



Market Forecast

Worldwide HPC Server Forecast Update, 2015-2019

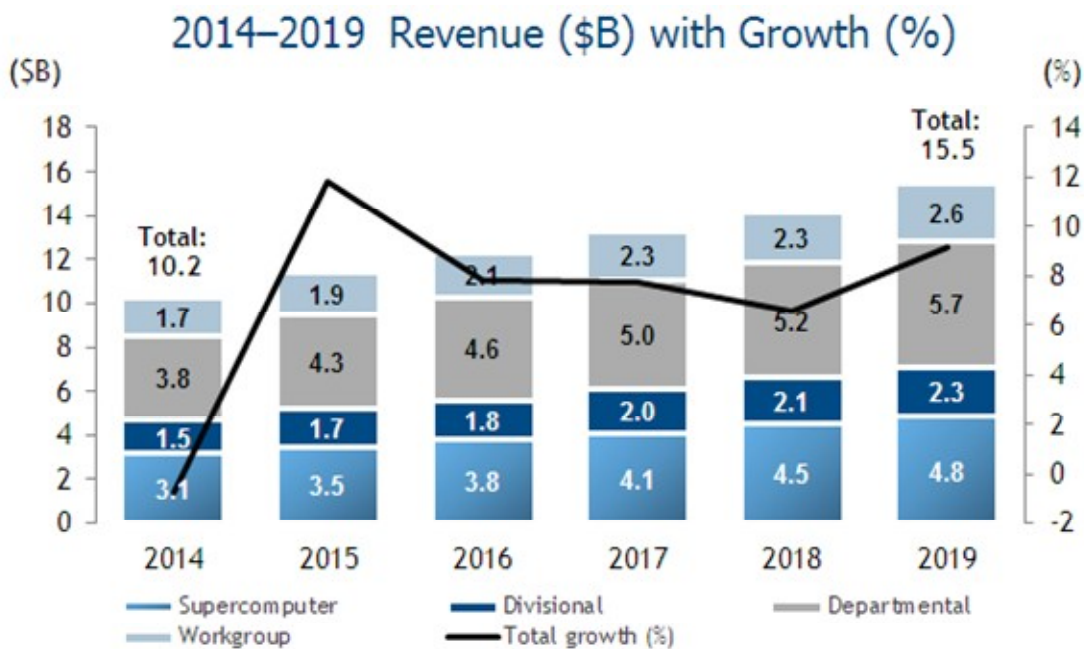
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IDC MARKET FORECAST FIGURE

FIGURE 1

Worldwide HPC Server Revenue Snapshot



Segment Shifts

Highest projected growth out to 2019 will be in the supercomputer segment with a CAGR of 8.9%, followed by the workgroup segment (8.8%), departmental segment (8.5%), and divisional segment (8.4%).

Source: IDC, 2015

EXECUTIVE SUMMARY

This document presents IDC's new forecast for the high-performance computing (HPC) server market. The first six months of 2015 have shown larger-than-expected growth in the HPC technical computing server market (15%). The strong growth was because of a sizable increase in purchases by the financial sector, increased purchases by new high-performance data analysis (HPDA) buyers, and strong vendor growth for HP, Cray, NEC, and the Chinese vendors.

2014 was a difficult year for the HPC server market with continued softness at the very high end, combined with a major vendor change. 2013 started the high-end slowdown, after three years of record-breaking growth. 2014 was basically flat compared with 2013 at \$10.2 billion in worldwide revenue. In this forecast update, we are adjusting our forecasts in a major way, starting with close to 12% growth in 2015, resulting in a CAGR of 8.6% from 2015 to 2019.

Note that outside the very high end (the top 2-3 system sales each year), the HPC market showed healthy growth in 2013 and 2014 but it was not enough to make up for the high-end slowdown.

This IDC study presents our latest five-year forecast for the HPC server space covering the 2015-2019 period.

"Note that HPC units shipped are projected to grow more slowly than revenue because of the increase in average system purchase prices. All four competitive segments are projected to show growth starting in 2015." – Earl C. Joseph, program vice president, Technical Computing

ADVICE FOR TECHNOLOGY SUPPLIERS

After three consecutive years of healthy growth (2009-2012), HPC saw a two-year slowdown (2013 and 2014), primarily driven by the slowdown at the very high end, combined with the IBM-Lenovo transition. Now, 2015 is looking like a record-breaking year. With the changing market dynamics in many different areas, we advise vendors to consider the following:

- Carefully select target markets, and then focus on developing differentiated solutions and services for your targeted segments (e.g., Big Data combined with big compute, industry-focused solutions, and petascale software solutions).
- Recognize that HPC ecosystem complexity and capability are increasing due to accelerators and coprocessors, new types of storage such as flash, and new I/O and interconnects, among other factors. Vendors will need to focus on developing scalable heterogeneous solutions to address different workloads' requirements.
- Look into new ways to offer HPC solutions. Now more than ever, users are rethinking ways to acquire HPC capabilities. Those considerations then become the drivers for the development of new ways of delivering HPC such as cloud computing, utility computing, and computing-cycle leasing models. We advise vendors that are interested in this space to pay close attention to the evolving user requirements, particularly users' HPC workload requirements and design solutions that directly address these needs (e.g., finding ways to adapt existing HPC applications to perform well in clouds and make cloud offerings more HPC friendly).
- U.S. and European vendors should look at expansion into geographic regions such as China, broader Asia, and the other BRICs but should spend time studying the unique market dynamics in these regions before committing resources. Conversely, IDC expects Japanese

and Chinese vendors to ramp up nondomestic expansion strategies, first in Europe and MEA and perhaps later on in the lucrative U.S. market.

MARKET FORECAST

HPC today is not as insulated as it used to be from the macroeconomic conditions because of cluster computer penetration and the resulting downstream adoption of commodity technologies. Although government labs and universities remain as the major users of HPC, clusters built on commodity components have helped expand HPC adoption significantly since 2003. Today, HPC has become indispensable for many industrial organizations to stay competitive. The broadening of the user base also makes the HPC server market more prone to macroeconomic changes and, therefore, more prone to resemble the dynamics of the general server market.

Starting in 2009 and continuing to 2012, there was a major shift in the market toward larger systems, with supercomputers showing the strongest growth. The lower end of the HPC server market started to show growth in 2013, but it still hasn't recovered from the previous high points.

The positive market results for 2009-2012 in HPC represent three successive years of growth, indicating that the HPC server market had emerged from the recession, and overall HPC spending was back to a healthy growth mode. Unfortunately, 2013 and 2014 reversed this growth trend.

We expect the finance, HPDA, government, homeland security, and academic space to remain bright spots during the forecast period. As the petascale/exascale race around the world becomes fiercer, we expect to see more nations announcing their petascale/exascale plans and more ultrascale systems being rolled out in the forecast period. We anticipate that over the next few years, nations will invest significantly in software and applications that can efficiently utilize coming exascale HPC systems.

In the entire industrial sector, IDC anticipates the oil and gas, finance, and DCC/gaming segments will grow at a very healthy rate from 2015 to 2019. On the DCC side, we are seeing an increased demand for systems capable of running large-scale, sophisticated games as well as 3D movies. For the rest of the industrial sectors, IDC expects increased spending in HPC at a more moderate rate.

Table 1 shows worldwide HPC server revenue, shipments, and average selling price (ASP). Figures 2-4 illustrate HPC server revenue, shipments, and average selling price, respectively.

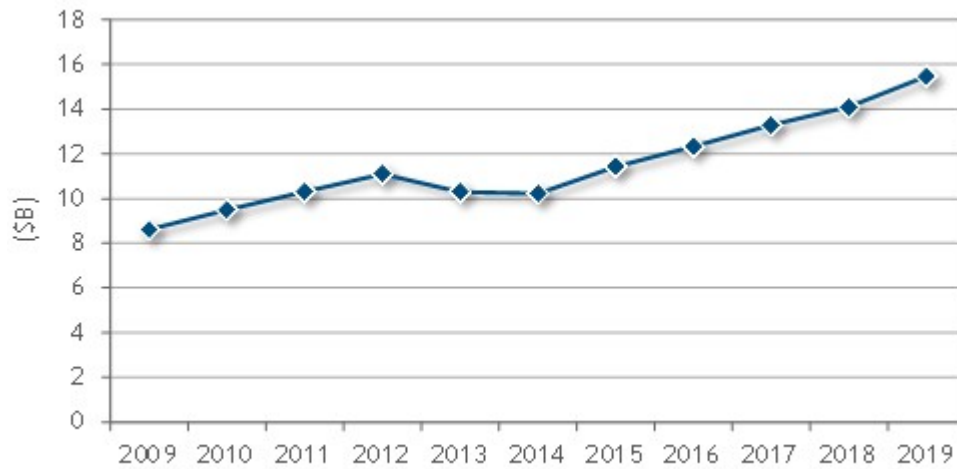
TABLE 1**Worldwide HPC Server Revenue, Shipments, and Average Selling Price, 2009-2019**

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2014–2019 CAGR (%)
Revenue (\$M)	8,614.1	9,498.3	10,300.1	11,097.7	10,298.8	10,222.3	11,434.2	12,326.6	13,286.3	14,160.0	15,469.8	8.6
Shipments	105,054	119,844	111,550	104,148	123,982	133,392	143,643	153,483	165,498	176,517	186,875	7.0
ASP (\$000)	82	79	92	107	83	77	80	80	80	80	83	1.6

Source: IDC, 2015

FIGURE 2

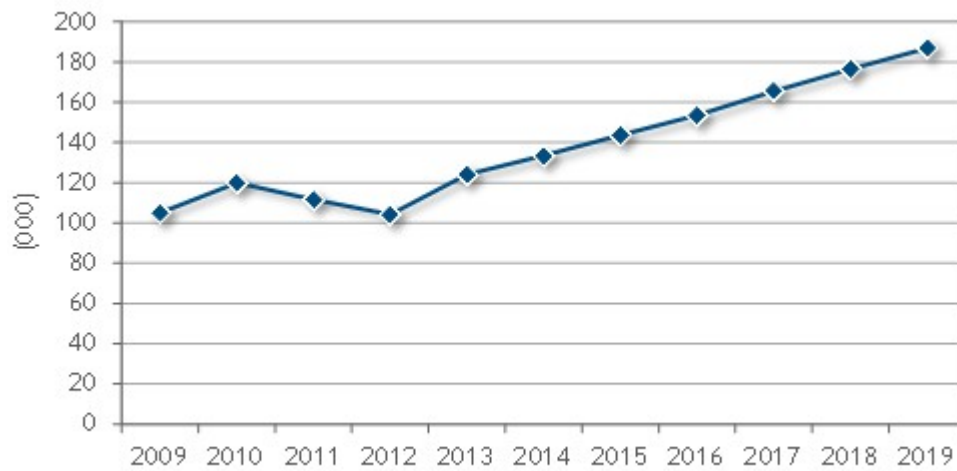
Worldwide HPC Server Revenue, 2009-2019



Source: IDC, 2015

FIGURE 3

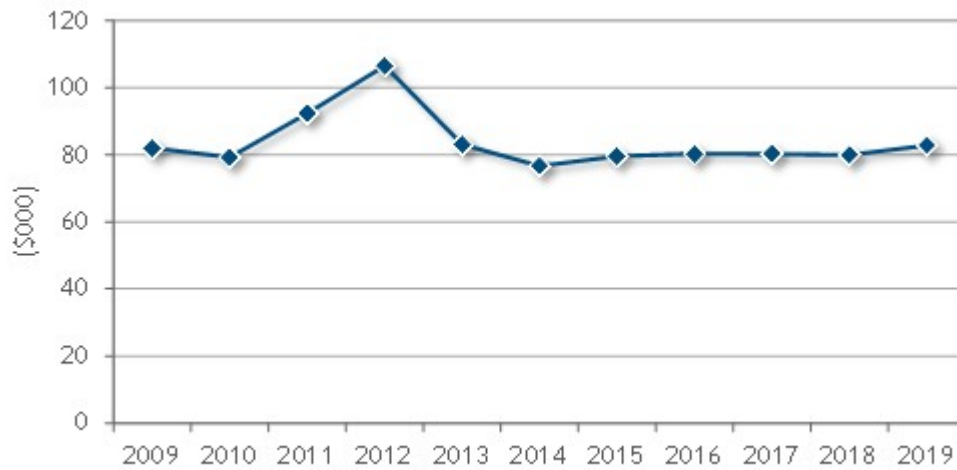
Worldwide HPC Server Shipments, 2009-2019



Source: IDC, 2015

FIGURE 4

Worldwide HPC Server Average Selling Price, 2009-2019



Source: IDC, 2015

Forecasts by Competitive Segments

Tables 2-4 present HPC revenue, shipment, and ASP forecasts, respectively, by the four competitive price band segments. From a competitive segment perspective, we expect to see the highest growth in the departmental segment, with a CAGR of 7.7%. Following closely is the workgroup segment, where we project a CAGR of 6.9% for the next five years (because of its continued recovery from dropping so much since the 2008 recession). The divisional segment is projected to grow at a 6.0% rate, and the supercomputer segment is projected to grow at a 4.7% rate out to 2019.

TABLE 2**Worldwide HPC Server Revenue by Competitive Segment, 2009-2019 (\$M)**

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2014–2019 CAGR (%)
Supercomputer	3,342.1	3,475.6	4,370.2	5,655.0	3,994.7	3,149.5	3,469.8	3,788.5	4,098.1	4,472.1	4,829.3	8.9
Divisional	1,078.6	1,268.7	1,236.7	1,216.2	1,355.1	1,524.2	1,706.5	1,825.5	1,965.3	2,115.7	2,277.7	8.4
Departmental	2,882.7	3,342.7	3,467.3	2,979.2	3,363.3	3,830.9	4,320.5	4,617.5	4,967.0	5,234.8	5,747.1	8.5
Workgroup	1,310.8	1,411.3	1,225.9	1,247.4	1,585.7	1,717.7	1,937.4	2,095.0	2,255.9	2,329.1	2,615.7	8.8
Total	8,614.1	9,498.3	10,300.1	11,097.7	10,298.8	10,222.3	11,434.2	12,326.6	13,286.3	14,160.0	15,469.8	8.6

Source: IDC, 2015

TABLE 3**Worldwide HPC Server Shipments by Competitive Segment, 2009-2019**

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2014–2019 CAGR (%)
Supercomputer	2,067	2,560	2,908	2,400	1,484	1,383	1,455	1,498	1,592	1,640	1,743	4.7
Divisional	3,596	3,914	3,724	3,663	4,271	4,788	5,150	5,539	5,958	6,231	6,409	6.0
Departmental	17,963	20,382	20,624	16,981	20,246	22,378	24,333	26,347	28,475	29,978	32,400	7.7
Workgroup	81,428	92,988	84,294	81,104	97,981	104,843	112,705	120,098	129,473	138,668	146,324	6.9
Total	105,054	119,844	111,550	104,148	123,982	133,392	143,643	153,483	165,498	176,517	186,875	7.0

Source: IDC, 2015

TABLE 4**Worldwide HPC Server Average Selling Price by Competitive Segment, 2009-2019 (\$000)**

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2014-2019 CAGR (%)
Supercomputer	1,617	1,358	1,503	2,356	2,691	2,277	2,385	2,528	2,575	2,726	2,771	4.0
Divisional	300	324	332	332	317	318	331	330	330	340	355	2.2
Departmental	160	164	168	175	166	171	178	175	174	175	177	0.7
Workgroup	16	15	15	15	16	16	17	17	17	17	18	1.8
Total	82	79	92	107	83	77	80	80	80	80	83	1.6

Source: IDC, 2015

MARKET CONTEXT

Drivers and Inhibitors

Drivers

HPC Leadership Efforts

- **Assumption:** The European Commission adopted an ambitious plan to double HPC funding through 2020, but the extent to which the plan is realized remains to be seen. China is becoming a much larger player in both having a top HPC vendor in Lenovo and becoming a major purchaser of large HPC servers. Lenovo could capture a significant share of the HPC server market in China in the next few years, bolstering China's efforts to become a commercial HPC powerhouse. The United States is still the largest market for HPC servers, but its high-end plans are uncertain. Russia and India announced plans for increasing funding for HPC, but they may be too strapped for cash to realize the vision. The wild card is how the United States will respond to this increased competition. National U.S. programs like the National Strategic Computing Initiative, recently announced by the White House, could have a significant positive impact on U.S. HPC prospects at least for the next few years.
- **Impact:** Competition in the global high-end HPC server market continues to heat up, especially as the race moves away from primarily hardware capabilities to innovative system design and associated software for a growing HPC and HPDA application base. The supercomputer segment took a step back in 2013 and again in 2014 after the major growth spurt in preceding years.

Economic Growth and HPCs

- **Assumption:** The recovery of the global economy will continue to have a positive impact on overall IT markets, IT server spending, and HPC server spending.
- **Impact:** HPC server sales will continue to grow following the declines in 2013 and 2014, after the positive momentum in 2010, 2011, and 2012. Pent-up demand at the low end should fuel growth as the global economy rebounds. IDC forecasts growth through 2019 for all HPC competitive segments.

Inhibitors

Stalled Growth at the Highest End

- **Assumption:** The very high end of the HPC server market has stalled for almost two years, after a major growth cycle. IDC expects that 2015 will not have major surprises, and so 2015 growth will be only slightly higher than 2014. But IDC expects funding initiatives associated with the global exascale race to reanimate the very high end in the coming years.
- **Impact:** The high end of the HPC technical server market has been the growth driver since 2009 and actually ramped up nicely during the global economic recession. Any change in the top 10, or even the top 5, systems has a major impact on the overall market growth rates. In 2012, the top 5 HPC sales represented over 10% of HPC server revenue. The gap between users anticipating exascale performance and what most mainstream HPCs users seek may widen, creating a disconnect between the two sectors.

Vendor Upheaval

- **Assumption:** The sale of IBM's x86 server business to Lenovo has caused some IBM clients to delay purchases, while the uncertainty about the ability of government agencies in the United States and a few other nations to purchase high-end x86 servers from Lenovo remains unresolved. In addition, the global vendor competition for the IBM installed base has delayed

purchases. These issues should settle down by late 2015, but by then, multiple vendors will capture some business from IBM and accounts intended for Lenovo.

- **Impact:** HP is now the clear HPC market leader. China's Lenovo and a growing host of Taiwanese and Chinese cluster suppliers could create significant turmoil in the overall server market (not just HPC) by driving down margins for the established, primarily U.S. server supplier base, ultimately restricting the U.S. suppliers' ability to offer servers designed to compete at the highest level of performance.

Significant Market Developments

Petascale/exascale initiatives around the world will continue to increase momentum in IDC's supercomputer segment. Despite the current uncertainty surrounding exascale development in the United States, IDC expects the United States to compete strongly with European and Asian exascale initiatives.

A number of nations are in the race to develop petascale and exascale systems, some of which already cost \$100 million per system. This will stimulate global revenue expenditures at the high end of the HPC market.

Although IDC expects x86-based processors to remain dominant during this period, *coprocessors and accelerators*, especially NVIDIA GPGPUs and Intel Xeon Phi, will see increased traction in the 2014-2016 period. Low-power processors, such as those made by ARM and Intel's Atom, will begin finding their place in the HPC ecosystem. The OpenPOWER Foundation is starting to gain market presence as well.

Coprocessors and accelerators are rapidly gaining momentum in the HPC community today, and mainstream adoption is largely dependent on the programming models and application readiness. In addition, ISV support will be critical for the growth potential of these components in the overall HPC sector.

Data-intensive computing has long been a part of HPC, but newer analytical methods using Hadoop and other methods (e.g., graph analytics) will grow the Big Data market in HPC (i.e., the HPDA market). In addition, the data explosion in HPC will drive larger system and storage purchases. In the long term, HPDA will shift HPC configurations away from their current extreme compute centricism, although the basic Von Neumann architecture will remain. There is some uncertainty as to how many of these new applications will be run in cloud-based datacenters. Further:

- We expect most buyers to purchase the same systems for traditional HPC and newer Big Data uses, but the new methods will increase average system sizes. However, a new wave of commercial firms are adopting HPC to tackle fraud and other daunting analytics challenges.
- The use of clouds for HPC workloads is growing at a strong rate. Over a longer period, HPC in the cloud could significantly alter the trajectory of this sector, should it prove to be technically capable and economically justifiable.

Changes from Prior Forecast

Table 5 and Figure 5 compare the previous IDC HPC server market forecast (see *Worldwide HPC Server 2015-2019 Forecast*, IDC #255147, March 2015) with this new five-year forecast. The new forecast represents a sizable increase in 2015 from IDC's March 2015 forecast and a smaller increase for the remaining four years, starting in 2016.

TABLE 5**Worldwide HPC Server Revenue 2009-2019: Comparison of March 2015 and November 2015 Forecasts (\$M)**

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2014–2019 CAGR (%)
November 2015 Forecast	8,614.1	9,498.3	10,300.1	11,097.7	10,298.8	10,222.3	11,434.2	12,326.6	13,286.3	14,160.0	15,469.8	8.6
March 2015 Forecast	8,614.1	9,498.3	10,300.1	11,097.7	10,298.8	10,222.3	10,718.2	11,466.9	12,957.6	14,073.2	15,164.6	8.2

Notes:

See Worldwide HPC Server 2015-2019 Forecast (IDC #255147, March 2015) for prior forecast.

Historical market values presented here are as published in prior IDC documents based on the market taxonomies and current U.S. dollar exchange rates existing at the time the data was originally published. For more details, see IDC's Forecast Scenario Assumptions for the ICT Markets and Historical Market Values and Exchange Rates, Version 3, 2015 (IDC #259115, September 2015).

Source: IDC, 2015

FIGURE 5

Worldwide HPC Server Revenue 2009-2019: Comparison of March 2015 and November 2015 Forecasts



Source: IDC, 2015

MARKET DEFINITION

This IDC study presents an overview of IDC's forecast for the HPC server market for the 2015-2019 period. The data in this study is based on IDC'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 IDC'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 IDC'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.

RELATED RESEARCH

Additional research from IDC in the technical computing hardware program includes the following documents:

- *IDC's Forecast Scenario Assumptions for the ICT Markets and Historical Market Values and Exchange Rates, Version 3, 2015* (IDC #259115, September 2015)
- *Worldwide HPC Server 2015-2019 Forecast* (IDC #255147, March 2015)
- *Experiences with Accelerators and Coprocessors in High-Performance Computing: HPC User Forum, September 15-17, 2014, Seattle, Washington* (IDC #251973, October 2014)
- *Major Global High-Performance Computing Initiatives: HPC User Forum, September 15-17, 2014, Seattle, Washington* (IDC #251971, October 2014)
- *Lenovo Completes Acquisition of IBM's x86 Server Business* (IDC #lcUS25176214, September 2014)
- *Worldwide Broader HPC 2014-2018 Forecast: Servers, Storage, Software, Middleware, and Services* (IDC #248835, June 2014)
- *Worldwide Technical Computing Server 2014-2018 Forecast* (IDC #248779, May 2014)
- *Global HPC Market Dynamics in 2013* (IDC #248137, April 2014)
- *Worldwide HPC Public Cloud Computing 2014-2017 Forecast* (IDC #247846, April 2014)

About IDC

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