisioning

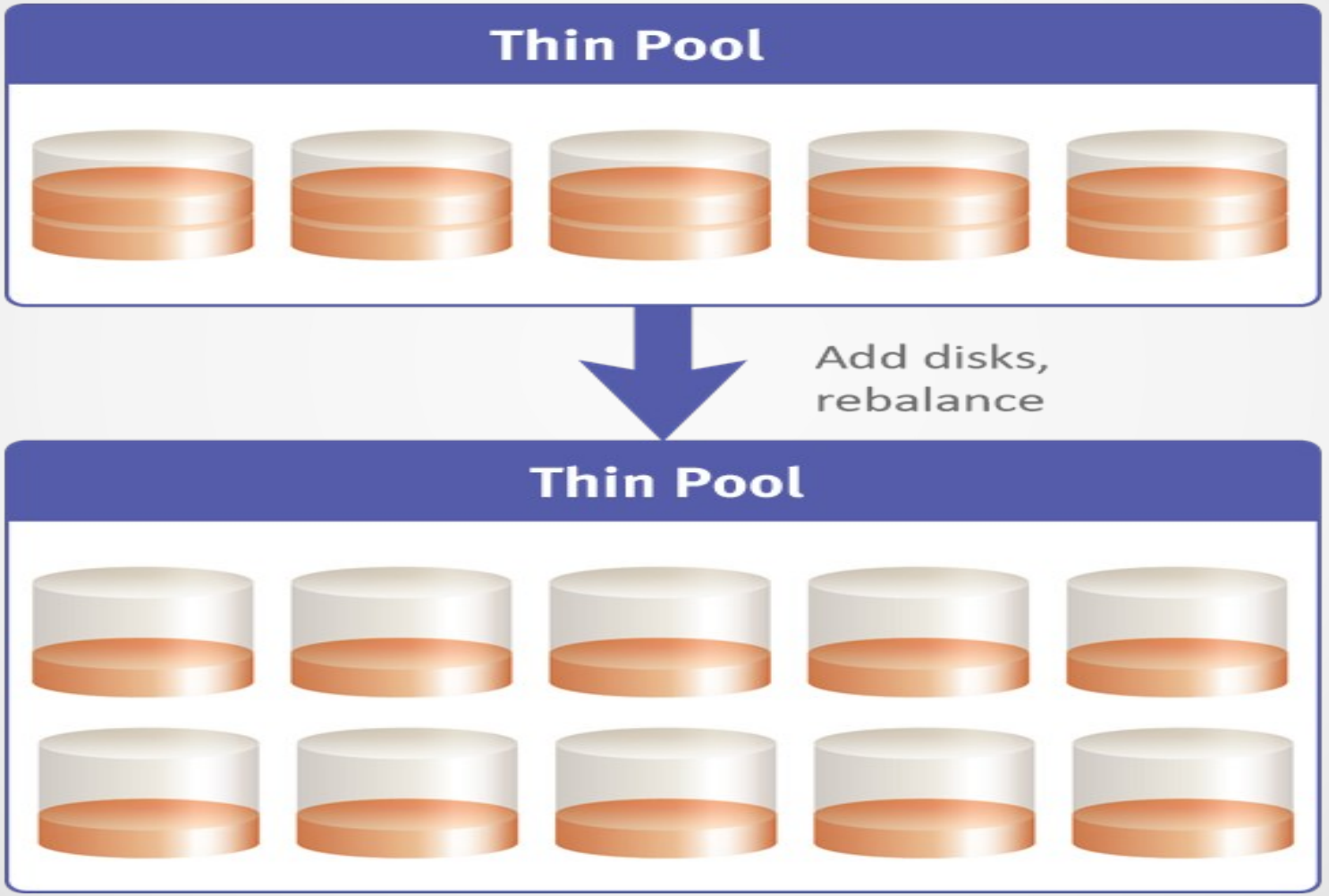
Тонкие тома в LVM

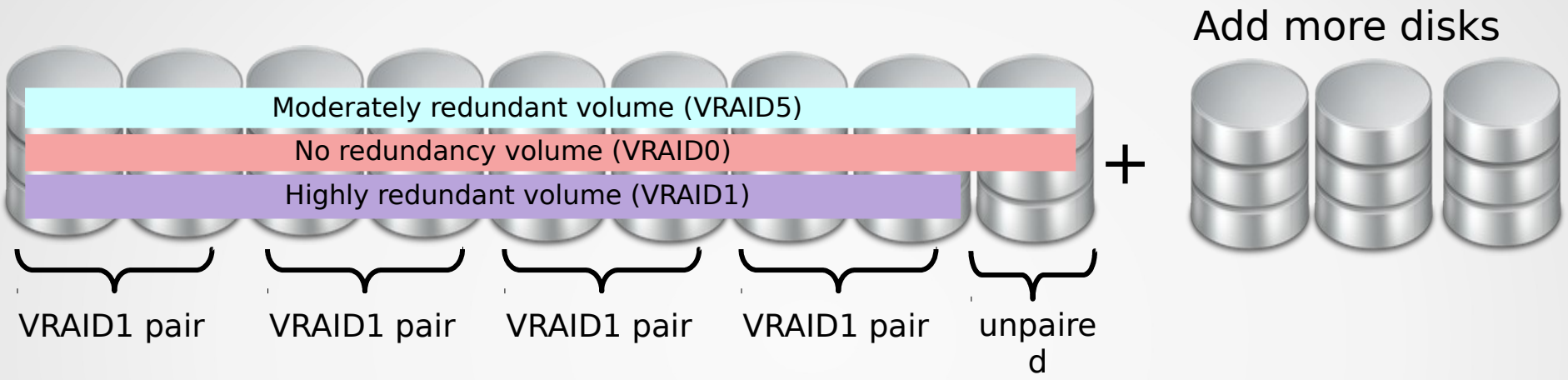
Создать пул для тонких томов:

```
# lvcreate -L 100M -T vg001/mythinpool
  Rounding up size to full physical extent 4.00 MiB
  Logical volume "mythinpool" created
# lvs
  LV           VG     Attr       LSize   Pool Origin Data%  Move Log
Copy% Convert
  my mythinpool vg001  twi-a-tz 100.00m                0.00
```

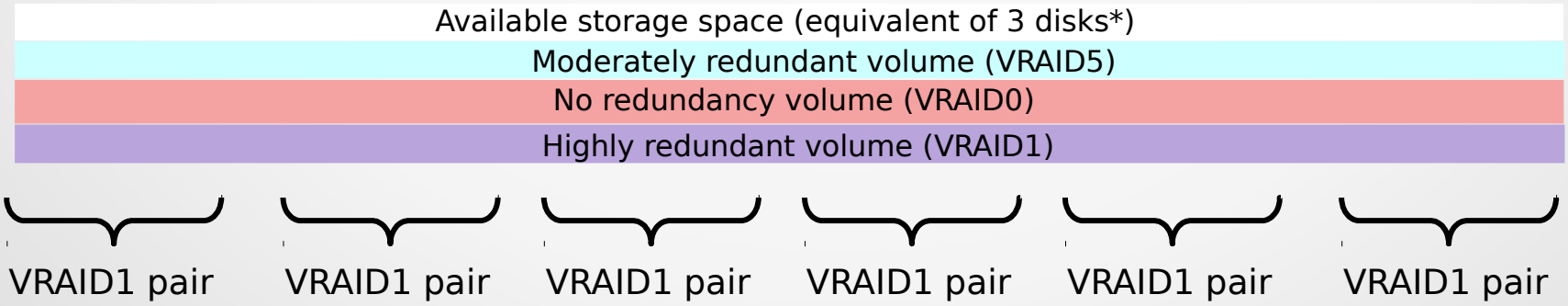
Создать тонкий том в пуле:

```
# lvcreate -V 1G -T vg001/mythinpool -n thinvolume
  Logical volume "thinvolume" created
# lvs
  LV          VG       Attr       LSize   Pool       Origin Data%  Move
Log Copy%  Convert
  mythinpool  vg001    twi-a-tz 100.00m                    0.00
  thinvolume  vg001    Vwi-a-tz   1.00g mythinpool          0.00
```

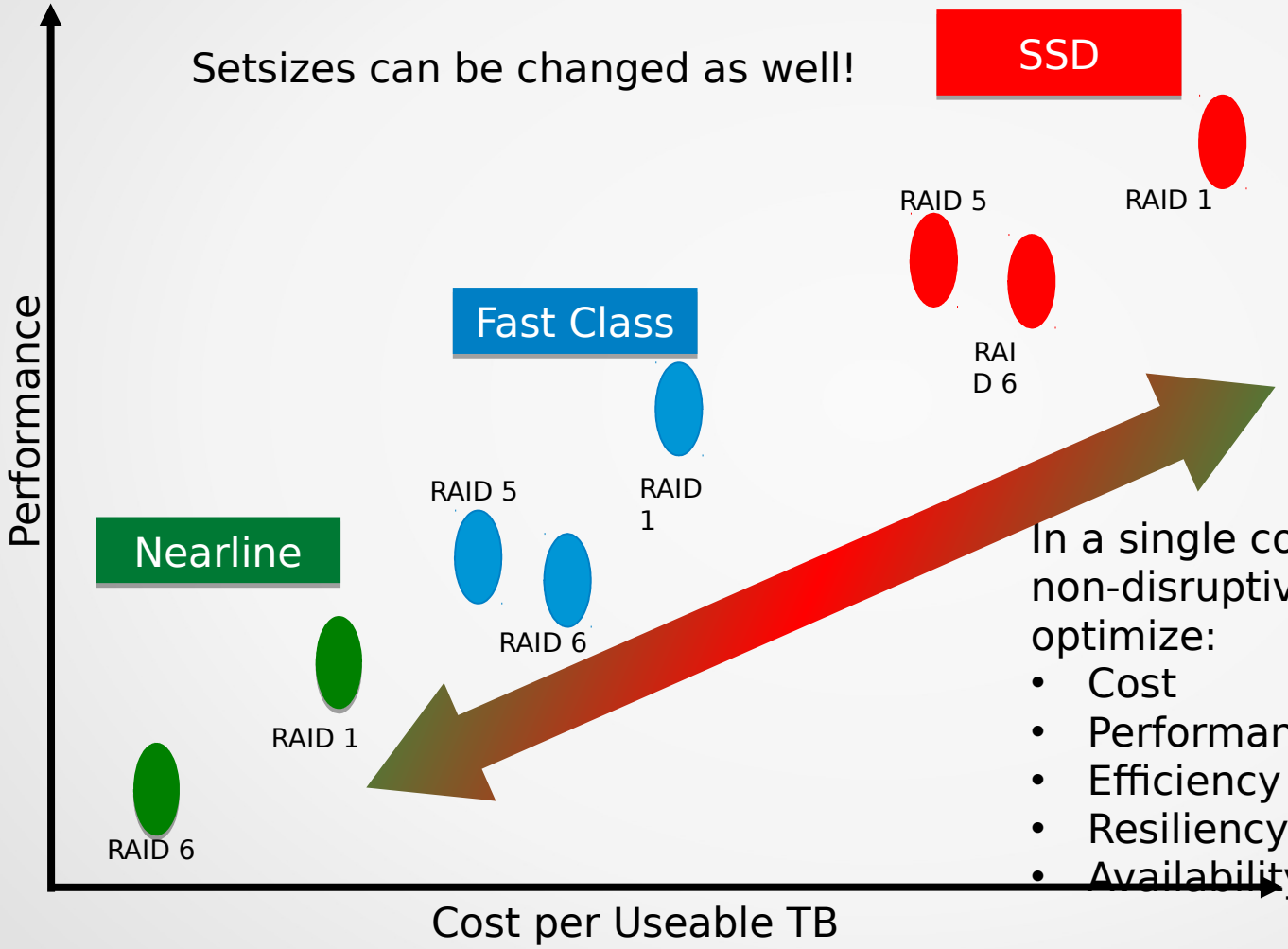

Thin Pool
Add disks,
rebalance
Thin Pool



Additional storage space available

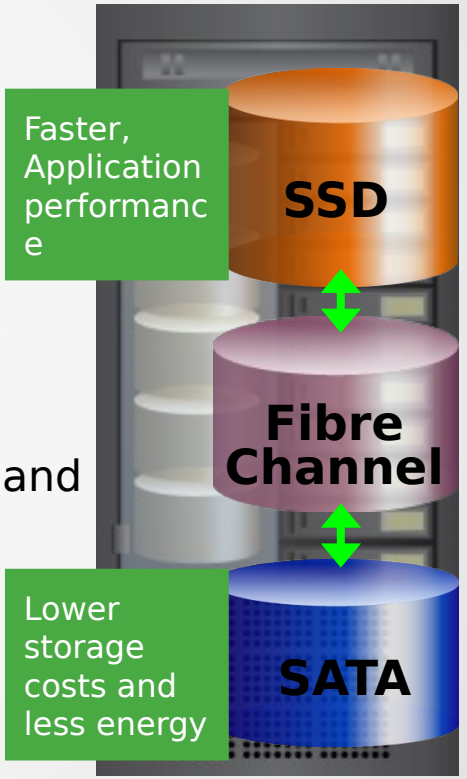


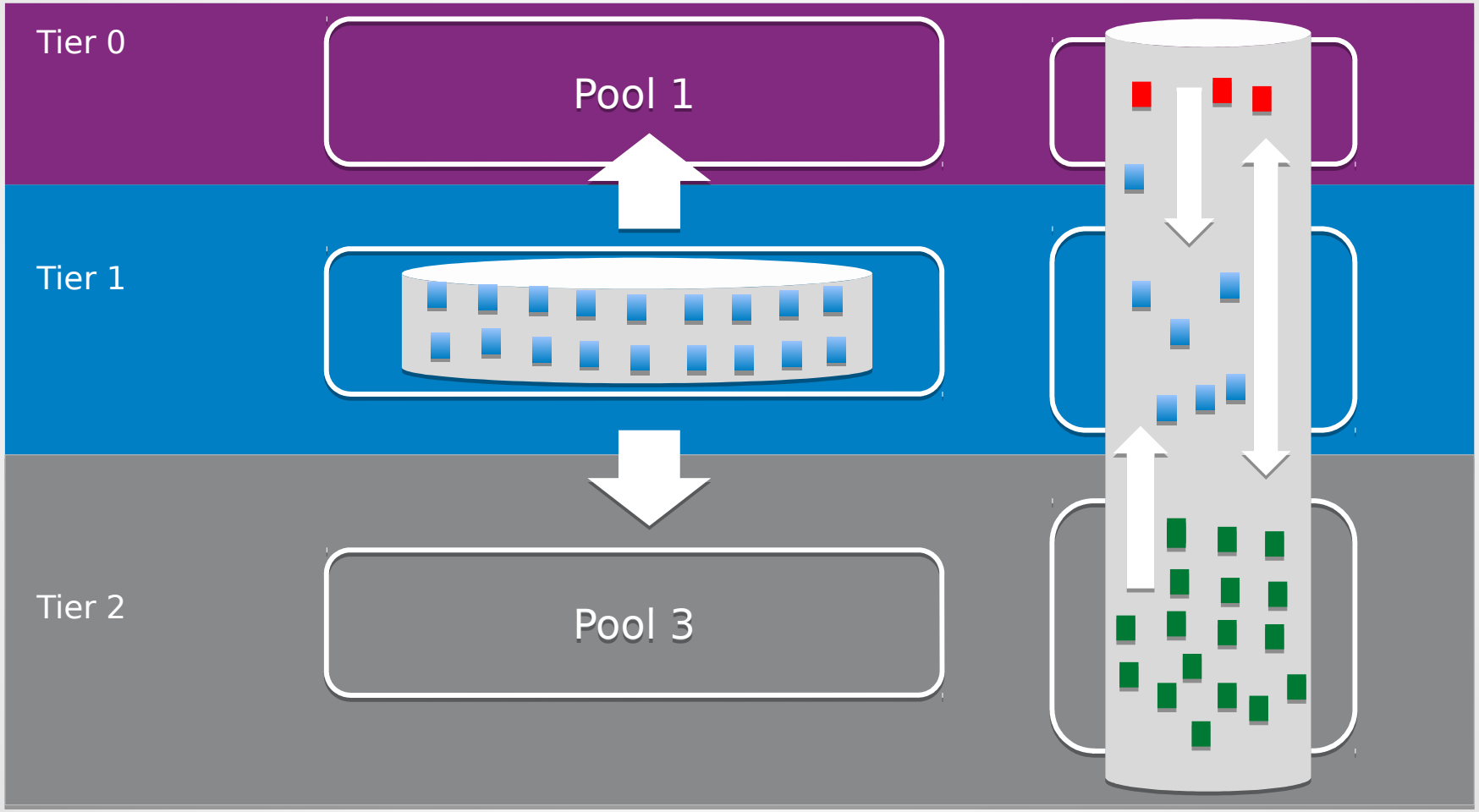
Setsizes can be changed as well!



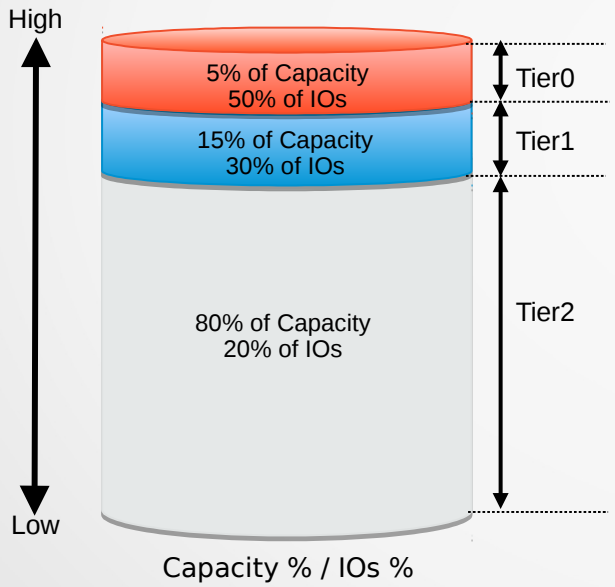
In a single command non-disruptively optimize:

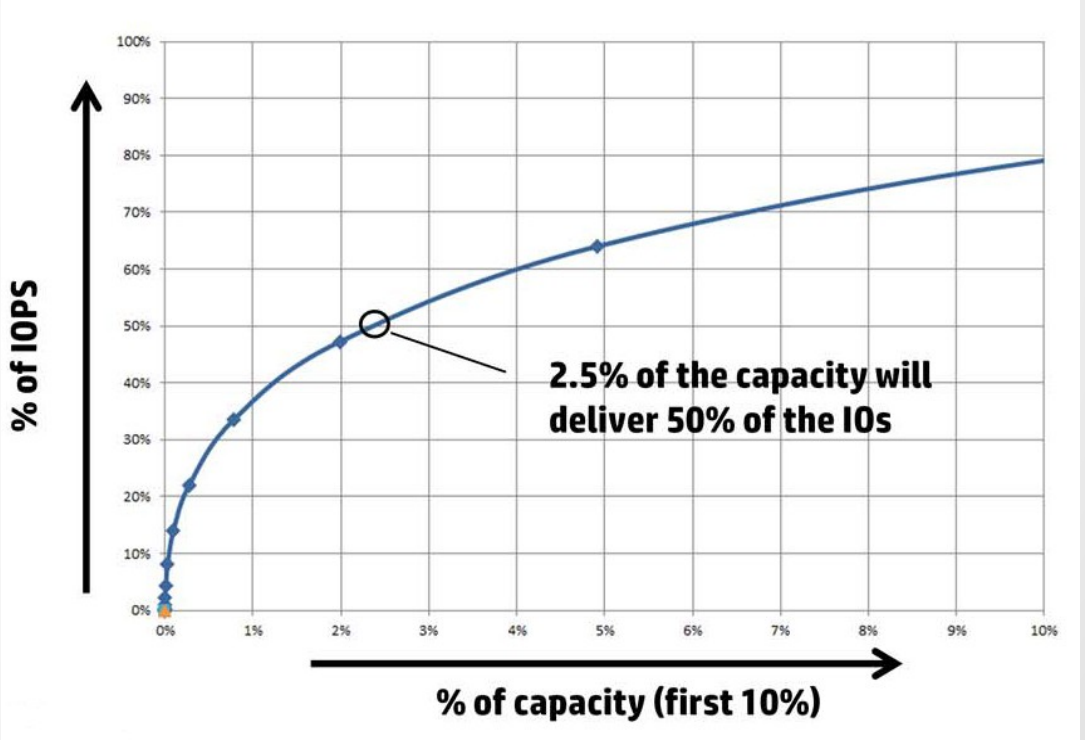
- Cost
- Performance
- Efficiency
- Resiliency
- Availability

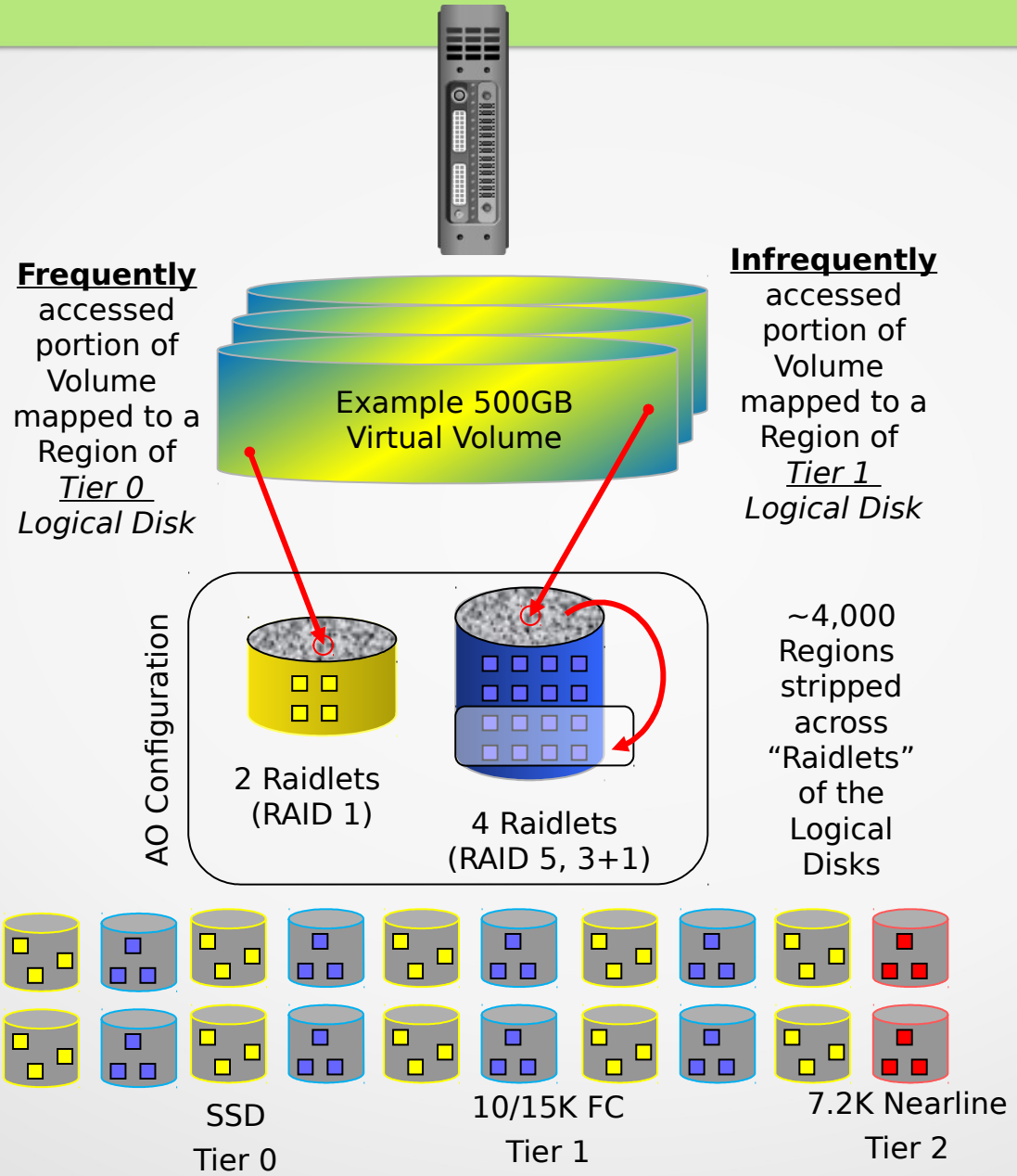



Tier 0
Pool 1
Tier 1
Tier 2
Pool 3

Workload Intensity





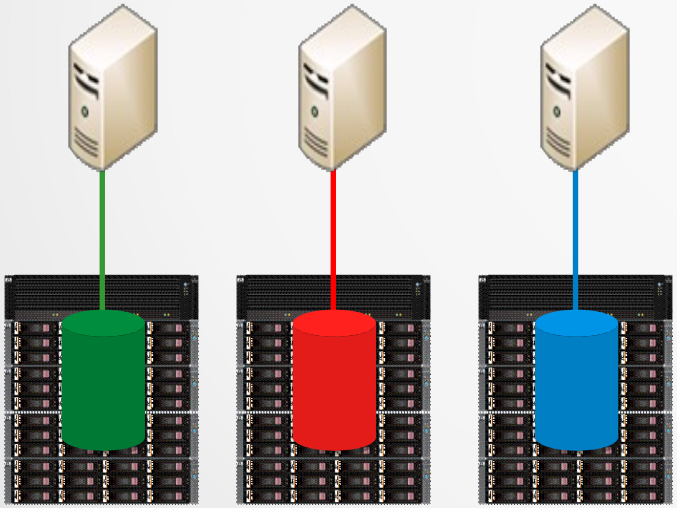

Frequently accessed portion of Volume mapped to a Region of *Tier 0 Logical Disk*
Example 500GB Virtual Volume
Infrequently accessed portion of Volume mapped to a Region of *Tier 1 Logical Disk*
AO Configuration
2 Raidlets (RAID 1)
4 Raidlets (RAID 5, 3+1)
~4,000 Regions stripped across "Raidlets" of the Logical Disks
SSD Tier 0
10/15K FC Tier 1
7.2K Nearline Tier 2

Multi-Tenancy with Traditional Storage

- Admin A
- App A
- Dept A
- Customer A

- Admin B
- App B
- Dept B
- Customer B

- Admin C
- App C
- Dept C
- Customer C



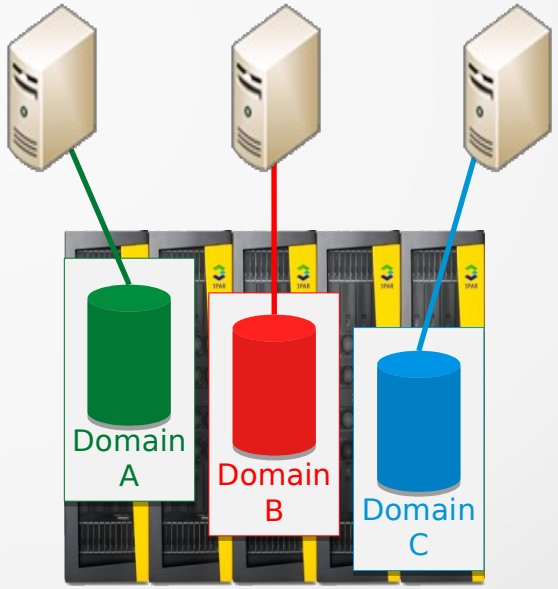
Separate, Physically-Secured Storage

Multi-Tenancy with HP 3PAR Domains

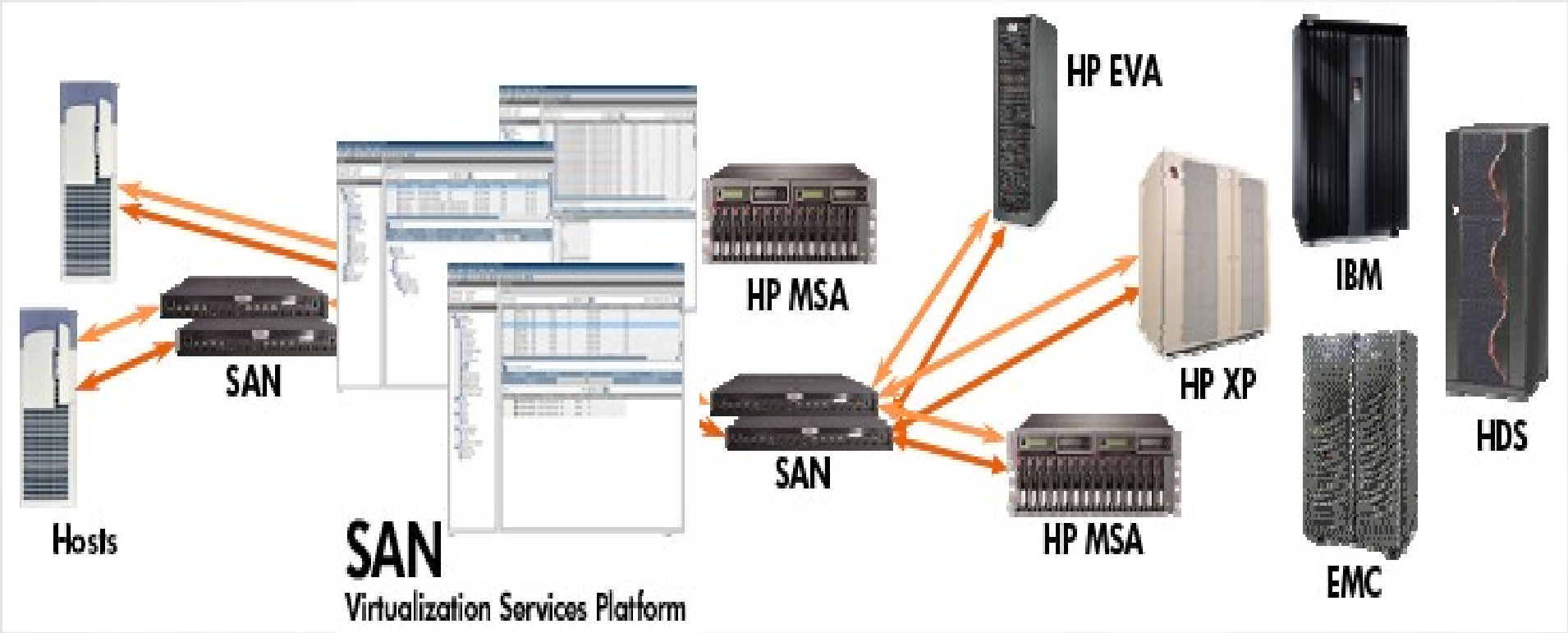
- Admin A
- App A
- Dept A
- Customer A

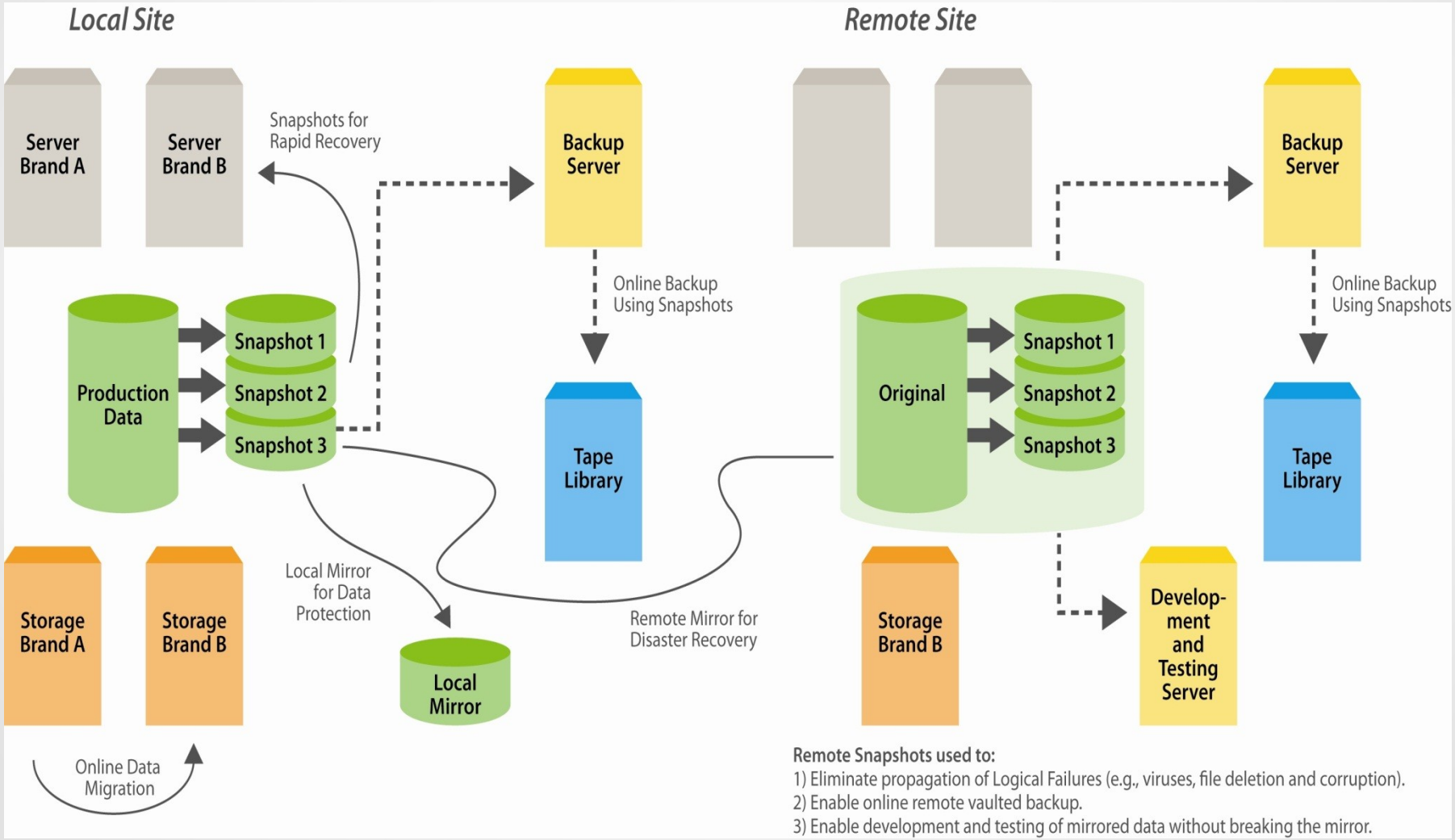
- Admin B
- App B
- Dept B
- Customer B

- Admin C
- App C
- Dept C
- Customer C

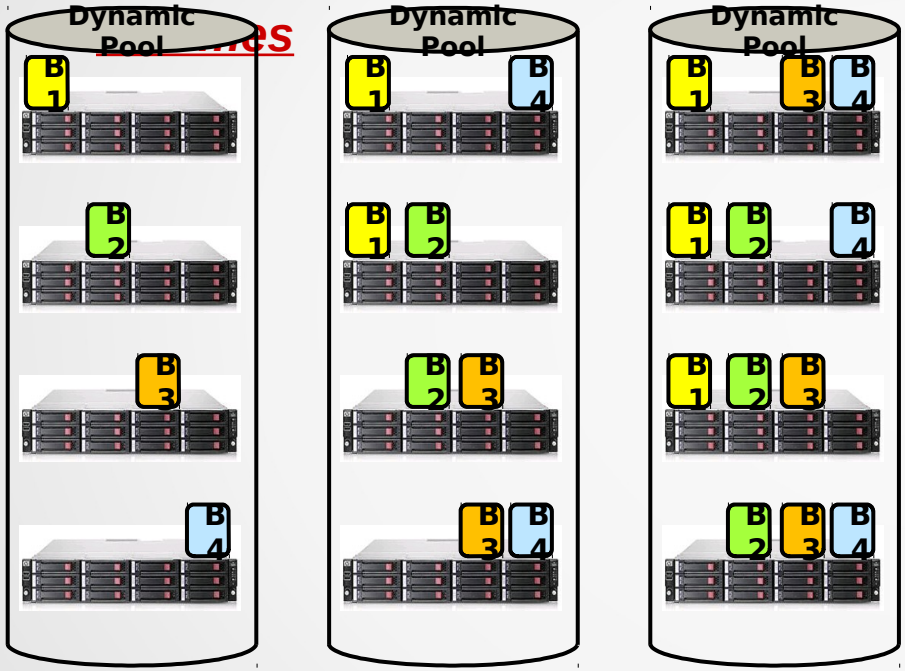


Shared, Logically-secured HP 3PAR Storage


HP EVA
IBM
HDS
HP MSA
HP XP
SAN
Hosts
SAN
HP MSA
EMC
SAN
Virtualization Services Platform


Local Site
Remote Site
Server Brand A
Server Brand B
Snapshots for Rapid Recovery
Backup Server
Online Backup Using Snapshots
Production Data
Snapshot 1
Snapshot 2
Snapshot 3
Tape Library
Original
Snapshot 1
Snapshot 2
Snapshot 3
Backup Server
Online Backup Using Snapshots
Tape Library
Storage Brand A
Storage Brand B
Local Mirror for Data Protection
Local Mirror
Remote Mirror for Disaster Recovery
Storage Brand B
Develop-ment and Testing Server
Online Data Migration
Remote Snapshots used to:
1) Eliminate propagation of Logical Failures (e.g., viruses, file deletion and corruption).
2) Enable online remote vaulted backup.
3) Enable development and testing of mirrored data without breaking the mirror.

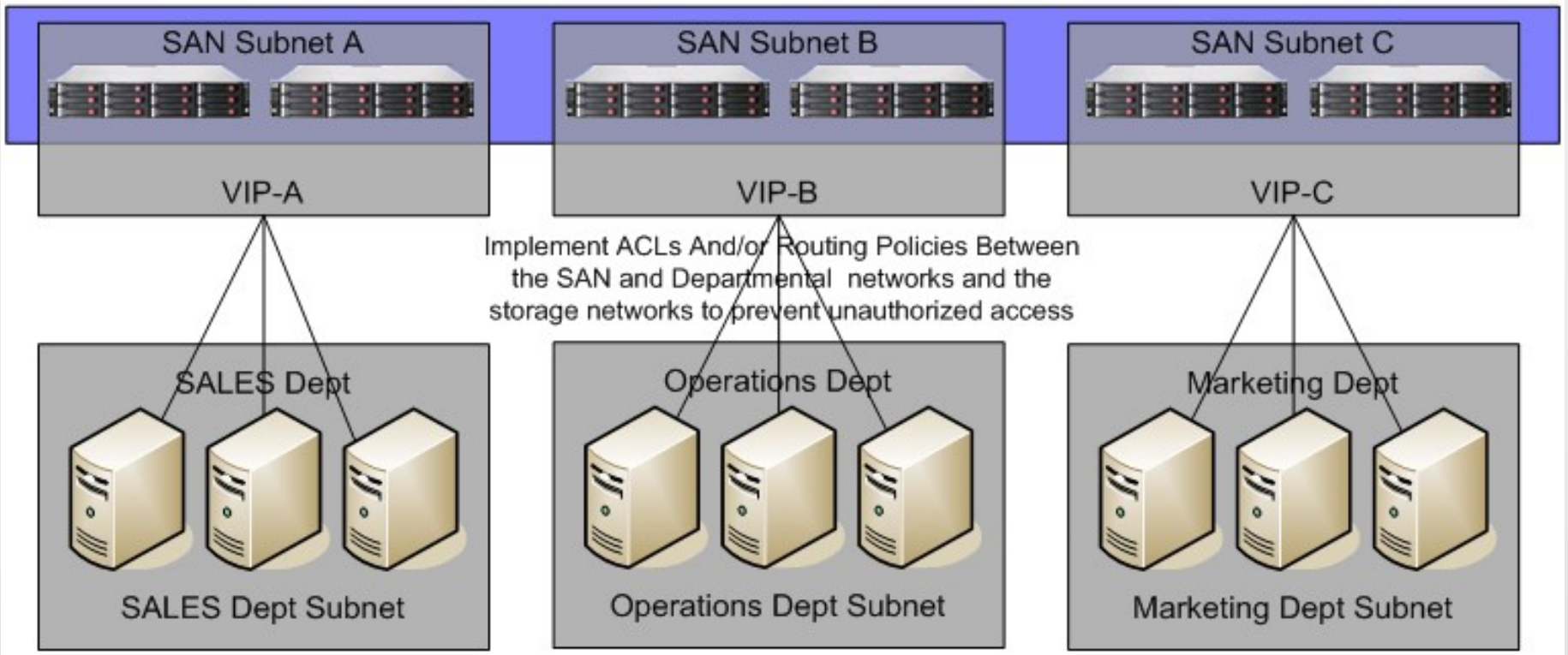
One Cluster… Three different Policies

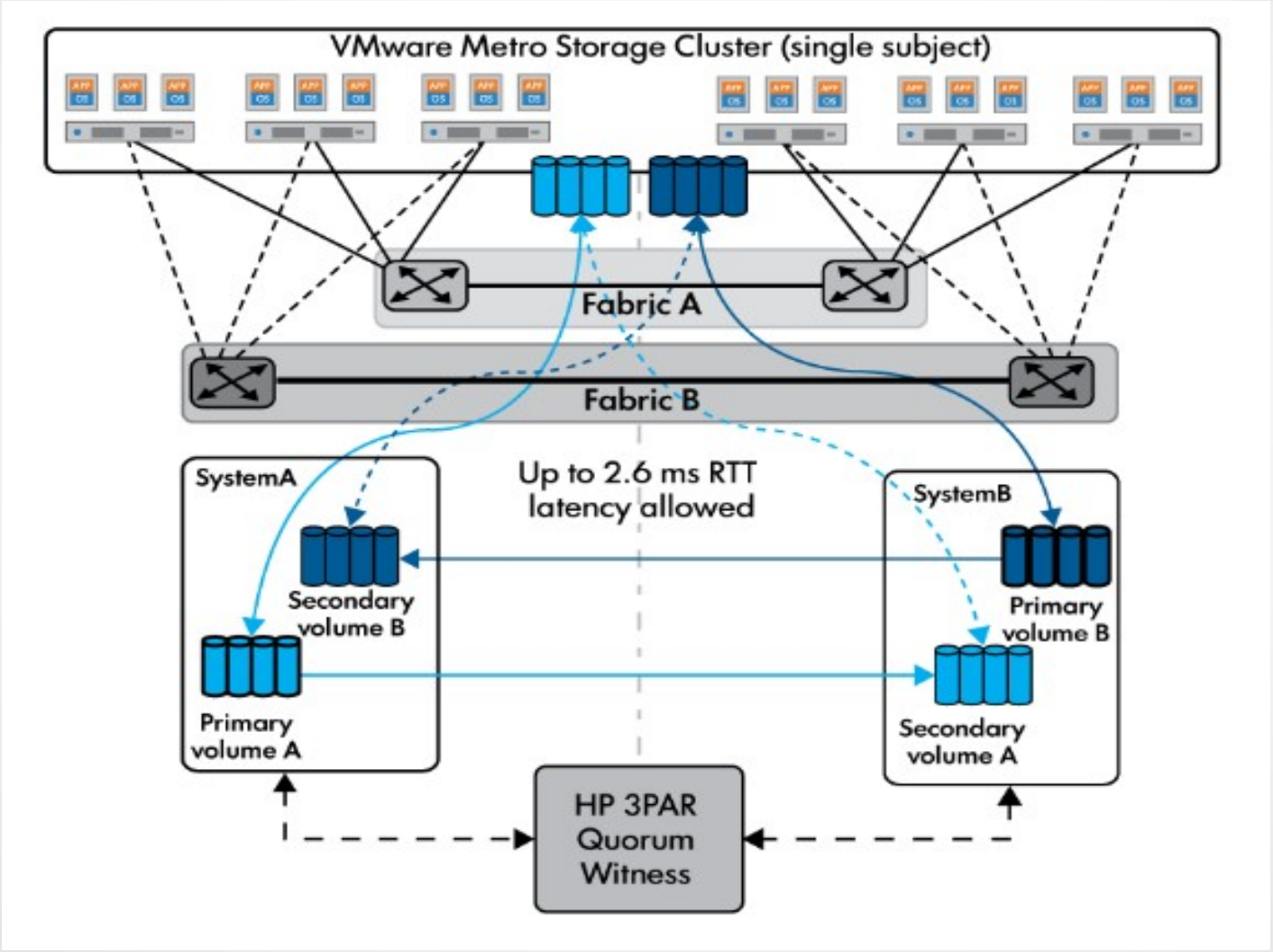


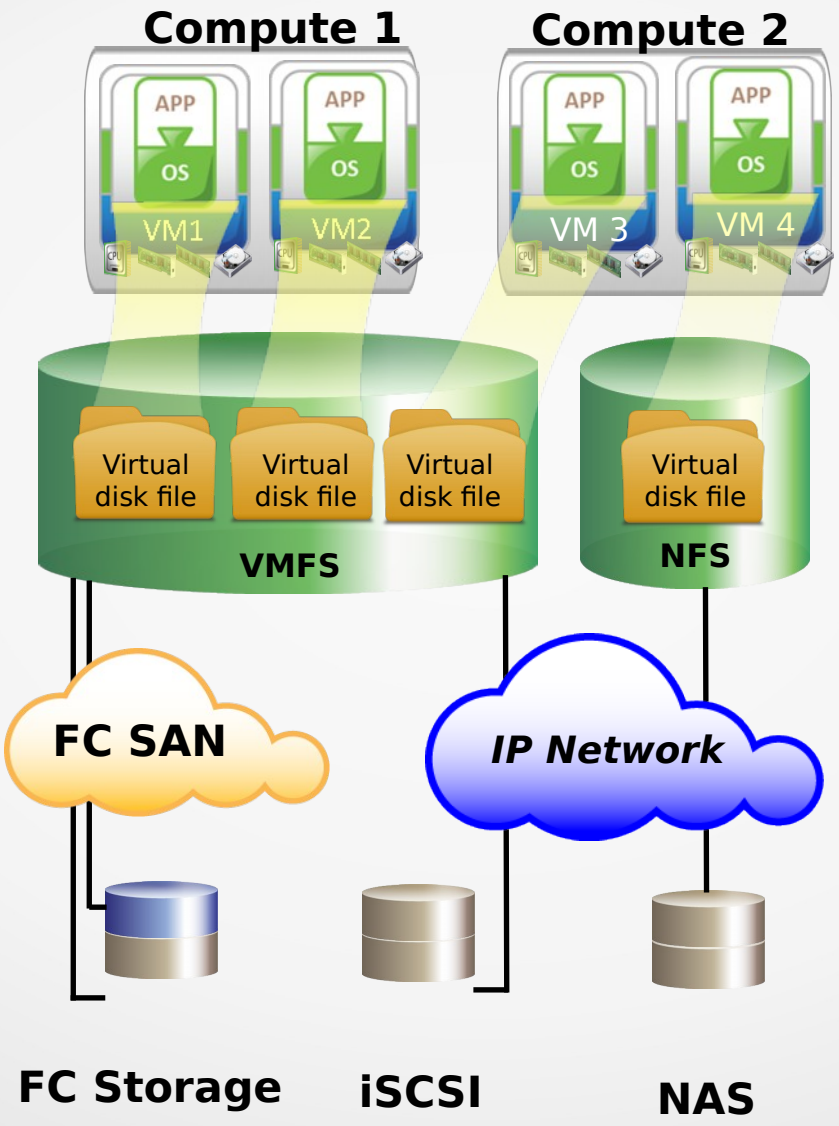
4 Blocks of Data
Network RAID-0
No Mirroring

4 Blocks of Data
Network RAID-10
2-way Mirroring

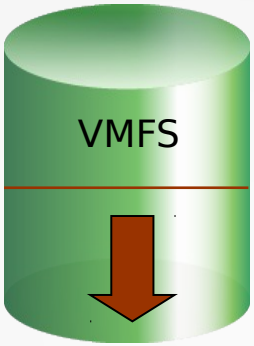
Storage Cluster



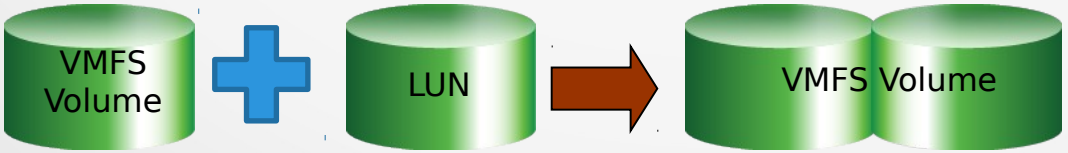

VMware Metro Storage Cluster (single subject)
Fabric A
Fabric B
SystemA
Up to 2.6 ms RTT
latency allowed
SystemB
Secondary
volume B
Primary
volume B
Primary
volume A
Secondary
volume A
HP 3PAR
Quorum
Witness

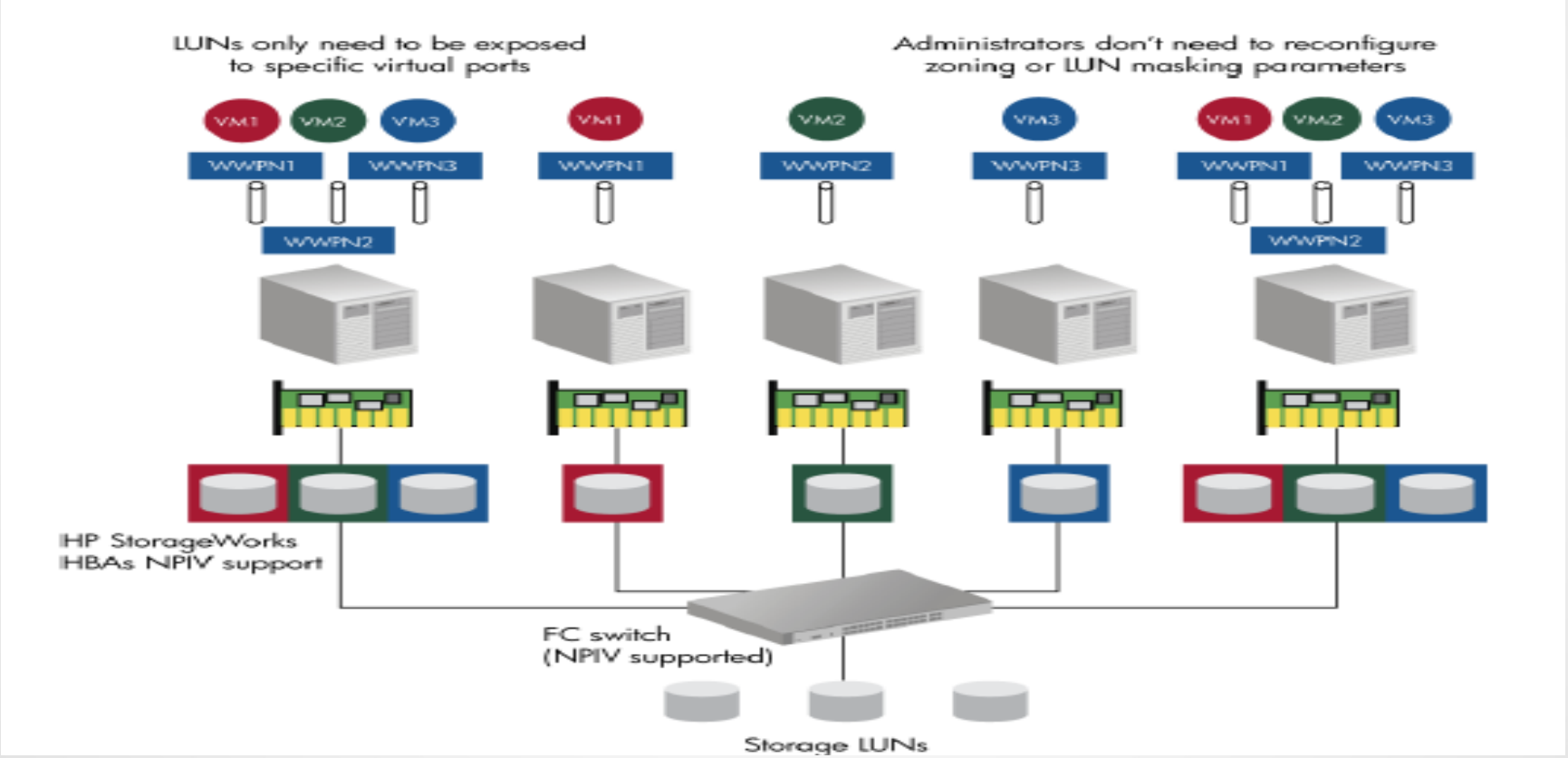

Compute 1
Compute 2
APP
OS
VM1
APP
OS
VM2
APP
OS
VM 3
APP
OS
VM 4
Virtual disk file
Virtual disk file
Virtual disk file
VMFS
Virtual disk file
NFS
FC SAN
IP Network
FC Storage
iSCSI
NAS

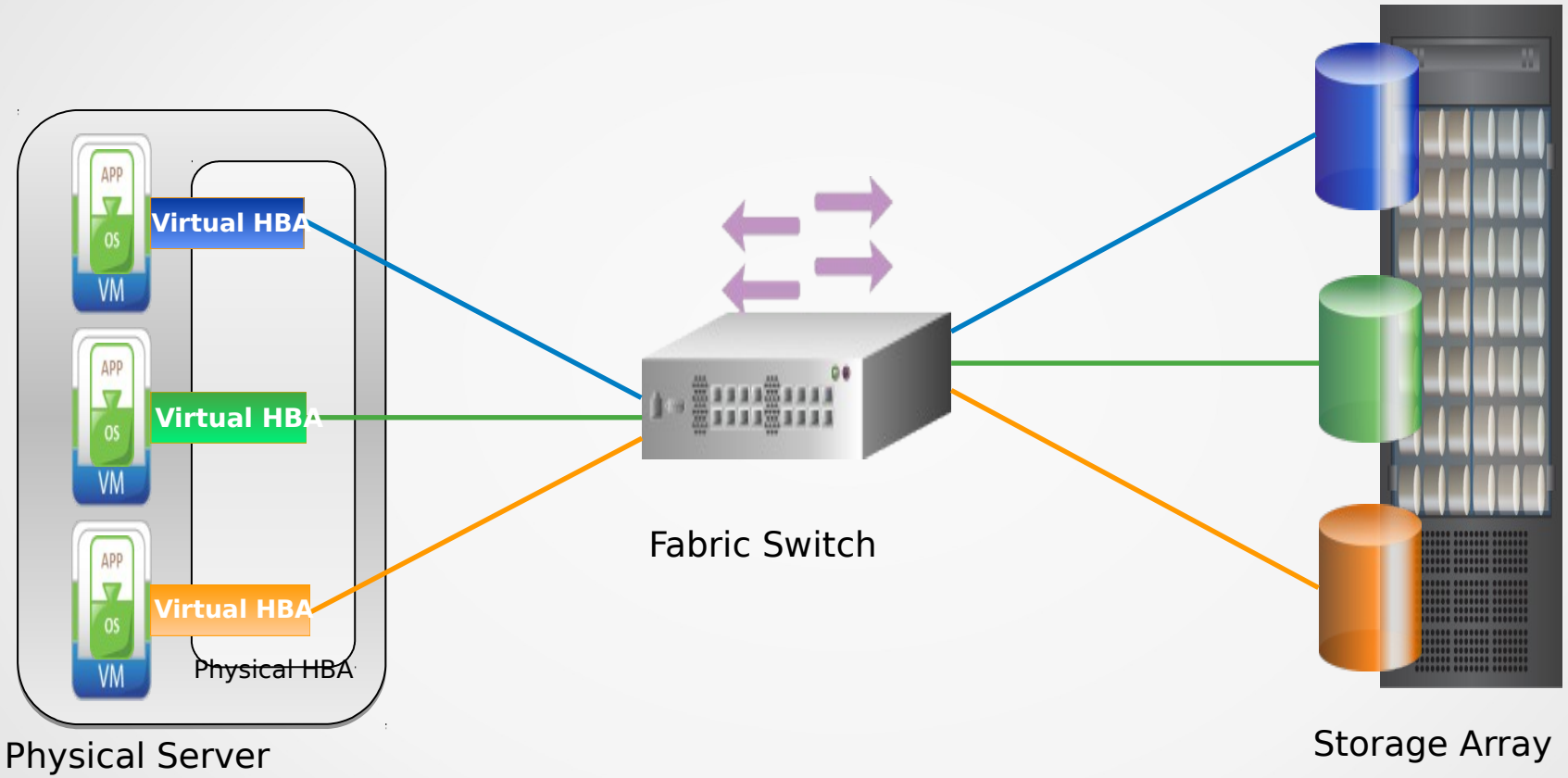
Expand VMFS on the existing volume



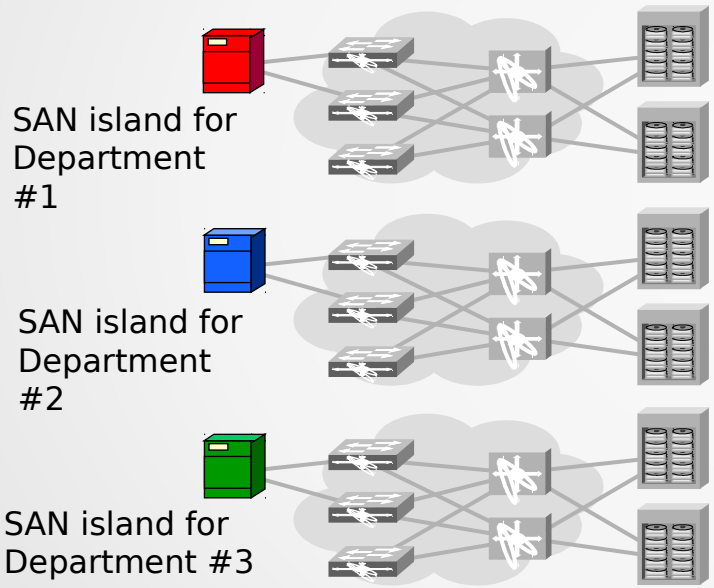
Add a LUN to the existing VMFS volume

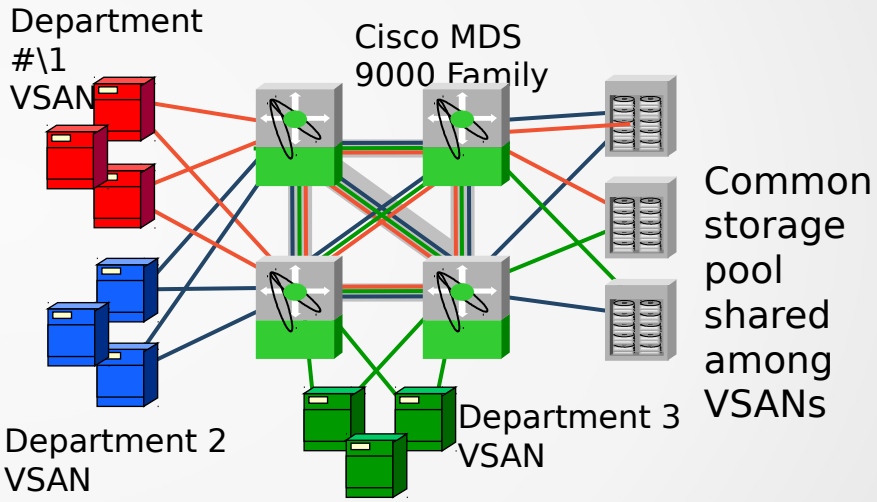



LUNs only need to be exposed
to specific virtual ports
Administrators don't need to reconfigure
zoning or LUN masking parameters
VM1
VM2
VM3
WWPN1
WWPN3
WWPN2
HP StorageWorks
HBAs NPIV support
FC switch
(NPIV supported)
Storage LUNs


APP
OS
VM
Virtual HBA
APP
OS
VM
Virtual HBA
APP
OS
VM
Virtual HBA
Physical HBA
Physical Server
Fabric Switch
Storage Array

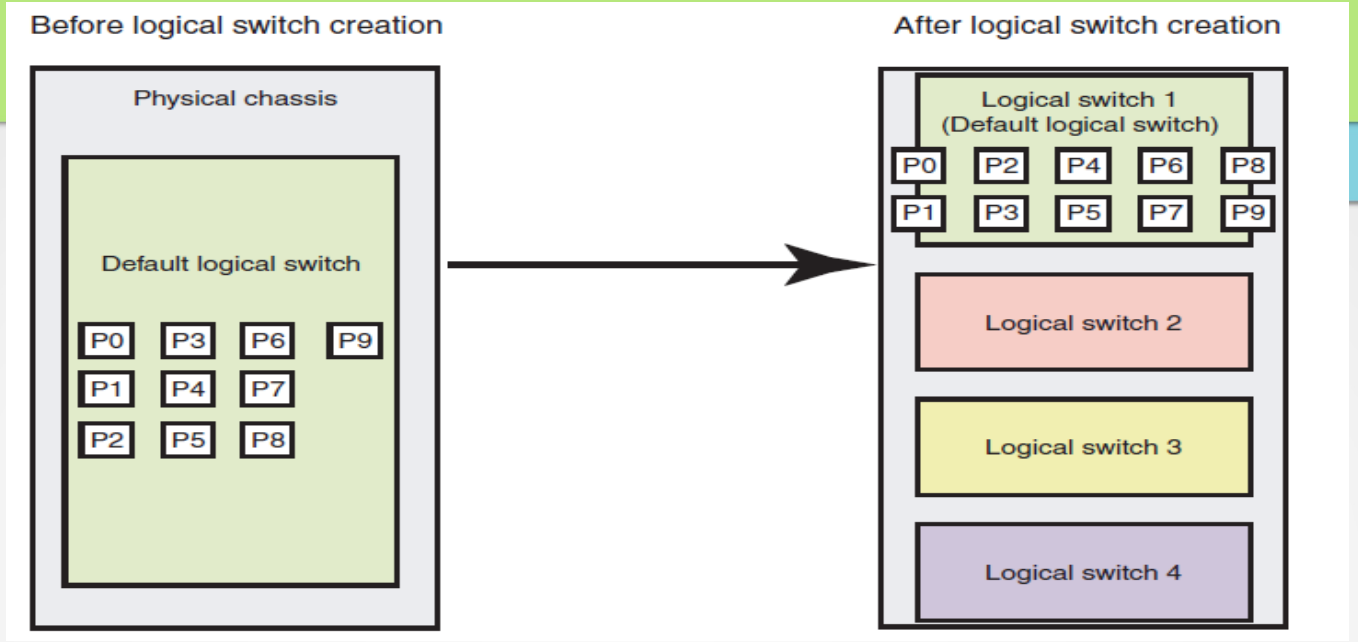
Application/Departme
nt-based SAN islands

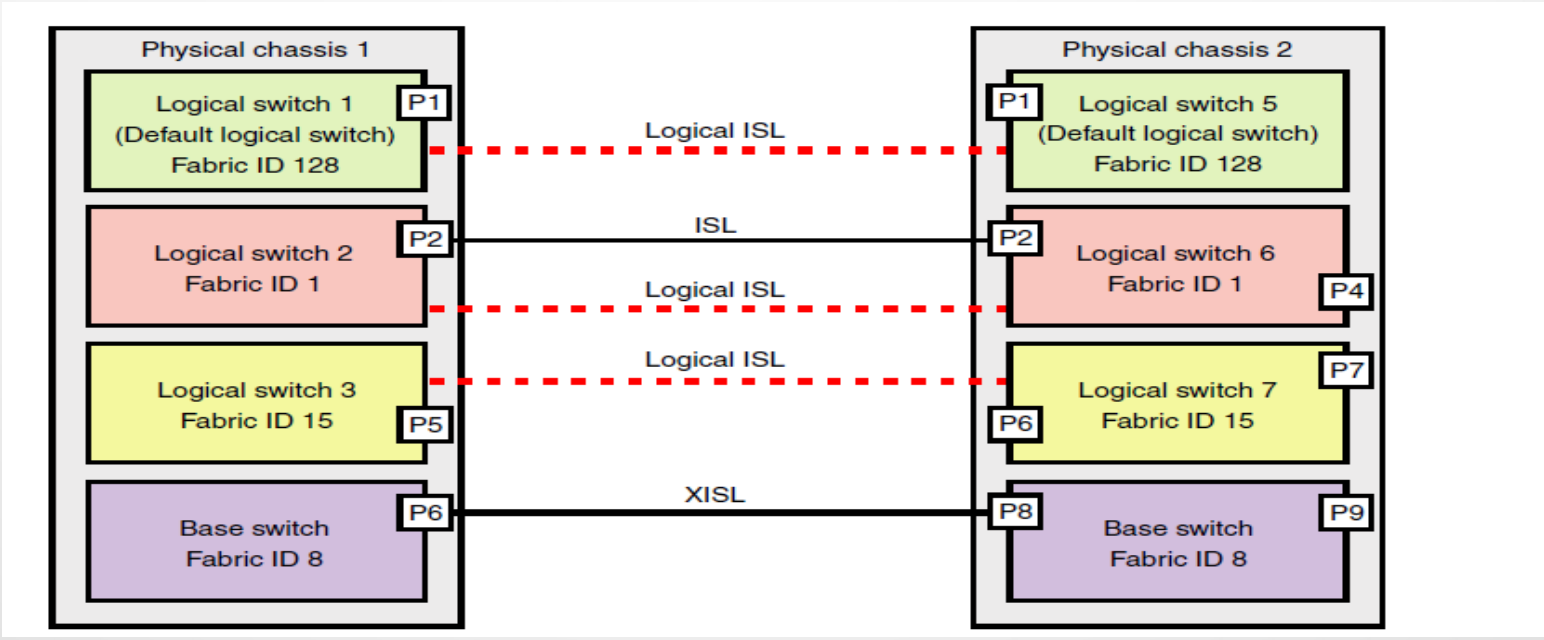




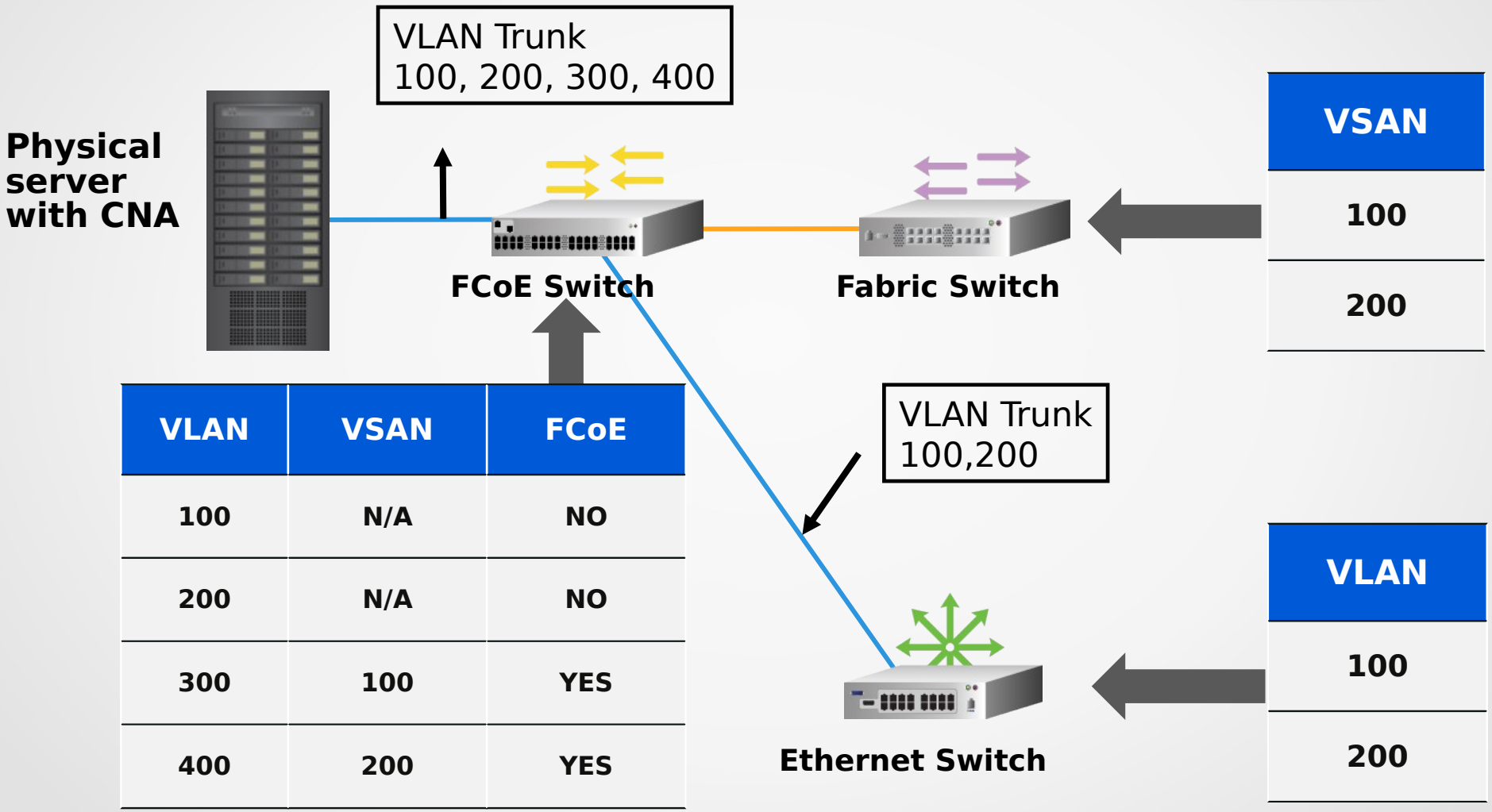
Collapsed fabric with
VSANs

vfabric


Before logical switch creation
After logical switch creation
Physical chassis
Default logical switch
P0
P3
P6
P9
P1
P4
P7
P2
P5
P8
Logical switch 1
(Default logical switch)
P0
P2
P4
P6
P8
P1
P3
P5
P7
P9
Logical switch 2
Logical switch 3
Logical switch 4


Physical chassis 1
Logical switch 1
(Default logical switch)
Fabric ID 128
P1
Logical switch 2
Fabric ID 1
P2
Logical switch 3
Fabric ID 15
P5
Base switch
Fabric ID 8
P6
Logical ISL
ISL
Logical ISL
Logical ISL
XISL
Physical chassis 2
P1
Logical switch 5
(Default logical switch)
Fabric ID 128
P2
Logical switch 6
Fabric ID 1
P4
P7
Logical switch 7
Fabric ID 15
P6
P8
Base switch
Fabric ID 8
P9

VLAN and VSAN



VLAN	VSAN	FCoE
100	N/A	NO
200	N/A	NO
300	100	YES
400	200	YES