

## Market Forecast

# HPC Cloud Forecast 2020-2025

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### HYPERION RESEARCH OPINION

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HPC in the cloud has been a focal point of the HPC community for many years and has experienced strong growth and adoption over the past three years. Cloud service providers (CSPs) have made concerted efforts to address the needs and desires of HPC users, bringing high performance instance types and domain area expertise to aid HPC users on their journey to cloud adoption. In 2018, Hyperion Research began tracking in detail the HPC cloud market from the end user perspective, forecasting end user spending on cloud resources for HPC jobs. In 2019, the cloud market for HPC underwent a major growth, with many new users beginning to run workloads in the cloud. Since 2019, the cloud market has shown healthy growth well ahead of the growth of the on-premises market.

This year, Hyperion Research uncovered several new trends in the HPC cloud market. For the first time cloud is starting to take business away from the on-premises market. Although not pervasive yet, there are a small number of HPC organizations that are moving their HPC infrastructure completely to the cloud. There is a much larger group of users that are moving part of their on-premises HPC budgets to support running applications in the cloud, either delaying future procurements in favor of the cloud or reducing the size of future procurements and using the residual budget for cloud computing.

Different levels of cloud growth rates are emerging from two different groups of users. The bulk of HPC users in the cloud are growing their cloud spending by around 10% a year, still healthy, but not as dramatic as the total growth rate in the forecast. That higher growth segment is growing much faster, resulting in a net 17% CAGR for the market. The higher growth is driven by a smaller portion of organizations increasing their cloud spending dramatically over the next few years.

Bringing all of this together, Hyperion Research is projecting the HPC cloud market to exhibit a five-year CAGR of nearly 17% and reach \$9.3 billion in end user spending in 2025. The key verticals driving much of the growth include: the bio-sciences and manufacturing sectors, as well as the economics/finance sector and the EDA sector, to name a few.

### KEY DEFINITIONS FOR THIS FORECAST

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This fourth iteration of the cloud forecast covers HPC end user spending on third-party cloud resources and does not include spending on HPC systems by cloud services providers (CSPs). In addition, this forecast includes only HPC end users who also have (or had) on-premises HPC systems. It does not include HPC end users who have only ever run workloads in the cloud.

Although the "cloud born" group of end users may be significant and impacts the market size, these users are not included in our forecast numbers for two reasons:

- Many of these users may not know that they are running HPC jobs in the cloud because of their unfamiliarity with what constitutes HPC workloads, based on the definitions Hyperion Research uses to categorize workloads and users.
- They are difficult to identify because CSPs do not track information about specific workloads running on their platform, making it hard to find all of these HPC users.

Hyperion Research is working to quantify this group of end users to include in future forecasts.

*Key data note: this forecast covers only spending on third-party (CSP) cloud resources for public, private and hybrid cloud configurations and does not include on-premises private clouds.*

## HPC CLOUD FORECAST 2021

As can be seen in the tables below, the new 2021 HPC cloud forecast shows a strong growth of 16.7% CAGR over the forecast period, reaching \$9.3 billion in end user spending on cloud resources for HPC applications in 2025. For 2021, Hyperion Research projects just over \$5 billion in cloud spending, a 18.6% growth from 2020.

One group of users Hyperion Research is paying special attention to in the cloud market is the workgroup segment. These users, who buy systems priced at less than \$100,000, are starting to delay or forgo procurements in favor of cloud resources. Part of this is due to the economics of cloud computing for workloads with spikes in utilization. If a workload does not need to be run all the time, it can be more cost-effective to run in the cloud. In addition to the flexibility the cloud offers, workgroup users can also take advantage of running on the latest hardware and can scale beyond what a workgroup system could offer. Hyperion Research expects the workgroup segment to continue to be a strong driver of cloud growth for HPC.

**TABLE 1**

### HPC Cloud Forecast 2019-2025

(\$M)	2019	2020	2021	2022	2023	2024	2025	CAGR '20-'25
NEW 2021 Cloud Forecast	\$3,910	\$4,300	\$5,100	\$6,300	\$7,150	\$8,100	\$9,300	16.7%
HPC Broader Market Forecast*	\$26,979	\$27,283	\$29,383	\$34,121	\$37,378	\$40,015	\$39,867	7.9%

\*As of August 2021

Source: Hyperion Research, 2021

## HPC Cloud Forecast by Vertical

By dissecting the HPC cloud forecast by vertical, the key sectors of cloud adoption and growth can be seen more clearly. The bio-sciences sector and the CAE, or manufacturing, sector represent the two early adopting verticals. By 2025, they are anticipated to represent 44% of the cloud market. However, there are a few verticals of interest that are expected to grow faster than the market itself. The economics, EDA, Defense, geosciences, and weather sectors are all expected to grow faster than the overall HPC cloud market.

One specific vertical of interest is the weather sector and the relationship UK Met and Azure have formed. Although unique in cloud deployment model, the partnership represents a focus on the hardest HPC jobs from the CSPs. Traditionally, the workloads that HPC users ran in the cloud were highly parallelized, enabling an easier migration and performance cloud computing. The harder HPC jobs, those that were tightly integrated and based on large, legacy codes, typically remained on-premises. However, the UK Met deal with Azure could represent the beginning of more migration of hard HPC jobs to the cloud.

**TABLE 2**

**HPC Cloud Forecast by Vertical**

(\$M)	2019	2020	2021	2022	2023	2024	2025	CAGR '20 - '25
Bio-Sciences	\$1,221	\$1,297	\$1,440	\$1,724	\$1,900	\$2,087	\$2,331	12.4%
CAE	\$733	\$795	\$957	\$1,200	\$1,369	\$1,558	\$1,798	17.7%
Chemical Engineering	\$98	\$108	\$128	\$158	\$179	\$194	\$223	15.7%
DCC & Distribution	\$222	\$244	\$289	\$356	\$403	\$478	\$549	17.6%
Economics/Financial	\$205	\$248	\$315	\$409	\$487	\$579	\$699	23.0%
EDA	\$285	\$316	\$379	\$474	\$544	\$623	\$723	18.0%
Geosciences	\$240	\$269	\$327	\$412	\$478	\$542	\$622	18.2%
Mechanical Design	\$20	\$21	\$24	\$28	\$31	\$33	\$36	10.8%
Defense	\$296	\$330	\$395	\$494	\$566	\$649	\$753	18.0%
Government Lab	\$274	\$304	\$353	\$428	\$476	\$528	\$594	14.3%
University/Academic	\$196	\$215	\$242	\$284	\$307	\$330	\$360	10.8%
Weather	\$42	\$65	\$140	\$189	\$234	\$288	\$361	41.1%
Other	\$79	\$88	\$111	\$145	\$177	\$211	\$251	23.4%
<b>Total</b>	<b>\$3,910</b>	<b>\$4,300</b>	<b>\$5,100</b>	<b>\$6,300</b>	<b>\$7,150</b>	<b>\$8,100</b>	<b>\$9,300</b>	<b>16.7%</b>

Source: Hyperion Research, 2021

***How does the cloud forecast compare with the on-premises forecast?***

This year marks the first time Hyperion Research has seen cloud computing begin to erode the on-premises market, raising the question, *how does the cloud forecast relate and compare with the new on-premises forecast?* The forecast shows continued healthy growth for the on-premises HPC broader market at an 8% CAGR over the forecast period, indicating HPC cloud utilization will continue

to be largely complementary and incremental. Key factors causing users to turn to the cloud to run their HPC workloads include:

- Augment the scale of their on-premises compute capabilities
- Provide access to technology diversity
- Leverage expertise of the CSPs in areas such as containerization and AI workload deployment
- Provide access to data sources not available or too expensive to transfer on-premises

The implication is that on-premises HPC will continue to be the largest component of the HPC market, from a financial perspective. That said, on-premises-to-cloud spending is projected to shrink from 6.3x to 4.3x over the forecast period. Furthermore, spend on public clouds for HPC workloads will be larger than every segment of the broader market except server revenues by 2025.

In order to manage the transition more smoothly from running HPC workloads mostly on-premises to more equally between on-premises and in the cloud, users will be looking for hybrid solutions to work harmoniously between on-premises and the cloud as they optimize their compute resources for the variety of workloads, users, and characteristics of their organizations.

## **FUTURE OUTLOOK**

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Growth in utilization of cloud resources for running HPC workloads is no longer an "if" or "when", but how much and for how long. The benefits cloud computing for HPC provide to a certain set of users for a certain class of workloads are undeniable. The magnitude of the cloud adoption growth and duration of those growth rates above the historical mean of overall HPC spending growth is of interest to many. Cloud adoption rates, and therefore cloud spending growth rates, can be accelerated even further as users in the HPC community understand the ways in which they can optimize their compute infrastructure to leverage the cloud where it makes sense. The optimal solution may hinge on specific workloads moving to the cloud, based on required hardware, time-sensitivity (or lack thereof) of an application, the location of data sets, or a myriad of other factors. However, certain workloads may ultimately never move, due to privacy, cost, or code base.

With these new scenarios, many users may be able to procure more directed on-premises systems, designed to handle a specific set of workloads. Thus, on-premises costs could be lowered in-lieu of spending more on cloud resources to handle the other workloads not destined for the new on-premises system. This trend is just beginning, and the data from recent studies shows that a sizeable portion of the market is starting to downsize on-premises in favor of spending more in the cloud to handle the HPC workloads at sites.

## About Hyperion Research, LLC

Hyperion Research provides data-driven research, analysis and recommendations for technologies, applications, and markets in high performance computing and emerging technology areas to help organizations worldwide make effective decisions and seize growth opportunities. Research includes market sizing and forecasting, share tracking, segmentation, technology, and related trend analysis, and both user & vendor analysis for multi-user technical server technology used for HPC and HPDA (high performance data analysis). Hyperion Research provides thought leadership and practical guidance for users, vendors, and other members of the HPC community by focusing on key market and technology trends across government, industry, commerce, and academia.

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