



HYPERION RESEARCH

Hyperion Research HPC Market Update

November 2022

www.HyperionResearch.com
www.hpcuserforum.com

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Tom Sorensen and Jaclyn Ludema

About Hyperion Research



(www.HyperionResearch.com & www.HPCUserForum.com)

Hyperion Research mission:

- Hyperion Research helps organizations make effective decisions and seize growth opportunities
 - By providing research and recommendations in high performance computing and emerging technology areas

HPC User Forum mission:

- To improve the health of the HPC/AI/QC industry
 - Through open discussions, information sharing and initiatives involving HPC users in industry, government and academia along with HPC vendors and other interested parties

The Hyperion Research Team

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Data Collection

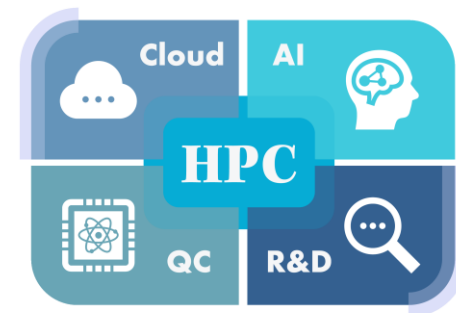
Sue Sudan, Market Data Group

Kirsten Chapman, KC Associates

Example Research Areas

(www.HyperionResearch.com & www.HPCUserForum.com)

- Traditional HPC
- AI, ML, DL, Graph
- Cloud Computing
- Storage & Data
- Interconnects
- Software & Applications
- Power & Cooling
- Tracking all Processor Types & Growth rates
- Quantum Computing
- R&D and Engineering -- all types
- Edge Computing
- Supply Chain Issues



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Agenda

- **HPC Market Update**
- **A Quick Update on Exascale Systems**
- **HPC in the Cloud Update**
- **Storage and Interconnects Update**
- **Multi-Client Study Results**
- **HPC Applications Update**
- **Global AI Update**
- **The Quantum Computing Sector**
- **HPC Innovation Awards**
- **Conclusions**

HPC Market Update

Top Trends in HPC



The first half of 2022 was soft due to supply chain issues – \$6.6 billion (US\$) in revenues

- We still expect the second half of the year to do better
- 2021 grew by a strong 9%
- Supercomputers are growing better at 5.3% (1H2022)

There are many high growth areas:

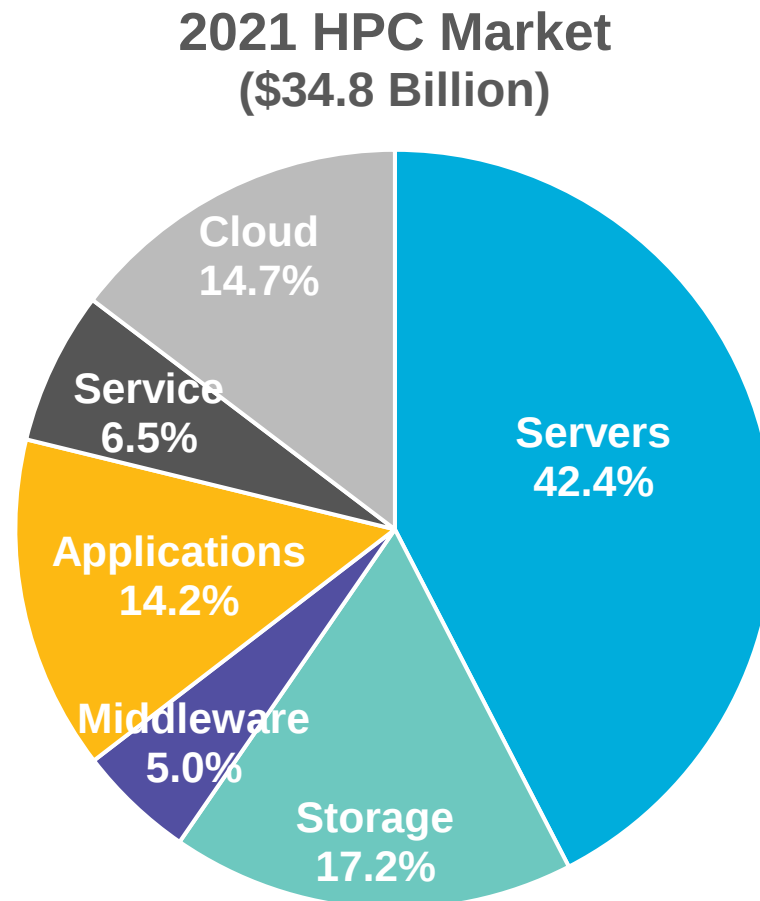
- AI, ML and DL
- Using clouds to run HPC workloads
- GPUs
- Storage

Software continues to be a major area that needs improvement

The lack of technical experts is creating a major constraint

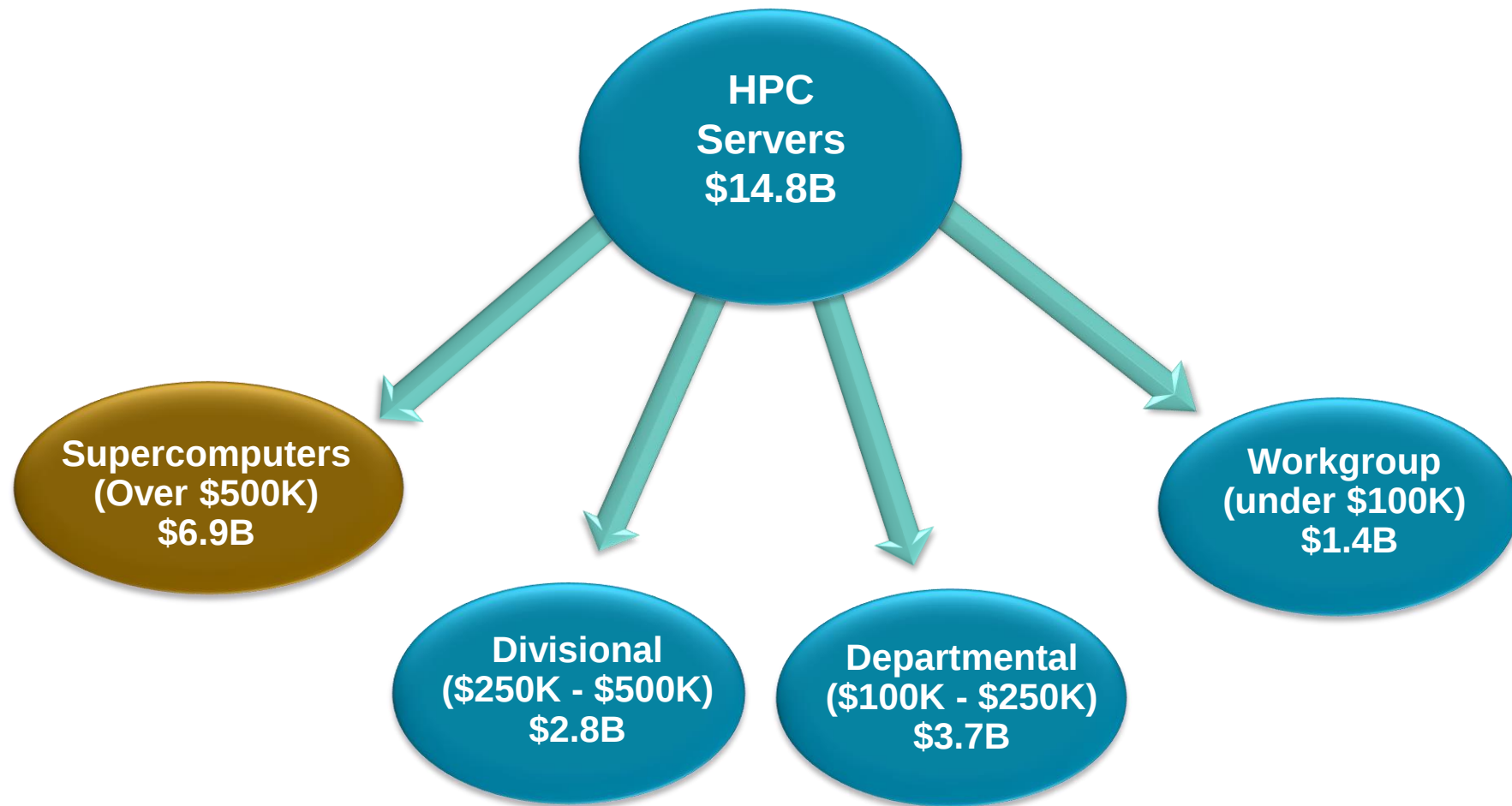
The Overall HPC Market in 2021

Looking at the overall HPC market, including servers, cloud usage, storage, software and repair services = \$34.8 billion USD



The 2021 Worldwide On-Prem HPC Server Market: \$14.8 Billion (up 9%)

2022 is projected to reach \$16 to \$17 Billion



WW HPC On-Prem Market By Vendor

(\$ Millions)

2021 On-Prem server Revenues By Vendor (\$M)		
Vendor	Server Revenues (\$M)	Market Share
HPE	5,050	34.2%
Dell Technologies	3,213	21.8%
Lenovo	1,174	8.0%
Inspur	993	6.7%
Atos	542	3.7%
Sugon	525	3.6%
IBM	463	3.1%
Penguin	378	2.6%
Fujitsu	176	1.2%
NEC	173	1.2%
Other	2,076	14.1%
Total On-Prem HPC	14,763	100.0%
<i>Source: Hyperion Research, 2022</i>		

WW HPC Market By Vertical (\$ Millions)

2021 WW On-Prem High-Performance Systems Revenue by Applications (\$M)	
	2021
Bio-Sciences	1,455
CAE	1,767
Chemical Engineering	177
DCC & Distribution	807
Economics/Financial	703
EDA / IT / ISV	849
Geosciences	1,010
Mechanical Design	59
Defense	1,552
Government Lab	2,866
University/Academic	2,637
Weather	681
Other	199
Total Revenue	14,763
<i>Source: Hyperion Research, 2022</i>	

The Broader On-premise Market Areas (\$ Millions)

***2021 total on-prem HPC spending reached \$29.7B
(excluding cloud spending, which brings it to \$34.8B)***

Revenues by the Broader HPC Market Areas			
	2019	2020	2021
Server	13,368	13,523	14,763
Storage	5,288	5,079	5,984
Middleware	1,572	1,491	1,731
Applications	4,569	4,315	4,952
Service	2,181	2,015	2,267
Total Revenue	26,979	26,423	29,697
<i>Source: Hyperion Research, 2022</i>			

HPC Market Forecasts

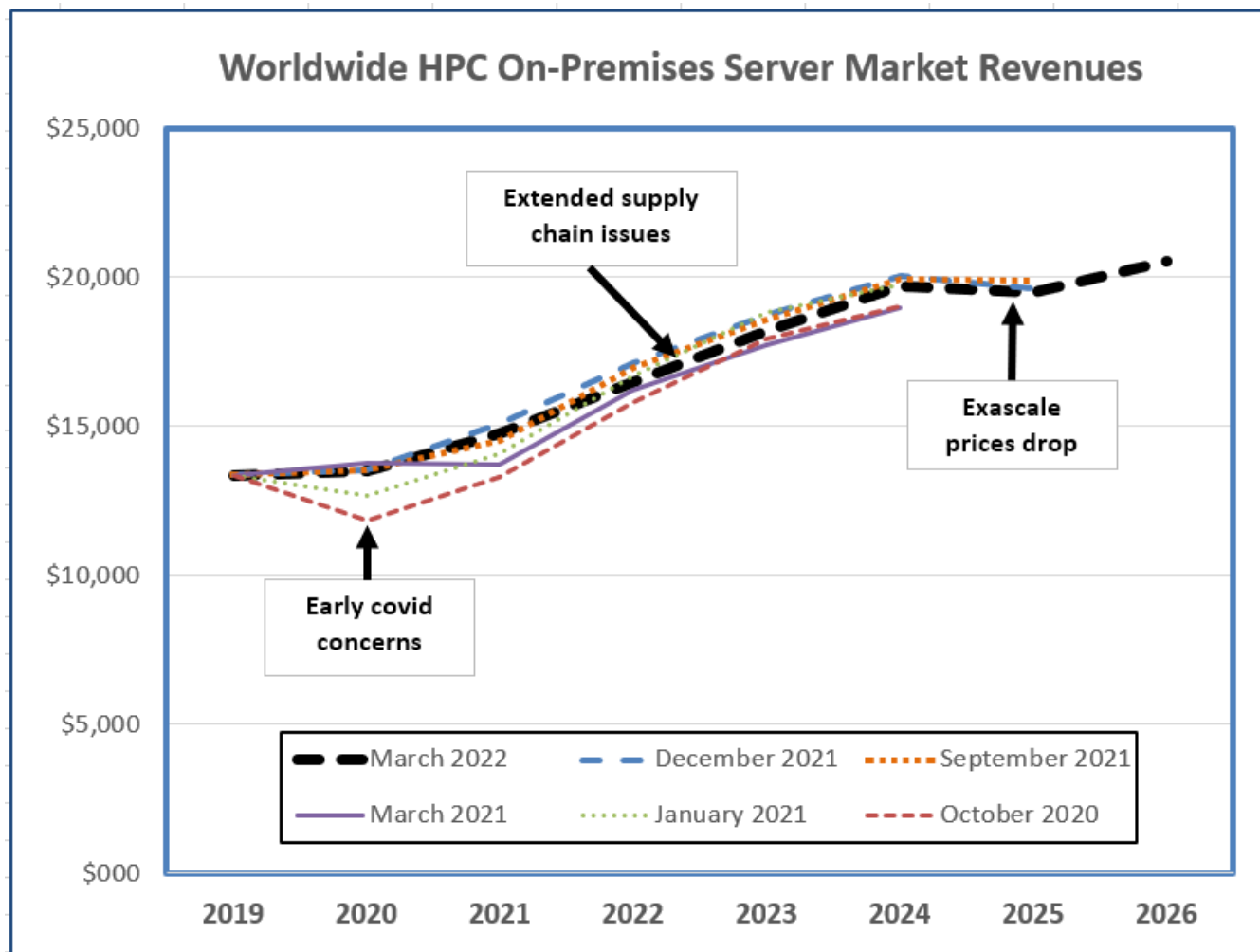
5-Year On-Prem HPC Server Forecast

6.9% growth over the next 5 years

On-Prem HPC Market Forecast by Competitive Segment							
<i>\$US Millions</i>	2021	2022	2023	2024	2025	2026	CAGR 21-26
Supercomputer	6,926	8,125	9,023	9,846	9,661	9,543	6.6%
Divisional	2,803	3,077	3,397	3,681	3,677	4,397	9.4%
Departmental	3,648	3,909	4,316	4,645	4,704	5,137	7.1%
Workgroup	1,373	1,392	1,472	1,525	1,450	1,471	1.4%
Total	14,763	16,503	18,208	19,697	19,492	20,549	6.9%

5-year HPC Server Forecast Changes

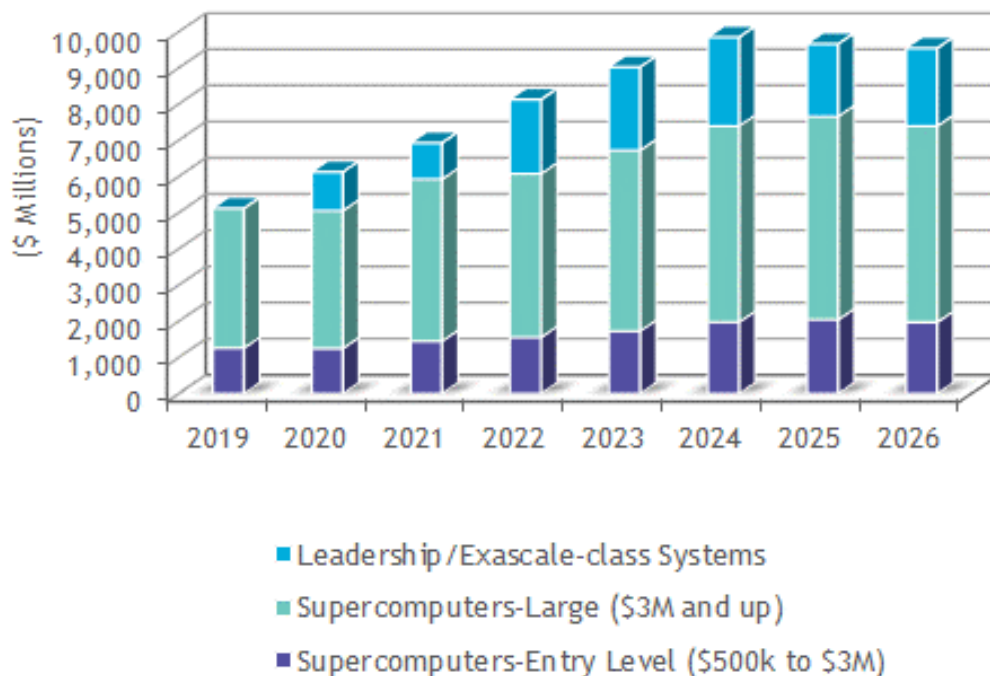
Quarterly adjustments due to covid



New Supercomputer Subsegments

New Supercomputer Subsegments									
\$ Millions									
	2019	2020	2021	2022	2023	2024	2025	2026	CAGR 21-26
Leadership/Exascale-class Systems	0	1,065	1,000	2,050	2,300	2,450	2,000	2,150	16.5%
Supercomputers-Large (\$3M and up)	3,858	3,808	4,477	4,516	4,995	5,420	5,615	5,419	3.9%
Supercomputers-Entry Level (\$500k to \$3M)	1,260	1,250	1,450	1,559	1,728	1,975	2,046	1,975	6.4%
Total Supercomputers (\$500K and up)	5,118	6,123	6,926	8,125	9,023	9,846	9,661	9,543	6.6%

Source: Hyperion Research, May 2022



HPC

High Growth Areas

High Growth Areas

These are redefining the HPC sector

- **The use of external clouds for running HPC workloads**
- **AI, ML and DL**
- **New processor types and accelerators/GPUs**
- **Storage**
- **Exascale-class systems**
- **Quantum technologies**

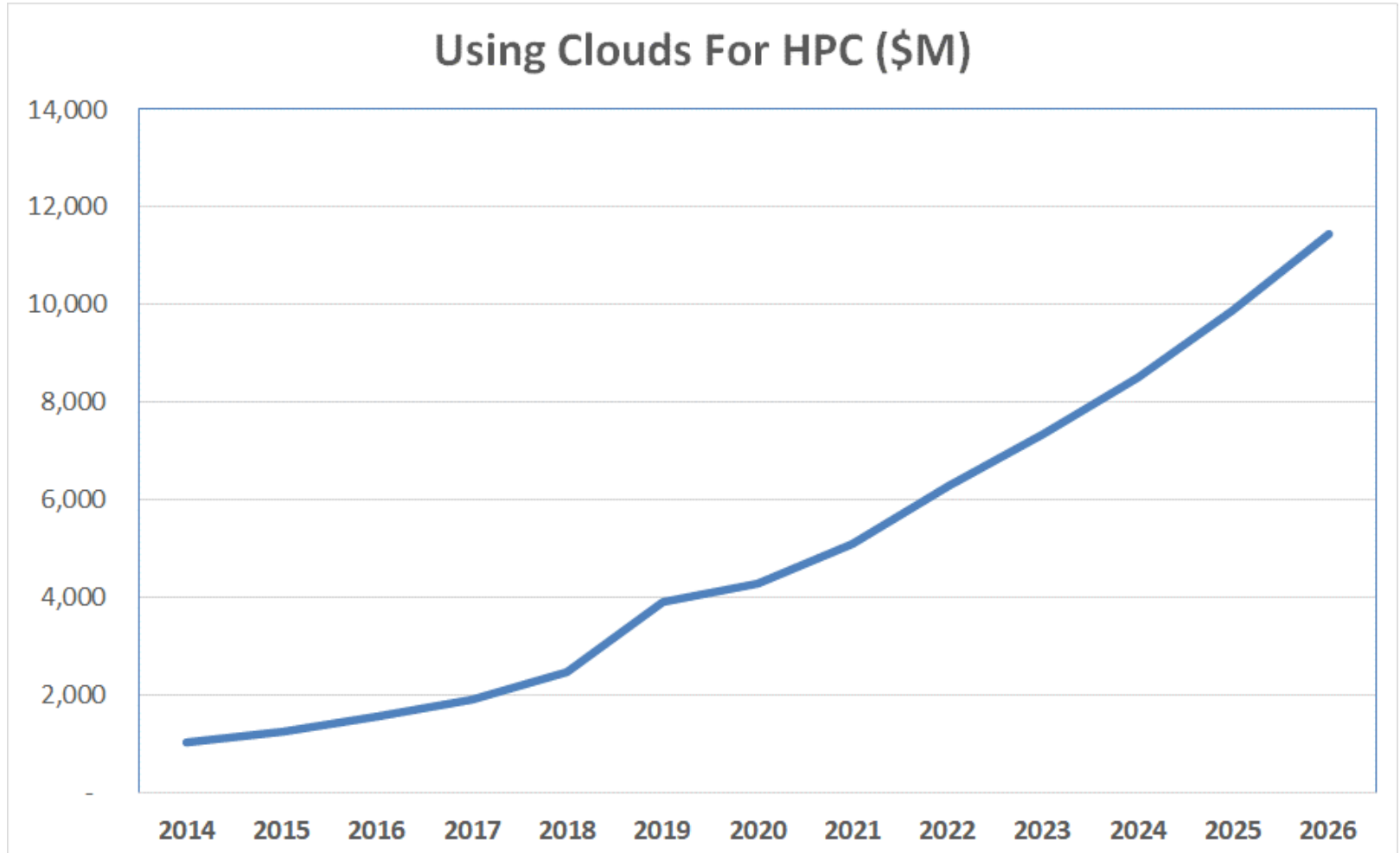
The HPC Cloud Market Will See Strong Growth in 2022

The growth will build on the fundamental changes in buying behavior seen in 2021

- **HPC & AI buyers around the world revealed for the first time that HPC buyers are planning to shift some of their on-premises budgets to spending in the cloud**
 - The shift is fundamental because up to 2021 very few sites were taking money from the on-premises budgets for cloud computing
- **End user spending on public cloud resources to run HPC workloads is projected to grow substantially in 2022, at a rate greater than 23%, and will exceed US \$6.2 billion**
- **This major shift in buying behavior doesn't mean that on-premises HPC systems are going away**
 - The on-premises HPC server market is anticipated to exhibit healthy growth, 7%-8% a year, over the forecast period

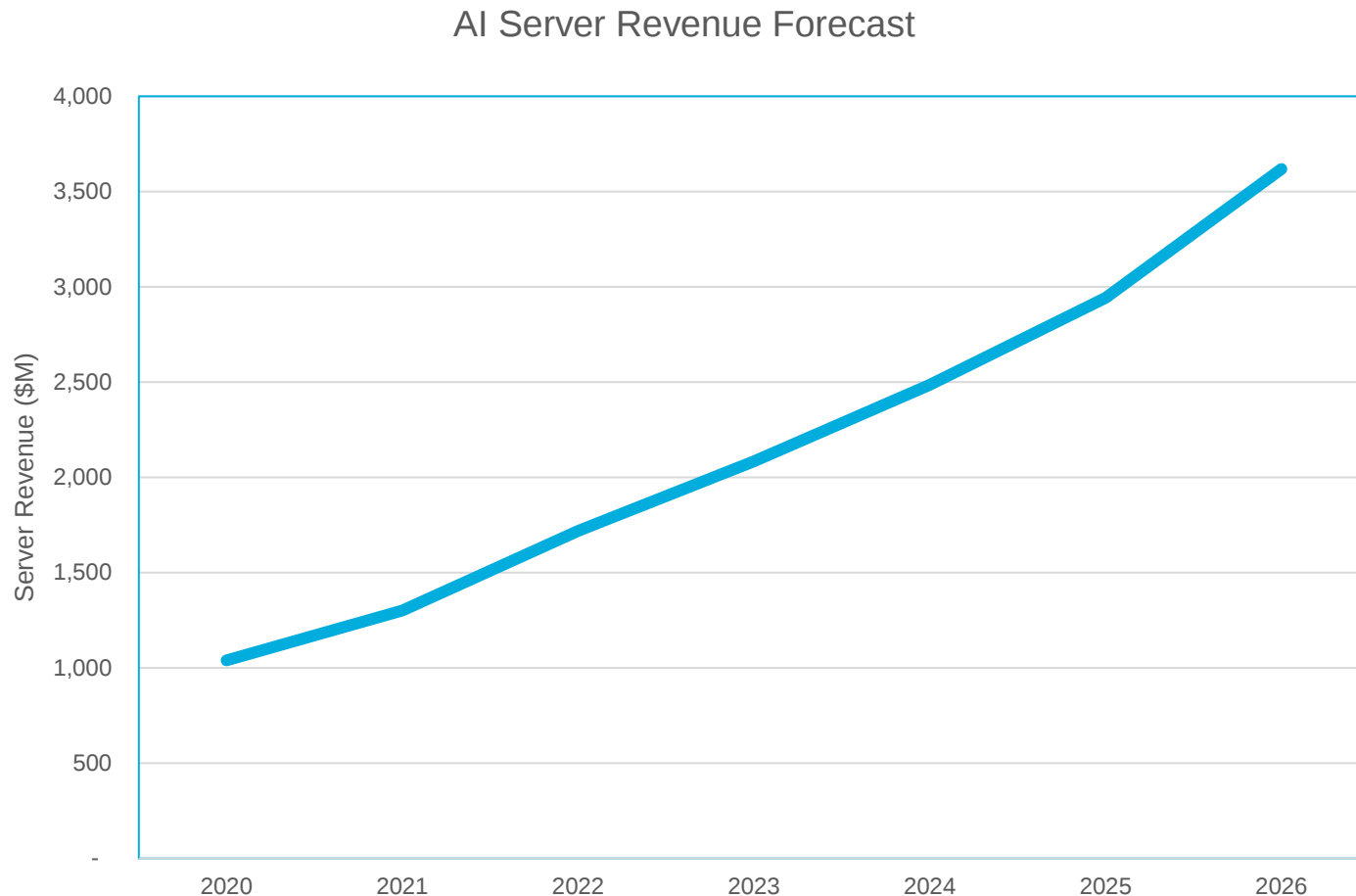
HPC Cloud Usage Forecast

17.6% growth over the next 5 years



HPC-enabled AI Server Forecast

5-year CAGR expected to exceed 22% growth



Use Of Different AI/ML/DL Approaches

From our end-user MCS study

36) Which categories will your top AI and/or data-intensive analytics applications fall under in the next 1 to 2 years?		
	Responses	Percent
Machine learning	99	70.2%
Deep learning	86	61.0%
Graph analysis	25	17.7%
Cognitive computing	24	17.0%
Semantic analysis	22	15.6%
Other big data/analytics	41	29.1%
We don't plan to run applications of these types	9	6.4%
n = 141		
Source: Hyperion Research, 2021		

83% Of Sites Have Accelerators Or Co-processors Today

From our end-user MCS study

How many co-processors or accelerators are in your largest HPC technical server?

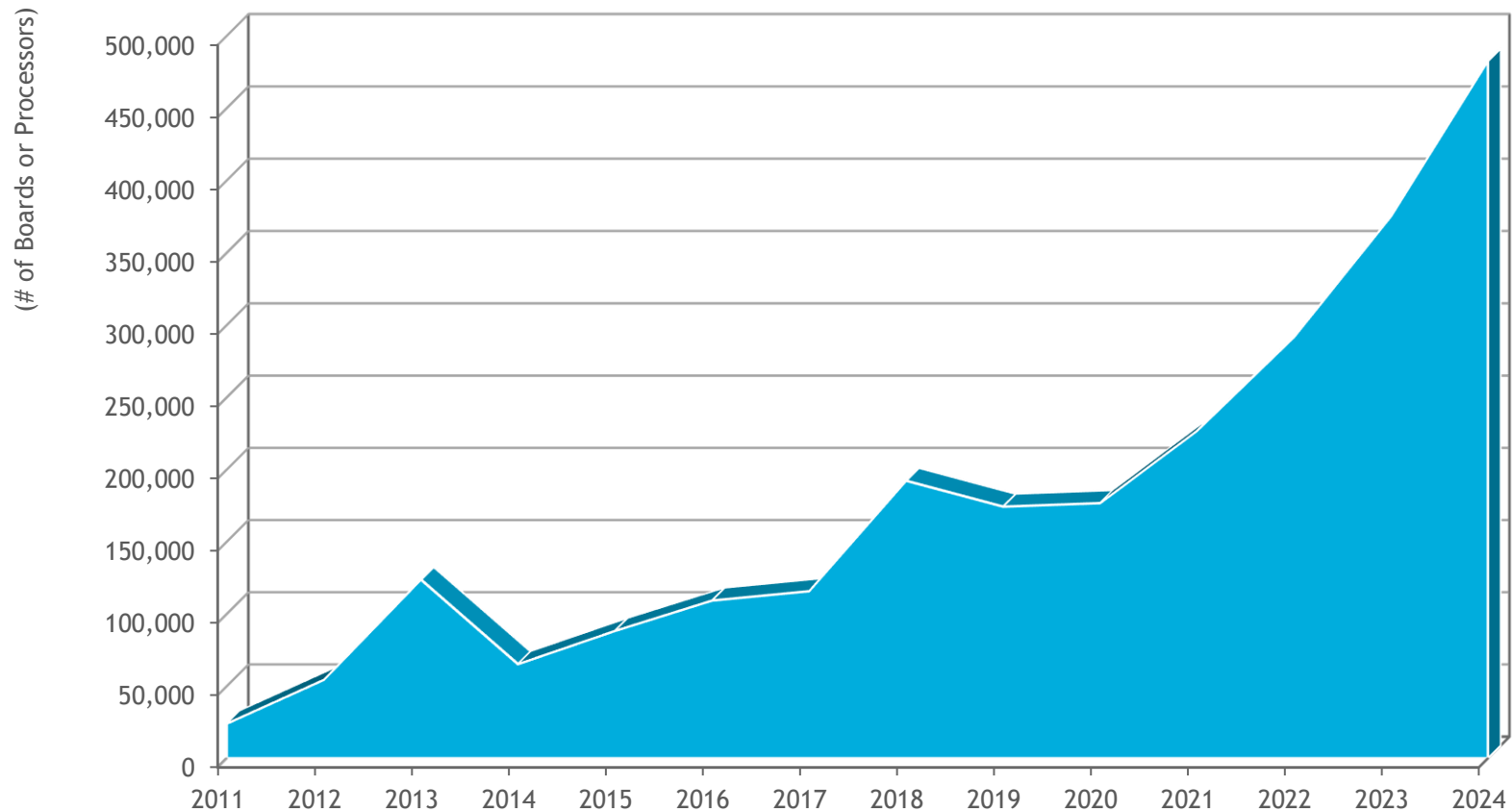
	Responses	Percent
None	23	17.3%
Less than 32	28	21.1%
32 to less than 64	18	13.5%
64 to less than 100	19	14.3%
100 to less than 500	18	13.5%
500 to less than 1,000	11	8.3%
1,000 to less than 5,000	10	7.5%
5,000 to less than 10,000	4	3.0%
10,000 or more	2	1.5%

n = 133

Source: Hyperion Research, 2021

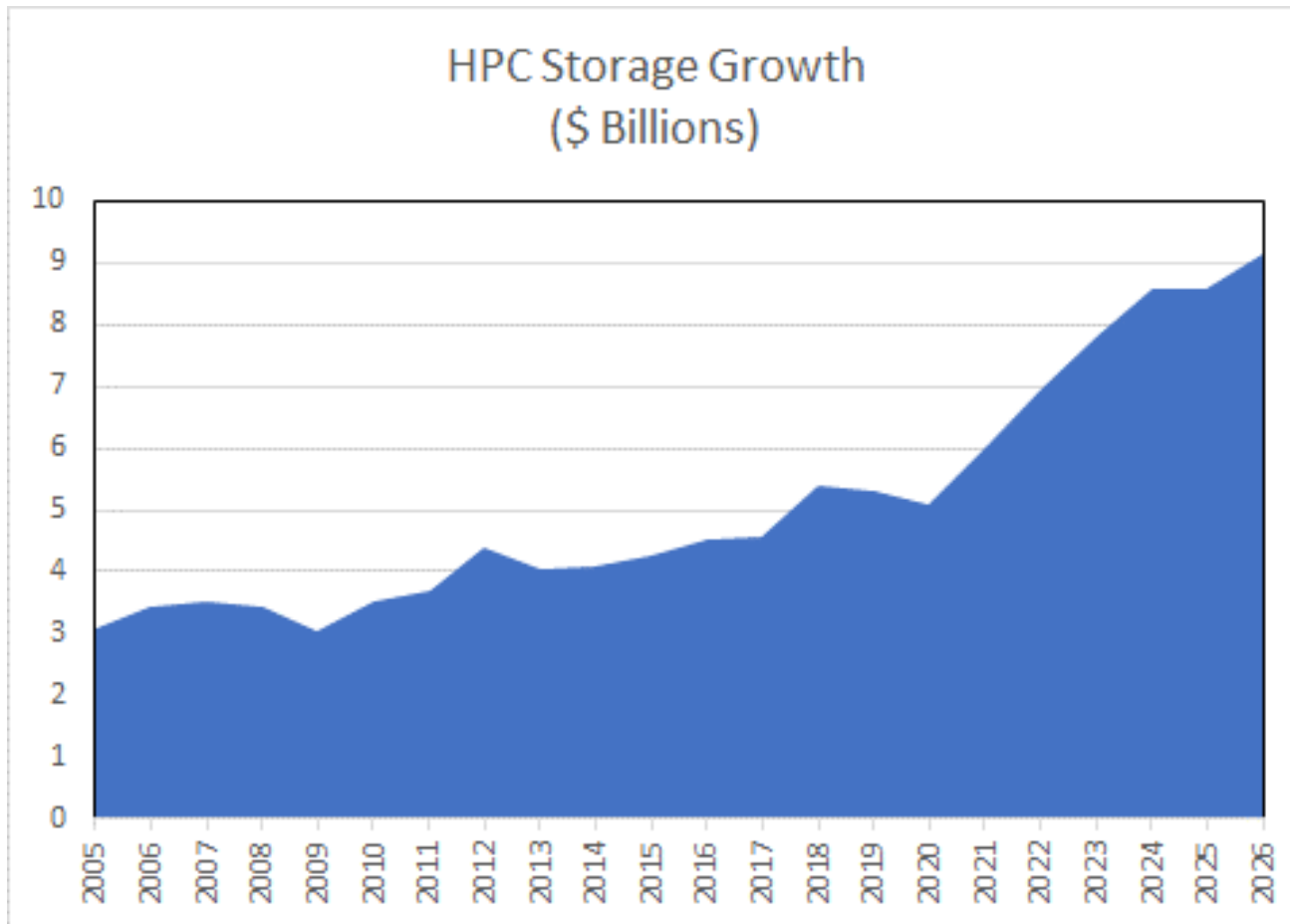
GPU/Accelerator Forecast

Anticipated high growth for accelerators over next 5 years



Storage Growth Rates

HPC storage is growing quickly, driven by AI, big data and growing modeling/simulation model sizes



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Questions?



**We welcome questions,
comments and suggestions**

**Please contact us at:
info@hyperionres.com**

The Exascale Market (System Acceptances)

Over 30 systems and over \$10 billion in value

Exascale and Near-Exascale Leadership Systems (2020 to 2027)							
Year Accepted	China	Europe	Japan	US	Other Countries*	Total Systems	Total Value
2020			1 near-exascale system ~\$1 B			1	\$1.0B
2021	2 exascale ~\$350M each	1 pre-exascale system ~\$180M	?	1 pre-exascale system ~\$200M	--	4	\$1.1B
2022	1 exascale ~\$350M each	2 pre-exascale systems ~\$190 each	1 near-exascale system ~\$150M	1 exascale systems ~\$600M	--	5	\$1.5B
2023	1 exascale system ~\$350M	1 or 2 pre-exascale systems ~\$150M each	1 near-exascale system ~\$150M	1 or 2 exascale systems ~\$600M each	--	4-5	\$1.8B - \$2.4B
2024	1 exascale system ~\$350M	1 exascale ~\$500M, plus 1 exascale (or pre) systems ~\$200 M	?	1 or 2 exascale systems ~\$400M each	1 exascale system ~\$200M	4-6	\$1.2B - \$1.9B
2025	1 or 2 exascale system ~\$300M each	1 or 2 exascale systems ~\$350M each	1 exascale system ~\$150M	1 or 2 exascale systems ~\$350M each	1 exascale system ~\$150M	5-8	\$1.3B - \$2.3B
2026	1 or 2 exascale system ~\$300M each	1 or 2 exascale systems ~\$325M each	?	1 or 2 exascale systems ~\$350M each	1 or 2 exascale systems ~\$150M each	4-8	\$1.1B - \$2.2B
2027	1 or 2 exascale systems ~\$250M each	1 or 2 exascale systems ~\$300M	?	1 or 2 exascale systems ~\$300M each	1 or 2 exascale systems ~\$150M each	4-8	\$1.0B - \$2.0B
Total	8-11	8-12	4	7-12	4-6	31-45	\$10B - \$14B
* Includes S. Korea, Singapore, Australia, Russia, Canada, India, Israel, Saudi Arabia, etc.							
Source: Hyperion Research, July 2022							