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High-performance computing drives innovation

Computers are an integral part of our lives. We use them to manage our everyday activities, from personal tasks to business projects and beyond. And, as technology has advanced, the demands placed on computers have grown drastically. Across industries, organizations now want to process data and perform calculations at levels and speeds that far exceed the capabilities of a single computer.

Enter high-performance computing (HPC). Organizations today use HPC to solve some of the world's most complex challenges in science, engineering, and business.

What is HPC?

Often called supercomputing, HPC allows you to rapidly process massive amounts of data and perform complex computations by combining hundreds or even thousands of computers into clusters connected by low-latency networks. Large computational models are divided into smaller tasks that are within the capabilities of a single system. These tasks are then distributed across the cluster to be executed and the results are reassembled into a unified outcome. HPC performance scales with the size of the cluster – adding more computers leads to higher performance and faster results.

Why is HPC important?

HPC can help organizations innovate and solve business, scientific, and engineering problems. For example, artificial intelligence and machine learning (AI/ML) are important HPC use cases because model training and inferencing tasks can require huge amounts of compute power to deliver timely results. As an increasing number of organizations deploy AI-assisted business projects, HPC environments will continue to grow in importance across industries and areas of use.

56%

of organizations are focusing on AI-assisted business projects as part of their digital transformation efforts.¹

Who uses HPC?

HPC has broad applications across many industries. Here are some examples of these use cases.



Public sector and national defense

Complex system modeling and cryptography



Energy, oil, and gas

Data processing and reservoir modeling



Manufacturing

Component design and test simulations



Automotive

Vehicle design and crash simulation



Aerospace

Computational fluid dynamics (CFD)



Life sciences

Genome-wide association scanning (GWAS)



Pharmaceutical

Molecular docking simulations



Media and entertainment

Special effects and animation rendering

¹ F5 Networks. "2021 State of Application Strategy Report," 2021.

The evolution of HPC

HPC has changed over time, evolving from large unified systems to expansive clusters of servers. As a result, modern HPC teams face new challenges.

- ▶ **Resource management**
HPC teams must tune, optimize, and administer a variety of resources across multiple clusters.
- ▶ **Long life cycles**
HPC teams rely on a diverse set of hardware and software that are used over long periods of time to generate returns.
- ▶ **Shortage of HPC experts**
A shortage of HPC specialists means that organizations must find ways to manage their environments with fewer staff.
- ▶ **Varying workload needs**
HPC environments must be able to support the software and configuration needs of many different workloads.
- ▶ **Security and compliance**
Organizations must maintain complex HPC environments in compliance with corporate, industry, and government security standards.

The ideal HPC environment features maximum compute power and optimized intracluster messaging, at scale. Your operating system plays a key role in determining how well your HPC environment operates and performs.

As the foundation of your HPC clusters, the operating system serves as a platform for all HPC resource capabilities. It connects your hardware, software, networking, and interfaces to form a unified, orchestrated environment. Choosing the right operating system can help you maximize the value of both your HPC clusters and your overall IT environment.

Key operating system features



Unified, advanced management tools that allow both HPC specialists and IT operations staff to manage HPC clusters



Built-in, layered security capabilities that protect your data, assets, and business and help you meet compliance standards



Interoperability and consistency across all hardware and software used by HPC teams and enterprise IT teams



Long, published release life cycle that includes security updates, bug fixes, and new features



Expert support, guidance, and resources that help you run your HPC cluster in alignment with best practices



Vendor commitment to and participation in the HPC and open source software and hardware communities

Deploy a platform for discovery



Red Hat® Enterprise Linux® helps you create a more reliable, efficient HPC environment to support rapid business, scientific, and engineering innovation and discovery. It provides a unified platform for running HPC workloads at scale across datacenter, cloud, and hybrid environments. Red Hat Enterprise Linux delivers key features and capabilities for HPC environments.

Management tools

Optimize resource use and performance over a diverse set of hardware and software to provide a streamlined user experience from development through production.

Built-in security features

Defend against threats and stay in compliance with regulatory requirements. Adopt common security standards and best practices with a hardened operating system.

Image builder tool

Easily create optimized operating system images to deploy workloads across hybrid and multicloud environments in a repeatable, consistent manner.

Certified ecosystem

Choose your preferred vendors, products, clouds, and open source projects, knowing that they will run reliably and efficiently on Red Hat Enterprise Linux.

Production-grade life cycle

Operate with confidence and ensure uptime with a long, enterprise-grade support life cycle that includes security updates, bug fixes, and feature enhancements.

Red Hat Enterprise Linux also prepares you for future HPC advancements. It includes a set of container tools that improve portability and reproducibility for HPC workloads. And Red Hat Enterprise Linux delivers a consistent, security-focused, and flexible platform for running AI and ML models at large scale on HPC systems.

Choose from a complete product portfolio

Red Hat offers a **complete, integrated portfolio** of platform, management, automation, storage, and development software to help you build the right environment for your organization. Key products include:



Red Hat Satellite is an infrastructure management product designed to keep Red Hat Enterprise Linux environments and other Red Hat infrastructure running efficiently, with security, and compliant with standards.



Red Hat Ansible® Automation Platform is a foundation for building and operating automation across an organization.



Red Hat OpenShift® is an enterprise-ready Kubernetes container platform with full-stack automated operations to manage hybrid cloud, multicloud, and edge deployments.



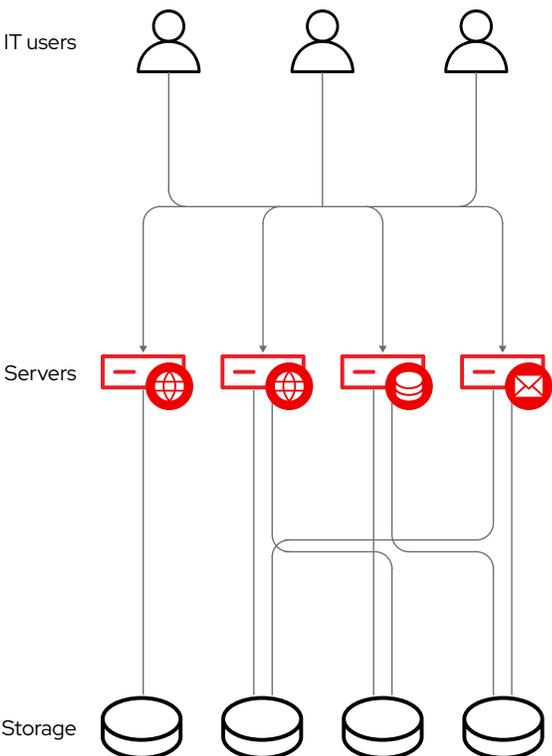
Unify your enterprise IT and HPC environments

Enterprise IT environments and HPC clusters have many things in common. Both start with mostly the same hardware: servers, networking, and storage. The difference is largely in the way the hardware is connected and used. Enterprise IT environments often assign specific, repeated tasks and applications to certain servers, while HPC clusters perform a larger computation by breaking it up into smaller tasks and distributing them across the servers in the cluster. As a result, you can unify operations and management across both your enterprise IT environments and HPC clusters.

Red Hat Enterprise Linux delivers a common foundation for HPC and enterprise IT environments.

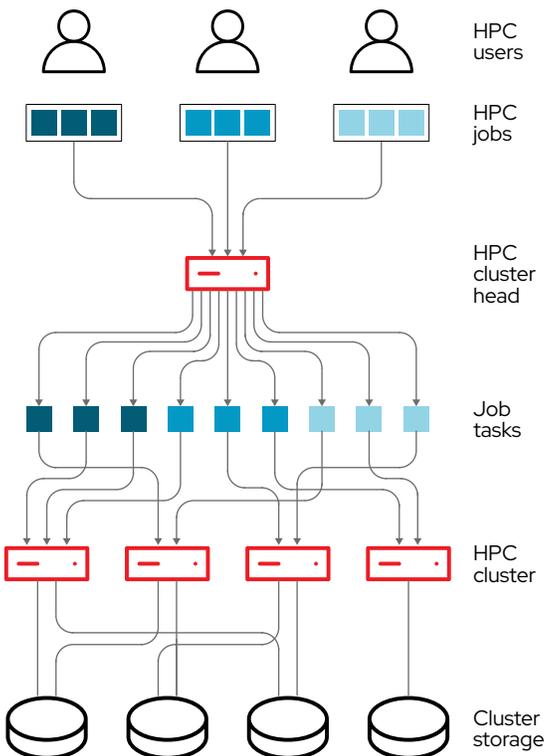
Enterprise IT environment

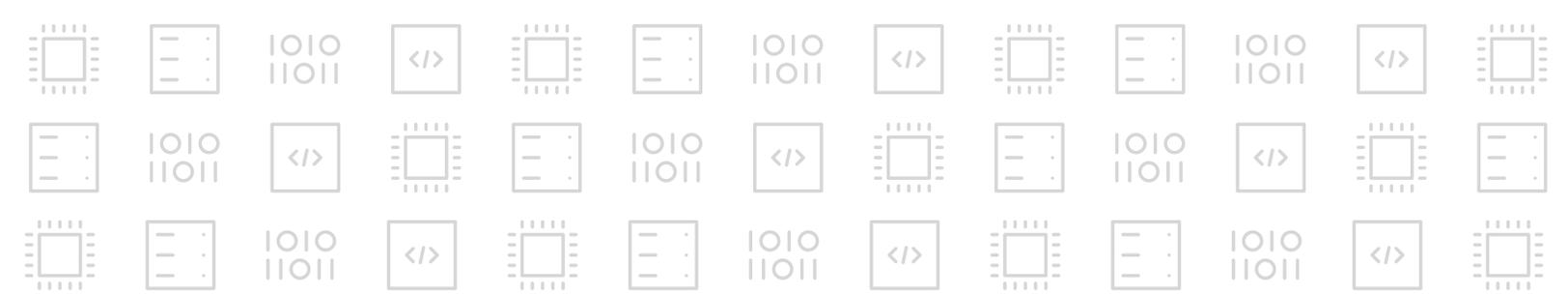
Users send web, mail, and database requests to servers running Red Hat Enterprise Linux. Each server is assigned and configured for a specific task and performs only that task.



HPC cluster environment

Users submit jobs to the HPC cluster head server, which divides the job into smaller tasks and distributes them to servers in the cluster. All servers run Red Hat Enterprise Linux.





Learn more

Build a foundation for innovation and discovery.

HPC helps organizations solve complex problems in science, engineering, and business. Red Hat Enterprise Linux gives you an efficient, optimized, and security-focused foundation for both HPC and enterprise IT. As a result, you can simplify IT and HPC management operations and focus on making the next big breakthrough.



Learn more about Red Hat Enterprise Linux for HPC:

red.ht/rhel-hpc



Contact your sales representative:

redhat.com/en/contact