New Corona System & CTS-2 Update

March 2019 LC User Meeting

March 28, 2019

Matt Leininger

CTS-2 POC
Corona is a Follow-on to Catalyst: First AMD GPU Cluster for HPC, ML, and Data Science

Node
- AMD Naples 24-core 2.0 GHz
- Memory: 256 GB; 5.3 GB/core
- Memory BW: > 300 GB/s DDR
- 1.6 TB NVMe
- Mellanox HDR100
- 4 GPU per compute node

System Nodes
- 82 CPU-only nodes
- 82 CPU+GPU
- 4 Gateways
- 1 Login
- 1 Management
Corona Highlights

Considering adding 328 AMD MI-60 GPUs to Corona
## Corona NVMe

<table>
<thead>
<tr>
<th>NVMe</th>
<th>Read</th>
<th>Write</th>
</tr>
</thead>
<tbody>
<tr>
<td>HGST 2N200 3 DWPD</td>
<td><strong>Sequential @ 128 KiB</strong></td>
<td><strong>Random @ 4 KiB</strong></td>
</tr>
<tr>
<td></td>
<td>3.35 GB/s</td>
<td>835K IOPs</td>
</tr>
<tr>
<td></td>
<td>2.1 GB/s</td>
<td>200K IOPs</td>
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Corona Software Environment

- Tri-Lab Operating System Software HPC environment as base foundation
  - TOSS 3.x based on RHEL 7.x
  - Provides smooth transition for TOSS team and LLNL HPC users
  - Includes AMD drivers, compilers, etc.
  - Slurm + Flux scheduler and resource manager
- Additional software for Data science & Machine Learning
  - Containers supported
  - Working with early users to explore other software

Corona is onsite and undergoing burn-in. Early User access in April.
Commodity Technology Systems

- Status of CTS-2 procurement
- Approximate Timeline
- Potential Architectures
CTS-2 activities leading to RFP and Contract

CTS-2 and TOSS teams continue to work together during CTS-2 deployment & lifetime support

**LANL**
- Market surveys

**LLNL**
- CTS-2 Market surveys
- Update Tech requirements
- Release DRAFT RFP
- Feedback on DRAFT RFP
- Final RFP
- Vendor Selection
- Tri-lab negotiations
- CTS-2 contract awarded

**SNL**
- Market surveys

2018-2019
- Oct. 2018 – March 2019
- Oct. 2018 – March 2019
- April 2019
- April 2019 - May 2019
- August 2019
- Sept 2019
- Sept-Oct 2019
- Jan. 2020
DRAFT

CTS-2 Procurement Timeline

ASC Deployments may start in 1H2021

Deliveries may start in 2H2020

2018


Release DRAFT CTS-2 RFP

2019


CTS-2 contract awarded

TOSS Early Evaluation System

Potential Architecture Decision Point

2020


CTS-2 SU: Phase 0 Deliveries

2021-2023


CTS-2 SU: Phase 1 Deliveries

CTS-2 SU: Phase 2 Deliveries

Begin software integration with TOSS

Release Final CTS-2 RFP

CTS-2 Proposal Review & Vendor Selection

Contract Negotiations Complete
Potential CTS-2 Node Design

CPU Architecture & Software Readiness are key aspects of CTS-2 Selection
- Intel Xeon, AMD Epyc, Marvell ThunderX, IBM Power all viable processors
- Maturity of platform?
- TOSS support
- Maturity of system software and overall software ecosystem?
- Cost/performance of platform?

What about GPU systems and HBM memory?
Bringing ATS features to CTS-2

• GPU are becoming more widely adopted
• Past commodity procurements were dominated by CPU-only SU’s
• GPU system will be available under CTS-2
  • Programs responsible for determining the mix of CPU-only + GPU nodes/clusters best address workloads
  • How much GPU memory do you need?
  • What is the ratio of CPU’s to GPU’s?
  • Is hardware support for unified memory required?
  • Can all codes utilize GPU’s?
  • Can all workloads utilize GPU’s – 3D vs 2D?
Bringing ATS features to CTS-2

• Give me the fast GPU memory but on CPU’s!!
• Today’s GPU utilize High Bandwidth Memory (HBM v2 or HBM2)
• CPU + HBM may be a nice architecture for CTS
• Time to market is likely 2022+
• High Bandwidth Memory provides
  — ~3X more bandwidth per socket
  — ~4X less memory capacity per socket
  — 1-1.5 GB/core – adapt applications accordingly
• CTS-2 will include options for CPU+HBM if/when available
Questions?

• Matt Leininger
  matt@llnl.gov