A3CUBE's Massively Parallel Data Processor

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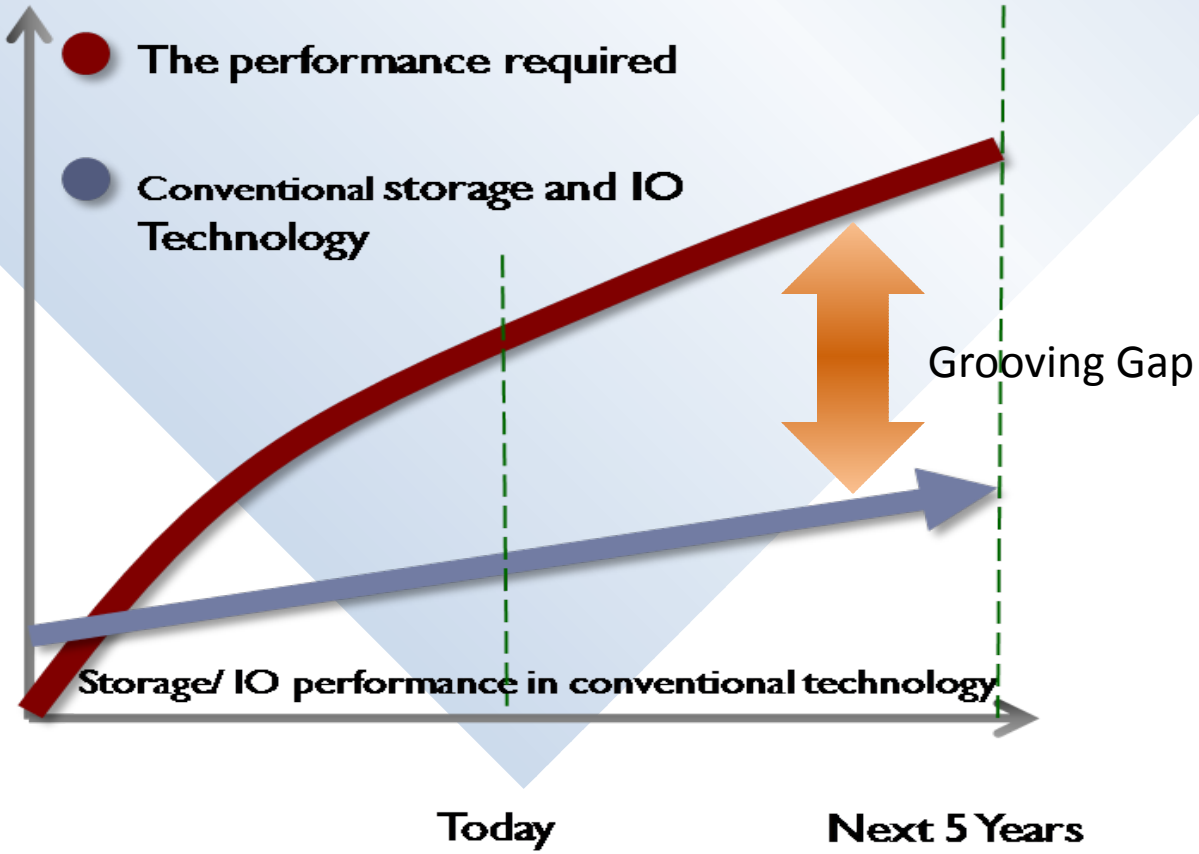
Everybody Knows:

1)Modern datacenters, high performance computing and high performance data systems require a new level of performance.

2) High-performance parallel computing technologies have become popular into the datacenter and industry for commercial research and development operations (e.g. Hadoop

3) but there is a gap in the CPU power and data storage technologies that limits the efficiency of the entire datacenter ecosystem. We can call this enormous problem: **I/O Performance Gap Problem.**


The performance required
Conventional storage and IO Technology
Grooving Gap
Storage/ IO performance in conventional technology
Today
Next 5 Years

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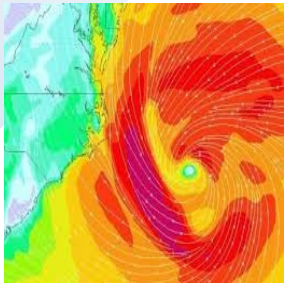
We are moving from HPC (High performance computing) to HPD (High performance data)

HPD = HPC + Big Data Analysis

Financial

Energy

Medicine



Weather

Multimedia

All of these markets need HPD solutions

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Every time we have a bottleneck we need an new architectural approach

Dr. Steve Chen

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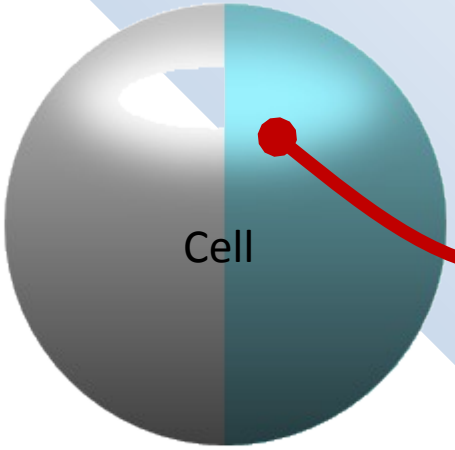
For all that reasons we design and realize:

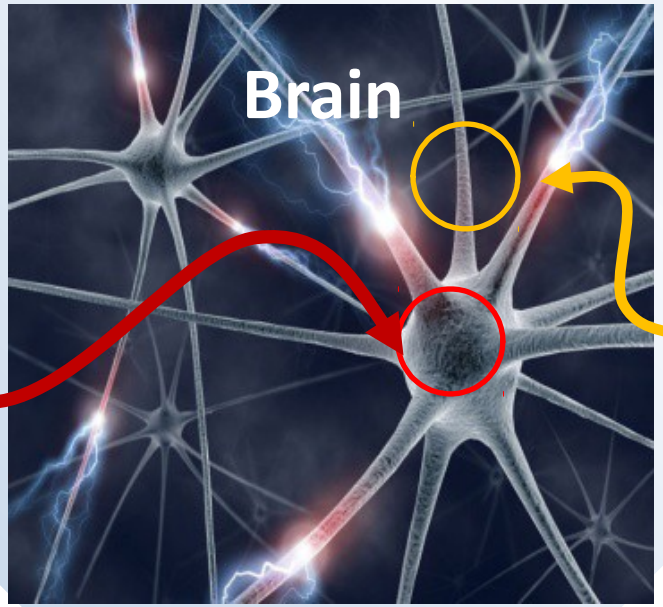
1) A fast, high bandwidth , extremely low latency, high scalable , shared memory network fabric, specifically designed for new exascale high performance parallel scale out storages. With the ultimate goal to remove the I/O bottleneck.

2) A global memory fabric the “In Memory Network” as a new building block

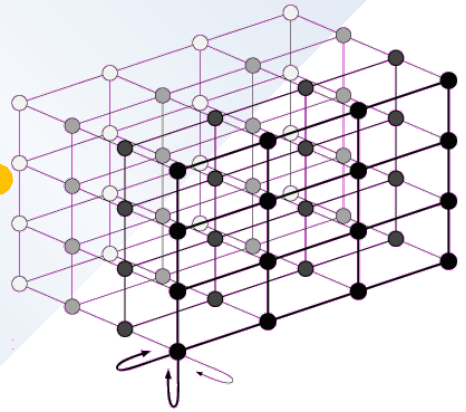
3) A brain inspired scale put storage/computing merged concept

Our Elementary functional Unit : “The Cell”





Our Network



- Simple storage “Cell” architecture
- Multidimensional, “brain like”, network approach.
- Fault tolerant Distributed Network Engines (for inter-communication) NO SINGLE POINT OF FAILURE

Comprising:

- Accelerator processors
- Storage Blocks
- External I/O connectivity

Fully integration between computation, memory, network and storage

A3CUBE creates RONNIEE a multidimensional and extremely efficient interconnection network

We combine the cutting edge technologies in a single network architecture, resulting in a multidimensional, highly scalable, architecture based on a global shared memory with direct memory to memory communication with military grade reliability, with disruptive performance.

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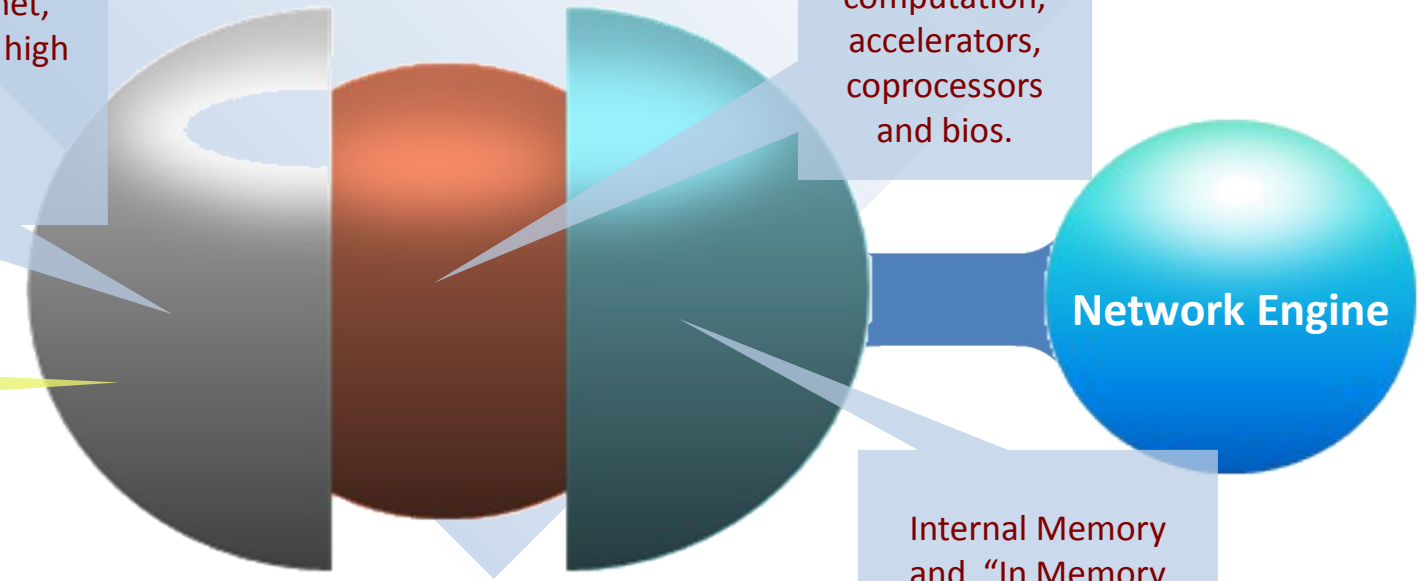
Inside interfaces: Disruptive proprietary I/O network (RONNIEE Express)

Storage I/O Interface
External I/O Interface
(the interface is designed to support standard Ethernet, Infiniband or proprietary high speed interface.)

The Cell

Engine with computation, accelerators, coprocessors and bios.

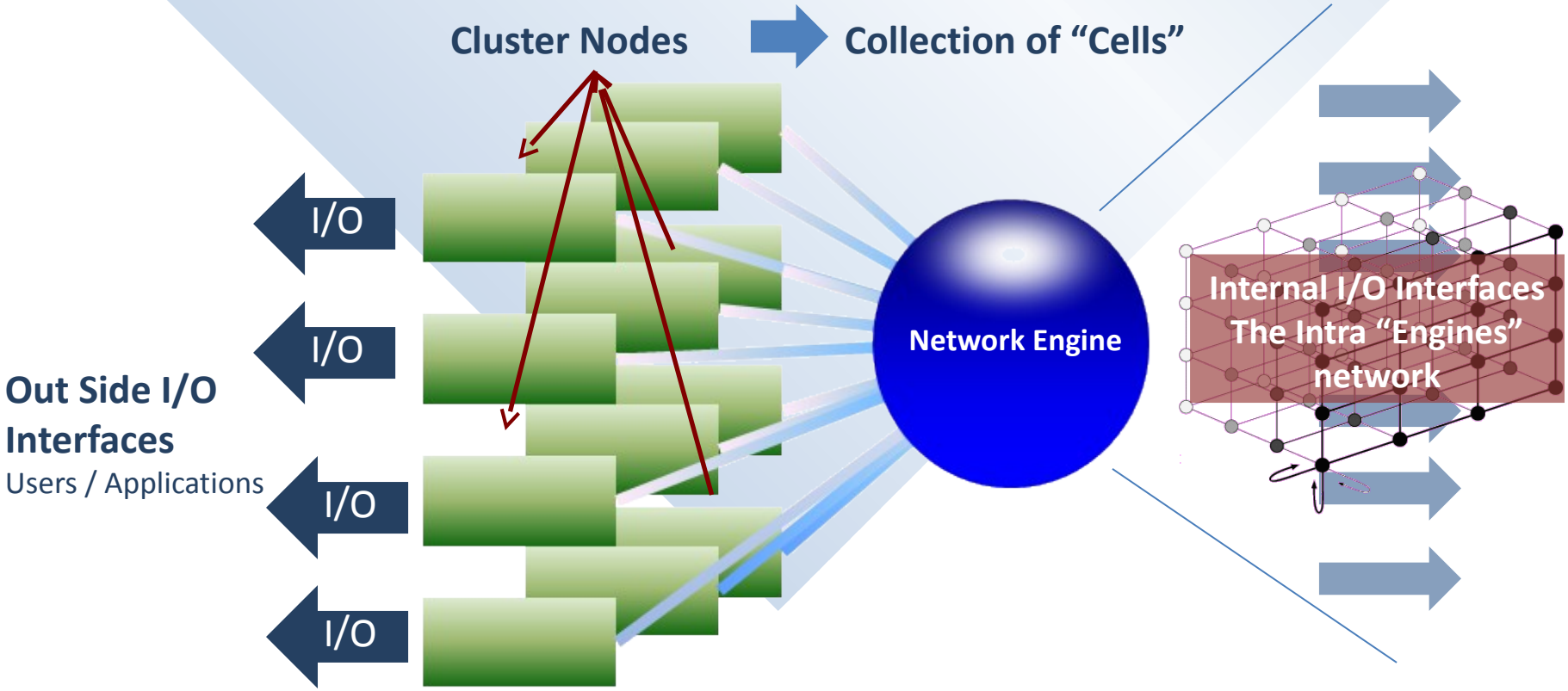


I/O User Interface

Internal Memory and "In Memory Network" Interface

Outside interfaces: Standard Interface for easy connection with all the world!

RONNIEE is the supercomputer stile interconnection with full shared memory capability that enables new powerful scenarios in Big Data, HPC and HPD



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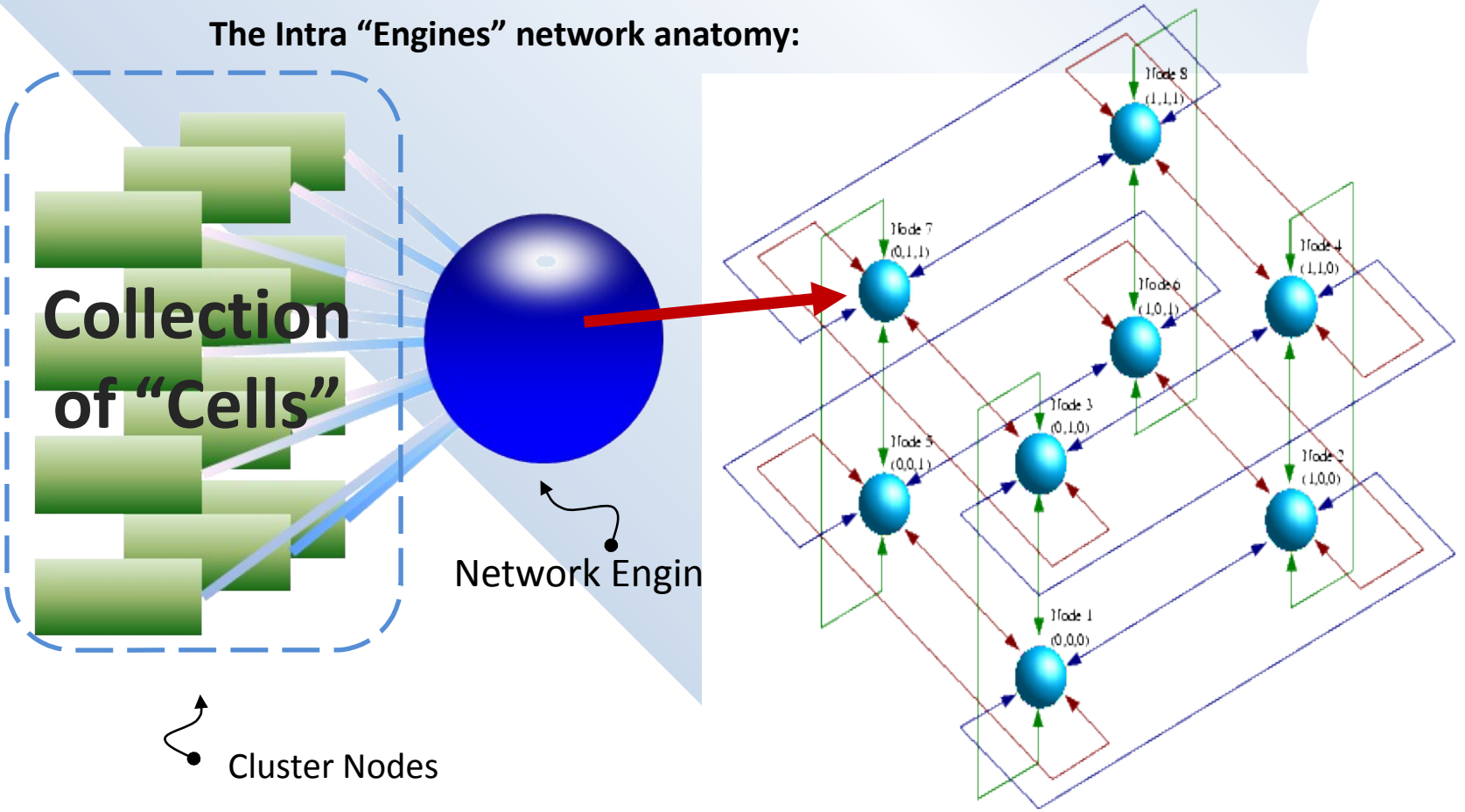
Brain Inspired Storage Architecture comes to the world

The Intra "Engines" network anatomy:



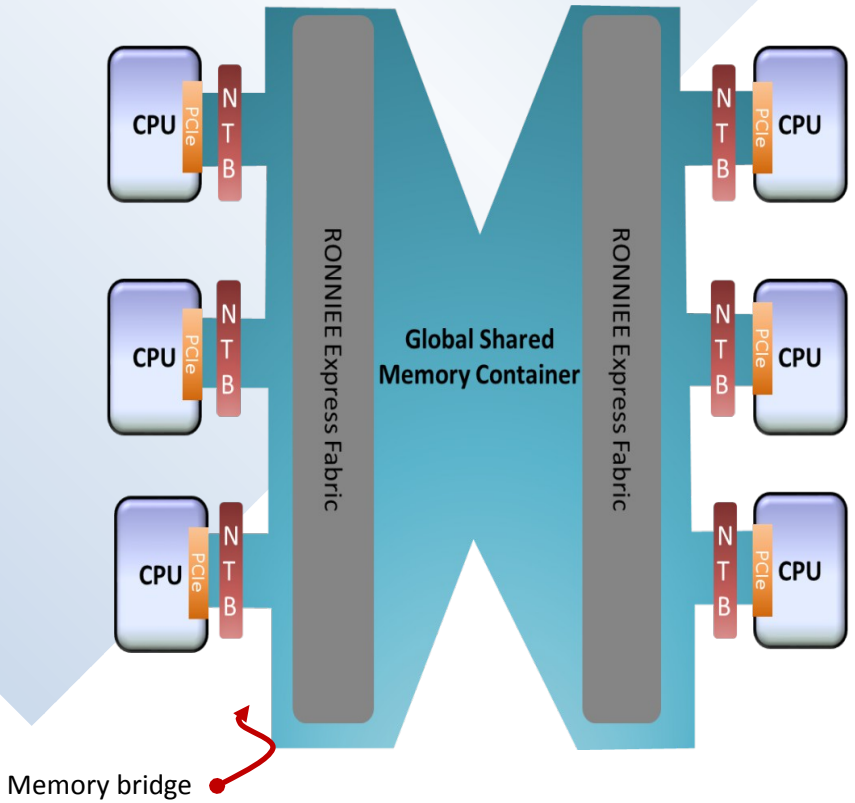
Up to 64 K nodes

Inter switch Interconnection with multidimensional topology

In Memory Network

Why RONNIEE Express is different and so powerful?

- The RONNIEE Express uses memory as the main communication paradigm
- With PCIe you can have direct access to memory using “memory windows”
- A3CUBE’s unique NIC architecture uses these “memory windows” to create a shared global memory container that permits direct communication between:
  - *Local CPUs and remote CPUs*
  - *Memory to memory*
  - *Local and remote I/O*



In Memory Network

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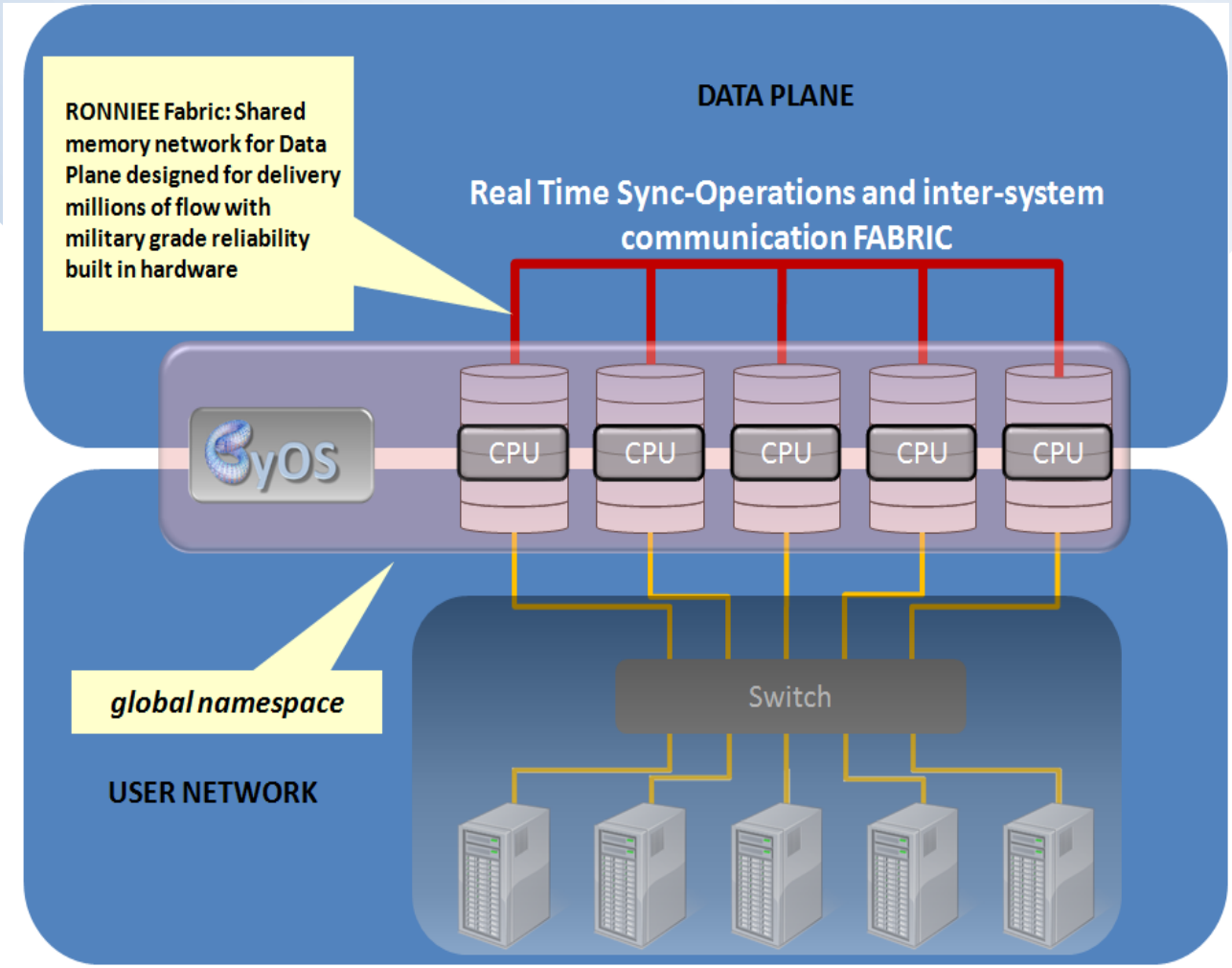
ByOS The Operating System for Parallel Storage

ByOS is designed to provide a **Massively Parallel Supercomputing Experience** applied to data access and computing

- Highly parallel architecture with intelligent relationship between available CPUs and I/O
- Leverages supercomputing's massively parallel design concepts for exascale data access and computing
- Bottleneck-free no-metadata server architecture
- Scaling of capacity and I/O independently


RONNIEE Fabric: Shared memory network for Data Plane designed for delivery millions of flow with military grade reliability built in hardware
DATA PLANE
Real Time Sync-Operations and inter-system communication FABRIC
SyOS
CPU
CPU
CPU
CPU
CPU
global namespace
USER NETWORK
Switch

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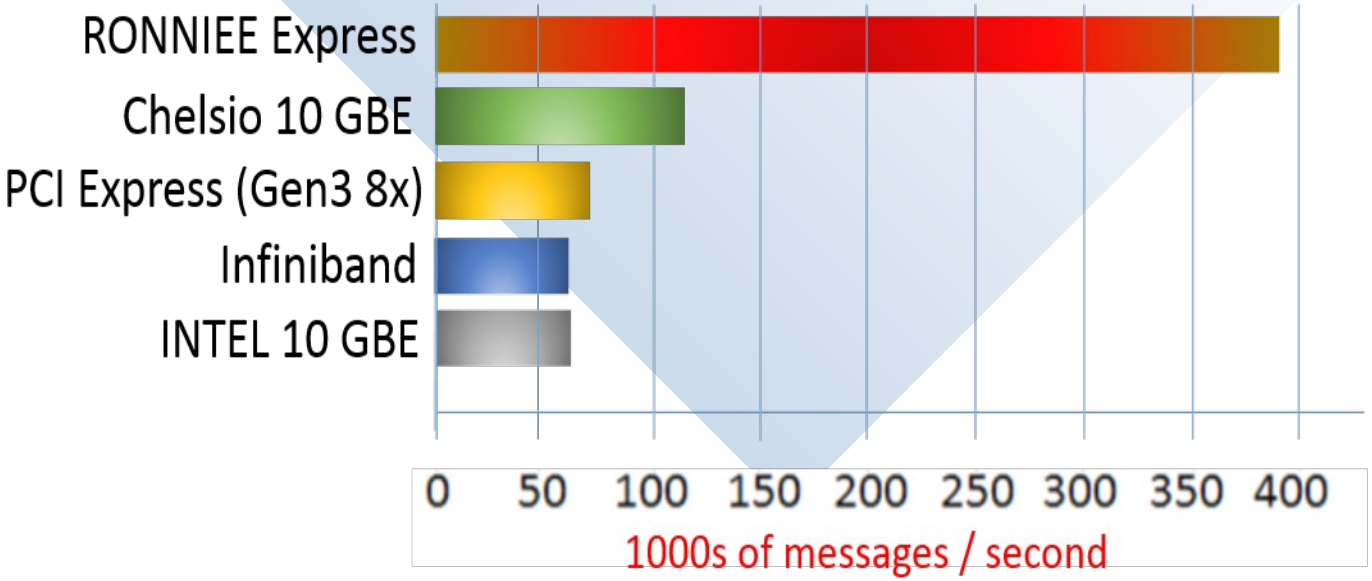
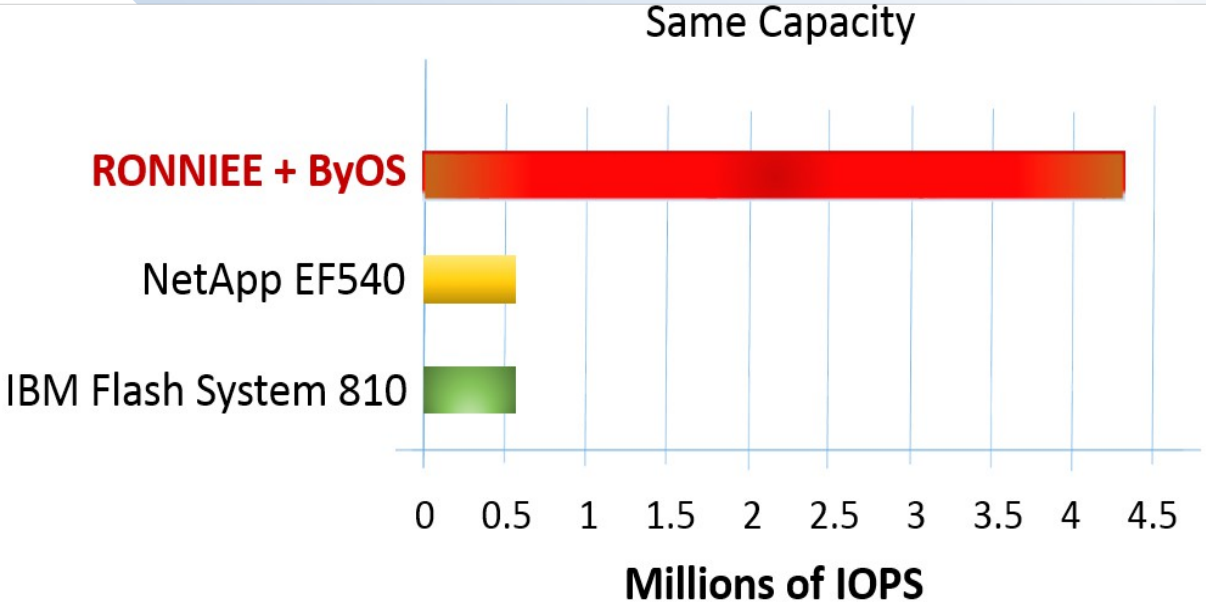
Benchmark example:
Extreme performance on maeassages

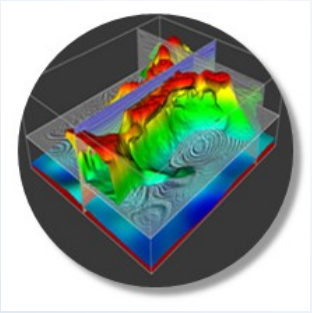


Benchmark example applied to storage:
Unmatched IOPS



Main Use Cases

Big Data / Datacenter



High-Performance Computing

Biotech

CFD

Conclusion

This architecture will allow unprecedented computing power to be deployed throughout the industry, which can power innovation in ways we might not have even thought of.
It realizes the perfect architecture for the emerging big data applications.

Thank you

Questions?