



HYPERION RESEARCH

Hyperion Research ISC22 Market Update

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www.HyperionResearch.com
www.hpcuserforum.com

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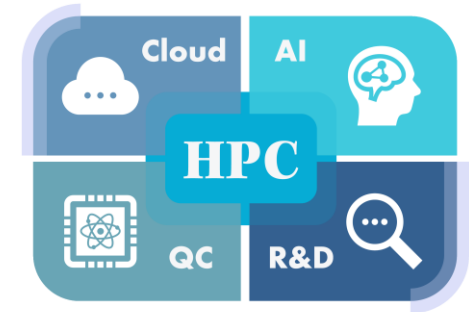
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Example Research Areas

(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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How We Do Our Research

*100% focused on HPC & the results from applying HPC
(HPC includes AI, advanced technologies, and all types of R&D)*

- **Worldwide coverage**
 - With a strong focus on international activities
- **Data is collected via direct interviews and surveys**
 - Many sites are surveyed directly by a team member
 - Research includes all types of R&D activities
 - Hyperion Research has deep relationships with the HPC suppliers and most of the larger HPC sites around the world
- **We offer both subscription services and custom research studies**
 - We publish over 90 documents a year

HPC Market Update

Our ISC22 Briefing Agenda

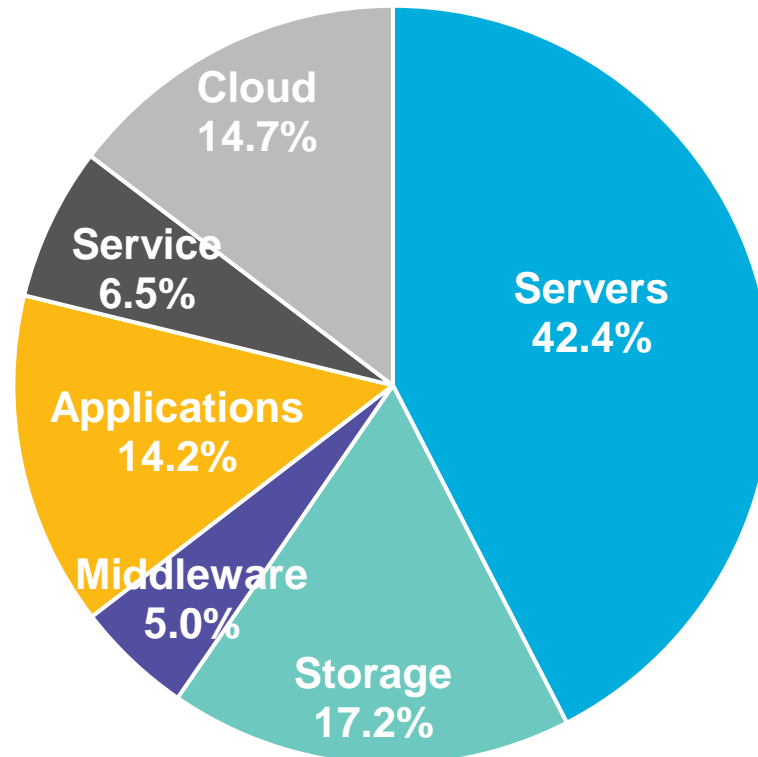
All registered attendees will receive the slide deck

- **Market Update and Forecasts**
- **Some Perspectives on European HPC**
- **Sustainability: Not Just a "Nice to Have"**
- **HPC and AI Talent Challenges**
- **Exascale Update**
- **Cloud Update**
- **Quantum Update**
- **AI Update**
- **Update on Storage & Interconnects**
- **Conclusions and Wrap-up**

The Overall HPC Market in 2021

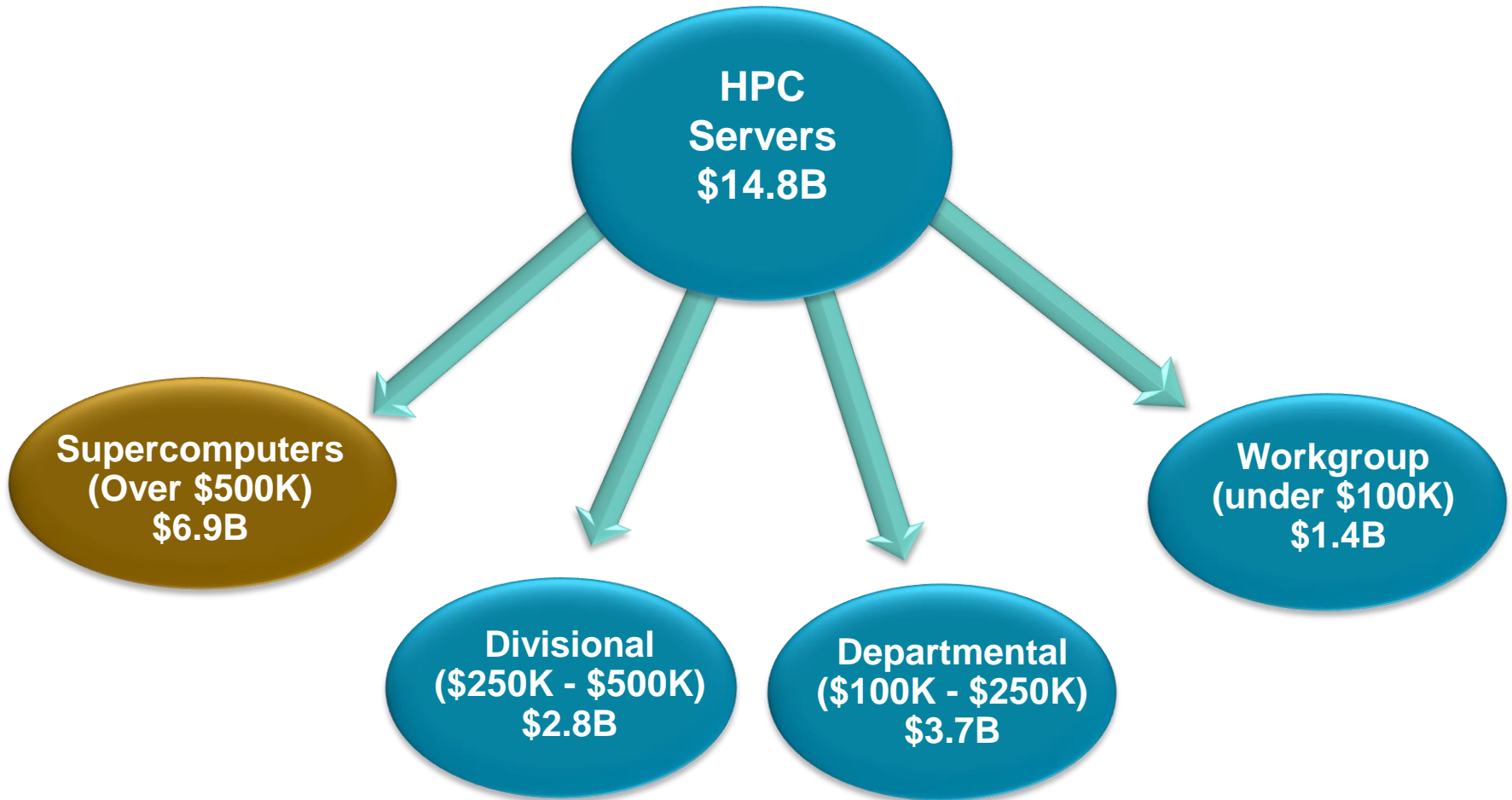
Looking at the overall HPC market, including servers, cloud usage, storage, software and repair services = \$34.8 billion USD

2021 HPC Market
(\$34.8 Billion)



The 2021 Worldwide On-Prem HPC Server Market: \$14.8 Billion (up 9.1%)

2022 is projected to be around \$17 Billion



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>	

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>		

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

2021 total on-prem HPC spending reached \$29.7B
(adding cloud spending, 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 Update For EMEA

HPC Market By Regions

In 2020: very high growth in Japan, the rest of the market declined by over 7%

In 2021: healthy growth in all other regions

2021 HPC Server Sales By Region			
	2019	2020	2021
North America	6,119	5,424	6,235
EMEA	3,871	3,686	4,142
Asia/Pacific w/o Japan	2,416	2,492	3,230
Japan	746	1,699	898
Rest-of-World	217	222	257
Total	13,368	13,523	14,763
<i>Source: Hyperion Research, 2022</i>			

HPC Market In Europe By Verticals

In 2021: very healthy SERVER growth at 14.3%

HPC Industry/Application Segments for EMEA			
<i>SUS Millions</i>	2020	2021	Growth
Bio-Sciences	365	422	15.8%
CAE	491	541	10.3%
Chemical Engineering	13	15	11.8%
DCC & Distribution	13	15	19.3%
Economics/Financial	82	94	14.0%
EDA	114	124	8.7%
Geosciences	350	385	10.1%
Mechanical Design	3	4	29.5%
Defense	330	357	8.1%
Government Lab	981	1,160	18.2%
University/Academic	634	727	14.6%
Weather	141	162	14.9%
Other	59	80	35.9%
EMEA Total	3,577	4,087	14.3%
<i>Source: Hyperion Research, April 2022</i>			

HPC Broader Market In Europe

In 2021: very healthy overall growth at 13.9%

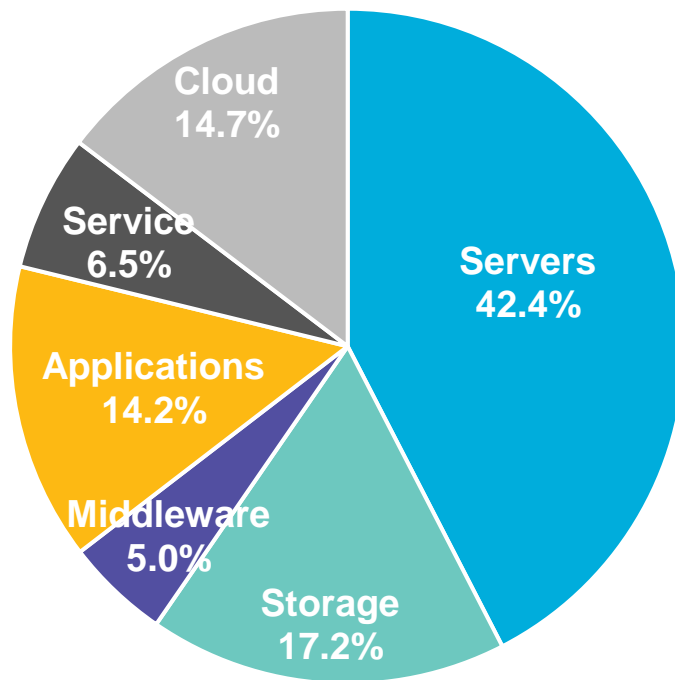
EMEA Revenues by the Broader HPC Market Areas			
<i>\$US Millions</i>	2020	2021	Growth
Server	3,577	4,087	14.3%
Storage	1,355	1,561	15.2%
Middleware	405	466	15.0%
Applications	1,156	1,298	12.3%
Service	528	581	10.2%
Total Revenue	7,020	7,993	13.9%
<i>Source: Hyperion Research, April 2022</i>			

HPC Market Forecasts

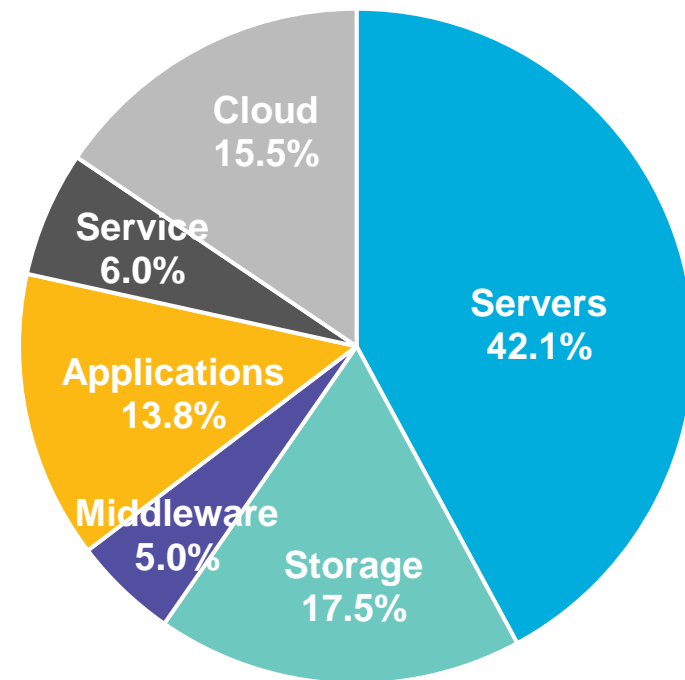
The HPC Market Will Grow in 2022

The strong market rebound in 2021 will carry into 2022 as more buyers look to HPC solutions to address new opportunities and compete more aggressively

2021 HPC Market
(\$34.8 Billion)



2022 HPC Market
(\$39.9 Billion)



The HPC Market Will Grow in 2022

On-prem servers: The strong market rebound in 2021 will carry into 2022 as more buyers look to HPC solutions to address new opportunities and compete more aggressively

- **Covid and the resulting supply chain issues have been a major concern for almost 2 years, but HPC vendors have found ways to keep producing products at record levels**
- **2022 is forecasted to reach an all-time high of around US \$17 billion in on-prem HPC servers with US \$35 billion in total on-premises HPC spending**
 - 2021 on-premises servers grew 9.1% over 2020
- **Countries and companies around the world continue to recognize the value of being innovative and investing in R&D to advance society, grow revenues, reduce costs, and become more competitive**
- **New technological developments in big data, AI, processors, etc. are providing many new areas for users to advance their research and engineering**

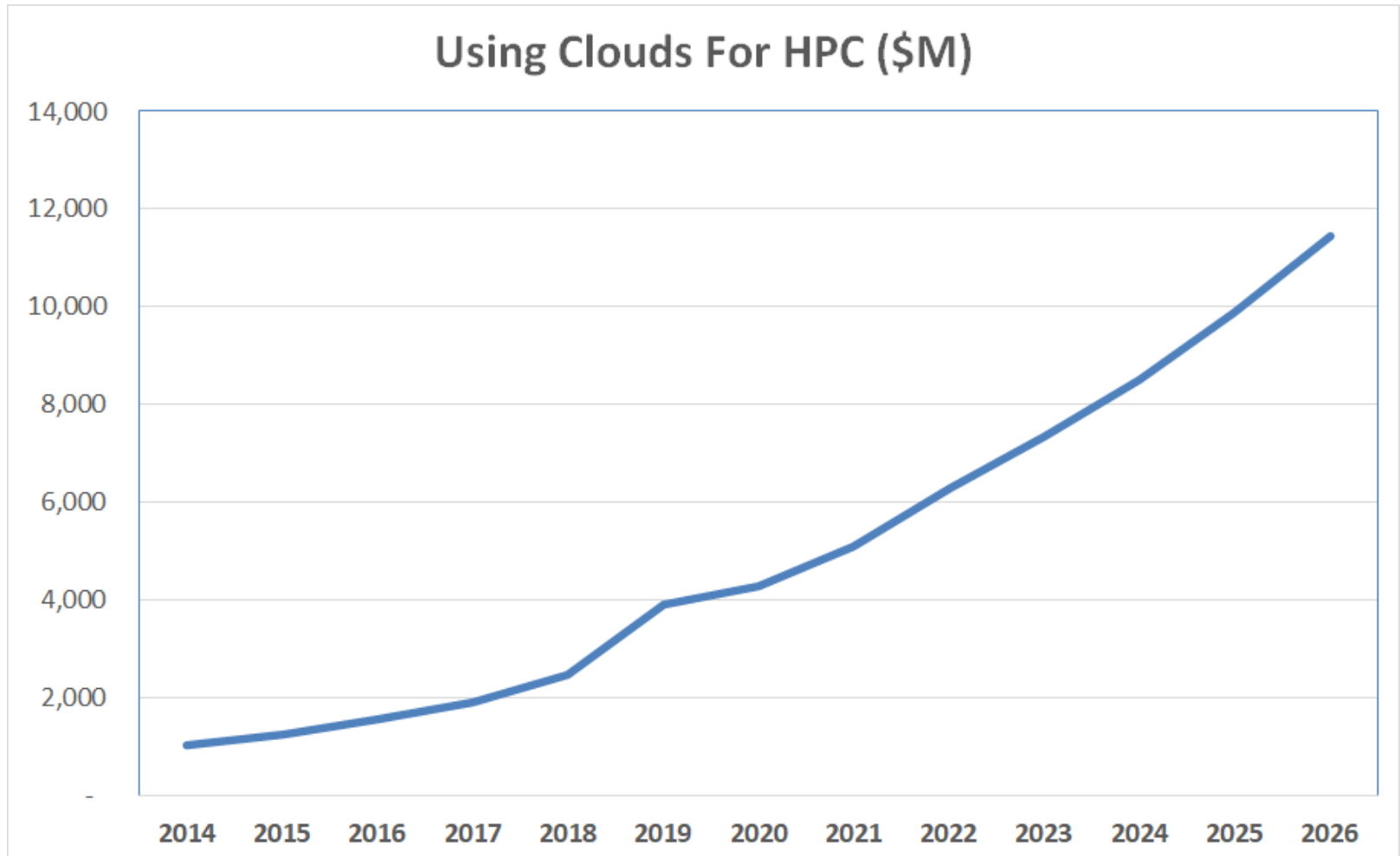
The HPC Cloud Market Will See Very Strong Growth in 2022

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%, to exceed US \$6 billion**
 - This strong growth reflects the heavy work that the cloud service providers (CSPs) have done to make clouds more HPC friendly
 - Users have also gone through extensive work to profile and evaluate where clouds make the most sense
- **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



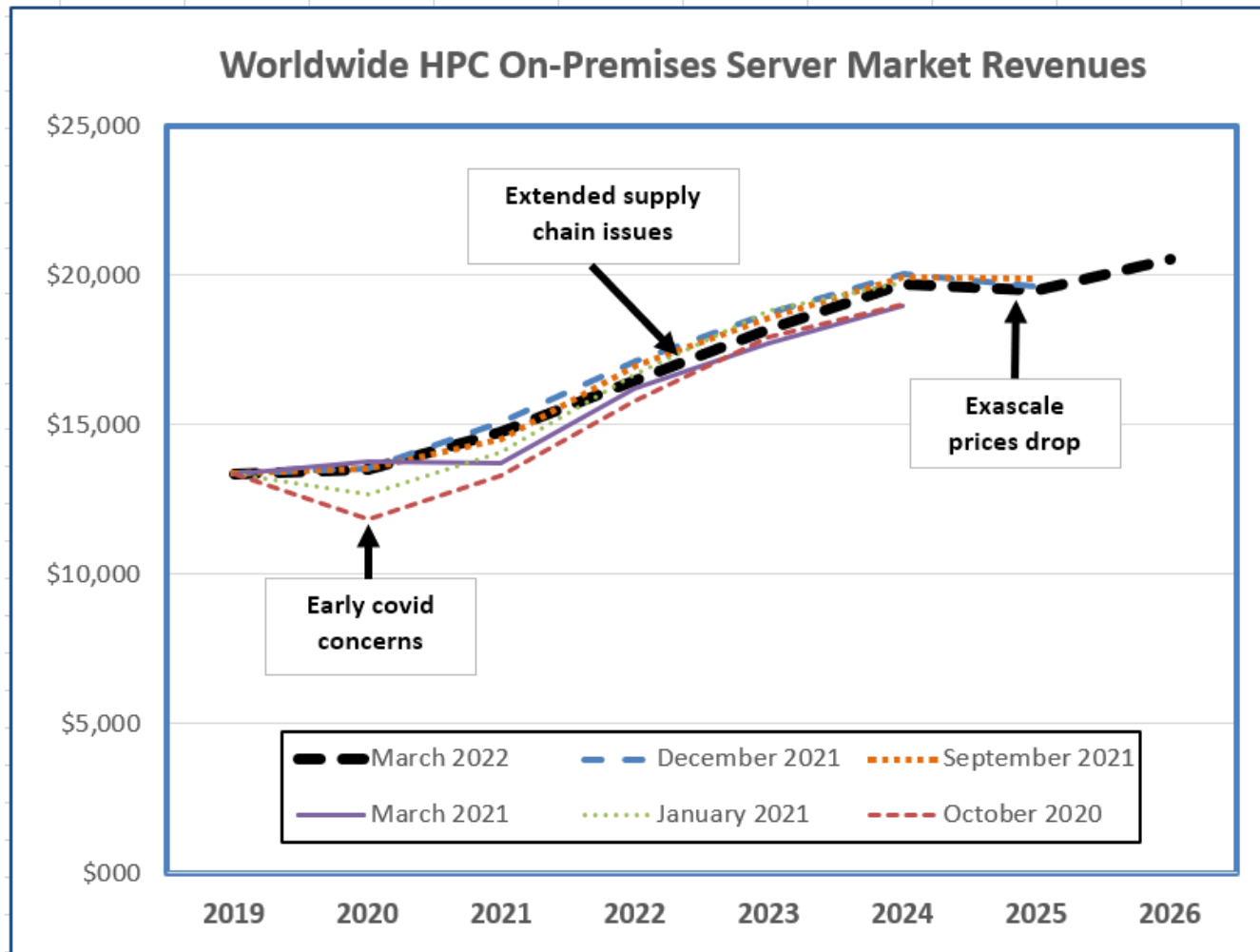
5-Year On-Prem HPC Server Forecast

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%
<i>Source: Hyperion Research, April 2022</i>							

5-year HPC Server Forecast Changes

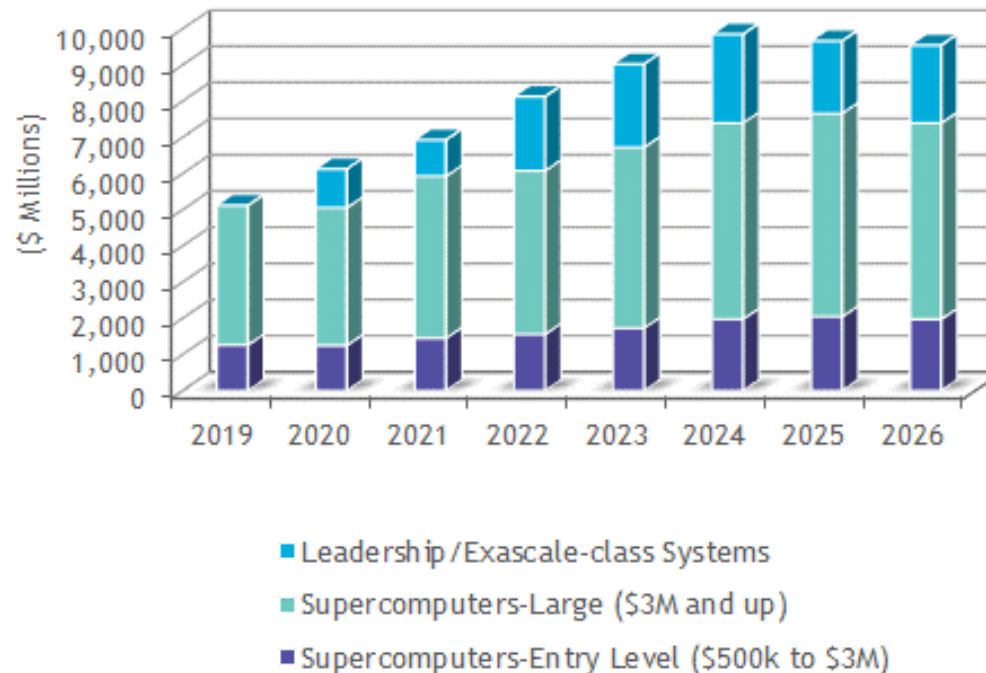
Quarterly adjustments due to covid



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



The Exascale Market (System Acceptances)

Over 30 systems and over \$11 billion in value

Exascale and Near-Exascale Systems (2020 to 2026)								
Year Accepted	China	Europe	Japan	US	Other Countries*	Total Systems	Total Value	
2020			1 near-exascale system ~\$1 B			1	\$1B	
2021	1 or 2 near-exascale systems ~\$350M to \$400M each	1 pre-exascale system ~\$185M	?	1 pre-exascale system ~\$200M	--	3-4	\$.8B - \$1.1B	
2022	1 or 2 exascale systems ~\$350M - \$400M each	2 pre-exascale systems ~\$400 total	1 near-exascale system ~\$150M	1 exascale systems ~\$600M	--	5-6	\$2B - \$2.3B	
2023	1 or 2 exascale system ~\$350M - \$400M each	1 or 2 exascale systems ~\$350M each	1 near-exascale system ~\$150M	1 or 2 exascale systems ~\$600M each	--	5-7	\$2B - \$2.8B	
2024	1 exascale system ~\$350M - \$400M	2 exascale ~\$350M each	?	1 or 2 exascale systems ~\$500M each	1 exascale system ~\$200M	5-6	\$1.9B - \$2.5B	
2025	1 exascale systems ~\$350M - \$400M	1 or 2 exascale systems ~\$350M each	1 exascale system ~\$200M	1 or 2 exascale systems ~\$400M each	1 exascale system ~\$200M	5-7	\$1.5B - \$2.3B	
2026	1 or 2 exascale systems ~\$350M - \$400M each	1 or 2 exascale systems ~\$350M each	?	1 or 2 exascale systems ~\$400M each	1 or 2 exascale systems ~\$200M	5-8	\$1.9B - \$2.8B	
Total	6-10	8-10	3+	6-9	3-4	28-39	\$11B - \$15B	

* Includes S. Korea, Singapore, Australia, Russia, Canada, India, Israel, Saudi Arabia, etc.

Source: Hyperion Research, May 2022

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