

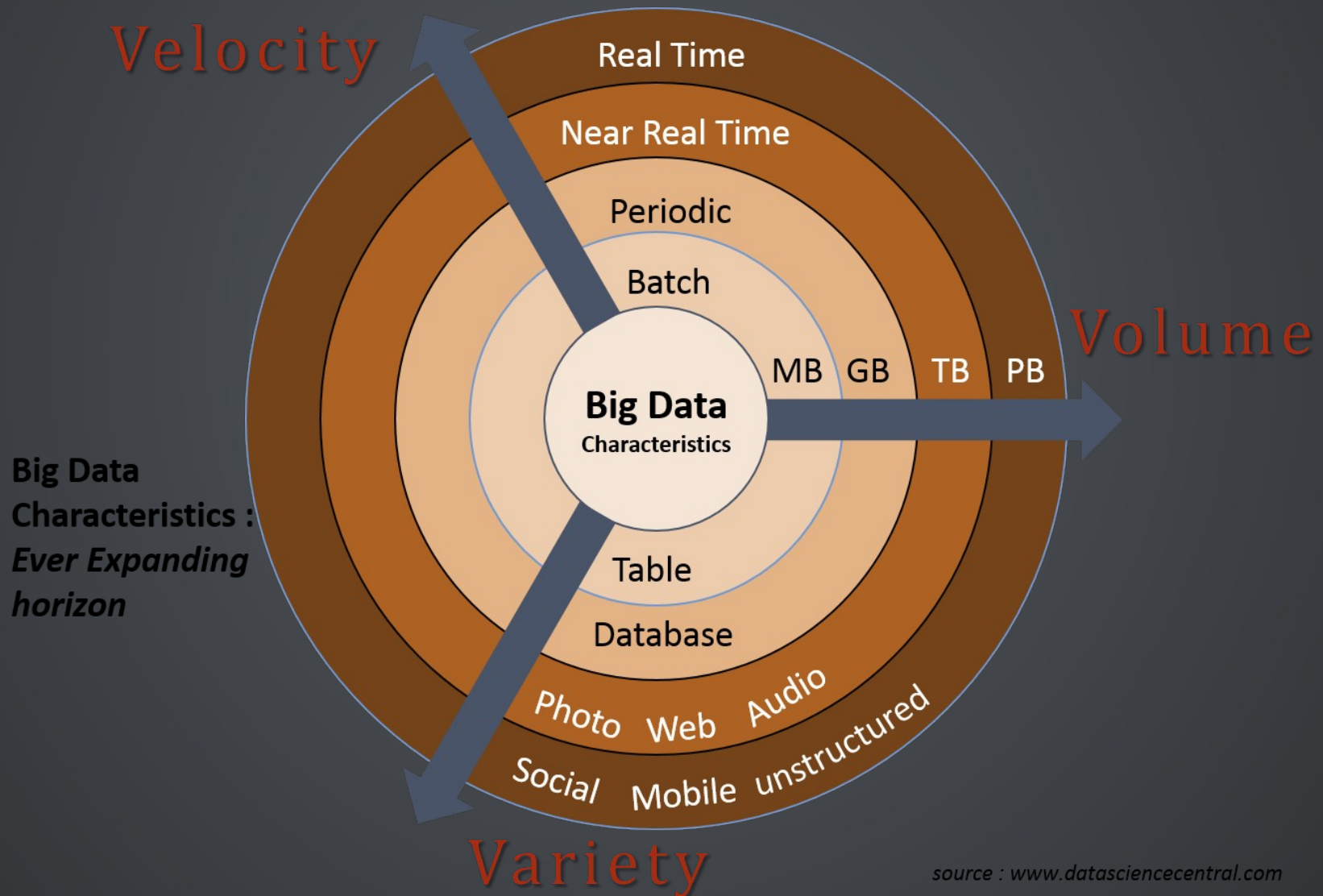
Services Overview

Javier Cacheiro



1. Big Data & Storage

3Vs of Big Data



Variety

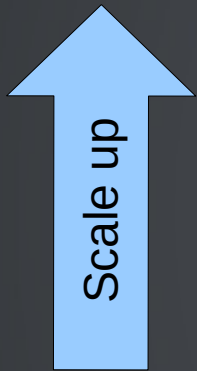
Structured Data



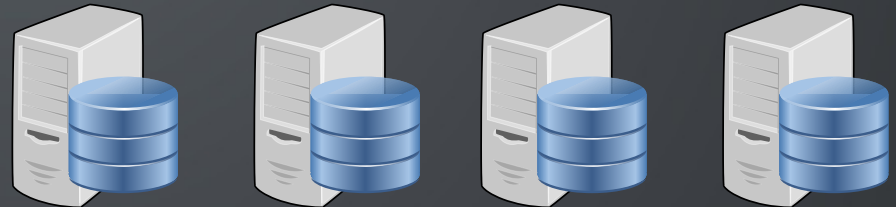
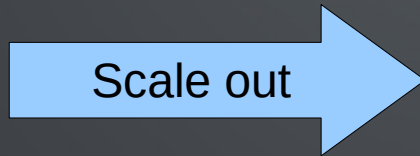
0.103	0.176	0.387	0.300	0.379
0.333	0.384	0.564	0.587	0.857
0.421	0.309	0.654	0.729	0.228
0.266	0.750	1.056	0.936	0.911
0.225	0.326	0.643	0.337	0.721
0.187	0.586	0.529	0.340	0.829
0.153	0.485	0.560	0.428	0.628

Unstructured Data





Scaling Options



DATA CENTRIC

Compute centric:

Bring the **data** to the **computation**

Data centric:

Bring the **computation** to the **data**

Hardware Infrastructure

- 38 nodes: 4 masters + 34 slaves
- 408 hard drives:
 - 211 upgraded to Seagate Exos X18 18TB

Storage capacity **2.5PB** (CDH)

Aggregated I/O throughput **30GB/s**

64GB RAM per node

10GbE connectivity between all nodes

Hardware Master Nodes

- Model: Lenovo System x3550 M5
- CPU: 2x Intel Xeon E5-2620 v3 @ 2.40GHz
- Cores: 12 (2x6)
- HyperThreading: On (24 threads)
- Total memory: 64GB
- Network: 1x10Gbps + 2x1Gbps

Disks: 8x480GB **SSD** SATA 2.5" MLC G3HS

Controller: M5210 1GB Cache **FastPath**

Hardware Slave Nodes

- Model: Lenovo System x3650 M5
- CPU: 2x Intel Xeon E5-2620 v3 @ 2.40GHz
- Cores: 12 (2x6)
- HyperThreading: On (24 threads)
- Total memory: 64GB
- Network: 1x10Gbps + 2x1Gbps
- ~~Disks: 12x 2TB NL SATA 6Gbps 3.5" G2HS~~
- Disks: 1x2TB + 11x18TB Seagate Exos X18
- Controller: N2215 SAS/SATA HBA

BD|CESGA Software

- Hadoop Platform
- PaaS Platform

Hadoop Platform

- HDFS
- MapReduce
- Hive
- HBase
- Kafka
- Spark

PaaS Platform

- MongoDB
- Cassandra
- PostgreSQL
- MariaDB
- etc

Parallel Storage

- HDFS
- Ceph
- Lustre

Lustre FT3

- Lustre performance:
 - 2xMDS servers
 - 2xOSS (NVME pool)
 - 2xNetapp E5700 60x12TB NLSAS
 - 2xOSS (NLSAS pool)
 - 2xNetapp EF600 20x3.8TB Flash
- Lustre HSM:
 - 2xMDS servers
 - 2xOSS servers (2 pools: SSD and NLSAS)
 - 1xNetapp EF570 22x3.8TB SSD
 - 2xNetapp E5700 130x16TB NLSAS
 - Tape library: 19.2PB

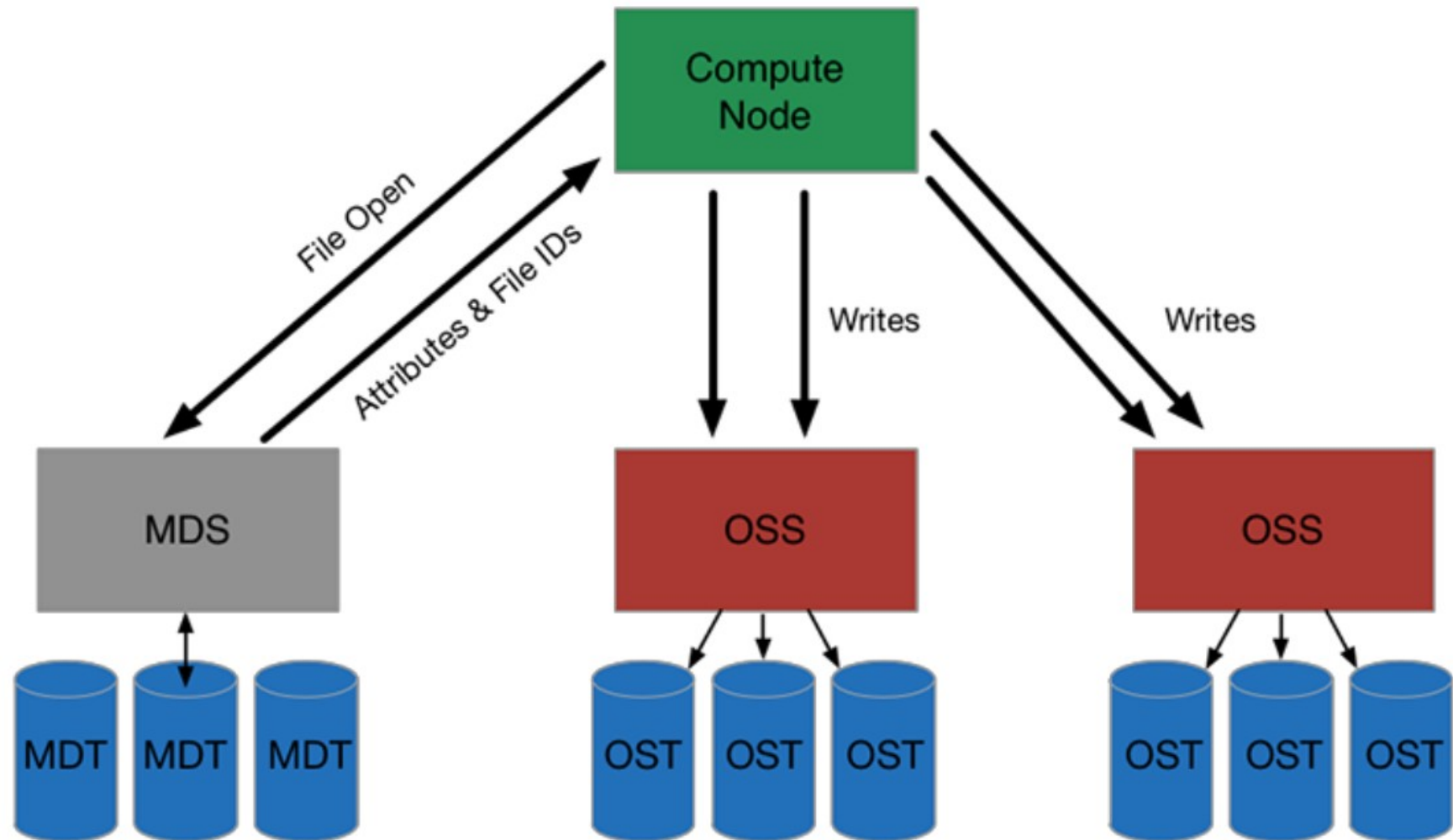
Lustre FT2

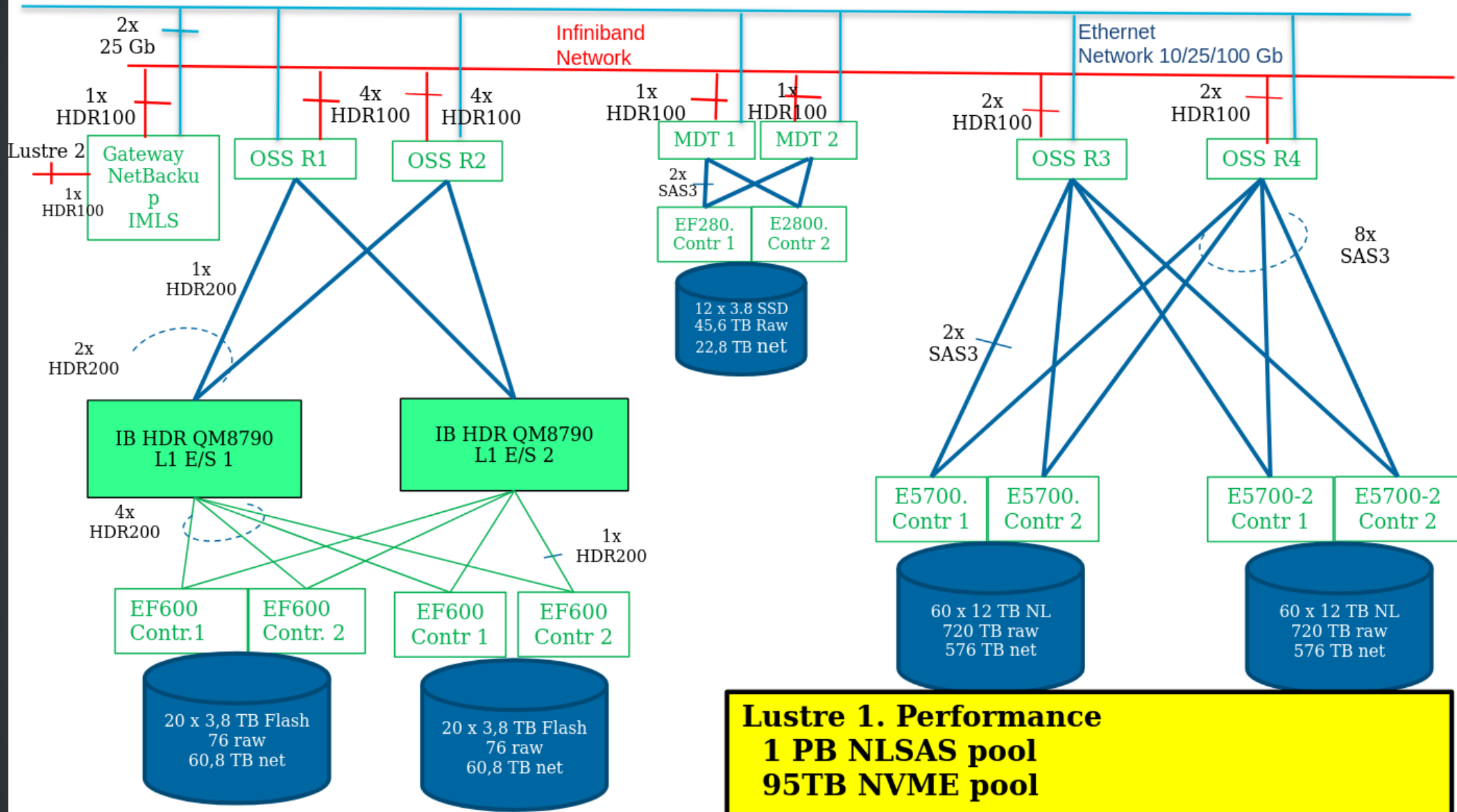
Bandwidth: **24GB/s**

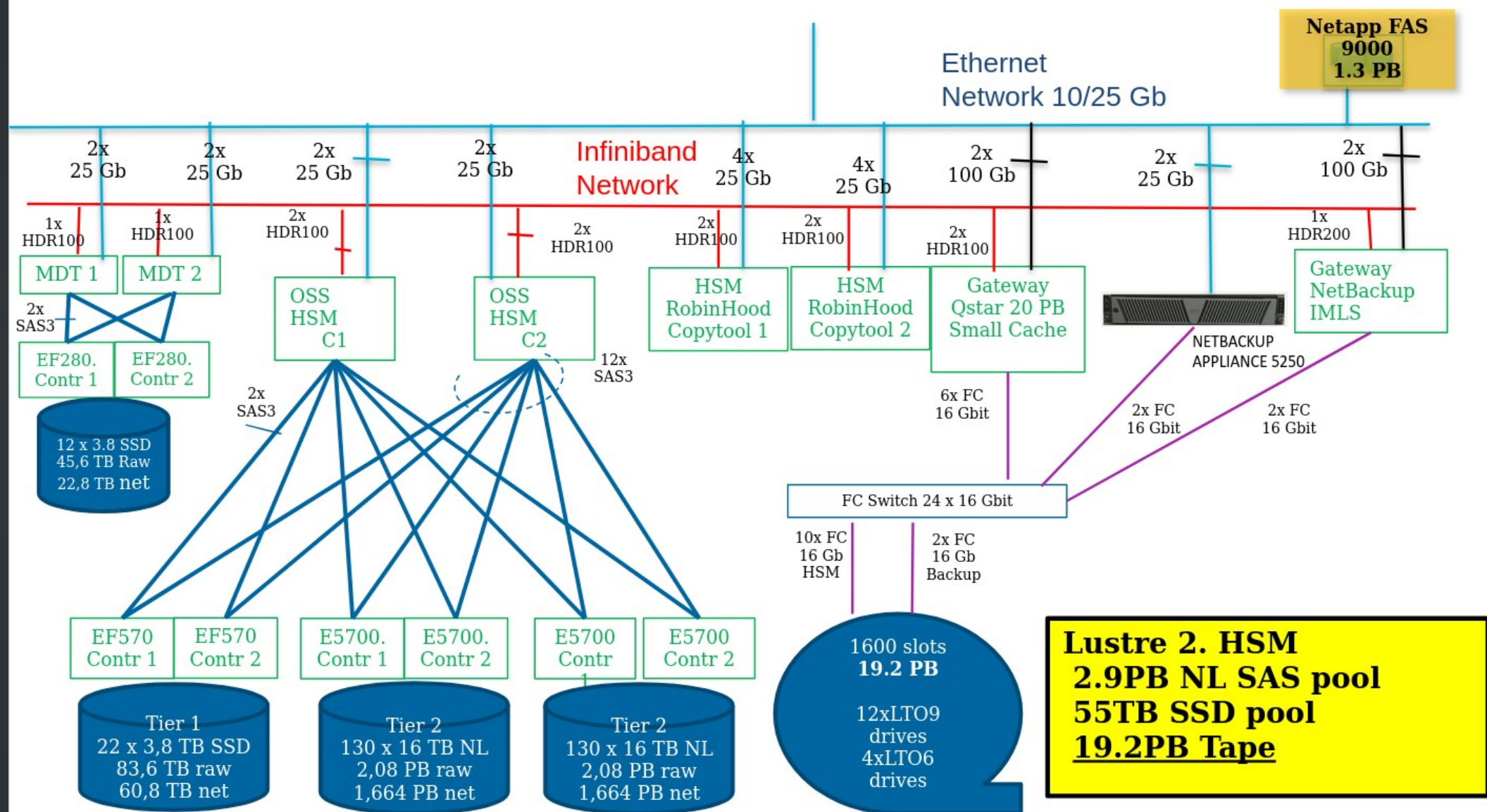
Capacity: **695TB**

Connectivity: **Infiniband FDR 56Gbps**

Lustre







Backups: Tape Library



Netapp FAS9000HA

Big Data/FT2/FT3 HOME

- High availability
- High cost
- Lower parallel performance than Lustre/HDFS
- High IOPS

Netapp

Bandwidth: **14GB/s**

Capacity: > **1PB**

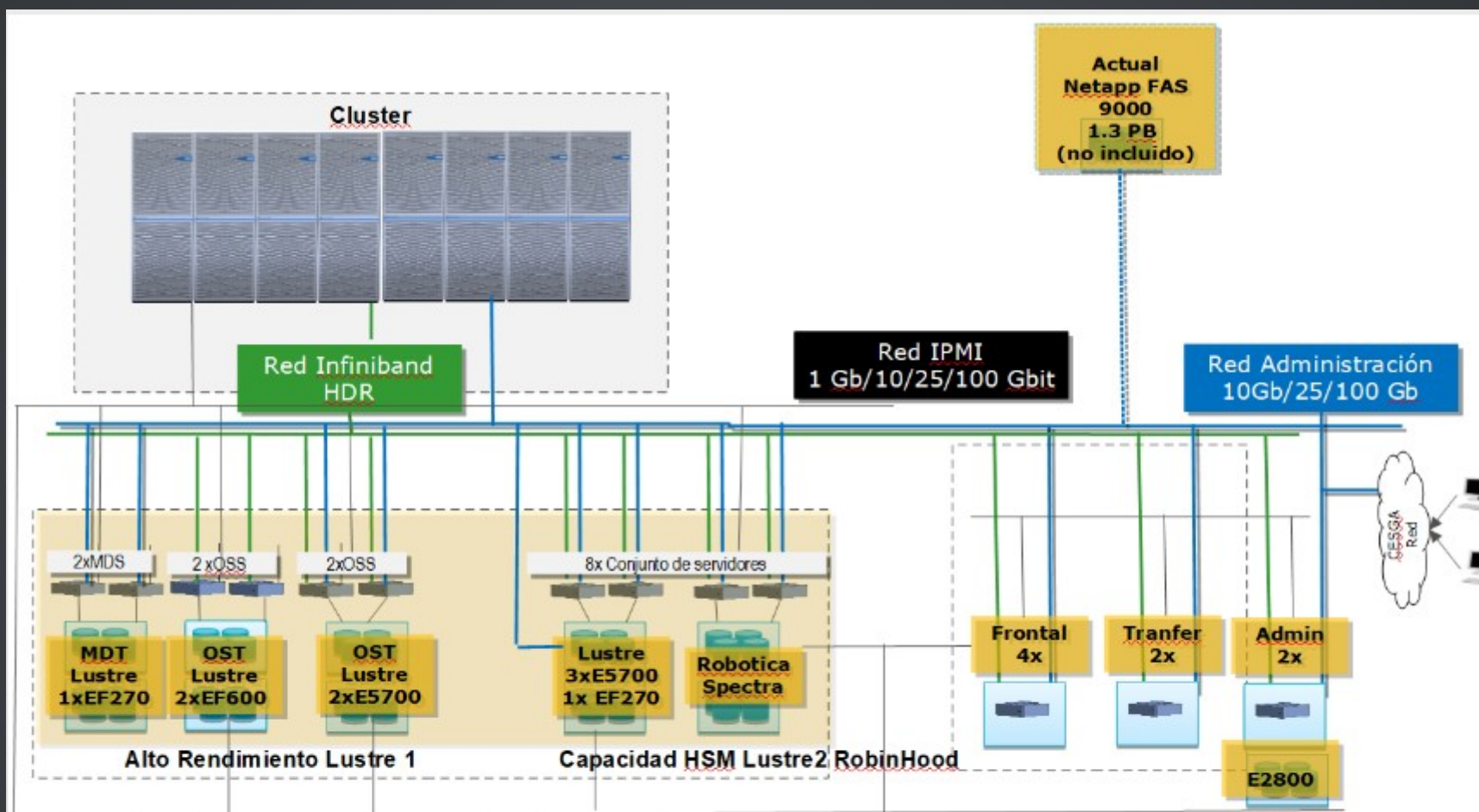
Performance: **1.5M IOPS**



2. Computing

FinisTerra III (FT3)

- 708 x procesadores Intel Xeon Ice Lake 8352Y de 32 cores, 2.2GHz
- 22.656 núcleos de proceso (cores)
- 144 aceleradores matemáticos GPU Nvidia A100 y Nvidia T4
- 118 TB de memoria agregada
- 355 TB capacidad agregada en discos SSD NVMe
- Red Infiniband HDR 100



Potencia de cómputo de 4 PetaFLOPS

	Thin nodes	GPU nodes	Viz nodes	Fat nodes	Transfer nodes	QLM node
Cantidad	256	64	16	16	2	Simulador de circuitos cuánticos Atos 30 qbits
Procesador	2x Intel Xeon Ice Lake 8352Y 32 cores 2.2 GHz					
Cores	64					
Memoria	256 GB			2 TB	256 GB	
Disco local	960 GB SSD NVMe			1920 GB SSD NVMe	960 GB SSD NVMe	
GPU	2x Nvidia A100		Nvidia T4			
Red baja latencia	Infiband HDR 100					

3. Cloud

	Cloud 1	Cloud 2	Cloud 3
Year	2009	2013	2021
Cores	1.200	1.464	6.240
Memory	2,4 TB	3,5 TB	24 TB
Storage	5,6 TB	63 TB	3.000 TB
Software	Opennebula 1	OpenNebula 5	OpenStack Xena

