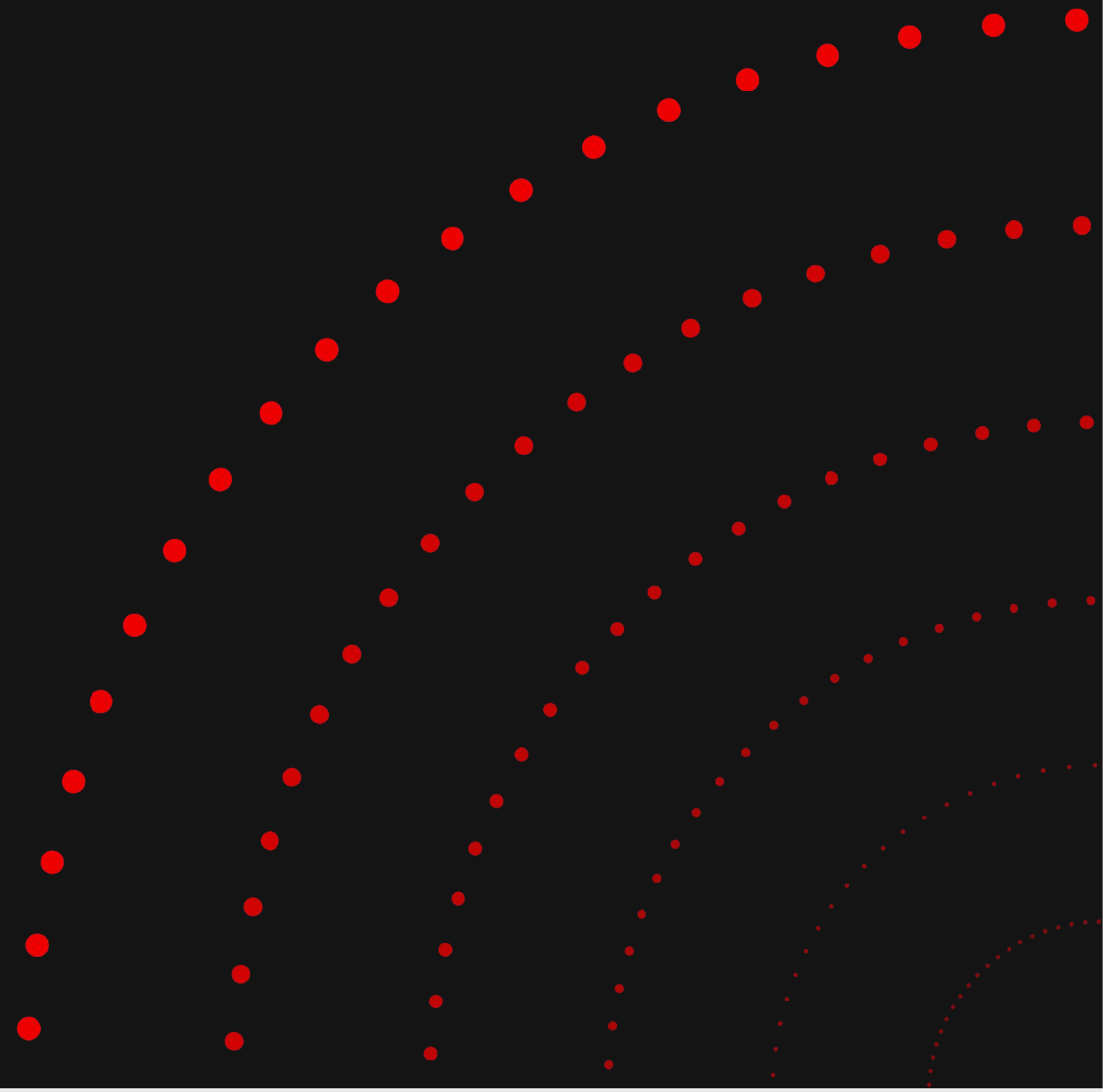
HPC User Forum

May 2021

Innovative Technologies Panel

Red Hat Update

Yan Fisher
Global Evangelist, Red Hat
yfisher@redhat.com



Red Hat

Emerging HPC trends

Cloud

On-prem and public, as well as other variations of HaaS (HPC-as-a-Service)

Multiple HW architectures

X86-64 (Intel,AMD), aarch64 (Arm), ppcle (IBM POWER)

Accelerators

GPGPU now mainstream, SmartNIC in the adoption phase, FPGA starting to emerge

Containers

Workflows are no longer highly parallel, they might traverse several hardware/software resources

AI/ML/DL

The data is out there, but finding and preparing it is a difficult scalability problem

Convergence with enterprise stacks

Over 50% of Top500 systems are from non-HPC areas such as telecom, social networks, gaming*

*** Source: © Hyperion Research 2020**

Multi-phase approach to enabling containers in HPC

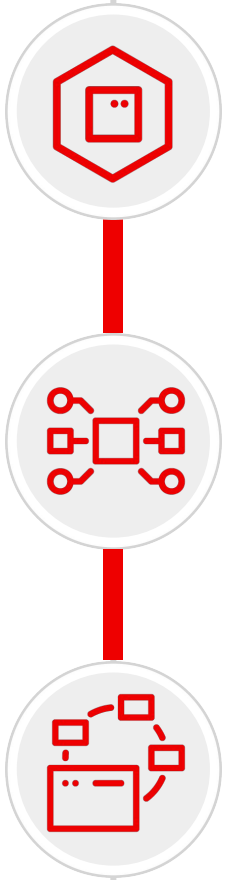
Preparing for exascale deployments

- **Crawl Phase - Enable single host environment**
  - Educate customers and developers about containers and their usage
  - Use Linux-native container tools (podman/buildah/skopeo)
  - Develop containers using Universal base image (UBI) for ease of sharing/distribution

- **Walk Phase - Scale HPC workflows to run on containers**
  - Provisioning and management of containers -- not orchestration
  - Enabling hardware features like accelerators, GPUs, NICs
  - Ability to run MPI jobs

- **Run Phase - Orchestrate HPC jobs with Kubernetes**
  - Tight integration with MPI scheduler(s)
  - Enable access to distributed files systems and existing environments
  - Expand to run workloads in commercial HPC verticals: FSI, Energy, Pharma, Bio etc

Red Hat's HPC-centric projects



Exascale Computing Project (ECP) supercontainers

Red Hat has been working with ECP and Sandia National Labs to develop container platform for exascale systems based on Podman and UBI that can run across multiple architectures, like x86-64, Arm and POWER

Scheduler integration into Kubernetes

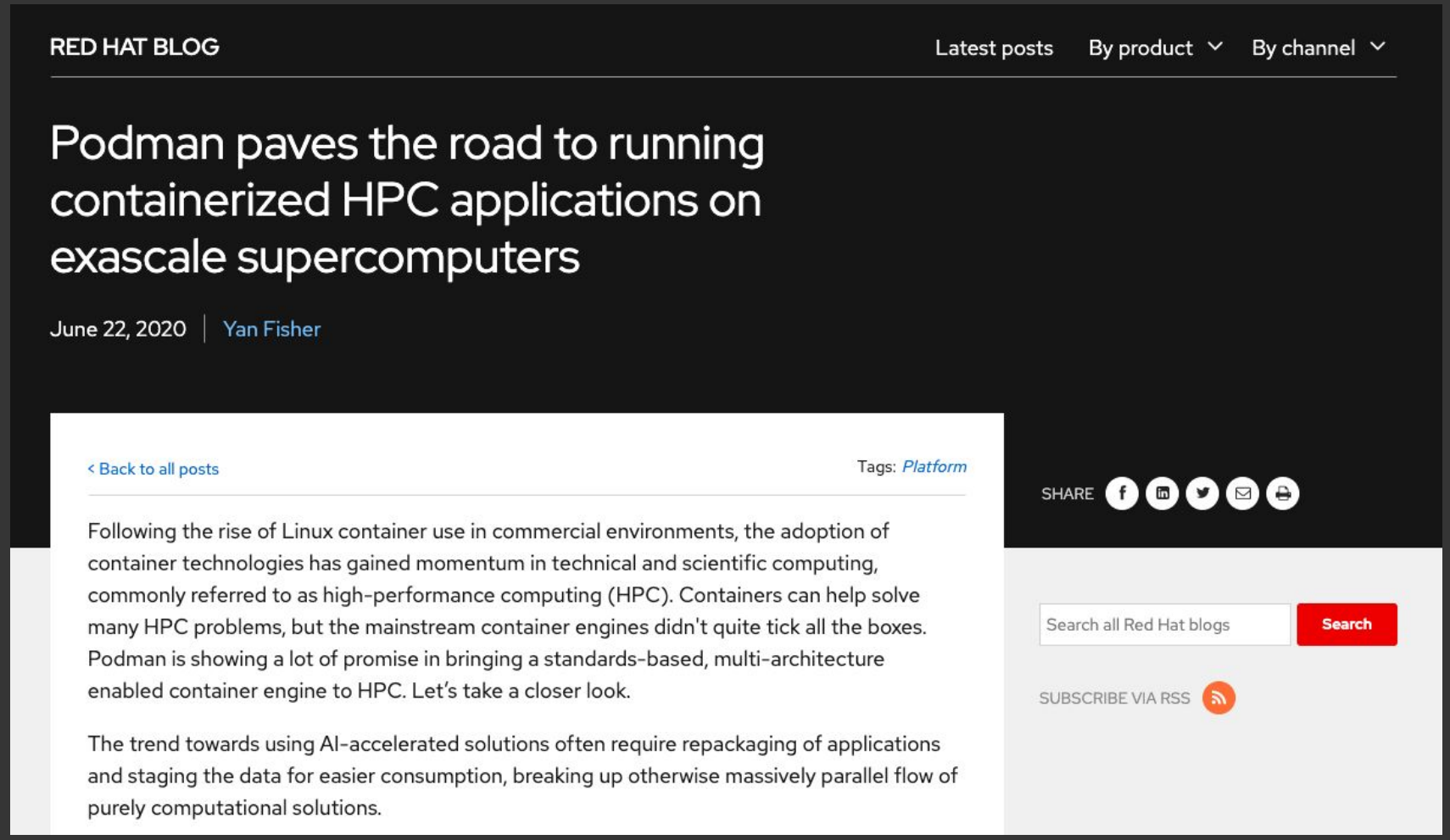
Red Hat, IBM and Lawrence Livermore National Labs joined forces to create a standard interface for commonly used schedulers in OpenShift and Kubernetes

Access to distributed filesystems from containers

Red Hat demonstrates typical scientific application, the molecular dynamics package called GROMACS, running on OpenShift, using MPI, while accessing data via distributed Lustre filesystem

Red Hat

Red Hat technologies for HPC



RED HAT BLOG

Latest posts By product By channel

Podman paves the road to running containerized HPC applications on exascale supercomputers

June 22, 2020 | Yan Fisher

< Back to all posts

Tags: *Platform*

SHARE

Following the rise of Linux container use in commercial environments, the adoption of container technologies has gained momentum in technical and scientific computing, commonly referred to as high-performance computing (HPC). Containers can help solve many HPC problems, but the mainstream container engines didn't quite tick all the boxes. Podman is showing a lot of promise in bringing a standards-based, multi-architecture enabled container engine to HPC. Let's take a closer look.

The trend towards using AI-accelerated solutions often require repackaging of applications and staging the data for easier consumption, breaking up otherwise massively parallel flow of purely computational solutions.

Search all Red Hat blogs Search

SUBSCRIBE VIA RSS

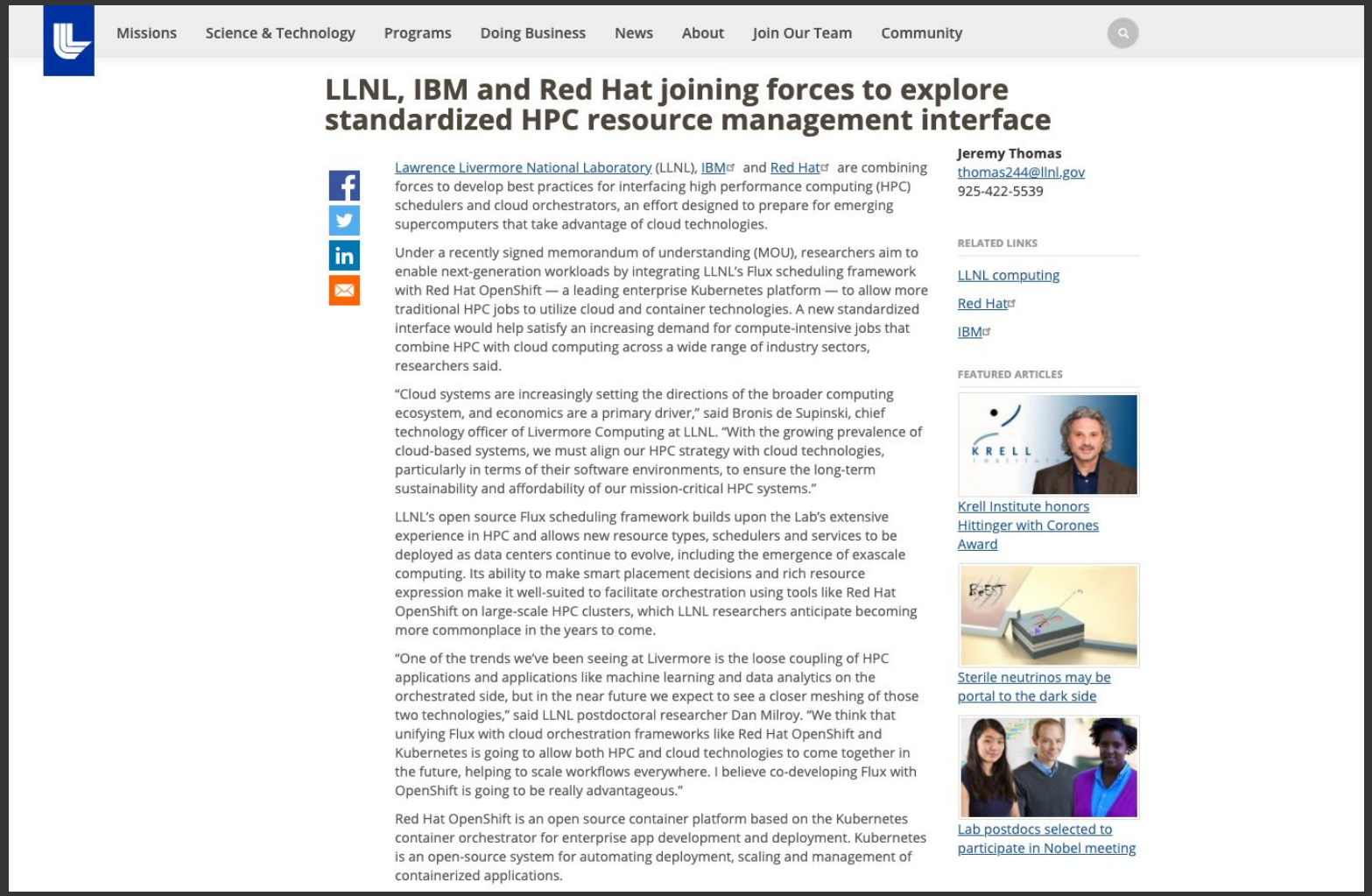
QR CODE

LINK

https://red.ht/37Ua06o

Red Hat

Red Hat technologies for HPC



Missions Science & Technology Programs Doing Business News About Join Our Team Community

LLNL, IBM and Red Hat joining forces to explore standardized HPC resource management interface

Lawrence Livermore National Laboratory (LLNL), IBM and Red Hat are combining forces to develop best practices for interfacing high performance computing (HPC) schedulers and cloud orchestrators, an effort designed to prepare for emerging supercomputers that take advantage of cloud technologies.

Under a recently signed memorandum of understanding (MOU), researchers aim to enable next-generation workloads by integrating LLNL's Flux scheduling framework with Red Hat OpenShift — a leading enterprise Kubernetes platform — to allow more traditional HPC jobs to utilize cloud and container technologies. A new standardized interface would help satisfy an increasing demand for compute-intensive jobs that combine HPC with cloud computing across a wide range of industry sectors, researchers said.

"Cloud systems are increasingly setting the directions of the broader computing ecosystem, and economics are a primary driver," said Bronis de Supinski, chief technology officer of Livermore Computing at LLNL. "With the growing prevalence of cloud-based systems, we must align our HPC strategy with cloud technologies, particularly in terms of their software environments, to ensure the long-term sustainability and affordability of our mission-critical HPC systems."

LLNL's open source Flux scheduling framework builds upon the Lab's extensive experience in HPC and allows new resource types, schedulers and services to be deployed as data centers continue to evolve, including the emergence of exascale computing. Its ability to make smart placement decisions and rich resource expression make it well-suited to facilitate orchestration using tools like Red Hat OpenShift on large-scale HPC clusters, which LLNL researchers anticipate becoming more commonplace in the years to come.

"One of the trends we've been seeing at Livermore is the loose coupling of HPC applications and applications like machine learning and data analytics on the orchestrated side, but in the near future we expect to see a closer meshing of those two technologies," said LLNL postdoctoral researcher Dan Milroy. "We think that unifying Flux with cloud orchestration frameworks like Red Hat OpenShift and Kubernetes is going to allow both HPC and cloud technologies to come together in the future, helping to scale workflows everywhere. I believe co-developing Flux with OpenShift is going to be really advantageous."

Red Hat OpenShift is an open source container platform based on the Kubernetes container orchestrator for enterprise app development and deployment. Kubernetes is an open-source system for automating deployment, scaling and management of containerized applications.

Jeremy Thomas
thomas244@llnl.gov
925-422-5539

RELATED LINKS

LLNL computing
Red Hat
IBM

FEATURED ARTICLES

Krell Institute honors Hittinger with Corones Award

Sterile neutrinos may be portal to the dark side

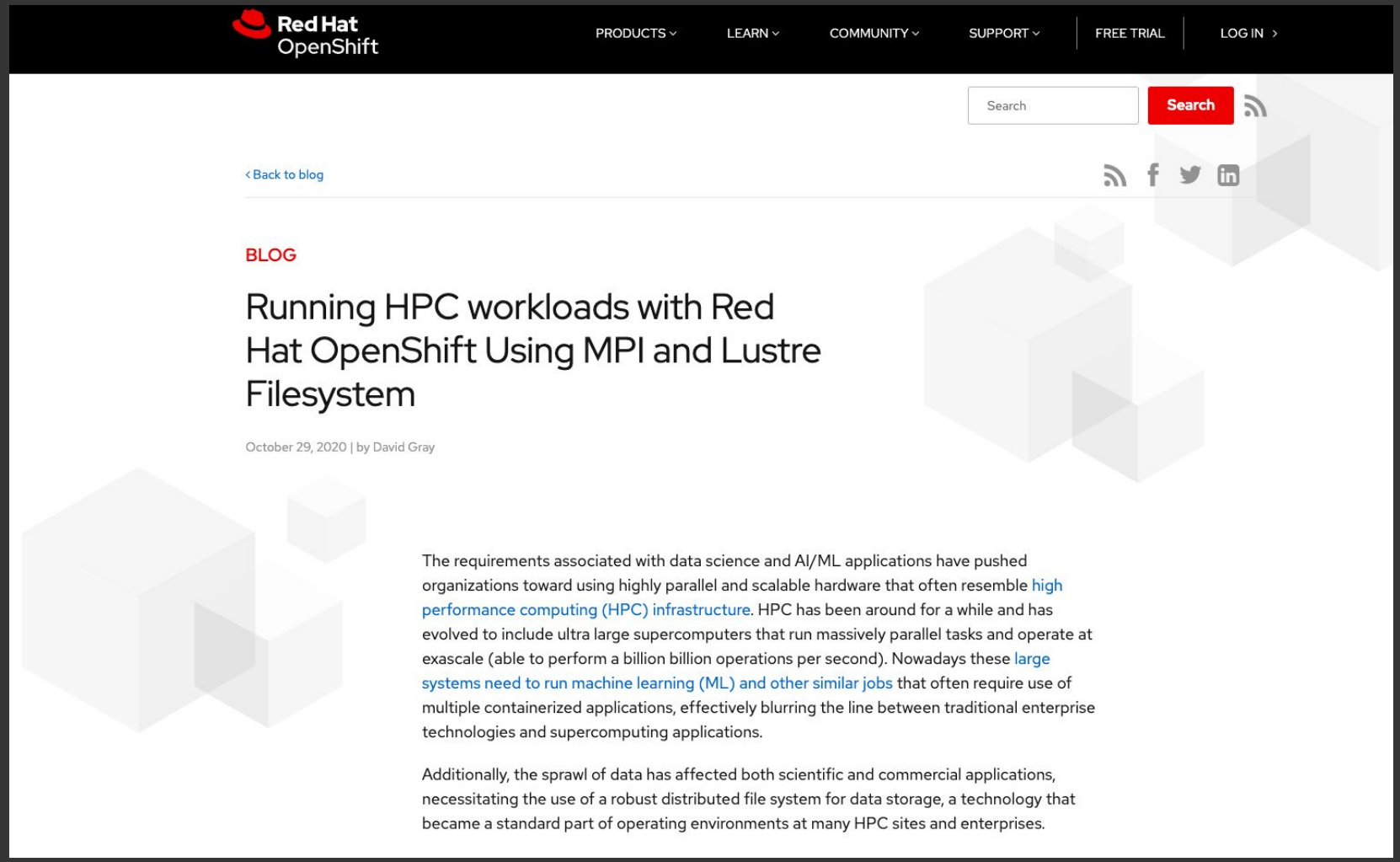
Lab postdocs selected to participate in Nobel meeting

QR CODE

LINK
https://bit.ly/2QF3DQc

Red Hat

Red Hat technologies for HPC



Red Hat OpenShift

PRODUCTS LEARN COMMUNITY SUPPORT FREE TRIAL LOG IN

Search Search

‹ Back to blog

BLOG

Running HPC workloads with Red Hat OpenShift Using MPI and Lustre Filesystem

October 29, 2020 | by David Gray

The requirements associated with data science and AI/ML applications have pushed organizations toward using highly parallel and scalable hardware that often resemble high performance computing (HPC) infrastructure. HPC has been around for a while and has evolved to include ultra large supercomputers that run massively parallel tasks and operate at exascale (able to perform a billion billion operations per second). Nowadays these large systems need to run machine learning (ML) and other similar jobs that often require use of multiple containerized applications, effectively blurring the line between traditional enterprise technologies and supercomputing applications.

Additionally, the sprawl of data has affected both scientific and commercial applications, necessitating the use of a robust distributed file system for data storage, a technology that became a standard part of operating environments at many HPC sites and enterprises.

QR CODE

LINK

https://red.ht/2HRQ2Ap

Red Hat

Thank you

Red Hat is the world's leading provider of enterprise open source software solutions. Award-winning support, training, and consulting services make Red Hat a trusted adviser to the Fortune 500.


linkedin.com/company/red-hat


youtube.com/user/RedHatVideos


facebook.com/redhatinc


twitter.com/RedHat

Red Hat