



Cloud Adoption Strategy for High Performance Computing



HPC Opportunity

High Performance Computing (HPC) has been critical to helping government agencies and businesses solve their most challenging and complex problems.

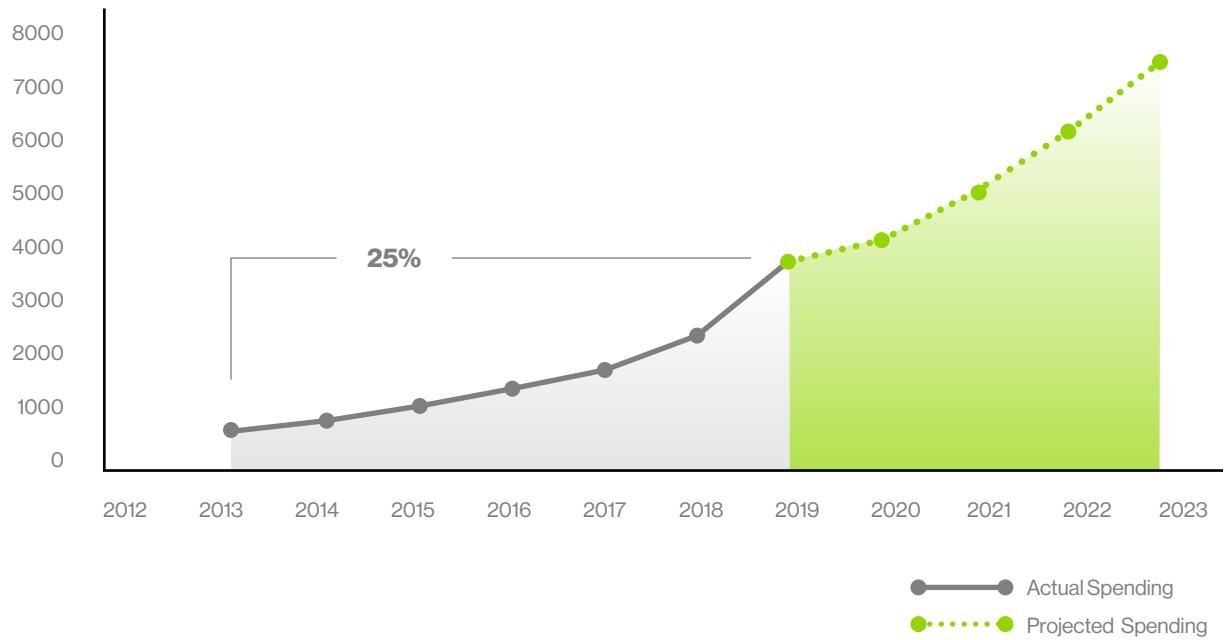
Organizations with HPC infrastructures have been investing in new technologies and tools to stay competitive while addressing one of the key drivers for use of cloud computing – access to surge capacity¹

As demand for HPC grows, new technologies such as advanced analytics, artificial intelligence (AI) and machine learning (ML) are needed to expand the capability of computing environments. However, on-premises HPC systems with even the most current technologies are having difficulty supporting current organizational needs and effectively allocating scarce HPC resources efficiently. The skills required to manage and maintain these systems have increased significantly due to the thousands of computing elements, large storage capacities, and high-speed, low latency networks required to support diverse and complex computations. In addition, keeping the HPC ecosystem up to date is costly, as computing capacity needs to scale with variable workloads, cybersecurity requirements continue to expand, and procurement and implementation cycles can be lengthy.

As a result, organizations that need HPC capabilities and providers of HPC technologies are exploring new avenues to overcome these challenges using cloud computing. Spending in public clouds for HPC (Exhibit 1) grew an average of 25% from 2013 to 2020 and is forecasted to grow at a similar rate in the coming years. As HPC demand rises, cloud service providers (CSPs) are investing in infrastructures, platforms, and the applications required to support a broader set of complex HPC workloads and customers.

¹ Drivers and Barriers to Using High Performance Computing in the Cloud, Cloud Lightning

Spending in Public Clouds for HPC Applications Continues to Increase Since Early 2010s



Catalysts Driving HPC in the Cloud

Organizations are adopting cloud technologies because they are seeking a competitive technology advantage. They realize that their HPC capabilities will benefit from cloud infrastructure and enable them to serve their user base more effectively, better execute strategic priorities, scale operational capacity, and innovate at an accelerated pace. Guidehouse experience in HPC has identified multiple organizational needs, or catalysts, that are driving the emergence of HPC commercial cloud solutions:

- Accelerate time-to-market and time-to-decision-making;
- Enable rapid elasticity and scalability of HPC resources;
- Provide access to new technology such as AI, ML, and advanced analytics;
- Manage effort to be compliant with various industry and government regulations;
- Increase access to HPC resources;
- Test viability of use cases, workloads, or other applications;
- Support critical new initiatives such as digital engineering and transformation; and
- Create an integrated, seamless and more advanced collaboration environment.

As organizations migrate applications and run workloads in HPC cloud environments they often find that the transition can be complex and expensive. Cloud initiatives must be assessed and planned with a focus on aligning HPC capabilities with technical requirements and meeting return on investment expectations. In addition, cloud migration or integration typically requires redesign of existing business models and processes.

A Journey in Adopting HPC Cloud

Embarking on a journey to adopt cloud for HPC requires a plan that fits the needs of each organization. More specifically, cloud must be made a part of an organization's HPC strategy, so that it is supported within their operating model, aligns with existing and future infrastructure, and the workforce skills can ensure optimum results. Working with clients, Guidehouse has leveraged these five components (strategy, operating model, infrastructure, workforce, and cost) to define a new go-to-market model for the client and formulate a cogent HPC cloud adoption plan that significantly improved benefits for the user community.

High Performance Computing Strategy

A High Performance Computing Strategy determines the future HPC capability needs to meet performance standards and business expectations. The process creating the strategy helps to answer whether HPC cloud is the right solution for the organization and defines the target state for HPC capabilities. Business and IT stakeholders collaboratively establish the strategic foundational services and capabilities required by customers that enable innovation and support growth. Furthermore, the HPC strategy ensures that the vision of HPC cloud aligns to the organization's business goals and objectives, and that the expected value created by HPC is clearly articulated and understood by all stakeholders.

Operating Model

To effectively support effective adoption of HPC cloud, organizations need to align their operating model to HPC cloud requirements and potentially redesign key aspects of the operating model. A properly aligned operating model will increase the benefits realized from HPC investments, enable efficient allocation resources, expand capacity and aid in defining effective process and management support.

For organizations that decide to migrate all or a portion of their on-premises HPC resources to the cloud, it is important to anticipate capacity changes and effectively balance computing supply and demand. In addition, building standardized workflows and common access platforms to allow users to run workloads between HPC cloud and on-premise infrastructure can optimize resource utilization. Implementing "capacity-on-demand" capabilities and workflow management for scale-up and scale-out, helps meet business needs and improves service levels as well. If the organization previously allocated HPC resources on a per user basis, then adjusting the allocation approach is recommended to maximize efficiency and usage of the hybrid ecosystem. In addition, it is important to provide cloud technical support to ease the transition and uptake of users to speed adoption of the new capabilities.

As processes are the enablers of the HPC strategy, organizations must recognize that redesigning business processes is often required to allow HPC cloud services to meet internal and external customer demands. HPC cloud services require core business processes to assess the performance, consumption, and growth of cloud services by user groups and organizations can leverage the analytical tools offered by CSPs. Additional analytics can be performed on HPC-cloud-based computations, so managers have a clear perspective on how users are employing the capabilities and for what purposes. In addition, they should establish a cadence for reporting key performance indicators for cloud usage to provide transparency and support proactive cost modeling and return on investment calculations.



Infrastructure

As the infrastructure serves as the physical and virtual foundation to support the target-state HPC environment, it is critical to deploy a robust set of capabilities to effectively manage the infrastructure, applications, and workloads. For example, IT automation capabilities can auto-scale to meet capacity needs, manage applications and workloads in a hybrid environment, and optimize consumption attributed to the HPC cloud through rule-based management and predictive analytics. In addition, a well-designed supporting infrastructure creates a platform for resources to access innovative technologies, such as AI/ML and advanced analytics, and apply them to new programs that position the organization for success in the market.

Workforce

Workforce alignment with the operating model and processes is essential for the business to deliver maximum value to customers and users. As the operating model to support HPC cloud services evolves and processes redesigned, the organization will need to be augmented with key resources and up-skilled. Successful cloud adoption requires executive support and starts with the formulation of a core cloud team to help the organization and its users navigate HPC cloud service complexities. In addition, most organizations will need to hire or appoint a senior cloud leader to oversee cloud computing, along with cloud architects and subject matter experts, to provide guidance to users and enable a smooth transition from the current computing environment. It is important that the senior cloud leader has considerable latitude within the organization (and sometimes externally) to drive cloud adoption and to champion any necessary business process or operational changes. In addition, the cloud lead should be part of a combined IT and operational governance structure that allows the cloud team to be embedded in the decision-making process and enable the organization to integrate new cloud capabilities to expand usage. Also, providing targeted training in cloud technologies is important to up-skill the workforce and build core capabilities to realize the value of the cloud investment.

Cost

There is much debate about cost factors when it comes to cloud usage. Organizations should not be deterred in making cloud decisions because of these discussions. However, they should understand the costs, as well as the associated benefits. While experts agree costs can be significant, there is also agreement that costs will diminish over time. From completing several studies on cloud cost factors, we recommend organizations think strategically about augmenting or migrating internal HPC computational capabilities. In addition, cost analysis requires a multi-year perspective with defined scenario forecasts, as cloud adoption takes time and will evolve along with the organization's needs. Implemented and managed correctly, cloud will yield competitive advantages and financial benefits over the long-term. If organizations only assess cloud in terms of one-time costs, they may sub-optimize their ability to invest and compete over the longer term. Core steps of detailing required investments, outlining an integration plan and schedule, and defining operational benefits, will enable ROI and payback period calculations to support decision making and tracking of value realized over time.

Success Factors When Adopting HPC Cloud

As organizations progress in their HPC cloud journey and mature technical capabilities, they can expect to realize multiple measurable benefits. Depending on the strategy and business needs, the benefits could include reduction in capital or operating expenditures, increased scalability of infrastructure and computing resources, improved ease of use, accelerated ability to develop prototypes and bring solutions to market. In addition, a well-integrated hybrid cloud environment with portability of workloads can increase process efficiency and operational productivity.

Several success factors for HPC cloud adoption influence an organization's ability to achieve these benefits. It is critical that business continuity be uninterrupted as organizations adopt cloud. As applications and workloads are migrated to the cloud, ongoing operations must continue seamlessly to support users. Also, it is important to have leadership buy-in and stakeholder engagement to maximize cloud awareness and obtain commitments for adoption not only from the leadership, but also from impacted teams across the business and supporting functions. A detailed analysis of the cost and benefits will enable better decision making and timing of investments as available technologies continue to evolve. Furthermore, organizations need to take a disciplined approach to cloud technology selection and implementation to achieve the potential benefits.

Guidehouse has the experience and expertise in high performance computing, cloud strategy and architecture, technology acquisition strategies, and systems integration to help organizations overcome challenges, formulate detailed cloud-adoption plans, and work closely with vendors to successfully implement HPC in the cloud. We work with clients at every level, and at each step in the process, to identify solutions that are aligned with organizational goals, leverage current technologies, enable the organization to operate at a high level of performance, maximize value and successfully navigate the transition.





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About Guidehouse

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