HPC Container Management

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Crossing The Container Chasm

**Kubernetes**
- New, initial release 2014
- Limited scheduling policies
- Everything is containerized – no bare metal.
- Support for Docker only (Singularity support under development)
- Typically launched by services

**Spectrum LSF HPC Scheduler**
- Mature technology, over 20 years old
- Rich scheduling policies
- Support for bare metal
- Multiple container technologies (Docker, Singularity, Shifter, CharlieCloud etc)
- Typically user submitted jobs

**Note:**
Singularity – Lawrence Berkeley, Shifter – NERSC, Charliecloud - LANL
1. A Shared Kubernetes & HPC Environment

- IBM Spectrum LSF scheduler manages both HPC and K8S workloads
- K8S Services can be placed within the cluster, and those services can launch jobs.
- Jobs can be placed within the cluster and start services if required.
- Jobs can use bare metal or whatever container runtime they need.

Docker, Singularity, Shifter, CharlieCloud etc
2. Enable HPC Scheduling Policies within Kubernetes

- Community work in this area with Kube-Arb / Kube-Batch to write a new scheduler from scratch.

- But we already have quite a few HPC Schedulers, why can’t we use them?

- The Kubernetes architecture allows multiple schedulers, and for the pods to specify which scheduler to use.

- LSF can run in a container providing advanced scheduling policies applied to pod placement.
Tech Preview: IBM Spectrum LSF and Kubernetes

- *Tech Preview* package combining the rich job management functions of IBM Spectrum LSF with the long running service capabilities of Kubernetes
- Share hosts between Kubernetes and IBM Spectrum LSF
- Take advantage of advanced IBM Spectrum LSF scheduling policies for Kubernetes workloads

IBM Spectrum Scale 5.0+ provides Persistent Storage to Containers and enables dynamic storage provisioning via IBM Cloud Private (Kubernetes)