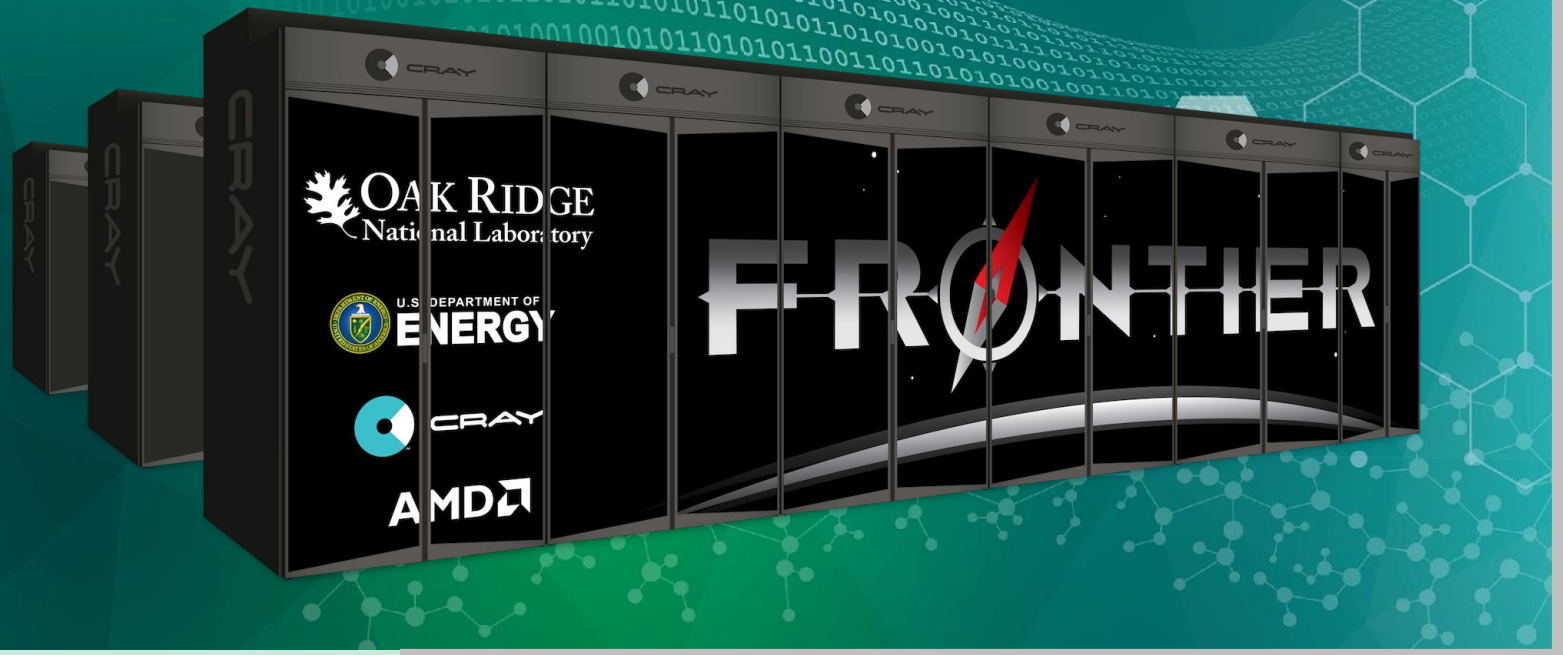
OAK RIDGE National Laboratory

Frontier System Overview



OLCF Frontier Overview

The system includes

- 9,408 nodes
- HPE Slingshot interconnect with 200 GbE interfaces
- 679 PB multi-tier Lustre filesystem "Orion"

System Performance

- Peak of 1.194 ExaFlop/s for modeling & simulation
- Peak of 9.95 ExaOps/s for data analytics and artificial intelligence

Each node has

- 1 AMD Optimized 3rd Gen EPYC 64 core processor
- 4 AMD MI250X Instinct GPUs (8 GCDs)
- 640 GB of fast memory (128 GB HBM2 + 512 GB DDR4)
- 3.48 TB of NV memory (2 X 1.92TB NVMe SSDs)


TOP500 CERTIFICATE

The List.

Frontier - HPE Cray EX235a, AMD Optimized 3rd Generation EPYC 64C 2GHz, AMD Instinct MI250X, Slingshot-11

DOE/SC/Oak Ridge National Laboratory, United States

is ranked

No. 1

among the World's TOP500 Supercomputers

with 1194.00 PFlop/s Linpack Performance

in the 61st TOP500 List published at the ISC23

Conference on June 01, 2023.

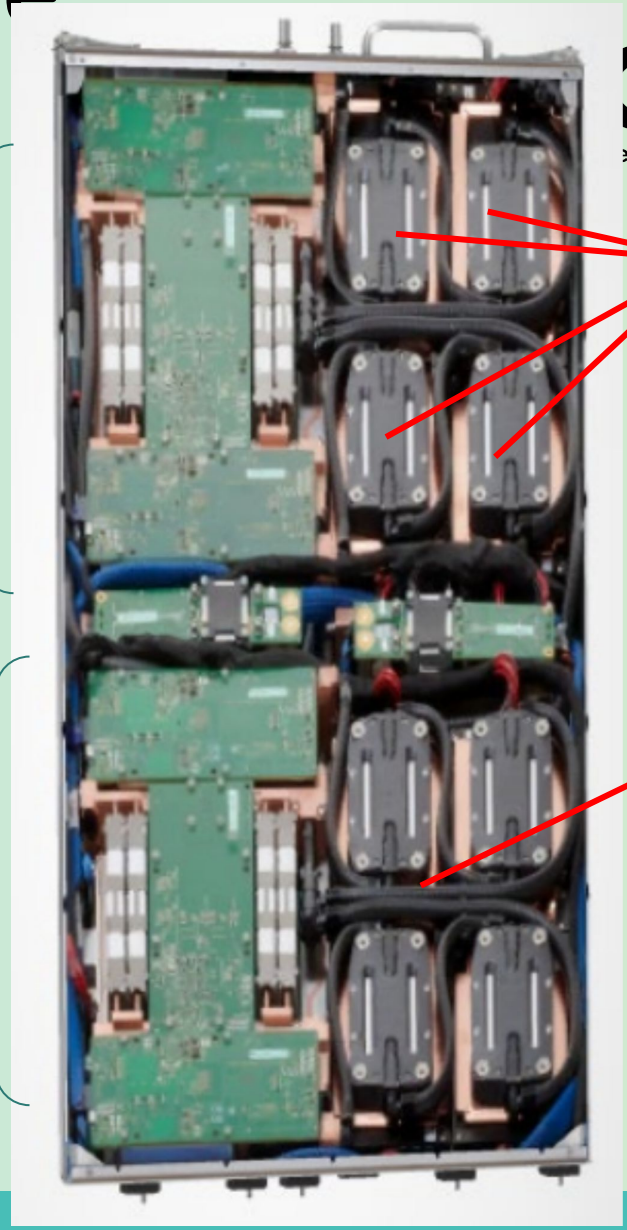
Congratulations from the TOP500 Editors

Erich Strohmaier, NERSC/Berkeley Lab
Jack Dongarra, University of Tennessee
Horst Simon, NERSC/Berkeley Lab
Martin Meuer, Prometeus

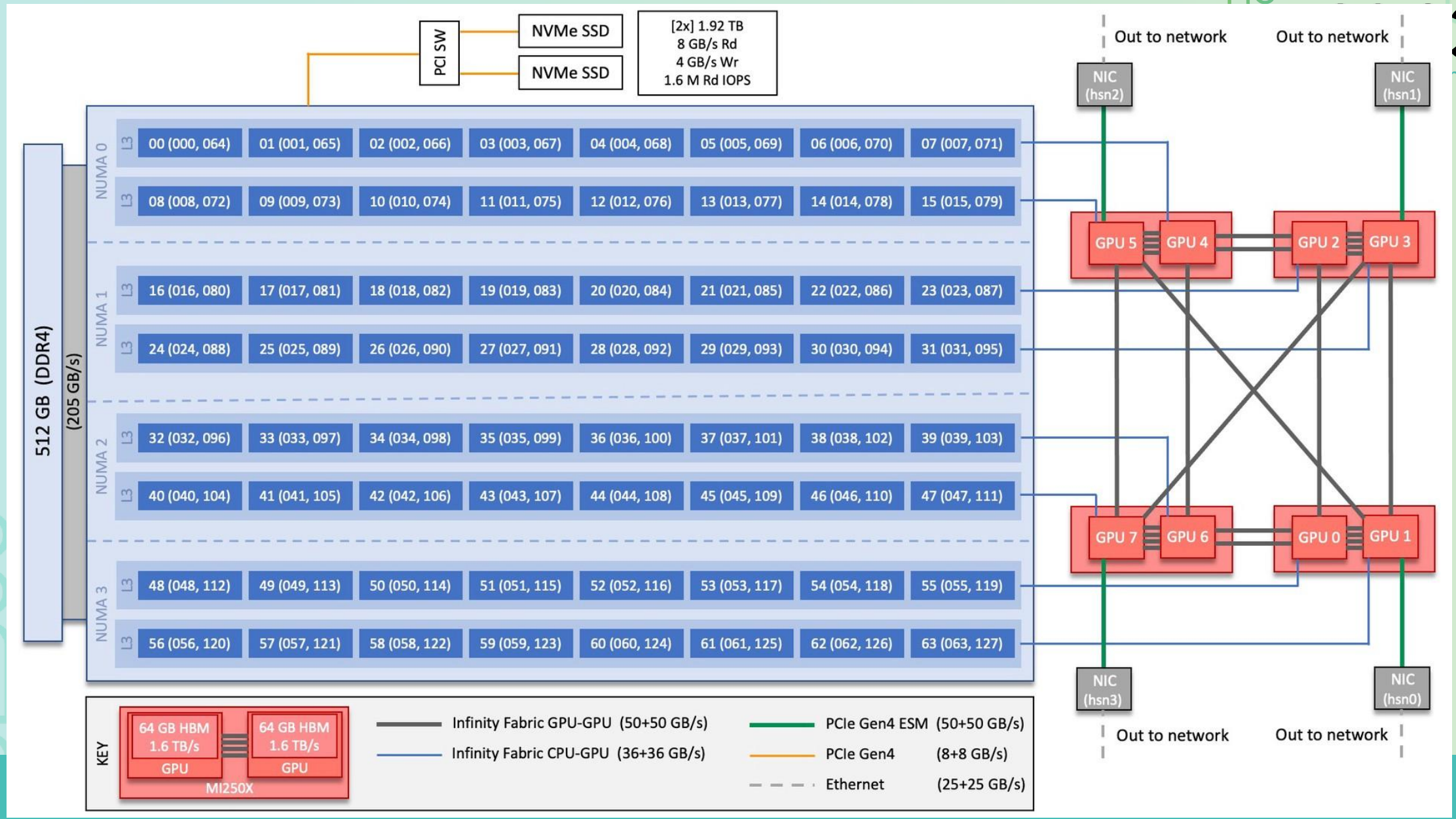
First to Exascale!

Frontier HPE Cray EX235A Blade

- 2 nodes per Blade
  - Each with one CPU and four MI250X accelerators
- Direct liquid cooled for all components
- Supports high power processors > 500W
- Water cooled > No fans > energy efficient!
- #6 on Geen500

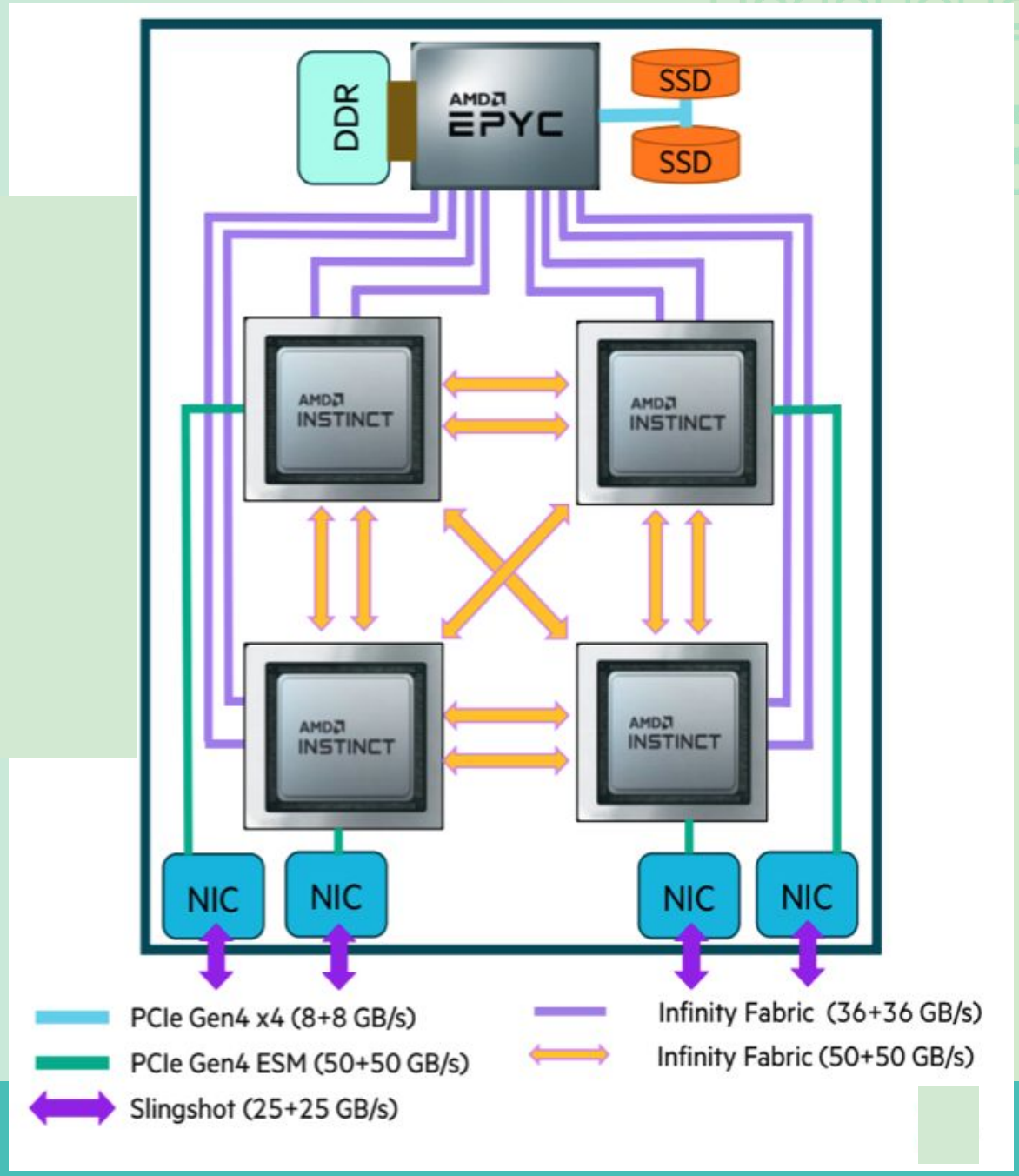


Frontier Node Schematic



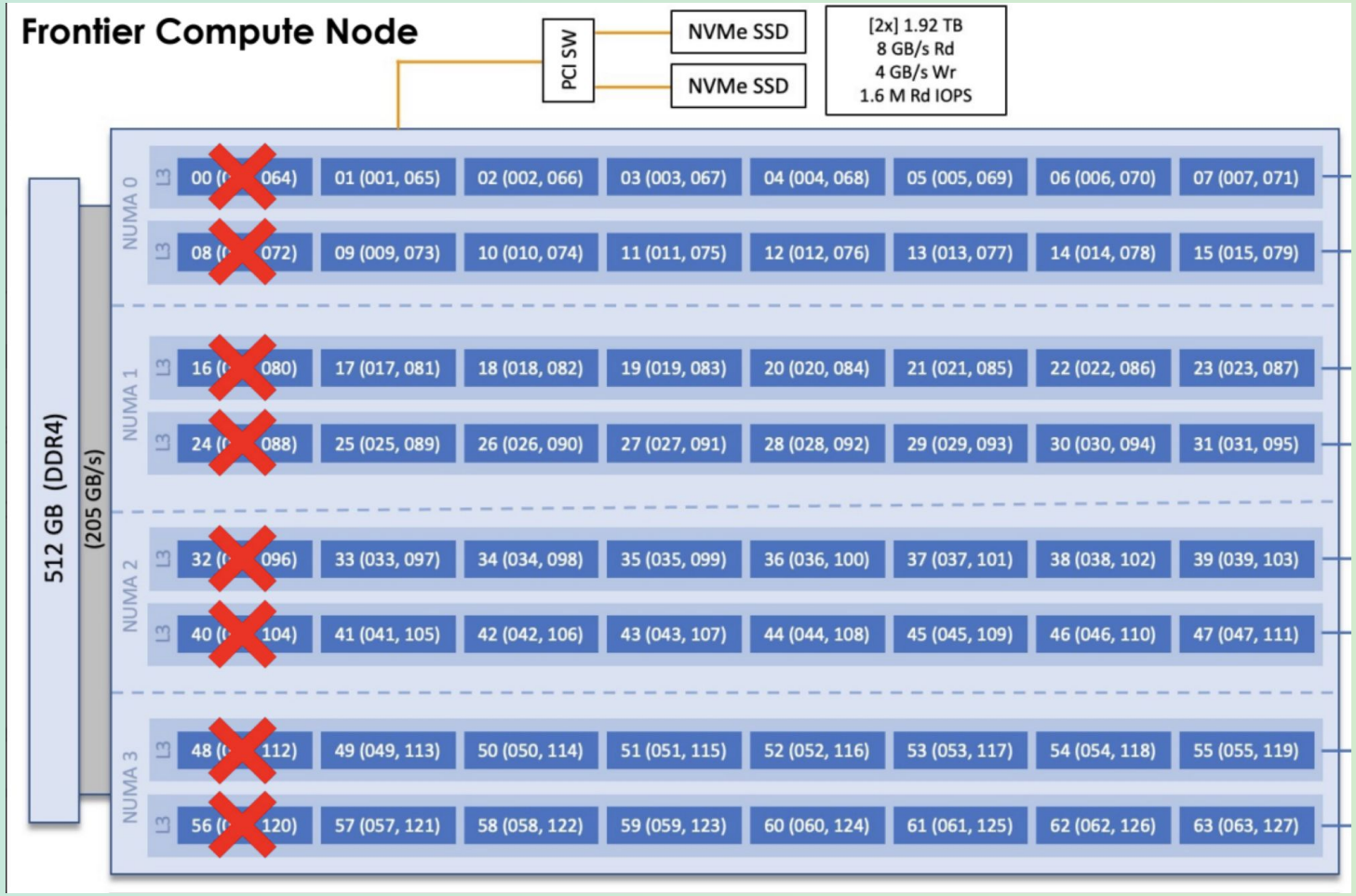
Node: Connections

- PCI-Express 4.0 ESM to Network Interface
  - 50+50 GB per link
- AMD Infinity Fabric between the CPU and GPU
  - Peak CPU to GPU speeds of 36+36 GB per link
- AMD Infinity Fabric between GPUs
  - Peak GPU to GPU speeds of 50+50 GB per link



Node: 3rd Gen EPYC CPU

- Frontier 3rd Gen EPYC :64 cores (2 hwthreads/core) Per CPU
- 4 NUMA Domains
  - 2 L3 Caches each
  - The first core in each Numa domaine is isolate from the user by default because system process run on this core.
- 512 GB DDR4 memory with 205 GB/s peak bandwidth
- 2x NVMe 2TB SSDs, peak 8 GB/s Read, 4 GB/s Write, >1.5M IOPs



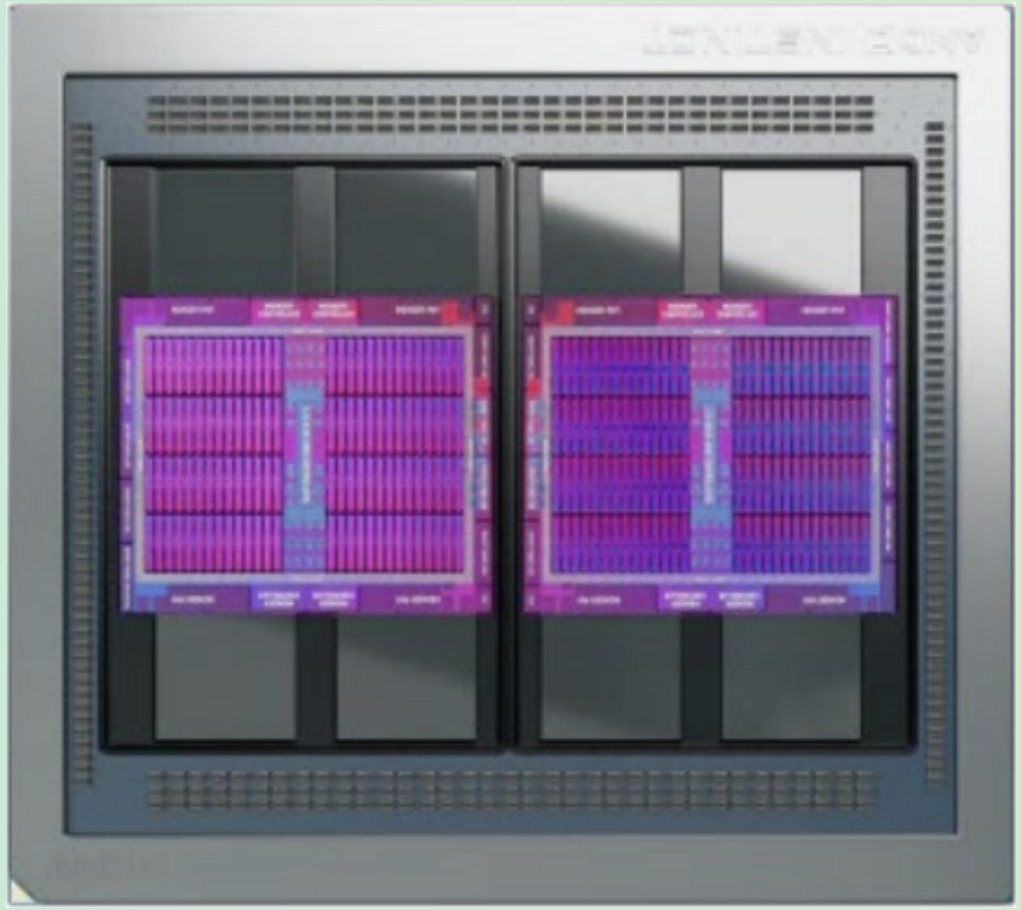
Node: MI250X GPU

Each MI250X GPU has:

- Two Graphic Compute Dies (GCDs)
    - total of 8 GCDs per node

Generally easier to refer to the 8 GCDs as GPUs

- Each Node then has 8 GPUs with the following specifications:
    - HBM Capacity: 64 GB
    - HBM Peak Bandwidth: 1.6 TB/S
    - Compute Units: 110
    - 26.5 TFLOPS double-precision peak
- The 8 GPUs are each associated with one of the 8 CPU L3 cache regions
- The two GCDs in the same MI250X have a higher bandwidth Infinity Fabric connection between them, with 200 GB/s peak



Available File Systems / Storage Areas on Frontier

NFS Directories – This is where you might want to keep source code and build your application.

`/ccs/home/<userid>`

- Your personal home directory

`/ccs/proj/<project_id>`

- Can be accessed by all participants of this event

Lustre Directories (parallel file system) – This is where you should write data when running on Frontier's compute nodes.

`/lustre/orion/<project_id>/scratch/<userid>`

- Your personal Lustre scratch directory

`/Lustre/orion/<project_id>/proj-shared`

- Can be accessed by all participants of the event


Questions?
Summit here
Frontier here
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