

Market Forecast

Worldwide HPC Application Workloads Market Forecast Update, 2016-2021

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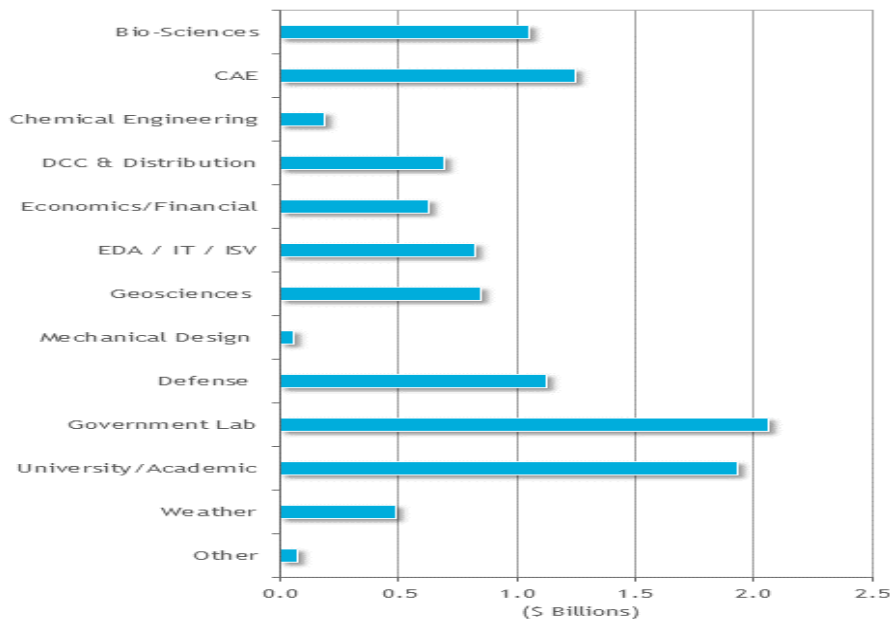
HYPERION RESEARCH OPINION

Worldwide HPC Application Workloads Revenue Snapshot

Hyperion Research forecasts that the worldwide HPC application workloads, representing the split-out of the HPC server market by application segments, will expand at a 6.2% CAGR to more than \$30 billion in 2021, up from \$22 billion in 2016 (see Figure 1). The categories in Figure 1 include high performance data analysis (HPDA) sub-segments: fraud and anomaly detection, affinity marketing, business intelligence, and precision medicine. Hyperion Research provides a separate detailed forecast on these sub-segments.

FIGURE 1

2016 Revenues by the Application Segments (\$ Billions)



Source: Hyperion Research 2017

IN THIS REPORT

This Hyperion research study presents our latest five-year forecast for the HPC application workloads market covering the 2016-2021 period.

Worldwide revenue for the HPC technical server market grew 4.7% from 2015 to 2016 to a record \$11.2 billion. Hyperion Research predicts CAGR growth of 5.8% to \$14.8 billion in 2021.

- The Supercomputer market segment for HPC systems priced at \$500,000 and up will show the highest growth rate (6.9% CAGR), driven substantially by the global exascale race.
- The Divisional and Departmental segments will continue to exhibit healthy growth, and the Workgroup segment will rebound to robust growth following several years of decline.

TABLE 1

Worldwide Total Technical Computer Market Revenue Forecast by Competitive Segment

	2015	2016	2017	2018	2019	2020	2021	CAGR 16-21
Supercomputer	\$3.3	\$4.1	\$4.4	\$4.3	\$4.6	\$5.2	\$5.7	6.9%
Divisional	\$2.2	\$2.3	\$2.4	\$2.5	\$2.7	\$2.7	\$2.8	4.6%
Departmental	\$4.0	\$3.1	\$3.4	\$3.5	\$3.7	\$3.9	\$4.1	5.2%
Workgroup	\$1.9	\$1.7	\$1.9	\$1.9	\$2.0	\$2.1	\$2.2	5.5%
Total	\$10.7	\$11.2	\$12.0	\$12.3	\$13.0	\$14.0	\$14.8	5.8%

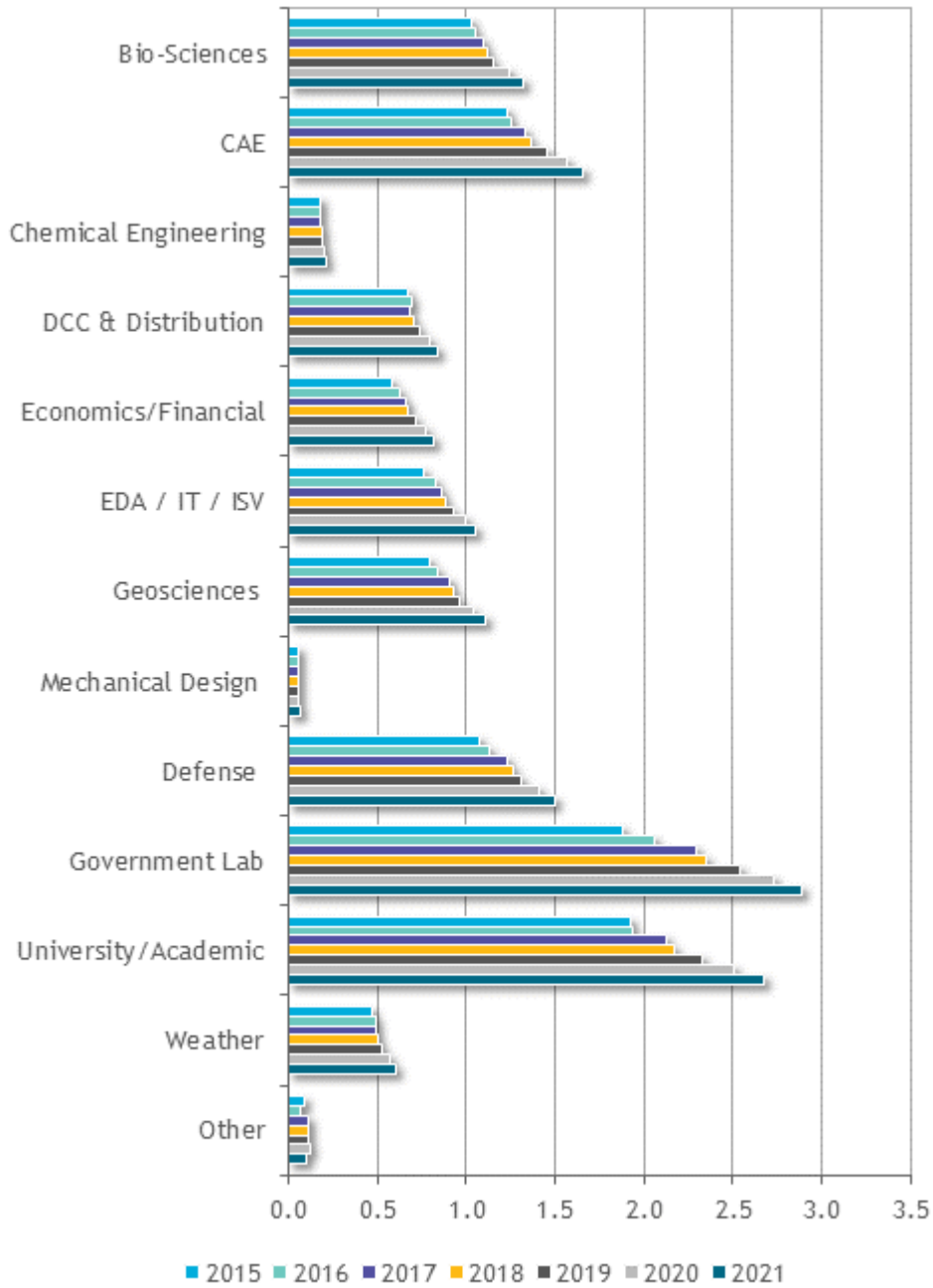
Source: Hyperion Research, 2017

THE HPC APPLICATIONS WORKLOADS FORECAST

Figure 2 shows the five-year forecast (2016-2021) for the application workload segments in the global HPC market. Hyperion Research predicts that in 2021, the largest workload segments will remain the same three that were biggest in 2016: government labs, university/academic and defense. We also project that these three segments will be the fastest growing during this period (see Table 1).

FIGURE 2

Revenues by the Application Segments (\$ Billions)



Source: Hyperion 2017

TABLE 2**Revenues by the Application Segments (\$ Billions)**

	2015	2016	2017	2018	2019	2020	2021	CAGR 16-21
Bio-Sciences	\$1.0	\$1.0	\$1.1	\$1.1	\$1.2	\$1.2	\$1.3	4.7%
CAE	\$1.2	\$1.3	\$1.3	\$1.4	\$1.4	\$1.6	\$1.7	5.7%
Chemical Engineering	\$0.2	\$0.2	\$0.2	\$0.2	\$0.2	\$0.2	\$0.2	3.0%
DCC & Distribution	\$0.7	\$0.7	\$0.7	\$0.7	\$0.7	\$0.8	\$0.8	3.8%
Economics/ Financial	\$0.6	\$0.6	\$0.7	\$0.7	\$0.7	\$0.8	\$0.8	5.5%
EDA / IT / ISV	\$0.8	\$0.8	\$0.9	\$0.9	\$0.9	\$1.0	\$1.1	5.1%
Geosciences	\$0.8	\$0.8	\$0.9	\$0.9	\$1.0	\$1.0	\$1.1	5.5%
Mechanical Design	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1	1.5%
Defense	\$1.1	\$1.1	\$1.2	\$1.3	\$1.3	\$1.4	\$1.5	5.8%
Government Lab	\$1.9	\$2.1	\$2.3	\$2.3	\$2.5	\$2.7	\$2.9	7.0%
University/ Academic	\$1.9	\$1.9	\$2.1	\$2.2	\$2.3	\$2.5	\$2.7	6.7%
Weather	\$0.5	\$0.5	\$0.5	\$0.5	\$0.5	\$0.6	\$0.6	4.1%
Other	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1	7.5%
Total Revenue	\$10.7	\$11.2	\$12.0	\$12.3	\$13.0	\$14.0	\$14.8	5.8%

Source: Hyperion 2017

Growth Drivers

Hyperion Research analysts are expecting a number of factors to drive healthy growth rates across all segments of the HPC sector going forward and that growth will likely outstrip the growth rate expected for the general-purpose enterprise IT server sector. These drivers include:

- Requirements for new HPC systems with a broad range of architectures to support development and operational capabilities in the artificial intelligence sector - especially in the area of deep learning.

- New and rapidly growing opportunities to support the continued migration and expansion of enterprise HPC workloads to cloud-based ecosystems. Hyperion expects that in many cases, HPC in the cloud operations will be used not as a replacement scheme but instead to augment critical on-premise HPCs capabilities. Additional growth will come as these HPC in the cloud offerings support a wider range of virtual environments targeted for key application sectors, lowering the barriers to entry for a host of new HPC users.
- The expanding role and diversity of new big data analytics running in non-traditional HPC environments, especially in the finance, personalized medicine, and cyber security sectors. Of particular import will be the ability of HPC systems to empower big data analysis on a near-real time basis, an increasingly necessary requirement for many application spaces.
- The continued expansion of HPCs into the traditional modeling and simulation environment as more and more commercial and government users turn to advanced computing to meet their toughest computational requirements for larger problem sizes, higher modeling fidelity, and more aggressive iteration methods, all operating under the requirement for faster turnaround time.

MARKET CONTEXT

Major Assumptions

Technology and Markets Forces Drive Growth at the Very High End of the Market

Although Hyperion does not expect any dramatic revenue increases at the highest end of the HPC market in the next few years, the number and scope of recent announcements about new petaflops and pre-exaflops systems around the world are clear indications that the high end "exascale race" is alive and well, and spending growth will no doubt follow. Indeed, Hyperion research estimates that the supercomputer segment of the HPC market will be one of the fastest growing with a CAGR of 6.9% between 2016 and 2021.

HPDA Growth Expands the Space

Hyperion Research analysts expect that many of the revenue gains in the HPC sector writ large will be driven by those within HPDA sector. Indeed, Hyperion Research analysts project that HPDA server revenues will grow at a CAGR of almost 17.0 % out to 2021, and new commercial analytics emerging within that space will see a CAGR of over 25% during the same time frame. Examples here include new big data applications that are running in non-traditional HPC environments but that use HPC hardware, such as in the finance or cyber security sectors.

Running HPC Workloads in the Cloud

HPC in the cloud offerings are increasingly providing HPC capabilities outside the traditional HPC vendor/user relationships, migrating HPC jobs to cloud environments for reasons that include managing surge workloads, accessing special hardware unavailable on their sites, and cost effectiveness. Hyperion Research indicates that currently 64% of HPC sites run some jobs in public clouds, up from only 13% in 2011.

- As such, HPC in the cloud providers are offering both the hardware and software needed to attract traditional HPC users to their services. Once the pricing models for these services settle down, more and more traditional HPC workloads will be pushed out into a cloud environment.

- This is not a zero sum game, but a way to grow the total HPC market. In addition, as many traditional HPC users are looking to cloud-based computation as a way to complement their in-house capabilities, vendors will need to offer seamless application migration between cloud and on-premise hardware or risk finding themselves locked out of the market. Cloud-based HPC could grow to over \$10 billion by 2021.

MARKET DEFINITIONS

The data in this study is based on Hyperion Research's segmentation of the technical market, which is as follows:

Supercomputers: Systems purchased to support technical applications and sold for \$500,000+

Technical divisional servers: Systems purchased to support technical applications and sold for \$250,000-\$499,999

Technical departmental servers: Systems purchased to support technical applications and sold for \$100,000-\$249,999

Technical workgroup servers: Systems purchased to support technical applications and sold for under \$100,000

METHODOLOGY

The forecasts in this study are based on a number of information sources, including Hyperion Research's technical computing systems quarterly census database, vendor results for the historical years, discussions with vendors and users on future business directions and expectations, end-user studies, and in-depth interviews with users.

The forecasts were developed based on Hyperion Research's technical computing systems forecast model, which targets compute servers. This model initially considers competitive segments (supercomputers, technical divisional servers, technical departmental servers, and technical workgroup servers), forecasting system unit shipments, revenue, and average sales price by industry/application segment. The forecasts include estimates for second-tier and new-entrant vendors selling into the HPC server market space.

The forecasts provided in this study include only server systems used in technical computing applications. Systems sold into commercial (nontechnical) applications and desktop technical computers are not included in this study.

Note: All numbers in this document may not be exact due to rounding.

About Hyperion Research, LLC

Hyperion Research, consisting of the former IDC high performance computing (HPC) analyst team, provides HPC information, analysis, and recommendations based on technology and market trends. 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). We provide 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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