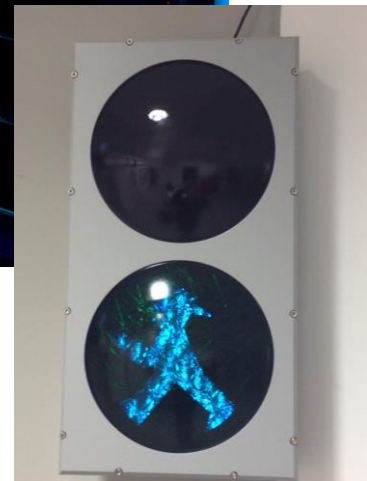# Cluster at the MPI for biophysical Chemistry

4 Racks, Rittal air/water cooling, 30 kW cooling capacity each

Cluster Hardware

80 Nodes :

- Supermicro Sys-1027GR Motherboard
- 128 GB RAM
- 250 GB Harddisk
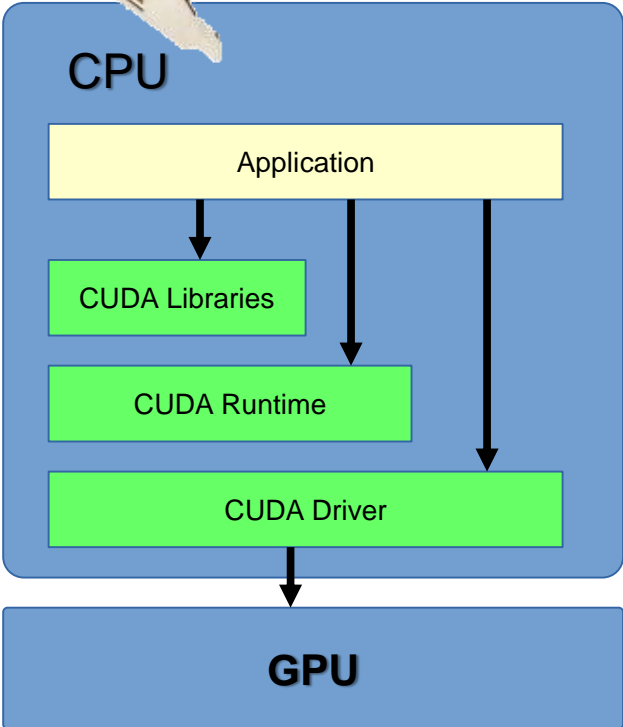- CPU 2x Intel Xeon E5-2620
- QLogic QDR-Infiniband
- 3x Tesla K20m

8 Infiniband-Switches

1.1 PByte File System

- *2 Meta-Nodes*
- *8 Storage Nodes with 130 TByte each*

NVIDIA Tesla K20

CPU

- Application
- CUDA Libraries
- CUDA Runtime
- CUDA Driver

GPU

NVIDIA Tesla Family Specification Comparison				
	Tesla K20X	Tesla K20	Tesla M2090	Tesla M2070Q
Stream Processors	2688	2496	512	448
Core Clock	732MHz	706MHz	650MHz	575MHz
Shader Clock	N/A	N/A	1300MHz	1150MHz
Memory Clock	5.2GHz GDDR5	5.2GHz GDDR5	3.7GHz GDDR5	3.13GHz GDDR5
Memory Bus Width	384-bit	320-bit	384-bit	384-bit
VRAM	6GB	5GB	6GB	6GB
Single Precision	3.95 TFLOPS	3.52 TFLOPS	1.33 TFLOPS	1.03 TFLOPS
Double Precision	1.31 TFLOPS (1/3)	1.17 TFLOPS (1/3)	655 GFLOPS (1/2)	515 GFLOPS (1/2)
Transistor Count	7.1B	7.1B	3B	3B
TDP	235W	225W	250W	225W
Manufacturing Process	TSMC 28nm	TSMC 28nm	TSMC 40nm	TSMC 40nm
Architecture	Kepler	Kepler	Fermi	Fermi

Network

InfiniBand Link	Signal Pairs	Signaling Rate	Data Rate (Full Duplex)
4X-QDR	8	40 Gbps (4 x 5 Gbps)	32 Gbps (4 x 8 Gbps)

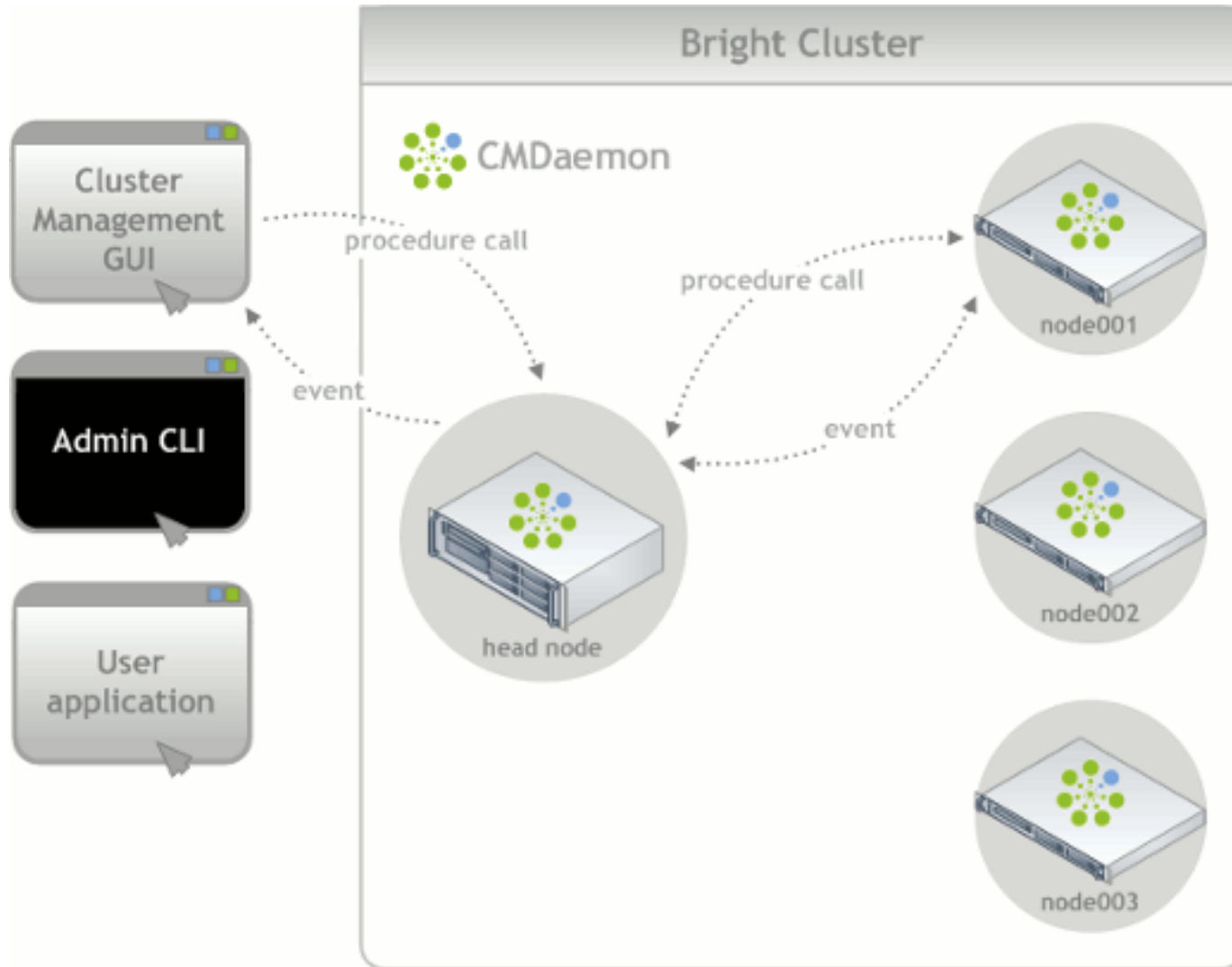Copper based

Level 2 - Switches

Level 1 - Switches
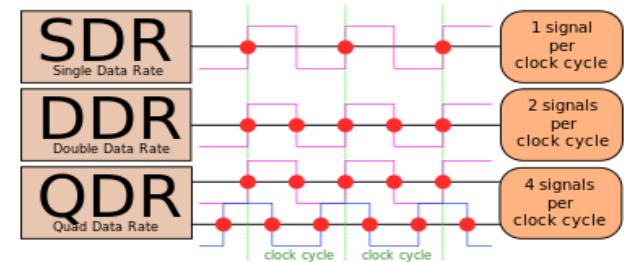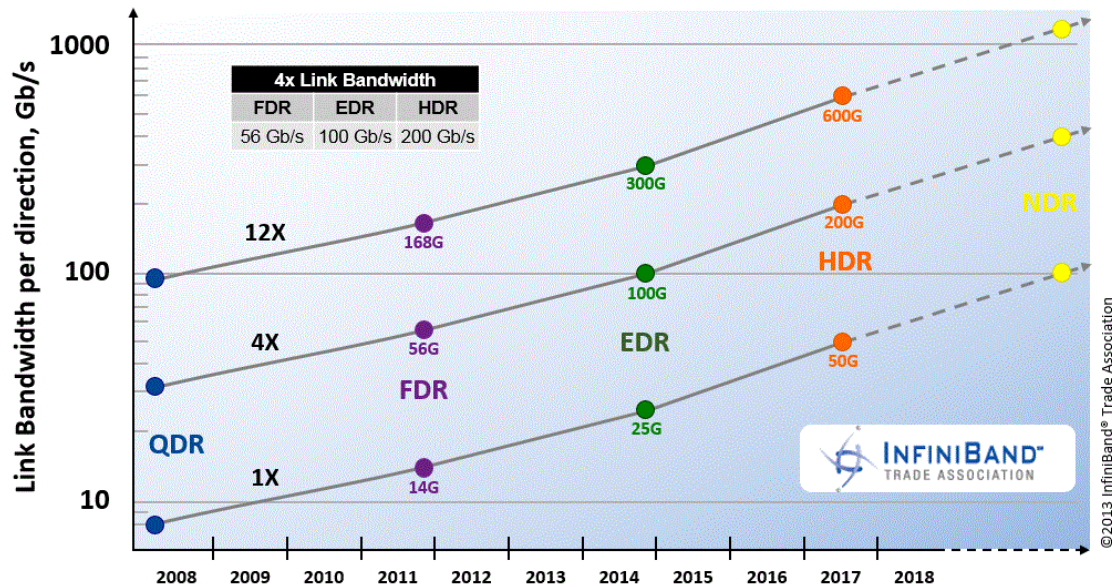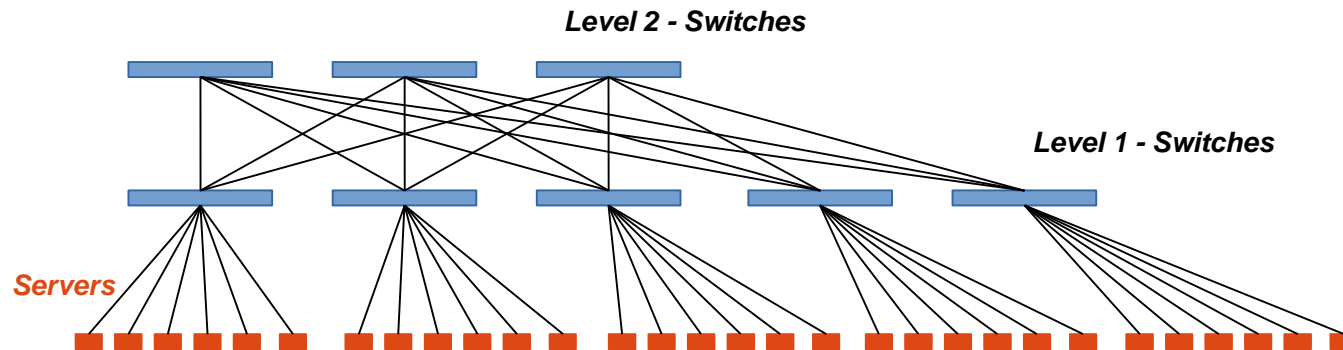
Servers

QDR, Quad data rate (or quad pumping)
is a communication signaling technique wherein
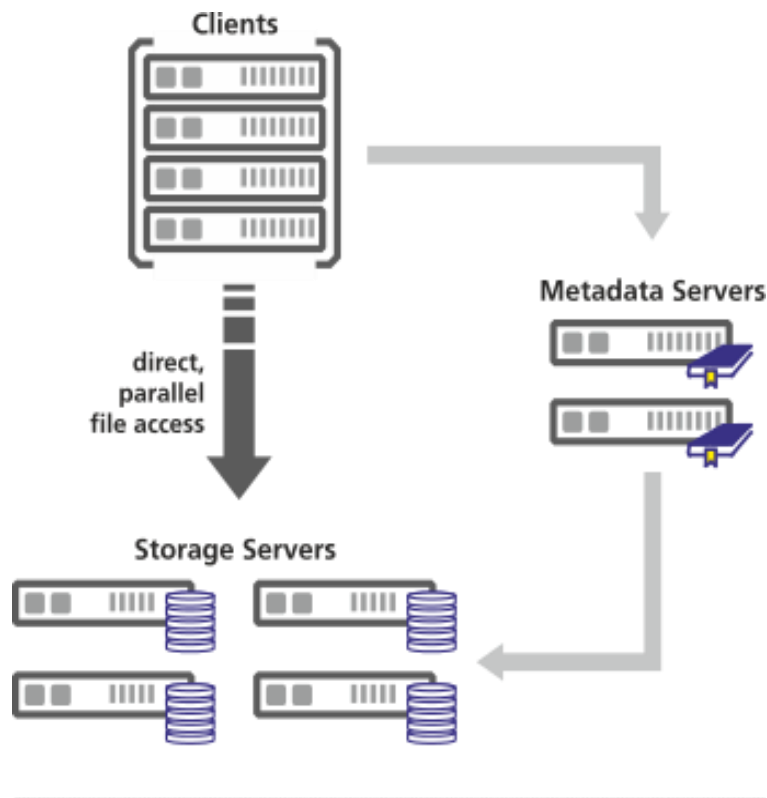four points are transmitted per clock cycle.

Cluster-Manager

Bright Cluster Manager is based on Red Hat derivated Linux.

- storage servers run on top of an existing local filesystem
- optimized especially for high data throughput in HPC

Chunks:
Parts of data which are stored independently on multiple servers

Metadata Server:
Take care of the correct locations of chunks

Maximum Speed:
We can write data at ~2 GB/s while the Cluster is on full load! (a local hard drive on your computer has ~160 MB/s)