Scale-out Storage Solutions for Today and Tomorrow
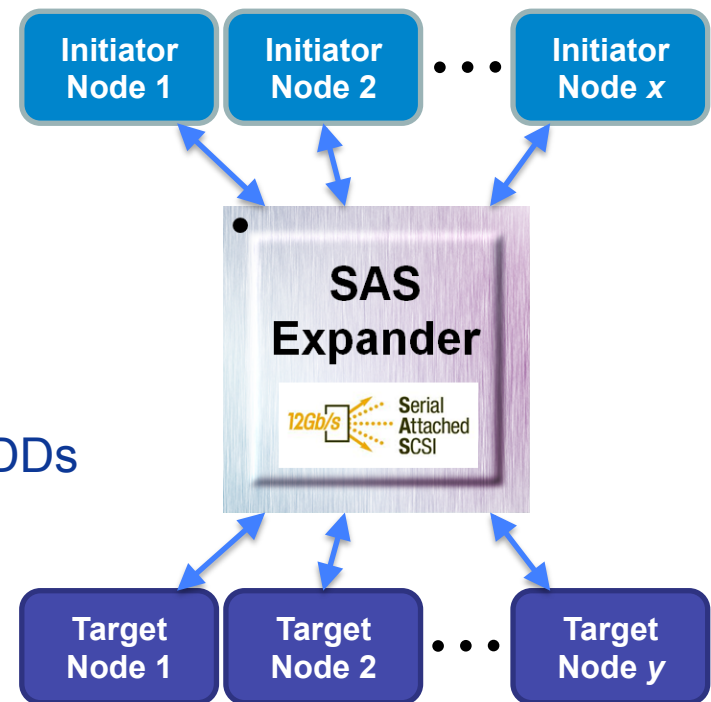
SAS Fabrics

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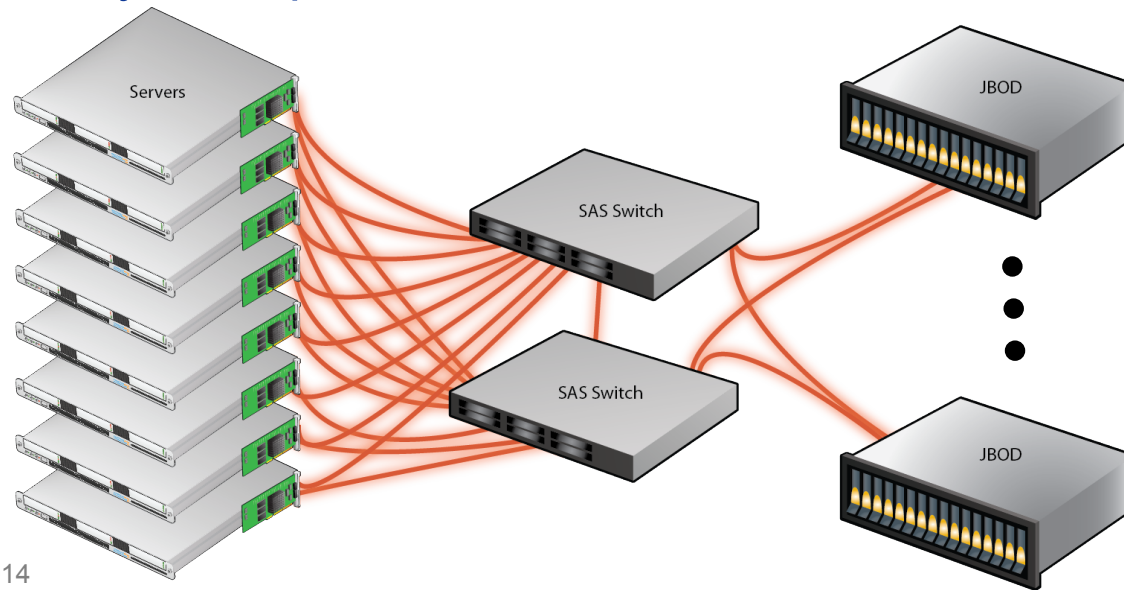
Challenge

- Provide enterprise switching services at effective costs

- Fabric Solution:
  - SAS expanders
    - Scalable connectivity
    - Scalable bandwidth
    - High availability / redundancy
    - Multi protocol support
    - Supports off-the-shelf SSDs and HDDs
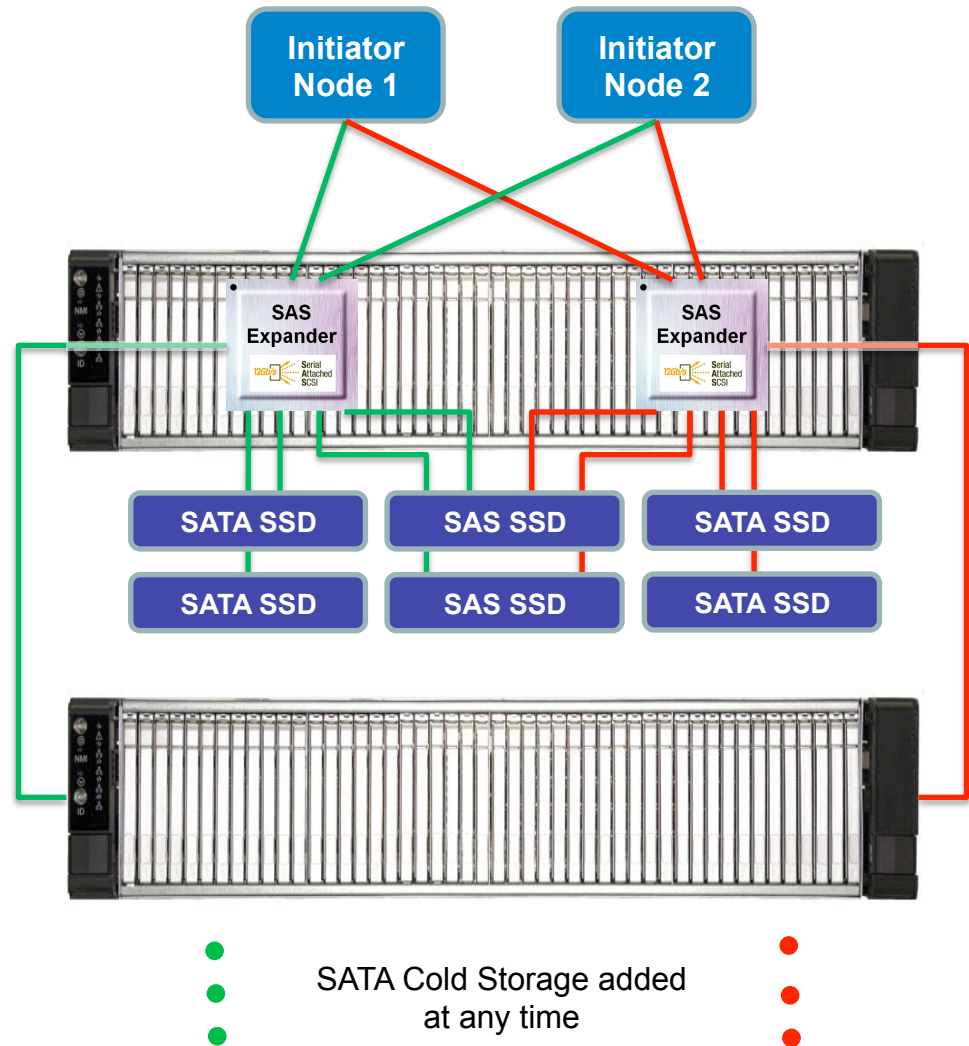 - Differentiation
    - Flexibility allows custom architectures

Initiator Node 1 | Initiator Node 2 | ... | Initiator Node *x*

SAS Expander
12Gb/s Serial Attached SCSI

Target Node 1 | Target Node 2 | ... | Target Node *y*

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SAS Fabric Capabilities

- **SCSI and RAS features**
  - Surprise hot plug
  - Dual-port, Wide-port
  - Management
- **Cold storage scale-out architecture review and examples (JBODs)**
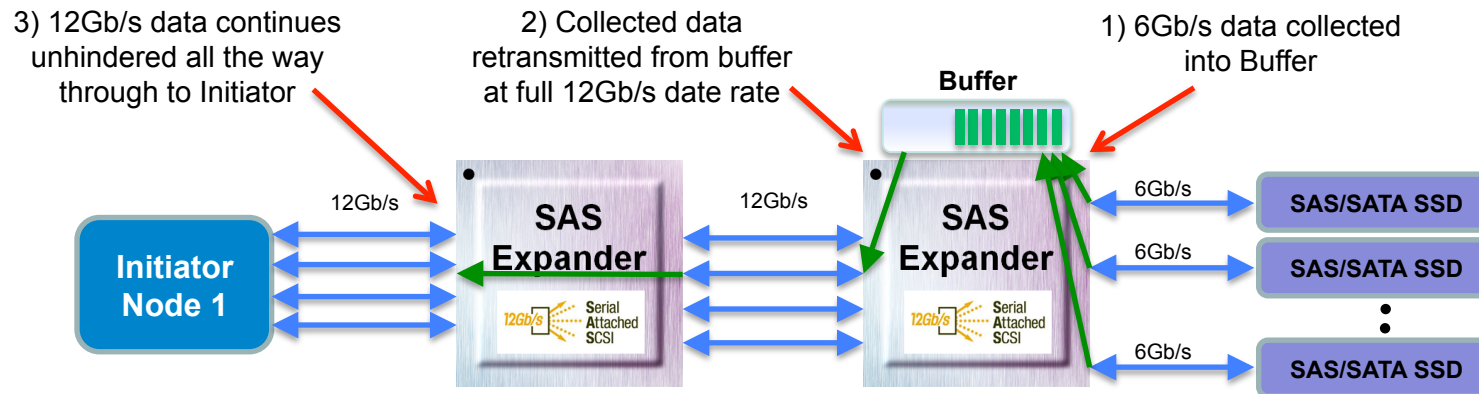- **Connectivity example**

SAS Fabric Details

- **Scalability**
- **Versatile bandwidth**
  - Variable Multi-PHY links
- **Supports SAS and SATA**
  - Mixed connections
- **Buffering**
  - Minimize lower-rate BW bottlenecks
- **Multi-path redundancy**
  - Dual-port
- **Surprise hot plug**
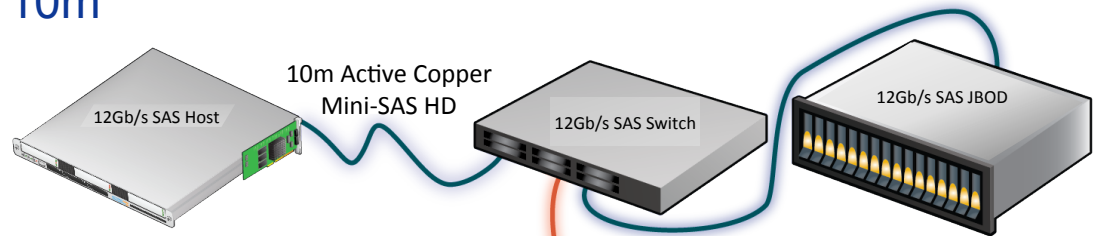 - Contained at PHY
  - Broadcast message

SATA Cold Storage added at any time

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SAS Buffering

3) 12Gb/s data continues unhindered all the way through to Initiator

2) Collected data retransmitted from buffer at full 12Gb/s date rate

Buffer

1) 6Gb/s data collected into Buffer

12Gb/s

Initiator Node 1

SAS Expander

12Gb/s

SAS Expander

6Gb/s **SAS/SATA SSD**

6Gb/s **SAS/SATA SSD**
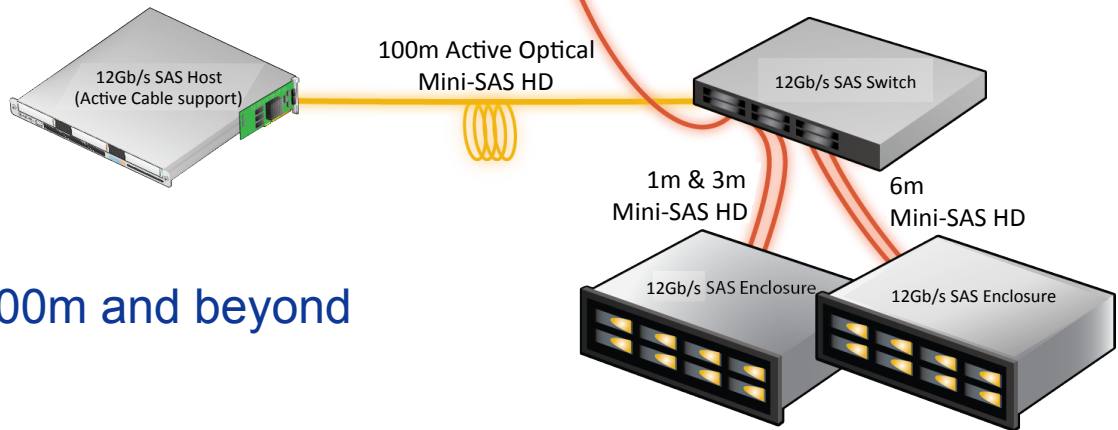
6Gb/s **SAS/SATA SSD**

- ■ Doubles upstream link bandwidth
  - • Buffering: 2x 600MB/s streams transferred at 1.2GB/s per link

- ■ Removes Expander to Expander Bottleneck
  - • No buffering: each 600MB/s stream transferred at 600MB/s per link (half of full bandwidth)

Connectivity Options

- SAS extends the reach of storage architectures
  - Passive Copper up to 10m*

  - Active Copper 10m to 25m

  - Optical connections 100m and beyond

10m Active Copper Mini-SAS HD

12Gb/s SAS Host

12Gb/s SAS Switch

12Gb/s SAS JBOD

25m Active Copper Mini-SAS HD

10m* Mini-SAS HD

100m Active Optical Mini-SAS HD

12Gb/s SAS Host (Active Cable support)

12Gb/s SAS Switch

1m & 3m Mini-SAS HD

6m Mini-SAS HD

12Gb/s SAS Enclosure

12Gb/s SAS Enclosure

NOTE: 10m is the recommended distance for 6Gb/s; 6m is the recommendation for 12Gb/s.

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