

Be Boulder.



University of Colorado **Boulder**

HPC Architecture

- Purpose: To insure a basic understanding of computer hardware and infrastructure
- Brief discussion of typical supercomputer
- Components discussed: processors, memory, network, storage
 - Focus: processors and memory



Architecture of a supercomputer

- Highest level to lowest level architecture:
 - System
 - Nodes
 - Cores/memory/storage
- Network interconnects the components of the system as a whole



Racks

- Supercomputers can encompass entire rooms
- Components of system mounted in racks
 - Nice cabinets with rails
 - Can purchase standard racks or customize
- RMACC Summit – 10 racks
 - Nine compute and one storage
 - Racks are black metal cabinets that enclose infrastructure



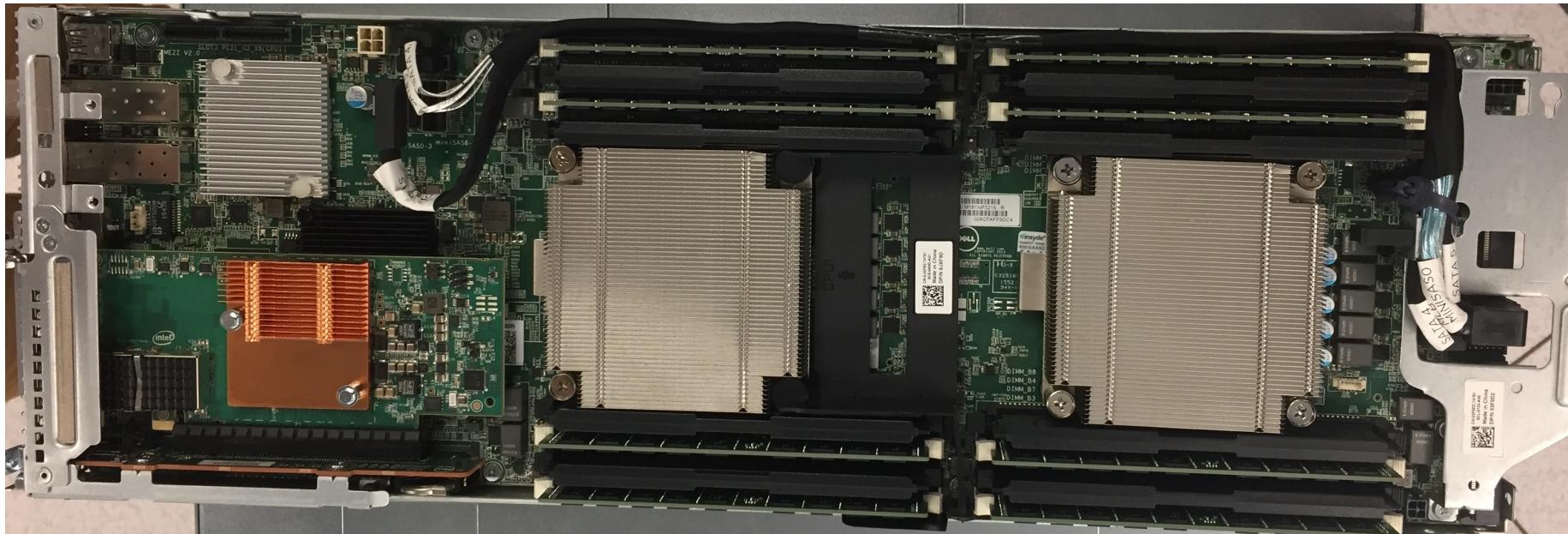
Racks (2)

- Behind is cooling unit
 - Moves hot air through heat exchangers
 - Keeps optimal temperature
- Infrastructure is compute, networking, or storage
 - Storage – disks
 - Network – high speed switches and cable
 - Compute is of interest here
 - 8 chassis of 4 nodes each (32 total)



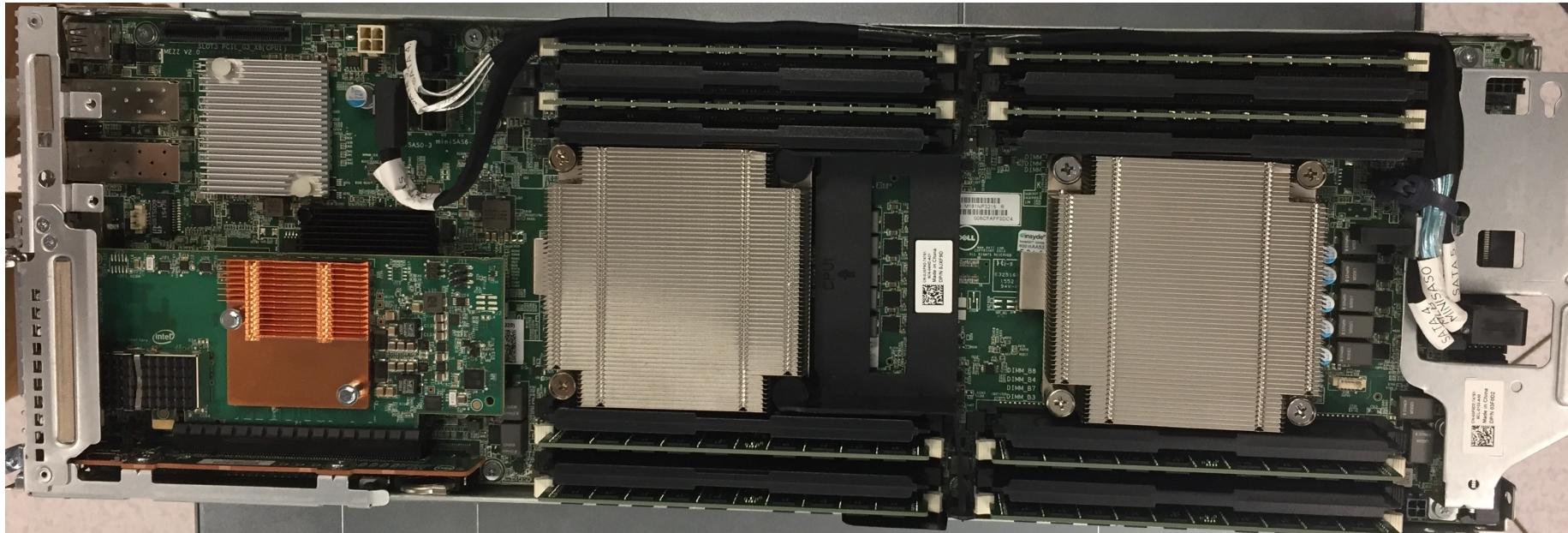
Compute Node – CPU Sockets

- Sit within sockets on node, under large silver heat sinks (2 sockets, 2 CPUs)
- Within CPUs are cores, main processing power, and memory
- This node has 12 cores per socketed CPU, 24 total
- Power from amount of cores



Compute Node – Memory

- Memory cards are eight green, thin cards (RAM)
 - Shared memory on node
 - Eight 16 GB memory cards per node
- Also memory in socketed CPUs (cache and shared between cores on one socket)



Interconnect

- Supercomputers work together as one big unit to solve larger problems
 - Provide large processing power
- In theory use entire system! Much bigger than laptop!
- To work together must have an interconnect
 - Access to memory and computing power
 - Nodes talk to each other
 - OmniPath, Infiniband
- How would use this system to solve a larger problem?