

Intersect360
RESEARCH

DELLTechnologies

What to Watch for in the New HPC
(Or: The Joys and Hazards of Being an Analyst)
January 2021

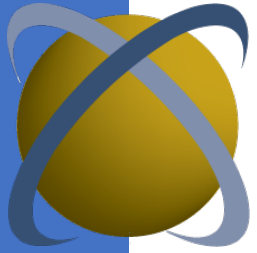
Addison Snell

addison@intersect360.com



Agenda

- The Joys and Hazards of Being an HPC Analyst: What Do You Want to Hear?
 - Joy/Hazard: The market is always changing
 - Joy/Hazard: There is a need for data and insights
- What to Watch for in the New HPC: New Market Data
 - The Role of Cloud Computing
 - The Future of Machine Learning
 - The Influence of Hyperscale
 - The Diversification and Democratization of HPC Technology
- Recommendations, Q&A



The HPC Market: What Are We Counting?

What is HPC?

Intersect360 Research defines HPC as the use of servers, clusters, and supercomputers—plus associated software, tools, components, storage, and services—for scientific, engineering, or analytical tasks that are particularly intensive in computation, memory usage, or data management. HPC is used by scientists and engineers both in research and in production across industry, government, and academia. Within industry, HPC can frequently be distinguished from general business computing in that companies generally will use HPC applications to gain advantage in their core endeavors—e.g., finding oil, designing automobile parts, or protecting clients' investments—as opposed to non-core endeavors such as payroll management or resource planning.

Characteristics of HPC applications include, but are not limited to:

- Requirements for leading-edge system performance, or ability to address the most demanding problems;
- Requirements for leading-edge scalability;
- Tendency to incorporate, test, and perfect new technologies and methodologies associated with market creation and expansion

We can count HPC as a distinct market because it generally has its own budget, with its own spending patterns distinct from other enterprise computing.

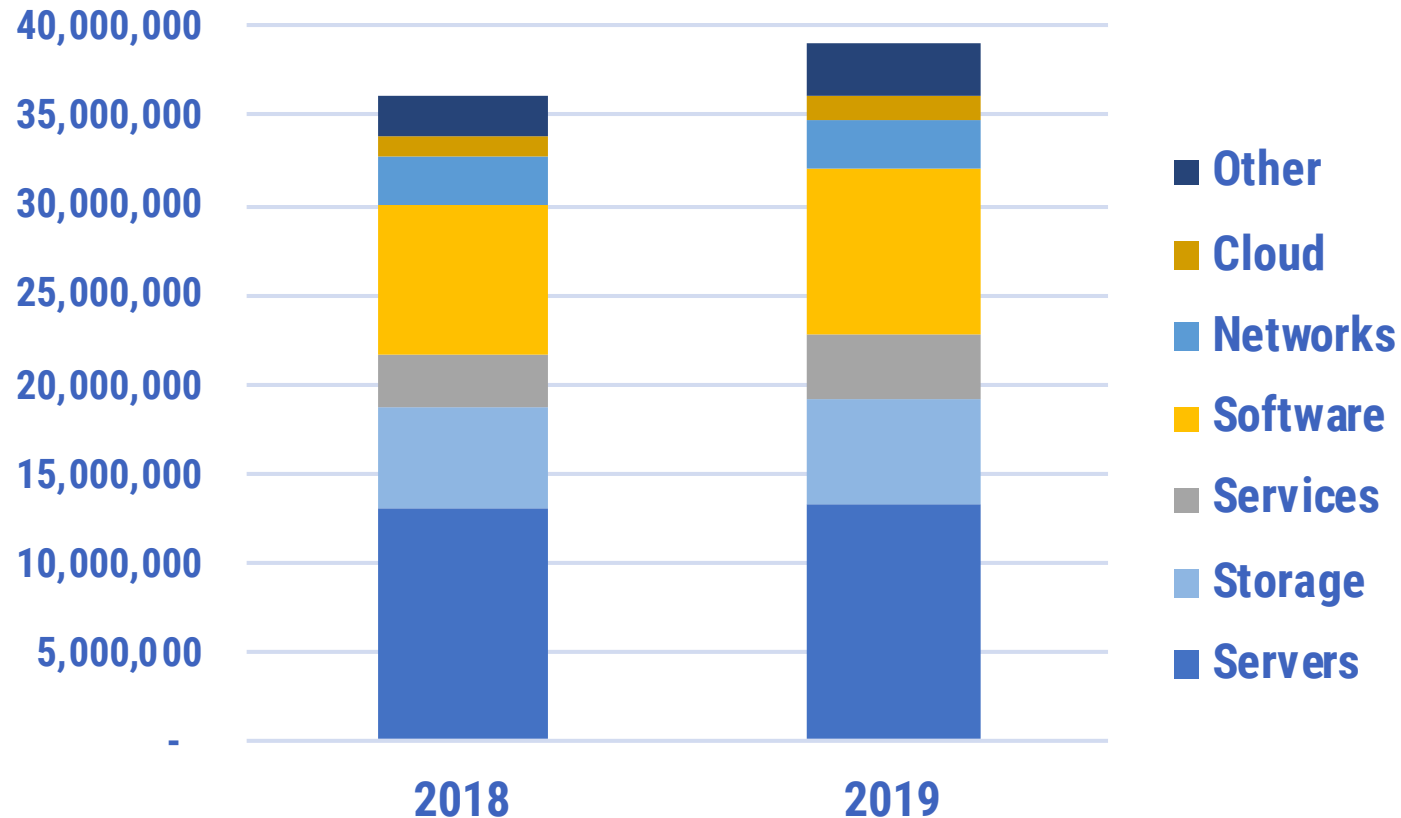


HPC Market in 2019: Notes

- Worldwide HPC market was \$39.0 billion in 2019, up 8.2% from \$36.1 billion in 2018
 - This was about a point higher than our forecast
 - Government led growth in 2019, after six years of growth led by industry
- Uneven distribution by product/service segment:
 - Servers and storage each grew between 2% and 3%
 - Major growth in cloud and cloud-like deployments
- Top vendors declined in market share relative to others; no major changes in rank



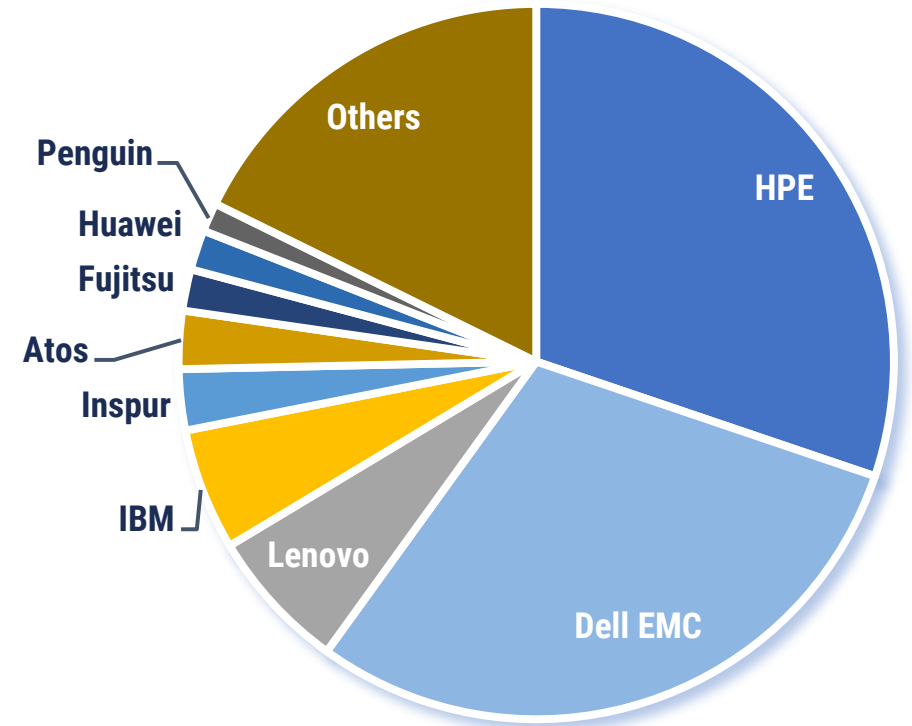
Products and Services (\$000): 2018 vs 2019

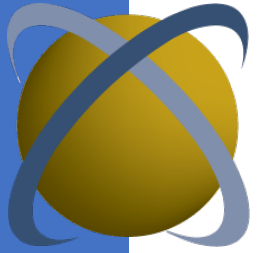




HPC Server Revenue Market Share

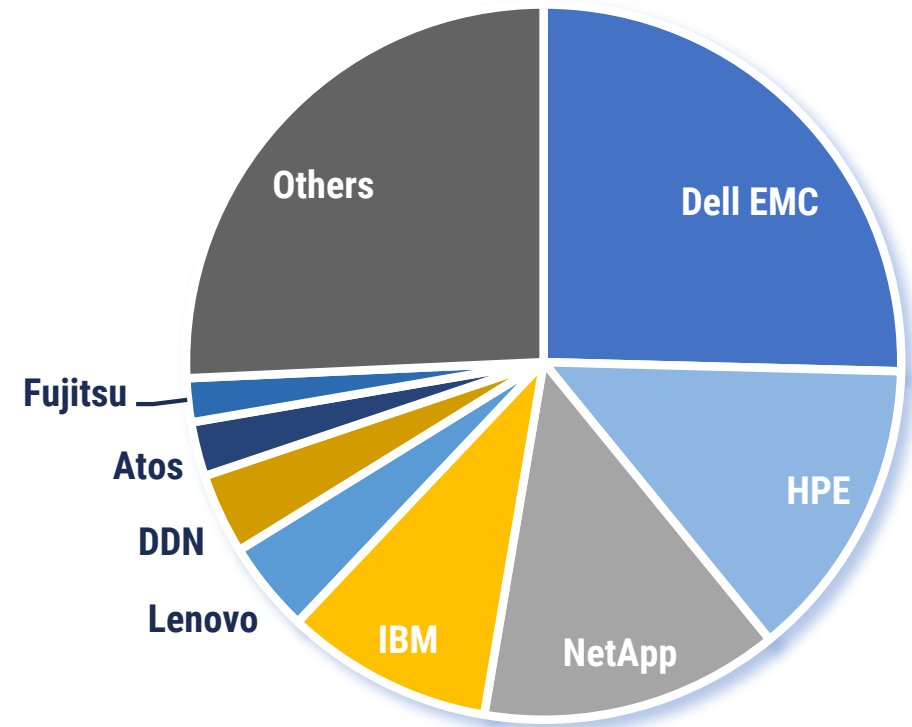
- Leaders HPE, Dell both slightly down in 2019; still 60% share combined
- Virtual tie for #1; HPE leads by less than half a percentage point
- HPE revenue includes Cray revenue post acquisition, completed in September 2019; Cray revenue prior to acquisition is in “Others”
- Lenovo largest vendor with year-over-year growth
- IBM failed to sustain growth from 2018
- Double-digit growth for **Atos**, Penguin, Inspur, and Fujitsu
- Huawei strong internationally despite trade and political issues with U.S.
- Notable “Others”: NEC, **NVIDIA**, Sugon, Supermicro

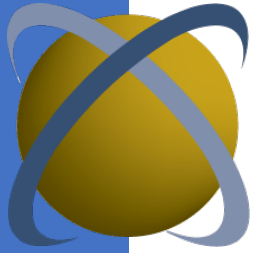




HPC Storage Revenue Market Share

- Top four vendors all lost revenue from 2018; still combine for over 60% share
- HPE, Dell, IBM all slightly down in 2019
- NetApp fell from #2 to #3 with a poor year
- Revenue is assigned to seller; NetApp partnership with Lenovo moved some revenue from the former to the latter
- Double-digit growth for **Atos**, **DDN**, and Fujitsu
- Some of Atos' growth is resale of DDN product; DDN true growth rate is even higher
- HDS has been moved to "Others" due to lack of focus on HPC. HDS had 5.0% share in 2018
- Notable "Others": HDS, Huawei, Inspur, **Intel**, Panasas, Quantum, Qumulo, Spectra, WekaIO





HPC Servers + Storage

WW HPC Servers plus Storage Revenue (\$000) and Share - Intersect360 Research, 2019

	2018	2019	Change	Y/Y Growth	Pct. (2018)	Pct. (2019)
Dell EMC	5,534,179	5,417,138	(117,041)	-2.1%	29.8%	28.4%
HPE	4,929,788	4,794,018	(135,770)	-2.8%	26.5%	25.2%
IBM	1,359,892	1,276,552	(83,340)	-6.1%	7.3%	6.7%
Lenovo	1,033,471	1,091,835	58,365	5.6%	5.6%	5.7%
Others	5,738,226	6,472,785	734,559	12.8%	30.9%	34.0%
Total	18,595,555	19,052,329	456,774	2.5%	100.0%	100.0%

- Dell and HPE both remain each over 25% of the market for servers and storage combined
- Dell maintains slight lead over HPC
- Intersect360 Research does not formally track market share for other segments, such as services. Dell and HPE are in a near tie for total solutions revenue; Dell has a slight lead.



Products and Services: 2018 vs 2019

Total WW HPC Market (\$000) - Products and Services - Intersect360 Research, 2020

	2018	2019	Change	Y/Y Growth	% of HPC (2018)	% of HPC (2019)
Servers	12,932,004	13,236,003	304,000	2.4%	35.8%	33.9%
Storage	5,663,551	5,816,325	152,774	2.7%	15.7%	14.9%
Services	2,966,345	3,758,167	791,822	26.7%	8.2%	9.6%
Software	8,483,530	9,182,570	699,040	8.2%	23.5%	23.5%
Networks	2,643,257	2,784,532	141,275	5.3%	7.3%	7.1%
Cloud	1,215,330	1,431,890	216,560	17.8%	3.4%	3.7%
Other	2,169,362	2,806,309	636,947	29.4%	6.0%	7.2%
Total	36,073,379	39,015,797	2,942,418	8.2%	100.0%	100.0%

- Cloud grew 17.8% to \$1.4 billion.
- Double-digit growth of \$217 million.
- Is \$1.4 billion the complete role of cloud? **No.**

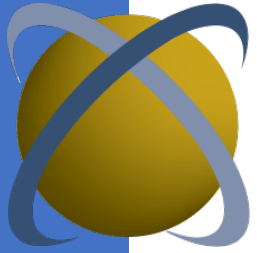


Products and Services: 2018 vs 2019

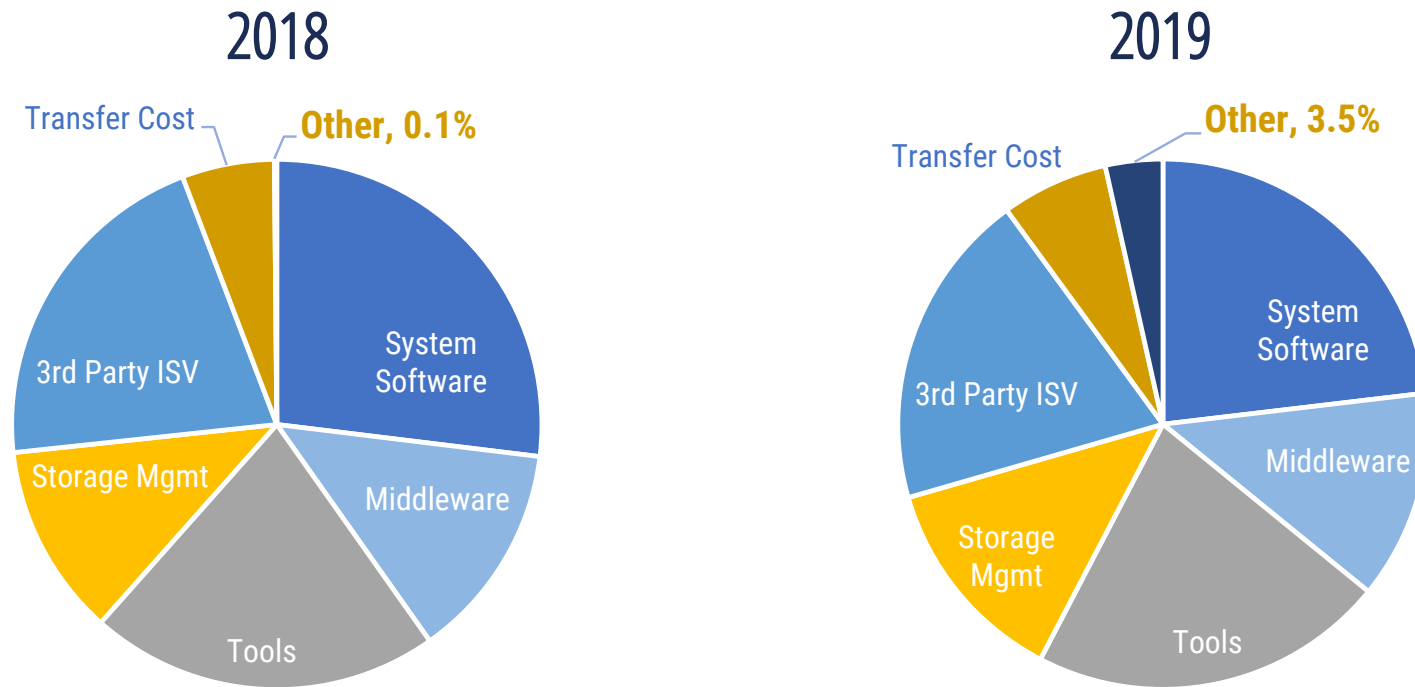
Total WW HPC Market (\$000) - Products and Services - Intersect360 Research, 2020

	2018	2019	Change	Y/Y Growth	% of HPC (2018)	% of HPC (2019)
Servers	12,932,004	13,236,003	304,000	2.4%	35.8%	33.9%
Storage	5,663,551	5,816,325	152,774	2.7%	15.7%	14.9%
Services	2,966,345	3,758,167	791,822	26.7%	8.2%	9.6%
Software	8,483,530	9,182,570	699,040	8.2%	23.5%	23.5%
Networks	2,643,257	2,784,532	141,275	5.3%	7.3%	7.1%
Cloud	1,215,330	1,431,890	216,560	17.8%	3.4%	3.7%
Other	2,169,362	2,806,309	636,947	29.4%	6.0%	7.2%
Total	36,073,379	39,015,797	2,942,418	8.2%	100.0%	100.0%

- Look at other categories that showed high growth. This growth shows up in “Other” ways:
 - Services: Other
 - Software: Other
 - Other: Other
- A closer look shows additional effect of cloud computing.



HPC Software: 2018 to 2019

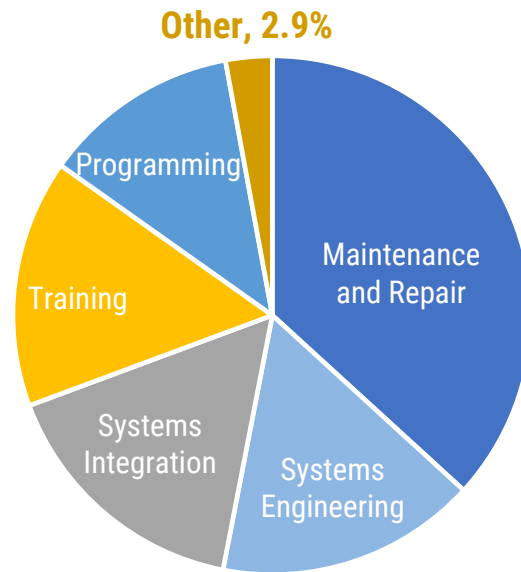


\$300+ million growth in **Software: Other**, primarily due to SaaS contracts, showing up in the Software budget.

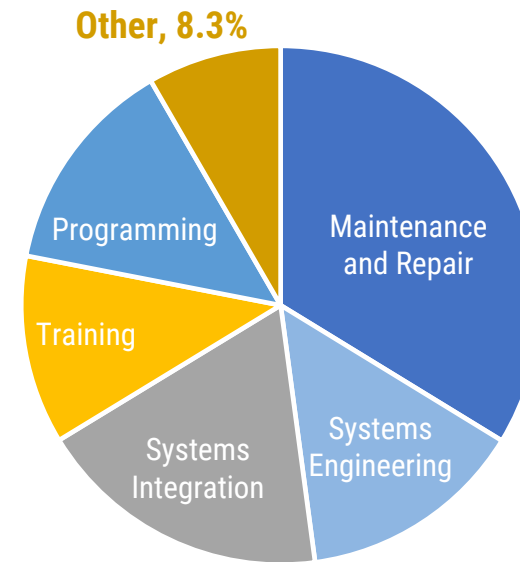


HPC Services: 2018 to 2019

2018



2019



\$200+ million growth in **Services: Other**, primarily due to cloud managed services contracts, showing up in the Services budget.



Cloud-Related Growth in “Other” Budgets

Directly measured HPC Cloud spending:	\$1.43 billion
Plus:	
SaaS in Software budgets:	\$200 – 400 million
Cloud managed services in Services budgets:	\$200 – 400 million
Other cloud contracts in Other budgets:	\$400 – 600 million
 HPC Cloud range:	 \$2.2 – 2.8 billion

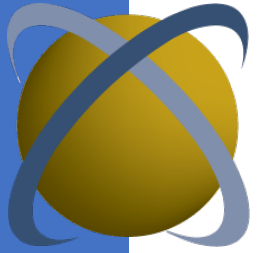
Additionally, there is some AI in the cloud that is entirely separate from HPC users and budgets. This can easily add \$1 billion, depending on methodology, for a total well over \$3 billion. Hyperscale AI infrastructure by itself is about \$8 billion.



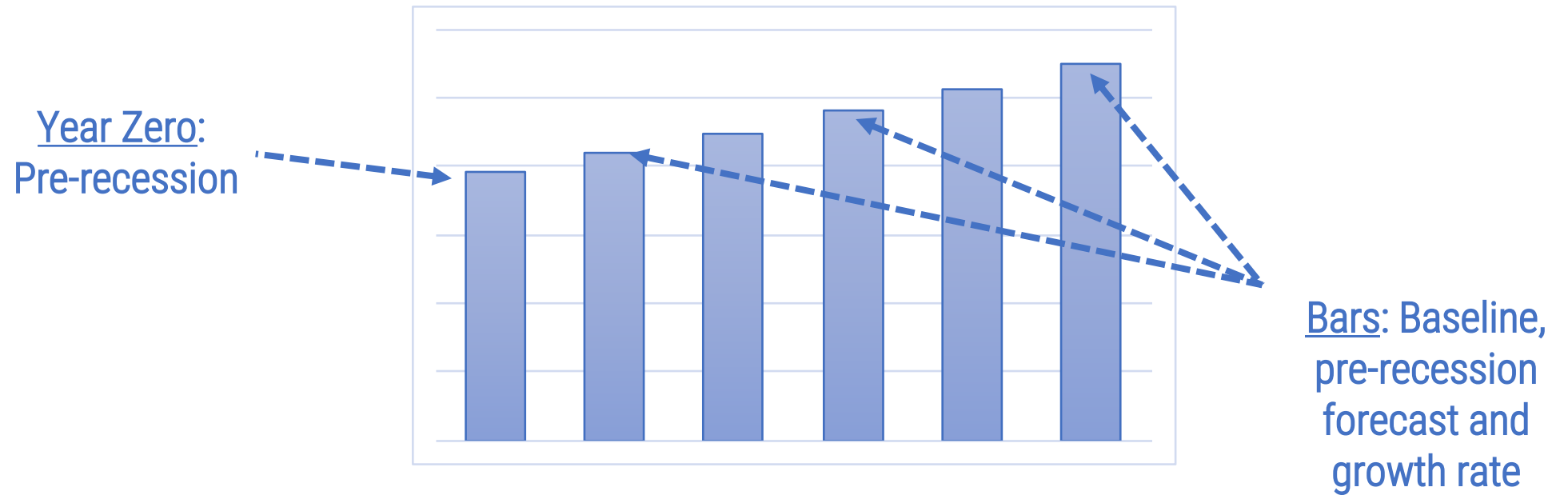
HPC Market Forecast to 2024: Notes

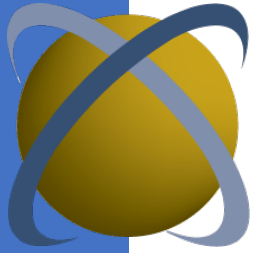
- Worldwide HPC market will grow to \$55.0 billion in 2024, 7.1% CAGR from 2019.
- Cloud will continue to grow at over 20% CAGR and have a major effect on the market.
- The government sector will have the highest CAGR over the next five years.
- HPC server revenue growth will continue to concentrate in larger configurations
 - Fueled in part by Exascale computing
 - Lower-end systems have higher replacement by cloud computing

The global COVID-19 pandemic will have a dramatic effect on HPC market revenue in 2020-2023, including lost revenue. By 2024, the HPC market will be back to its original growth curve. There is no effect on CAGR.

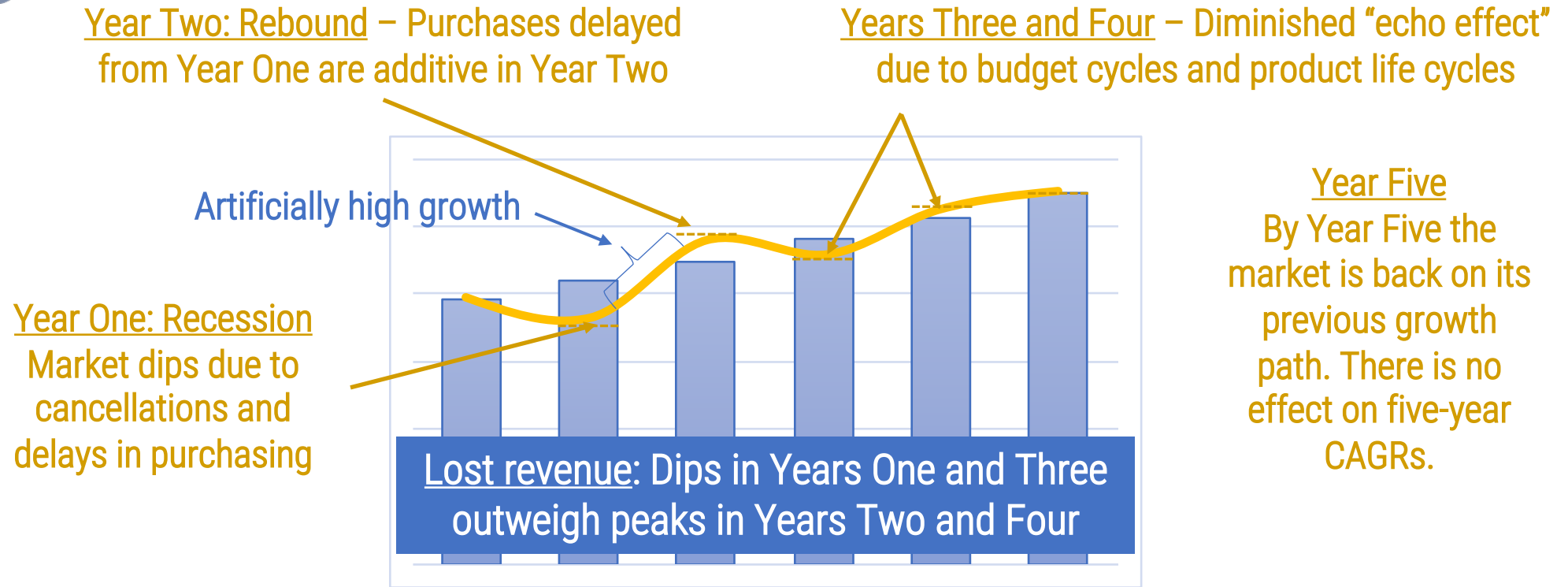


The Shape of an HPC Recession





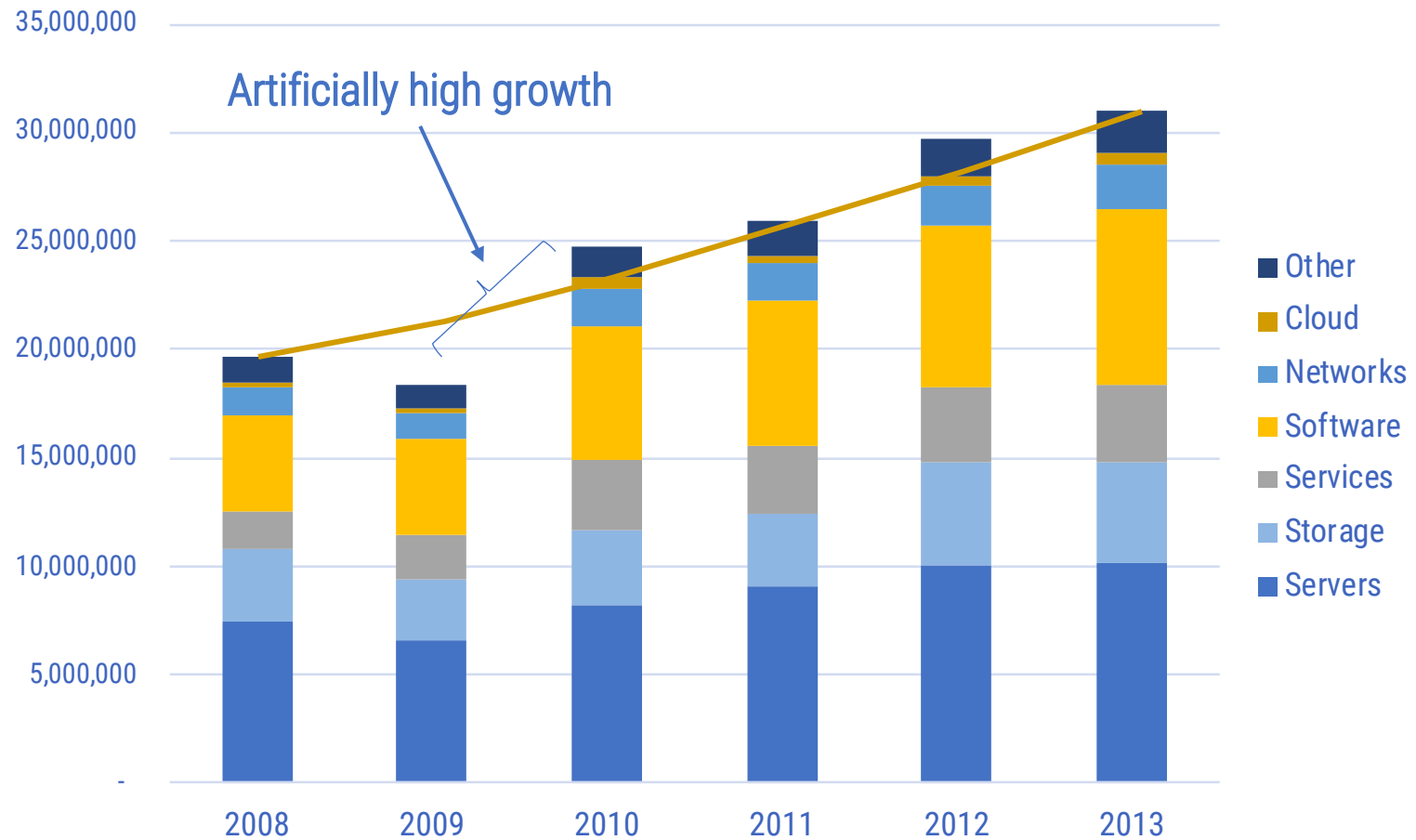
The Shape of an HPC Recession



The HPC market followed this pattern in 2009-15 after recession in 2009.
HPC Storage also followed this pattern after supply chain disruptions due to flooding in Southeast Asia in 2011.



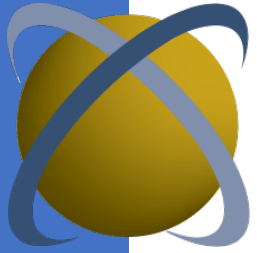
HPC Market History: 2009 Recession





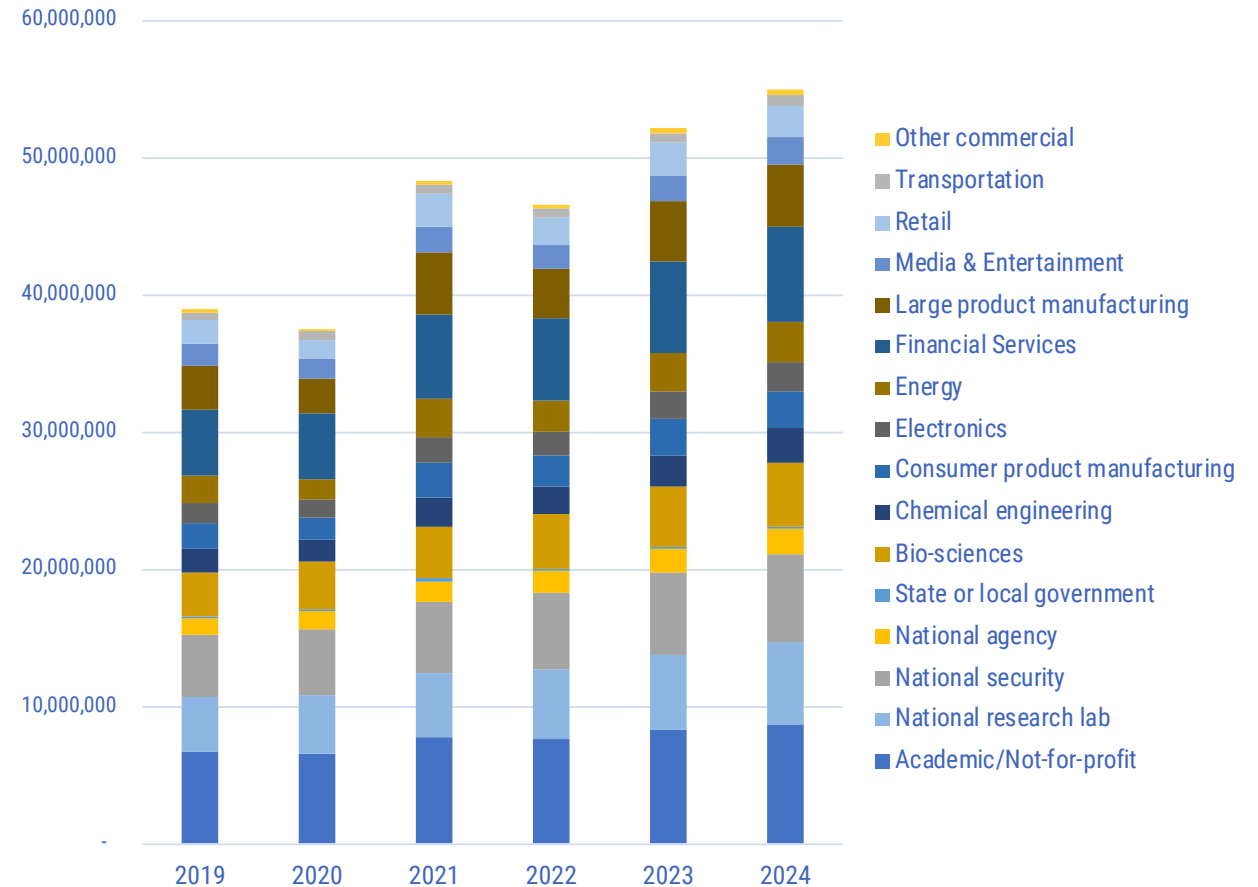
HPC Market Forecast: COVID-19 Adjustment

- Worldwide HPC market will fall 10.1% below baseline forecast for 2020
 - Translates to **\$4.2 billion** below baseline forecast
 - Nullifies previously forecasted growth; now **3.7% decline year-over-year**
 - Forecasting first year of HPC market decline since 2009
- Most revenue is delayed, not lost. 2021 will be a rebound year: 8.0% above baseline forecast
- Echo effects in 2022 (2.8% below baseline forecast) and 2023 (1.6% above baseline forecast)
- Return to “normal” in 2024; five-year CAGR still 7.1%; significant adjustment to segments
- COVID-19 adjustment translates to total \$1.2 billion revenue loss over the five-year forecast: shortfalls in 2020 and 2022 outweigh gains in 2021 and 2023
- Significant forecast risk: How long does COVID-19 last as an economic damper?



HPC Forecast: Vertical Markets (\$000)

- This is the primary segmentation for COVID-19 adjustments to forecast
- Hardest hit vertical markets in 2020 (with 2021 rebound):
 - Energy
 - Retail
 - Large product manufacturing
- Bio-sciences has slight increase over 2020 baseline
- National research labs, national agencies, and national security also stable





Making a Forecast at Intersect360 Research

1. All the vendors in the space give analysts detailed, quarterly reports on the HPC systems they sold, what the configurations were, who bought them, the price and terms, and what applications they're running.
2. We put it all into a spreadsheet and report.

**Ha ha, just kidding, not really.
That would be great though.**



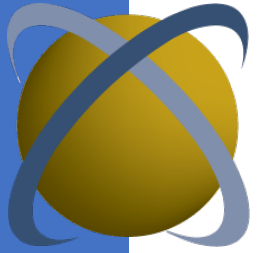
What Goes Into Our HPC Market Model

- Supply-side model (primarily servers; supplemental analysis of storage and processors):
 - Analysis of quarterly and annual reports (where available)
 - Companies' statements of HPC revenue (where available, trusted, relevant)
 - Models of HPC revenue as proportion of enterprise business unit revenue
- Demand-side data (weighted by economic sector):
 - Budget data—ratio of servers to storage, software, services, cloud, etc.
 - Installation data—technology trends and relative positions of vendors
 - Other trend data as appropriate
- Analyst opinion (we fight about it until we all agree)



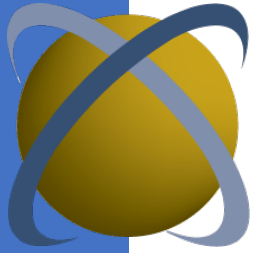
Examples: HPE and Dell, HPC Servers

- Start with HPE. Easy one. HPE reports quarterly HPC system revenue to analysts. (Hooray!)
 - 2018 CY: \$3.1 billion (approx. because need to correct for calendar vs. fiscal)
 - 2019 changed reporting to include Cray mid-year. Long run this will make it easier, but short term this meant doing two separate models: pre-Cray and post-Cray
- So, it's \$3.1 billion for 2018? No.
- That's what HPE reports as HPC systems, such as Apollo line. What if someone buys a Proliant server and uses it for HPC? We need to model that in.
- We think there's 35% more revenue not reported. CY2018: \$4.1 billion. (2019: \$4.0B)
- **At that level, HPC accounts for 30% of total HPE enterprise server revenue.**



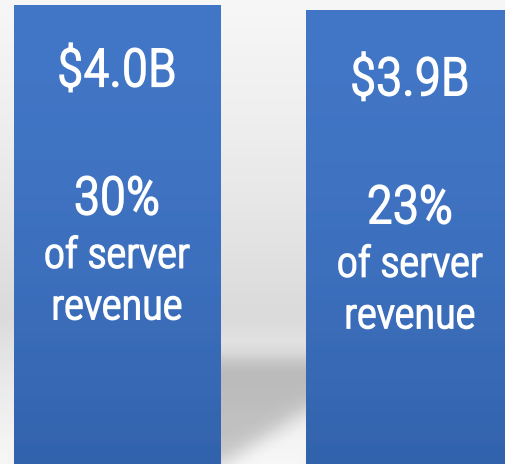
Examples: HPE and Dell, HPC Servers

- Now Dell. Tough one. Dell is private but does release enterprise business data.
 - 2019, Infrastructure Solutions Group, Servers: \$17.1 Billion
 - What percentage of Dell systems do we think is HPC?
- Dell is consistently slightly ahead of HPE in number of reported installations in surveys
- When analyzed by economic sector ... same conclusion
- However, HPE configurations are slightly larger on average
- **For 2019, we modeled 23.0% of Dell's enterprise server revenue as HPC: \$3.9 Billion.**
- Now do the same work for (Cray), Lenovo, IBM, Atos, Fujitsu, Inspur, and Huawei, and decide what to do with the Other category. Does your model make sense? Adjustments?



Methodology Comparison: 2019 HPC Servers

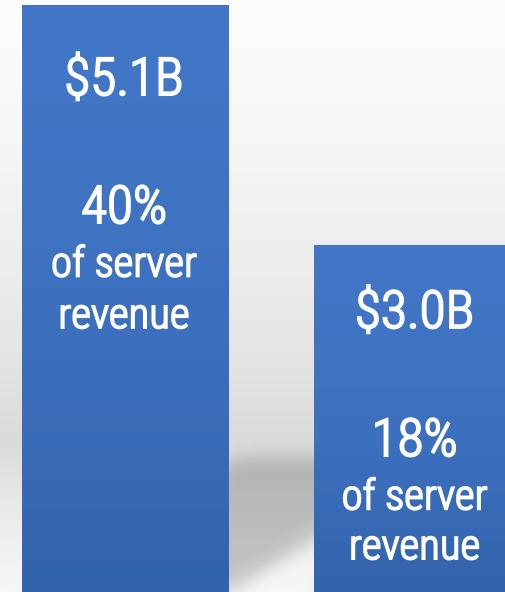
Intersect360



HPE

Dell

Hyperion



HPE

Dell



Hype vs. Reality

What's Popular to Say ...

Cloud is taking over HPC!

Cloud is cheaper than on-premise!

Intersect360 Research Says ...

Cloud has been in high-growth mode since 2017. We forecast ~20% CAGR. By 2024, cloud will still be < 10% of HPC.

The biggest drawback to cloud is it's usually more expensive. (Data movement is also still a factor.) Cloud providers would do well to promote where cloud makes sense as a premium service.

Challenge to hyperscale market?



Hype vs. Reality

What's Popular to Say ...

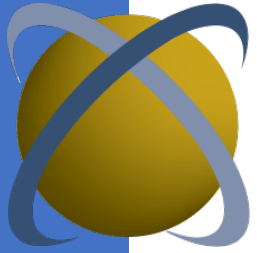
AI is taking over HPC!

Analytics is taking over HPC!

Intersect360 Research Says ...

Both are important new workloads and are helping expand HPC usage in commercial markets. They could blur the line between what is HPC and what isn't.

HPC is an enduring market because the need for scientific computing isn't going away. In the next five or hundred years, we'll still need to do science.



Hype vs. Reality

What's Popular to Say ...

4,600% average ROI if you buy HPC!

Every company should!

Commercial use cases will drive HPC through the roof!

Intersect360 Research Says ...

Commercial markets were already the growth engine of HPC for most of the 2010s, and growth continues, but it doesn't happen all at once. Adoption takes a long time.

(Gov't is highest growth in forecast.)

There is no magic ROI to buying HPC. HPC is a significant contributor to innovation. Be satisfied with that.



Hype vs. Reality

What's Popular to Say ...

GPUs are taking over HPC!

ARM will take over HPC!

Quantum will dominate HPC!

Intersect360 Research Says ...

GPUs are well-established now, but still less than 20% of commercial HPC users say they have “widespread use.” There’s a long way to go on ARM, and even longer on quantum.

The biggest challenge facing end users (and software developers) in HPC is technology diversity. Buyers would prefer not to make wholesale changes.



Recommendations

Dell

- Leverage HPC Innovation Labs to guide on which configurations best suit various workloads.
- Stop ceding the federal supercomputing space. But what is your high-end interconnect solution?
- Make better use of broad storage portfolio.

Dell Partners

- Application domain expertise is critical. Verticalize messages where possible.
- There will be a spending rebound post-pandemic. Be fast to capitalize.
- Dell is the leading HPC vendor with strong, complete solutions.

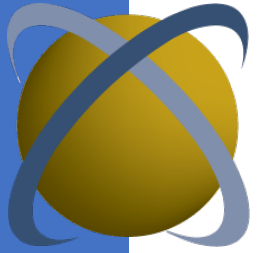
HPC Users

- Your own workloads are the only ones important to you. What is your definition of HPC success?
- Cloud is a complicated proposition. Pay special heed to data sovereignty.
- With this much complexity in the market, it's reasonable to hedge bets.



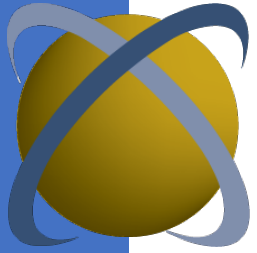
This Just In ...

- **Intersect360 Research HPC Technology Survey**
- Survey closed December 7. Delivery to clients Q1 2021. Open for inquiry now.
 - Usage/penetration rates and configurations of CPUs and accelerators
 - Server configurations and vendor shares
 - Cloud adoption and vendor shares
 - Liquid cooling deployments
 - Storage tiering and parallel file systems
 - Effect of COVID-19 on budgets, procurements, and operations
 - And more!



More from Intersect360 Research

- Full pre-SC20 market update webinar: <https://www.intersect360.com/presentations>
- Sign up for our newsletters, answer surveys, stay abreast of research: <https://www.intersect360.com/newsletter-signup-form>
- Listen to our podcast, *This Week in HPC*:
 - Find it in iTunes; listen on Soundcloud: <https://soundcloud.com/this-week-in-hpc>
 - <https://www.intersect360.com/podcasts>
- Becoming a client:
 - Individual reports available at: <https://www.intersect360.com/2020-research>
 - Full list of services: <https://www.intersect360.com/features/services>
 - For more options and information, email info@intersect360.com



Intersect360
RESEARCH

DELLTechnologies

What to Watch for in the New HPC
(Or: The Joys and Hazards of Being an Analyst)
January 2021

Q&A | Thank you!