Astra Computer
New HPC Data Center

PRESENTED BY
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Astra Architecture

- 2,592 HPE Apollo 70 compute nodes
  - Cavium Thunder-X2 Arm SoC, 28 core, 2.0 GHz
  - 5,184 CPUs, 145,152 cores, 2.3 PFLOPs system peak
  - 128GB DDR Memory per node (8 memory channels per socket)
  - Aggregate capacity: 332 TB, Aggregate Bandwidth: 885 TB/s
- Mellanox IB EDR, ConnectX-5
- HPE Apollo 4520 All-flash storage, Lustre parallel file-system
  - Capacity: 403 TB (usable)
  - Bandwidth 244 GB/s
Astra Architecture

HPE Apollo 70 Chassis: 4 nodes

18 chassis/rack
72 nodes/rack
3 IB switches/rack (one 36-port switch per 6 chassis)

36 compute racks (9 scalable units, each 4 racks)
2592 compute nodes (5184 TX2 processors)
3 IB spine switches (each 540-port)
MCS Cooling Units

• Up to 150kW cooling capacity or 110kW in an N+1 fan configuration

• Supports 7°C to 32°C Facility inlet water temp

• Automatic Transfer Switch providing redundant power input

• Support for 380 to 480 VAC power input

• Includes four electrically commutated high efficiency centrifugal blowers

• Warm water cooling ready: support IT loads up to 75 kW at 30°C inlet water with 70 GPM and a server supply air temperature of 35°C. Input power support for 380-480VAC (3-phase)

• Extend cooling up to four racks with optional HPE Apollo 42U or 48U MCS racks
Astra Advanced Power and Cooling

Extreme Efficiency:
- Total 1.2 MW in the 36 compute racks are cooled by only 12 fan coils
- These coils are cooled without compressors year round. No evaporative water at all almost 6000 hours a year
- 99% of the compute racks heat never leaves the cabinet, yet the system doesn’t require the internal plumbing of liquid disconnects and cold plates running across all CPUs and DIMMs

Sandia Thermosyphon Cooler Hybrid System for Water Savings
Cooling system of Astra
New HPC data center build (725 East)

- Design build - Started in October 2017, completed October 2018
- LEED Gold certified
- 14,000 sq. ft.
- 85% warm water cooled 23°C (74°F) to 29°C (84°F) entering water temp
- Primary loop and secondary loop are non mechanical cooled 85% of the year
- Thermosyphon installed (water/energy savings)
- 15% air cooled outside air economization 3 stage 22°C (72°F) to 25°C (77°F)
- 4.5MW build out to 14MW - 1.5MW load centers
- Overhead buss system (1200 amp)
- 3 ft. raised floor 4,000 lbs. rated
- Open floor
  - No beams
- Natural light (northside) and led lights as well as motion sensors
- All automated control systems (DCIM tool installed)
- Overhead network cable structure
• Adjacent data center non-load bearing wall
• Cooling units
  • 2 each
  • 1 additional

• Utilization of phase change on refrigerant
• Estimated 3 million gallons of water saved per year
• Place holder for 3 additional future installs
Process pumps

- 3500 GPM each
- Primary and back up valves installed
- Valves installed for third pump
- Heat exchanger
Flooring

- 3 ft raised flooring
- Process pipe pressure differential valve
- Process pipe 4” feeds every 12 ft. on center

Flooring complete in late August
Prep for arrival of computer
Water/air cooled load banks were leased for load simulation of 1.4 MW load
Installation of 1200 amp buss systems

- Flexibility for expansion
- All IT power connections are on separate feed
First Delivery of Astra System

- Dock under construction during first deliveries
- Dock lift was not operational
Astra System completion install

- Installation complete October 2018
- First measured PUE run 1.11

System test being performed