HPC solutions on IBM Cloud

Help accelerate productivity and solve compute-intensive challenges with automated deployment of HPC clusters

Highlights

HPC solutions on IBM Cloud are designed to:

- Accelerate time to value
- Enhance data protection with built-in security, observability and compliance
- Enable intelligent autoscaling and flexible capacity
- Deliver cost-optimized cloud consumption
- Support ecosystem integration and extensibility

Enterprises across industries such as automotive, aerospace, life sciences, and financial services are often under immense pressure to accelerate innovation cycles while managing increasingly complex product designs and stringent regulatory requirements. These demands are helping to drive exponential growth in compute-intensive workloads - from simulation and modeling to AI and deep learning. However, some traditional on-premises high-performance computing (HPC) infrastructures can struggle to keep pace due to high capital costs, long procurement cycles, scalability limitations, as well as operational complexity. Consequently, many organizations are seeking more agile, cost-effective alternatives to meet their HPC needs. HPC solutions on IBM Cloud aim to help enable organizations to run computationally intensive workloads in the cloud - importing data, defining compute requirements, running workloads, and retrieving results - through a streamlined experience designed to accelerate time to insights and free teams up to focus on innovation rather than infrastructure.

IBM Cloud HPC is a fully integrated platform service built to to simplify and accelerate cloud adoption for organizations running computationally intensive workloads. Built on IBM Cloud VPC, it combines infrastructure, scheduling, and automation through deployable architectures - allowing teams to focus on innovation and business outcomes rather than the complexity of managing HPC environments.

The platform includes IBM Cloud Observability (Logging and Monitoring), IBM Cloud Security (Security and Compliance Center Workload Protection, Key Protect, and Secrets Manager), IBM Spectrum Computing workload schedulers, and optionally IBM Storage Scale, delivering a unified experience across compute, workload and storage management.

"As Cadence continues to drive computational software innovation, continuity is critical when it comes to optimizing operations across our business unit teams who are responsible for delivering chip and system design software to customers at a rapid pace. Leveraging IBM Cloud as part of our multi-cloud environment and IBM Spectrum LSF as the HPC workload scheduler, we've successfully achieved high-compute utilization, which lets us efficiently utilize our cloud budget and streamline our computational workload," [1]

Tarak Ray
Corporate Vice President and CIO
Cadence

IBM Cloud HPC support automatic scaling and offer flexible consumption models, including on-demand and 1- or 3-year reserved capacity, to meet diverse workload requirements. With access to leading Intel® Xeon® x86-64 microarchitecture and GPU instance profiles on IBM Cloud from NVIDIA, AMD and Intel, it helps enable efficient execution of complex simulations, data processing, and AI training, while helping organizations manage infrastructure and operational complexity with greater agility.

Primary markets served:
- Electronic Design Automation (EDA)
- Economics / Financial Services
- Health and Life Sciences
- Automotive
- Aerospace
- Oil and Gas
- Transportation
- Research
- Manufacturing

Components
- IBM Cloud provides a globally distributed infrastructure for building high-performance computing (HPC) environments using IBM Virtual Private Cloud (VPC). Clients can configure compute instances, high-performance storage, and advanced networking components such as public gateways, load balancers, and virtual routers to support diverse workload requirements. With a broad global footprint and multiple connectivity options, IBM Cloud helps to enable scalable HPC deployments across regions. This allows organizations to place workloads closer to data sources or users, improve performance, and support compliance with data residency and sovereignty requirements.
- IBM Cloud Key Protect delivers strong encryption and centralized key management, supporting FIPS 140-2 Level 4 for enhanced security. IBM Cloud Security and Compliance Center Workload Protection is to designed to deliver unified cloud-native protection across hybrid multi-cloud environments, offering capabilities such as security posture management, real-time vulnerability scanning, and threat detection. IBM Cloud Secrets Manager, built with HashiCorp Vault, enables centralized secrets management with support for multiple engines, helping organizations securely store and control access to sensitive credentials.
- IBM Cloud Logs and Monitoring provides ongoing visibility into application and infrastructure performance, designed for fast troubleshooting and improved operational resilience.
- IBM LSF and IBM Symphony workload schedulers provide dynamic hybrid cloud capabilities, helping organizations to extend workloads to the cloud and provision resources based on defined policies. These schedulers support automated scaling and workload distribution, helping teams manage compute resources efficiently across on-premises and cloud environments.

Optional components
- IBM Storage Scale is an optional enterprise grade High Performance File System (HPFS) that delivers scalable capacity and performance to handle demanding data analytics, content repositories, and HPC workloads. IBM Storage Scale architecture is designed to handle tens of thousands of clients and billions of files and petabytes of data written and retrieved as files or objects with low latency.
- IBM Aspera can be used for high-speed data movement using the FASP protocol.

Accelerate time to value

IBM Cloud HPC solutions help streamline the creation of high-performance computing environments through automation and deployable architectures. Clients can quickly provision clusters using IBM Spectrum Symphony or IBM Spectrum LSF – both designed to eliminate the complexity of manual setup and configuration. Built on infrastructure-as-code principles, deployable architectures aim to provide a secure, repeatable, and scalable foundation. These modular templates are version-controlled and incorporate IBM Cloud best practices, helping to ensuring consistency across deployments. This approach not only aims to speed up implementation, but it can also help reduce operational risk and simplify lifecycle management.

Built-in security, observability and compliance

IBM Cloud HPC solutions are built with a secure-by-design architecture, helping clients create and operate secure cloud environments from day one. It integrates IBM Cloud Security and Compliance Center Workload Protection (SCC WP), delivering unified CNAPP capabilities such as security posture management, vulnerability scanning, and threat detection—helping to ensure workloads remain protected and compliant across hybrid environments.

Key management is centralized through IBM Key Protect, which supports Keep Your Own Key (KYOK), while IBM Secrets Manager is designed to securely store and manages access to sensitive credentials. For observability, IBM Cloud Logs and Monitoring provide on-going visibility into workloads, helping teams detect issues early and maintain compliance. Together, these integrated capabilities aim to reduce risk, simplify secure operations, and accelerate time to value in hybrid cloud deployments.

Intelligent autoscaling and flexible capacity

IBM Cloud HPC solutions intelligently scales compute resources up or down based on workload demand and scheduling policies, helping to ensure efficient resource utilization, cost control, and elimination of idle capacity.

The scheduler automatically selects the most suitable instance type and size, including GPU-enabled options for AI and high-performance workloads. For storage, IBM Cloud File Storage for VPC offers reliable, high-throughput storage. For organizations with more demanding I/O requirements and scalability, IBM Storage Scale can be provisioned to deliver a robust parallel file system with features such as high availability, data replication, policy-based management, and support for multi-site operations.

By dynamically adjusting compute resources to match workload requirements, organizations can help avoid overprovisioning and pay only for what they use—which can lead to added cost control and improved return on investment.

Cost-optimized cloud consumption

IBM Cloud HPC solutions provide flexible compute capacity through automatic scaling and support for both on-demand and reserved instances (1- or 3-year terms), tailored to meet the needs of computationally intensive workloads.

Thes solutions integrate advanced observability tools designed to provide deep visibility into cluster usage and workload performance, helping organizations make informed decisions about resource allocation and cost management. With IBM Cloud Monitoring (built in collaboration with Sysdig), Log Analysis, and pre-built LSF dashboards, users gain comprehensive insights into job execution, infrastructure health, and performance bottlenecks.

Unified dashboards offer both on-going and historical views of workload behavior and cluster performance, enabling proactive tuning and operational efficiency. These capabilities support data-driven strategies to help manage consumption and align infrastructure usage with business priorities.

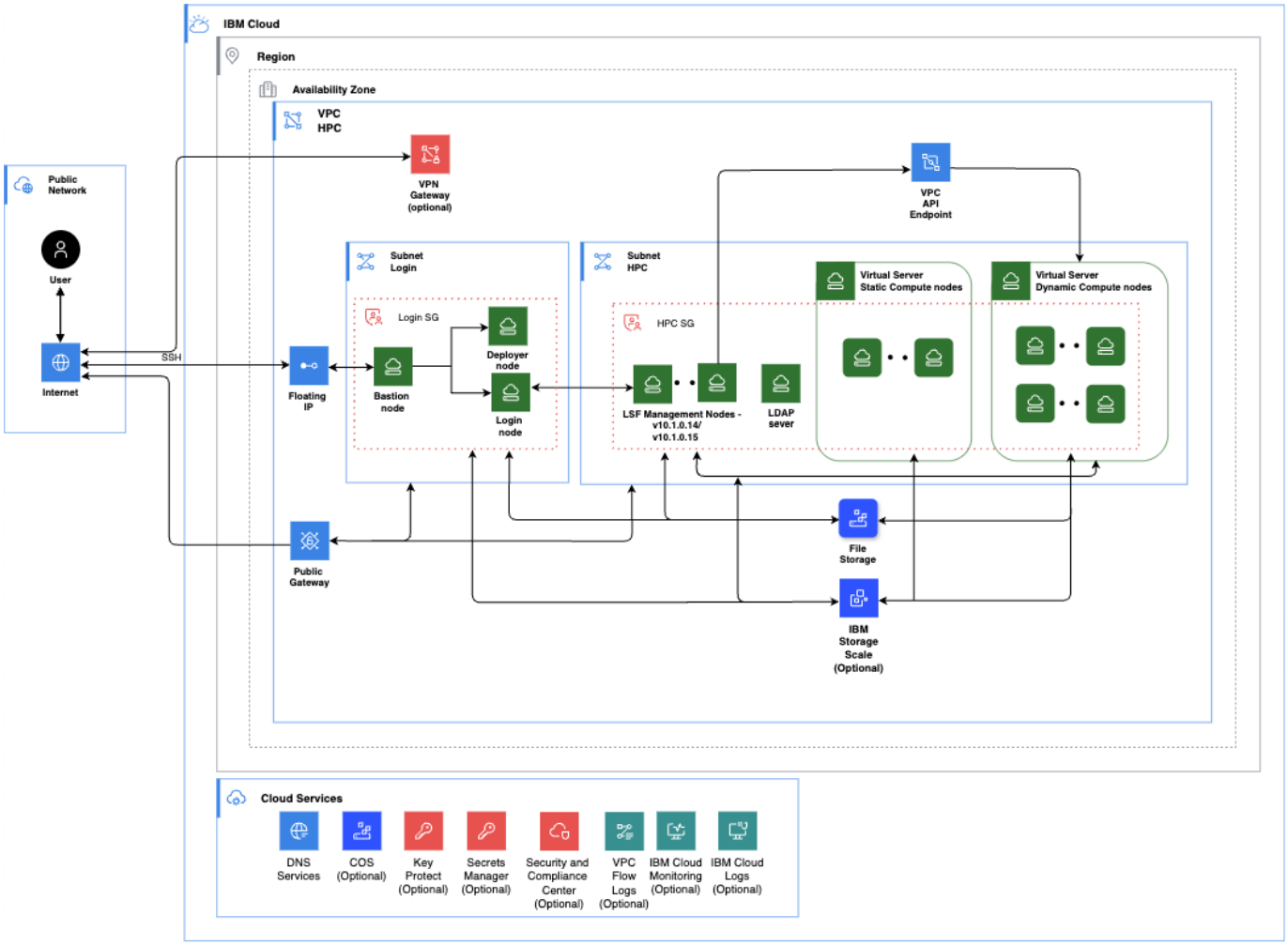
Offers Ecosystem Benefits
IBM Cloud HPC solutions offer several ecosystem benefits and assistance through a range of technical and consulting services:

The IBM Cloud Carbon Calculator is available to provide data on emission trends and patterns on a variety of IBM cloud workloads via an AI-informed dashboard. It helps enable enterprise clients to track and visualize detailed GHG emissions for their workloads over time down to the cloud service level, aligned with the Greenhouse Gas Protocol.

IBM Cloud Code Engine is a fully managed, serverless platform that simplifies running containerized workloads. It aims to help organizations to deploy web applications, microservices, event-driven functions, and batch jobs without the burden of managing infrastructure. It's also designed to accelerate deployment, scale seamlessly, and reduce operational overhead, allowing organizations to focus on delivering business outcomes.

IBM Expert Assistance connects organizations with IBM's top specialists across a wide range of services, like technical consulting, deployment support, expert labs, etc. to help accelerate deployments, optimize solutions, and quickly resolve challenges. The service also offers specialized expertise in areas like Data and AI, Automation, Sustainability, Security, and Cloud software solutions.

Figure: IBM Cloud HPC architecture with IBM LSF workload scheduler



Conclusion

IBM Cloud HPC solutions provide a complete ecosystem designed to deploy secure, scalable high-performance computing environments in the cloud. These solutions help simplify operations by automating the deployment, scaling, and monitoring of HPC clusters—freeing administrators from manual, time-consuming tasks. With software and an infrastructure designed for security, observability, and compliance, organizations can confidently leverage the cloud for HPC workloads while maximizing business value.

Why IBM?

As an industry leading, global brand, IBM has an impressive track record helping clients through digital transformation, focusing on areas that yield the biggest impact on their business and positively influence their corporate culture with technology. With decades of experience and expert assistance in solving the world's biggest business problems, IBM offers solutions and expertise wherever you are on your HPC journey.

For more information

To learn more about IBM Cloud HPC, contact your IBM representative or IBM Business Partner, or you can visit: https://www.ibm.com/solutions/high-performance-computing

1. Cadence Leverages IBM Cloud HPC to Accelerate Electronic Chip and System Design Software Development, IBM Press Release, May 2023

For more information: https://www.ibm.com/case-studies/cadence-designs

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