The Tri-Lab Operating System Stack on Cray EX Supercomputers

Cray User Group 2023

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May 7-11, 2023
Helsinki, FI

LLNL-PRES-848428
This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under contract DE-AC52-07NA27344. Lawrence Livermore National Security, LLC

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Let’s Talk About TOSS

- What is TOSS?
- Why TOSS?
- Current Status of TOSS on Cray EX
- Challenges
- Future Work

TOSS is RedHat with Sprinkles on top

The Sprinkles

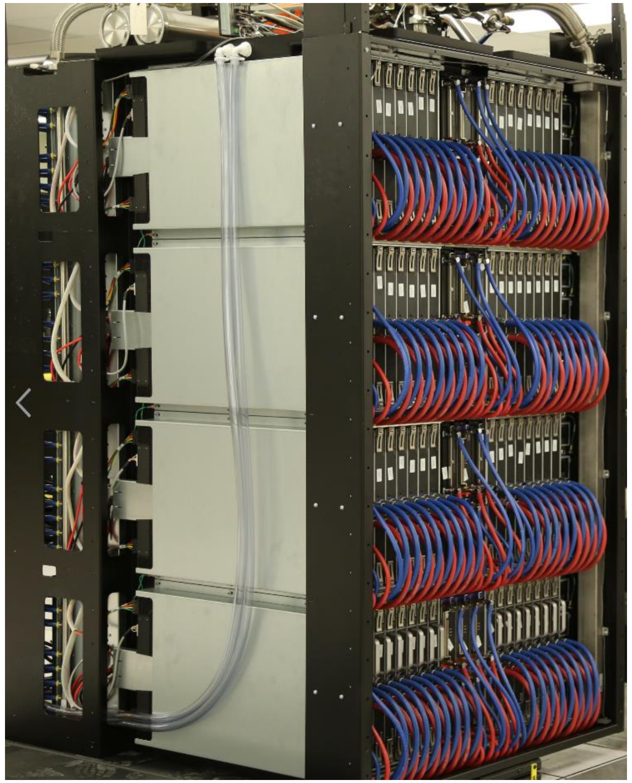
- Release every month
  - Every version of every package is tracked for every release
  - Base OS like RHEL Server and the AppStream “like” stuff
- ~150 Sprinkles:
  - Cassini support
  - Beegfs, GPFS, 3 lustres versions 2.15 with Cassini support
  - Nvidia / AMD GPU support with supporting software
  - SLURM, Flux
  - Cluster management tooling; power, console, parallel shells….
  - Vendor specific tools
    - Dell, SMC, firmware, Proprietary Mellanox OpenSM, Intel
      - Tooling for diags and firmware updates
  - Compilers, MPIs
  - Kernel patches

Why TOSS?

- Simple
  — TOSS philosophy keeps things as simple as they can be in order to improve reliability.
- Mature
  — Over 20 years of incremental development and use on production Top 500 HPC systems.
- Community Oriented
  — Upstream whenever possible. Standard components wherever they exist. Open source any additions where possible.
- Secure
  — TOSS provides monthly security patch releases.
  — TOSS follows a published STIG security baseline.
- Software Supply Chain
  — Every package in TOSS is signed providing a 100% trackable pedigree.

Current Status of TOSS on Cray EX

- Running on four Cray EX systems at LLNL
  - Three production early access systems
  - One testbed
- Full suite of management features
  - Diskless and Diskfull provisioning
  - Power and console management
  - Firmware update
  - Diagnostics
  - Rolling updates
- Shipped on El Capitan infrastructure systems
  - Pre-installed at HPE manufacturing by LLNL and HPE engineers
  - Used to perform pre- and post- ship diagnostics for El Capitan infrastructure
- Base OS for El Capitan ClusterStor filesystem



Challenging Interface Points With Cray EX Software

- Firmware
  - Production level HFP-firmware release schedule
    - To keep consistent update process in place, pre-production firmware is repackaged to match HFP
- Kernel Drivers
  - Delay in compass github repos to match Slingshot release
    - Kernel related software, cxi driver, kbabric…
- Cray PE / Modules
  - Early issues have been resolved, packages are production quality
- Monitoring
  - Cray was ahead of the dmtf standards
    - Cray uses OEM endpoints to capture lots of data with one request
  - LDMS support libfabric support?
    - Cassini is not a provider upstream

Future Work

- K8s
  - Extending K8s support from Rabbit hardware to a service on compute nodes
- Using upstream xpmem
  - HPE has opened tickets with upstream
  - Need to find people time to work on issues
  - HPE looking at alternatives
- Moving to RHEL 9
  - TOSS 5.0 work to begin in May 2023 based on RHEL 9.2
  - Likely move to RHEL 9 based TOSS in 9.5 or 9.6 timeframe