

New Corona System & CTS-2 Update

March 2019 LC User Meeting

Matt Leininger
CTS-2 POC

March 28, 2019

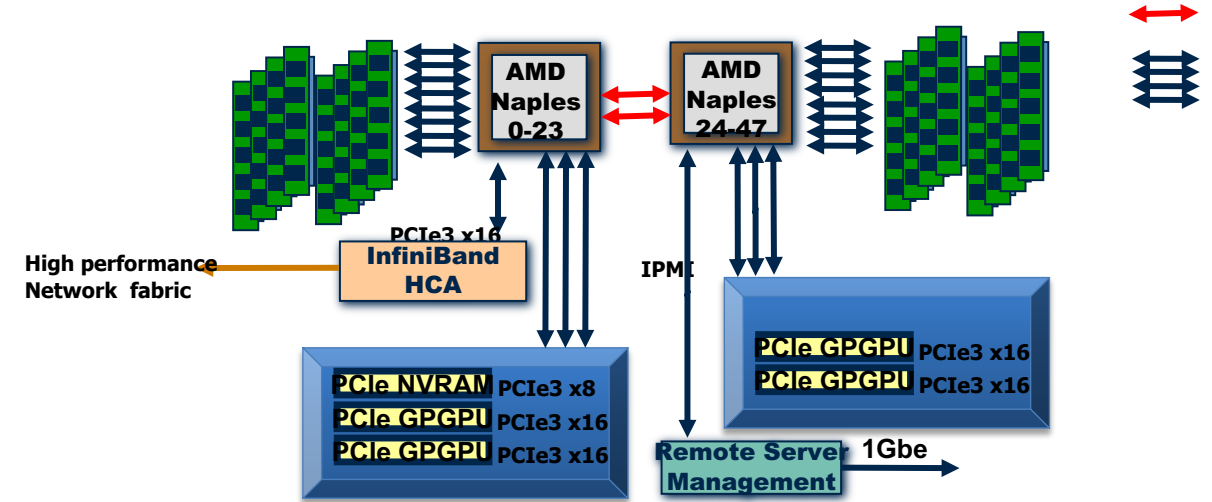


Corona is a Follow-on to Catalyst:

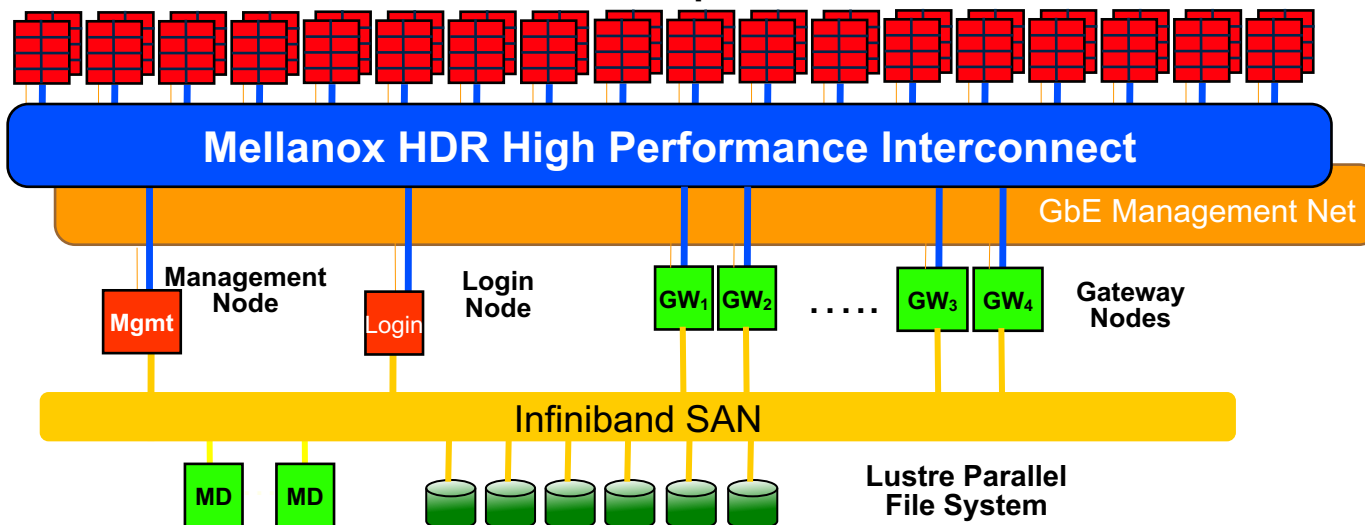
First AMD GPU Cluster for HPC, ML, and Data Science

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



164 2-Socket 24-Core Compute Nodes + 328 GPUs



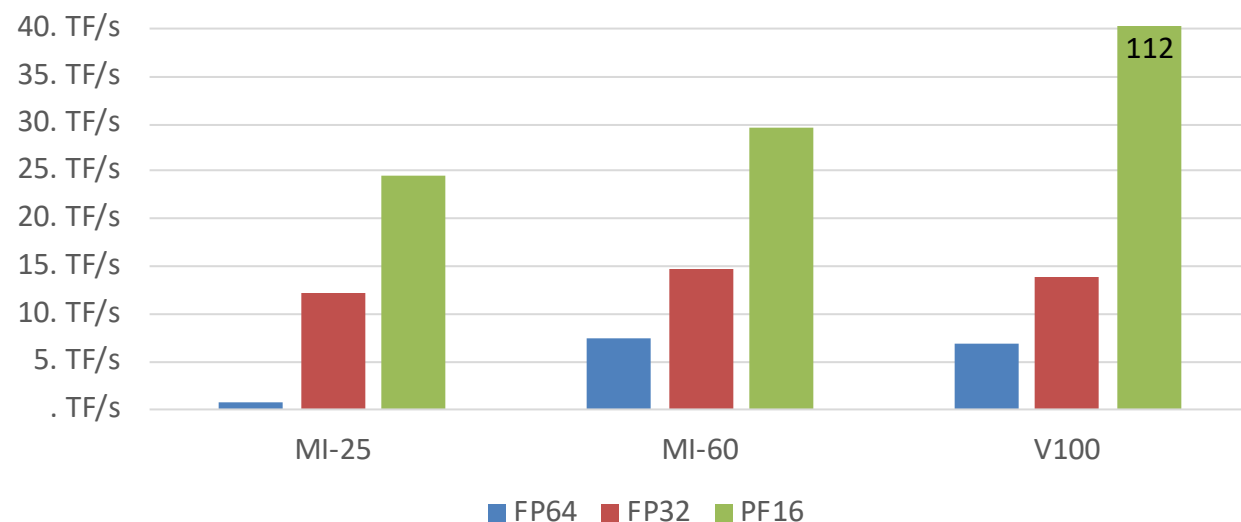
System Nodes

- 82 CPU-only nodes
- 82 CPU+GPU
- 4 Gateways
- 1 Login
- 1 Management

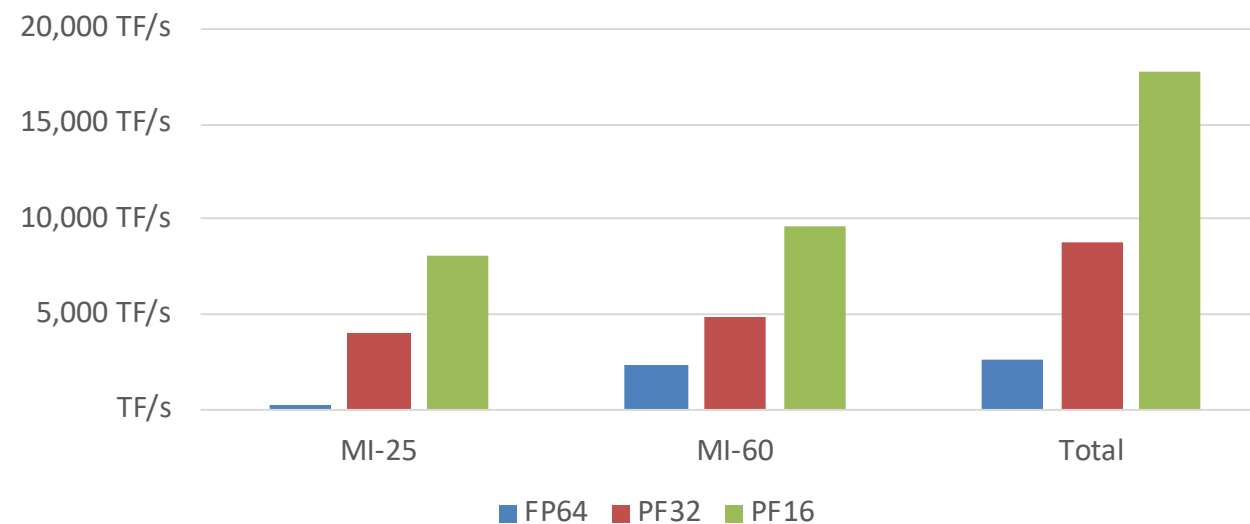


Corona Highlights

GPU FP Performance



Corona FP Performance



Considering adding 328
AMD MI-60 GPUs to
Corona

Corona NVMe

NVMe HGST 2N200 3 DWPD	Read	Write
Sequential @ 128 KiB	3.35 GB/s	2.1 GB/s
Random @ 4 KiB	835K IOPs	200K IOPs
Total	549 TB/s; 137M IOPs	344 TB/s; 32.8M IOPs

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

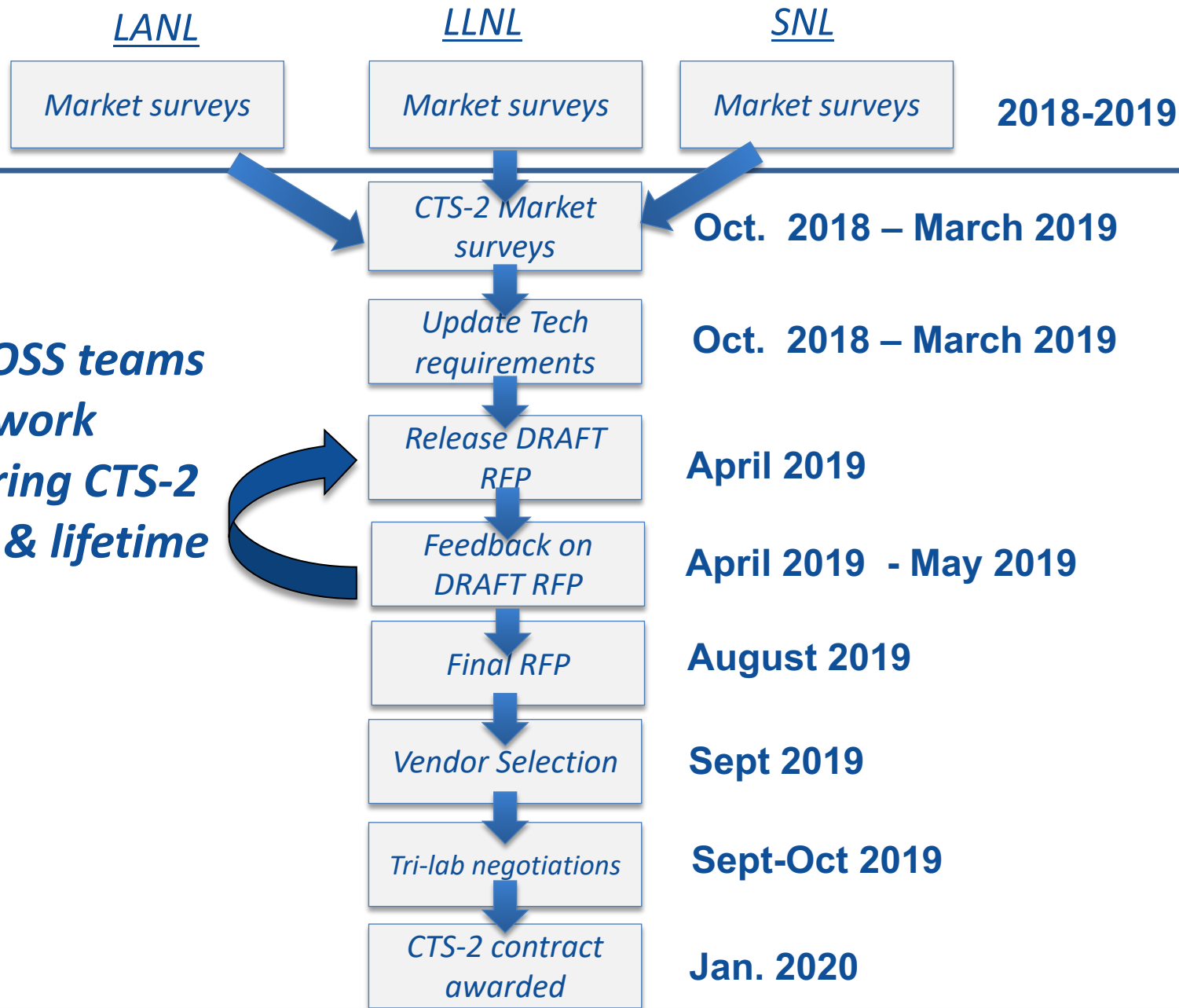
Corona is onsite and undergoing burn-in. Early User access in April.

Commodity Technology Systems

- Status of CTS-2 procurement
- Approximate Timeline
- Potential Architectures

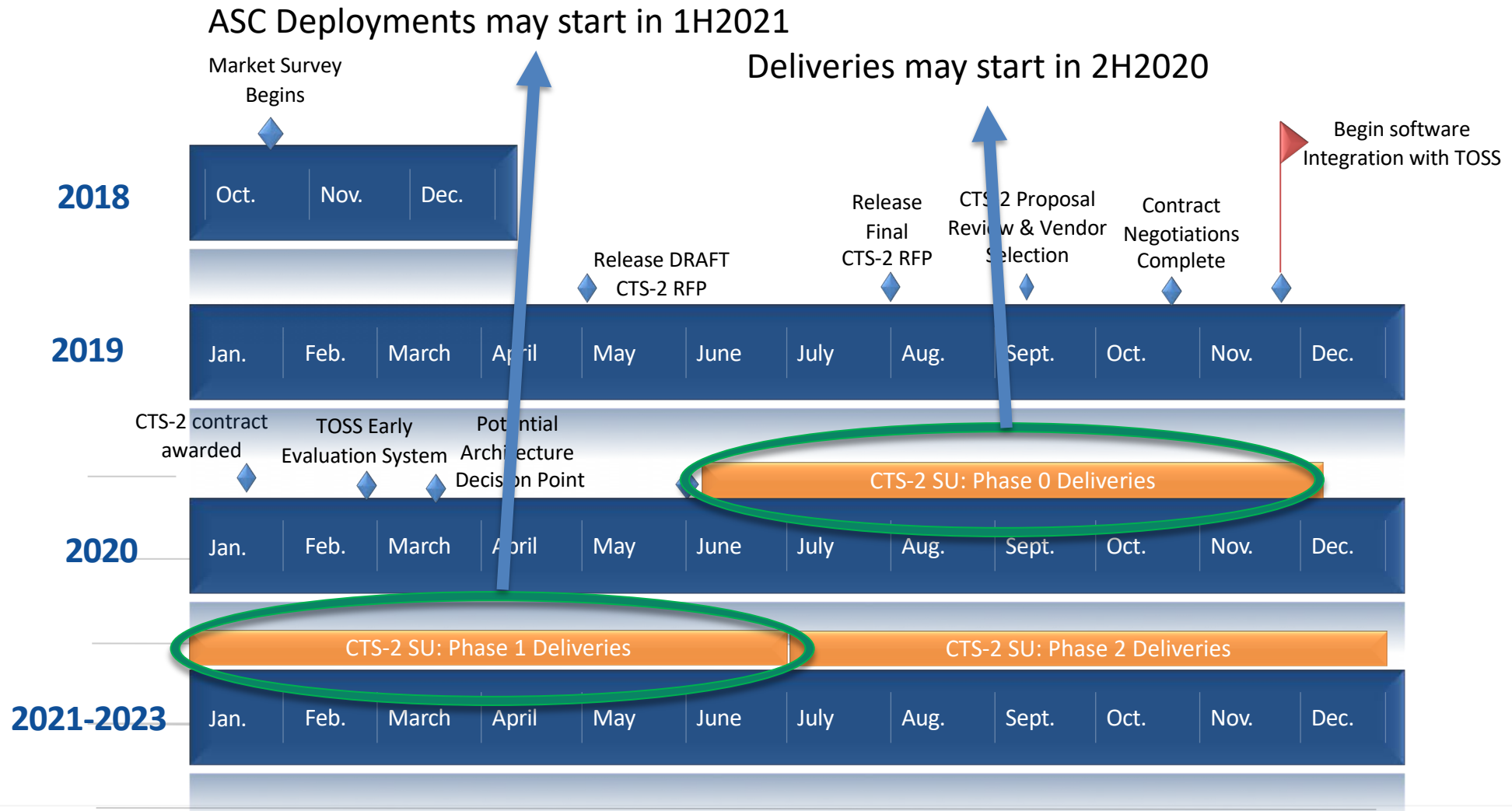
CTS-2 activities leading to RFP and Contract

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

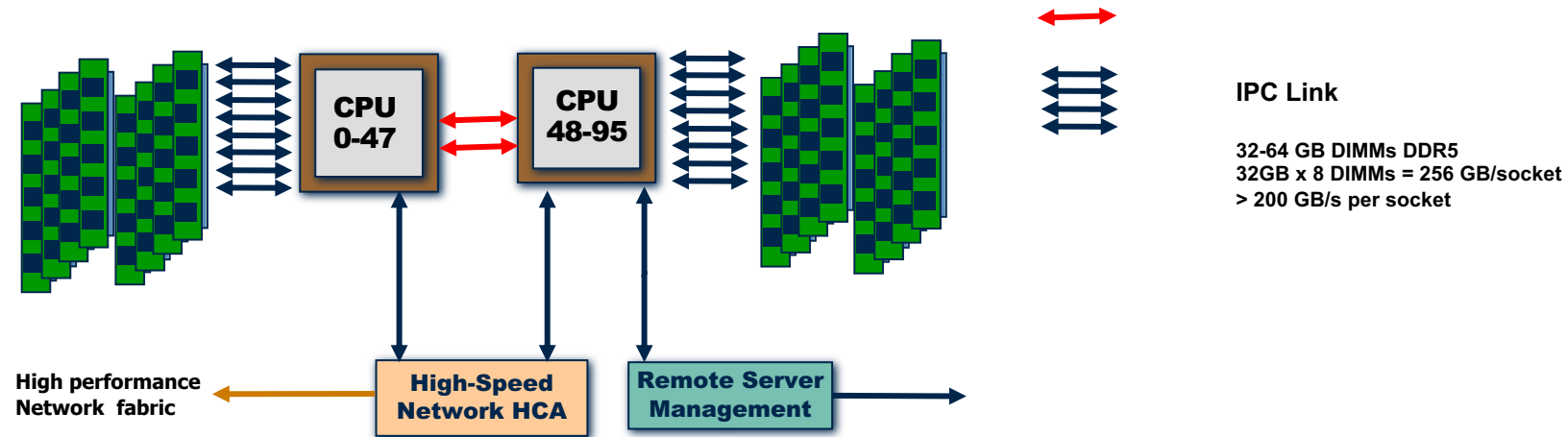


DRAFT

CTS-2 Procurement Timeline



Potential CTS-2 Node Design



CPU Architecture & Software Readiness are key aspect 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



Disclaimer

This document was prepared as an account of work sponsored by an agency of the United States government. Neither the United States government nor Lawrence Livermore National Security, LLC, nor any of their employees makes any warranty, expressed or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States government or Lawrence Livermore National Security, LLC. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States government or Lawrence Livermore National Security, LLC, and shall not be used for advertising or product endorsement purposes.