Hewlett Packard Enterprise

Transforming Hybrid Workflows

The Role of HPE Cray Supercomputing User Services Software in Bridging HPC and AI

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Agenda

Welcome and Session Guidelines

User Pain Points

Current Landscape Overview

Roundtable – How HPE Cray SC User Services Software aims to address key challenges?

HPE Cray Supercomputing User Services Software

Flexibility

Diverse HPC/AI Workflows
can be run with organizations' existing infrastructure

Containerization
enables consistent portable application environments across varied infrastructure

Multiple Linux Distributions
including Red Hat Enterprise Linux and SUSE Linux Enterprise Server are supported

Sustainability

Turbo Boost Limiting
reduces energy consumption and costs as well as performance variation

Power Monitoring
keeps users aware of power utilization and distribution

HPE Cray Supercomputing User Services Software **revolutionizes user experience**

Efficiency

Complex Workflow Orchestration
facilitates execution of diverse workloads on HPC infrastructure

File System I/O Operations
reduces bottlenecks associated with data I/O operations

Low Noise Mode
focuses resources on running workloads

XPMEM
creates shared memory capabilities that enhance scalability

Persona based pain points: HPC and AI workflow management

DevOps/ Platform Engineers

- No consistent tooling for container lifecycle automation

- Fragmented federation APIs and access control challenges

- No influence over power-aware workload placement

Workload Admins/ Application Engineers

- Workflow orchestration is hard across AI + simulation

- Complex orchestration across bare metals, VMs, and containers

- Multiple execution environments degrade tuning and performance

End Users/ Scientists

- Hard to reuse container workflows across systems

- Poor reproducibility across hybrid and federated systems

- Limited insights into resource and power use

Cross-Cutting Themes

- Fragmented tooling across the software stacks complicates integration
- Lack of portability and standardization across hybrid environments
- Limited visibility into performance, power, and resource

Current landscape: workflow and infrastructure challenges

Container lifecycle

- Tools like Apptainer, Docker, Podman are common
- Fragmented image creation, signing, and validation practices
- Poor integration with stack managers like Spack

Orchestration and deployment

- Slurm dominates HPC but lacks advanced orchestration support
- Kubernetes emerging in AI, also important for persistent private services
- Use of workflow engines growing

Virtualization and hybrid environments

- Bare metal, VMs, and containers often coexist with friction
- Lack of cohesive tools for unified management

Power and Resource Management

- EAR, GEOPM, vendor tools exist but aren't integrated
- Power aware scheduling is rare and not user visible

Federation and Portability

- Limited API standardization across systems
- Workflow portability remains a major challenge

Roundtable – How should USS address these key challenges?

Container lifecycle

- Tools for building, curating, and managing verifiable container environments

- Enables smooth integration with HPC stacks

Orchestration and deployment

- Flexible orchestration with dynamic resources

- Simplifies workflow orchestration across HPC and AI
- Offers interfaces that complement both batch and K8s environment

Virtualization and hybrid environments

- Support full virtualization with hardware virtualized devices

- Supports hybrid deployment model (bare metal, VMs, containers)
- Guides users with system-aware deployment tooling

Power and Resource Management

- Power aware scheduling and system management

- Integrates power policies with job scheduling
- Enables dynamic resources steering and visibility into energy use

Federation and Portability

- API driven support for workflow portability

- Seamless coordination across federated environments

Thank you

Please take this <u>short survey</u> to help us better understand requirements for user services:
<u>https://forms.office.com/r/N5MAvz7BCR</u>

Please free to reach out to the product manager for suggestions/feedback –
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User Services Software