



HYPERION RESEARCH

HPC User Forum:

Hyperion Research HPC Market Update

March 2022

www.HyperionResearch.com

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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

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Data Collection

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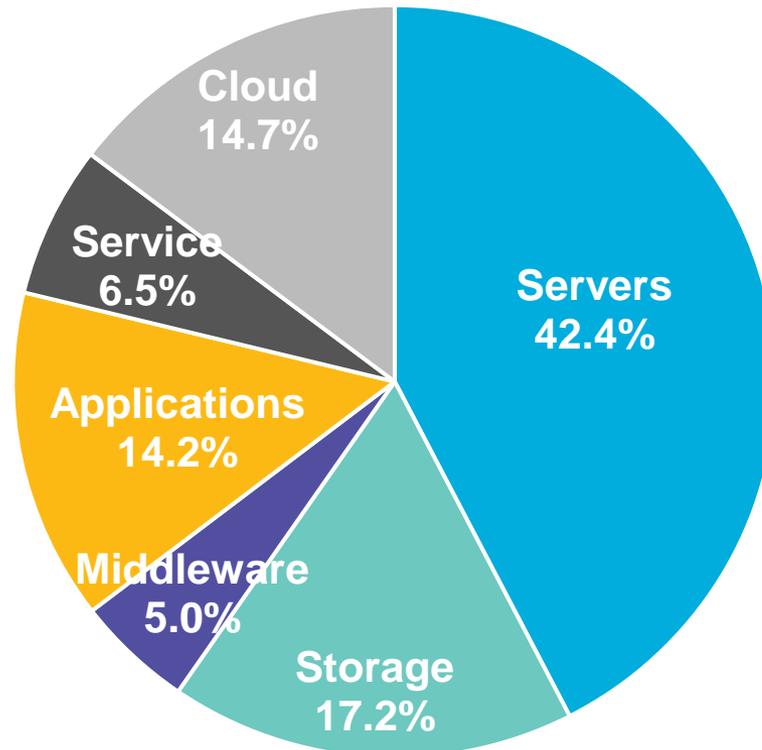
Sue Sudan, Market Data Group

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The Overall HPC Market in 2021

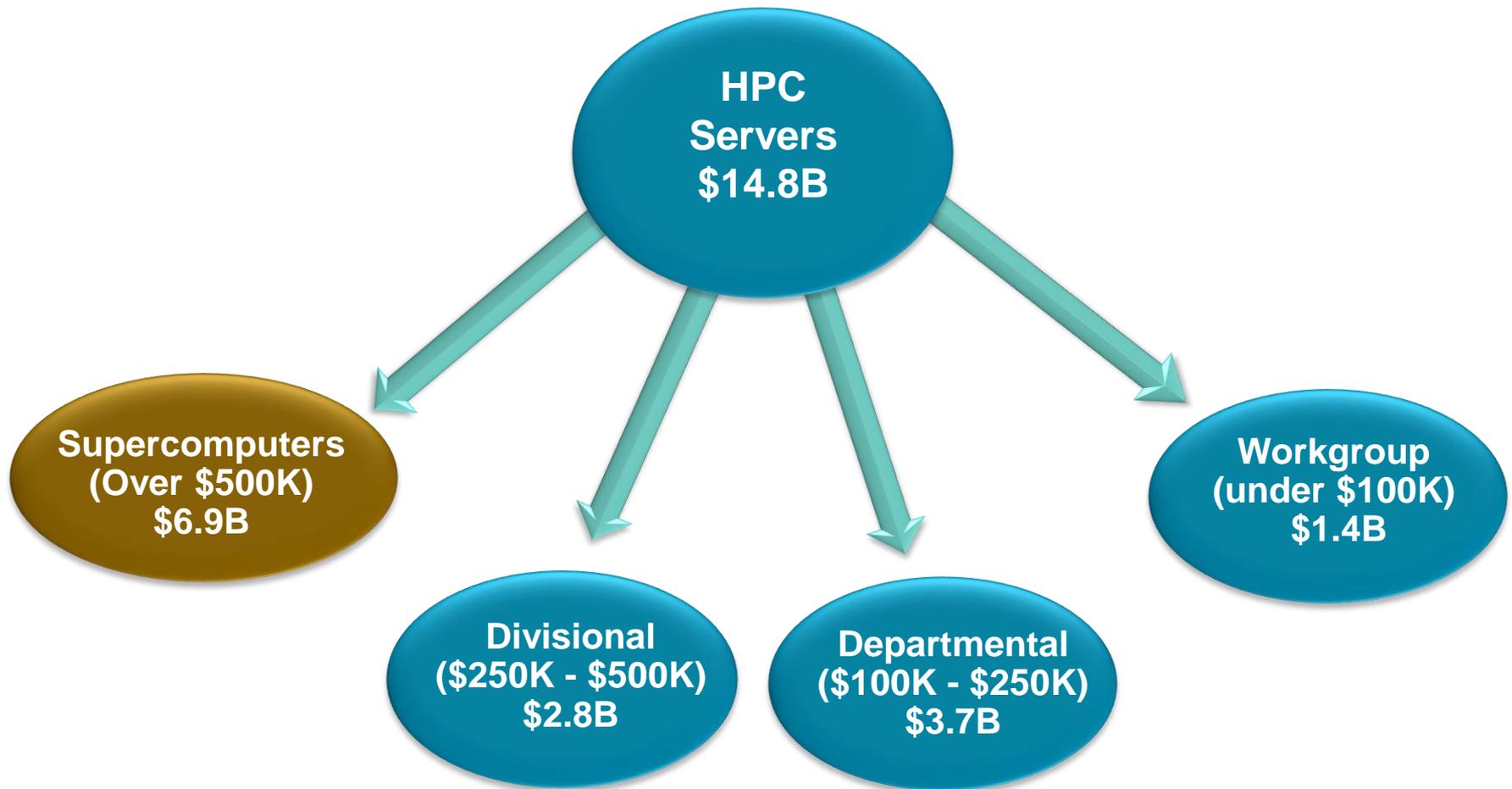
Looking at the overall HPC market, including servers, cloud usage, storage, software and repair services = \$34.8 billion USD

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 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>	

WW 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 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>			

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)

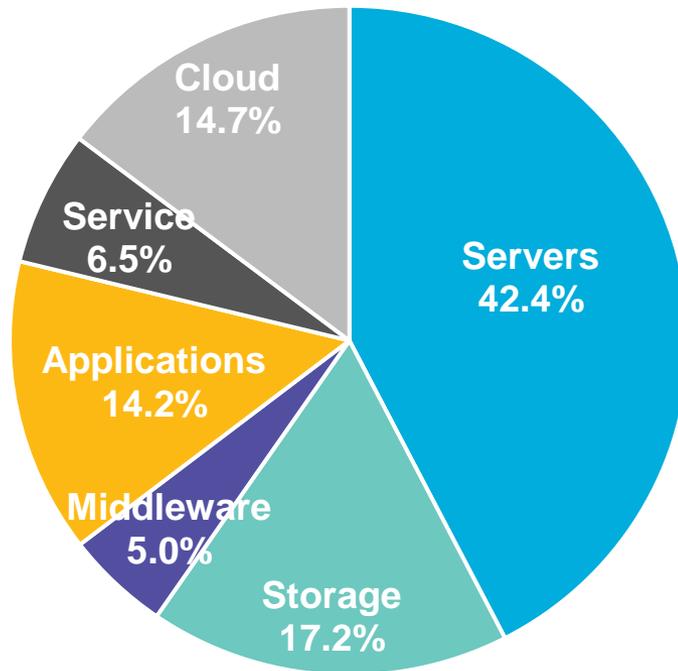
Revenues by the Broader HPC Market Areas			
	2019	2020	2021
Server	13,368	13,523	14,763
Storage	5,288	5,079	5,984
Middleware	1,572	1,491	1,731
Applications	4,569	4,315	4,952
Service	2,181	2,015	2,267
Total Revenue	26,979	26,423	29,697
<i>Source: Hyperion Research, 2022</i>			

Some Predictions For 2022

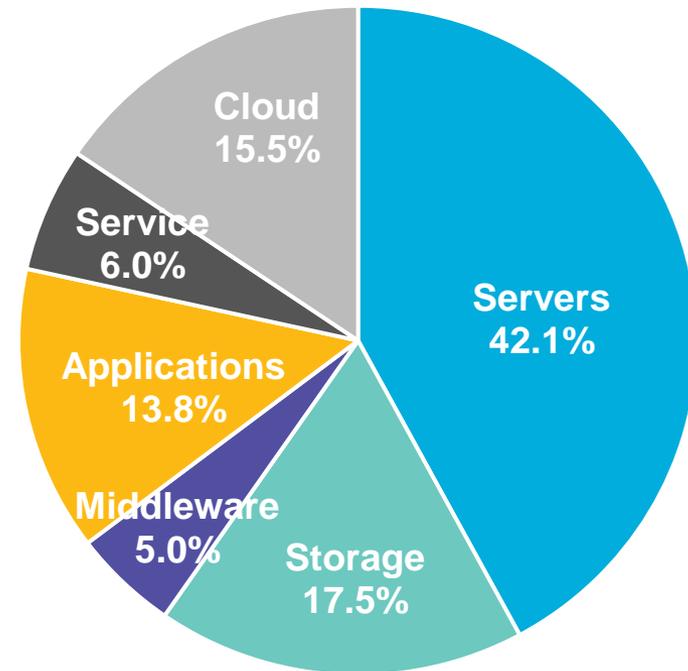
The HPC Market Will Grow in 2022

1. 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)

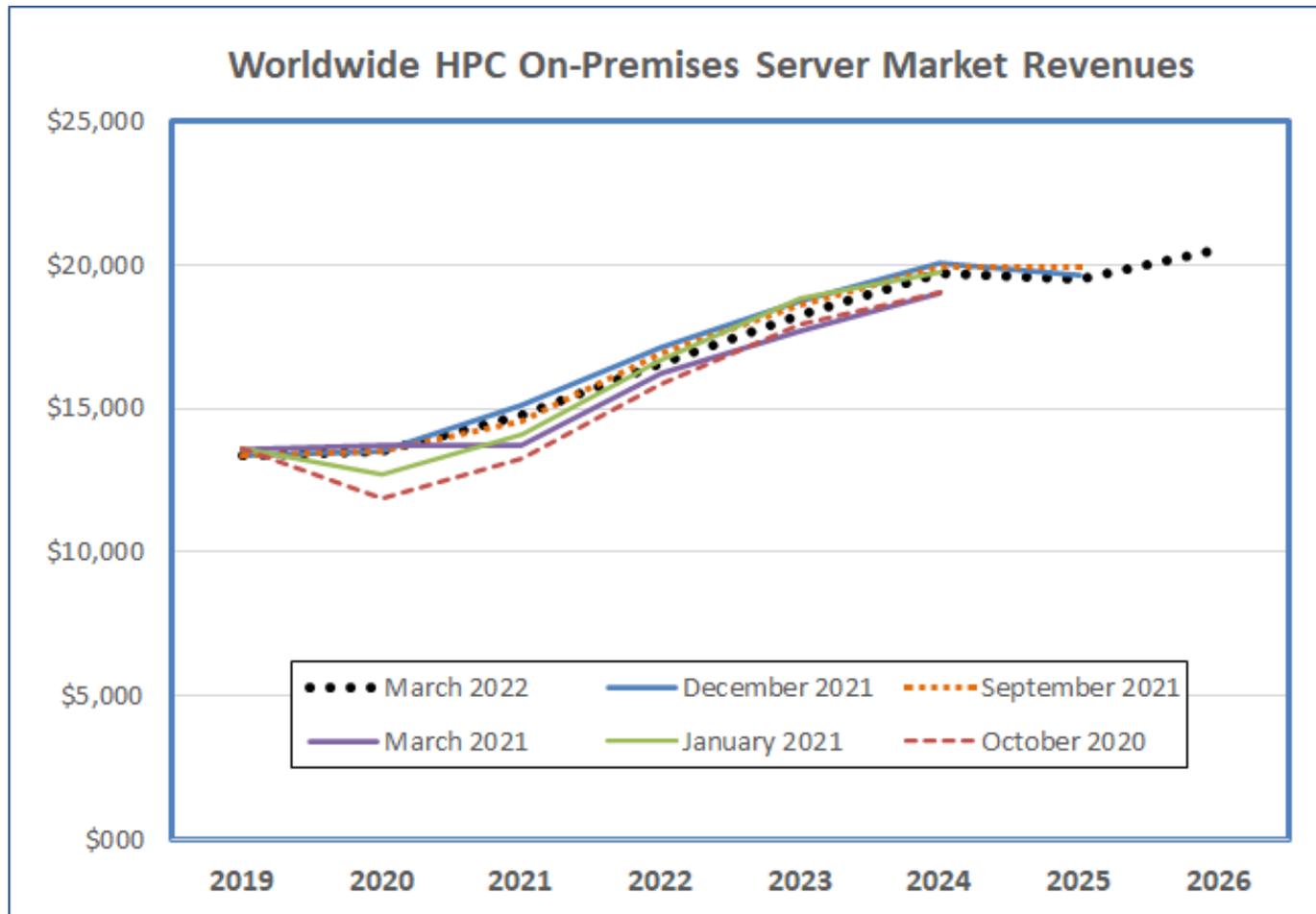


2022 HPC Market
(\$39.9 Billion)



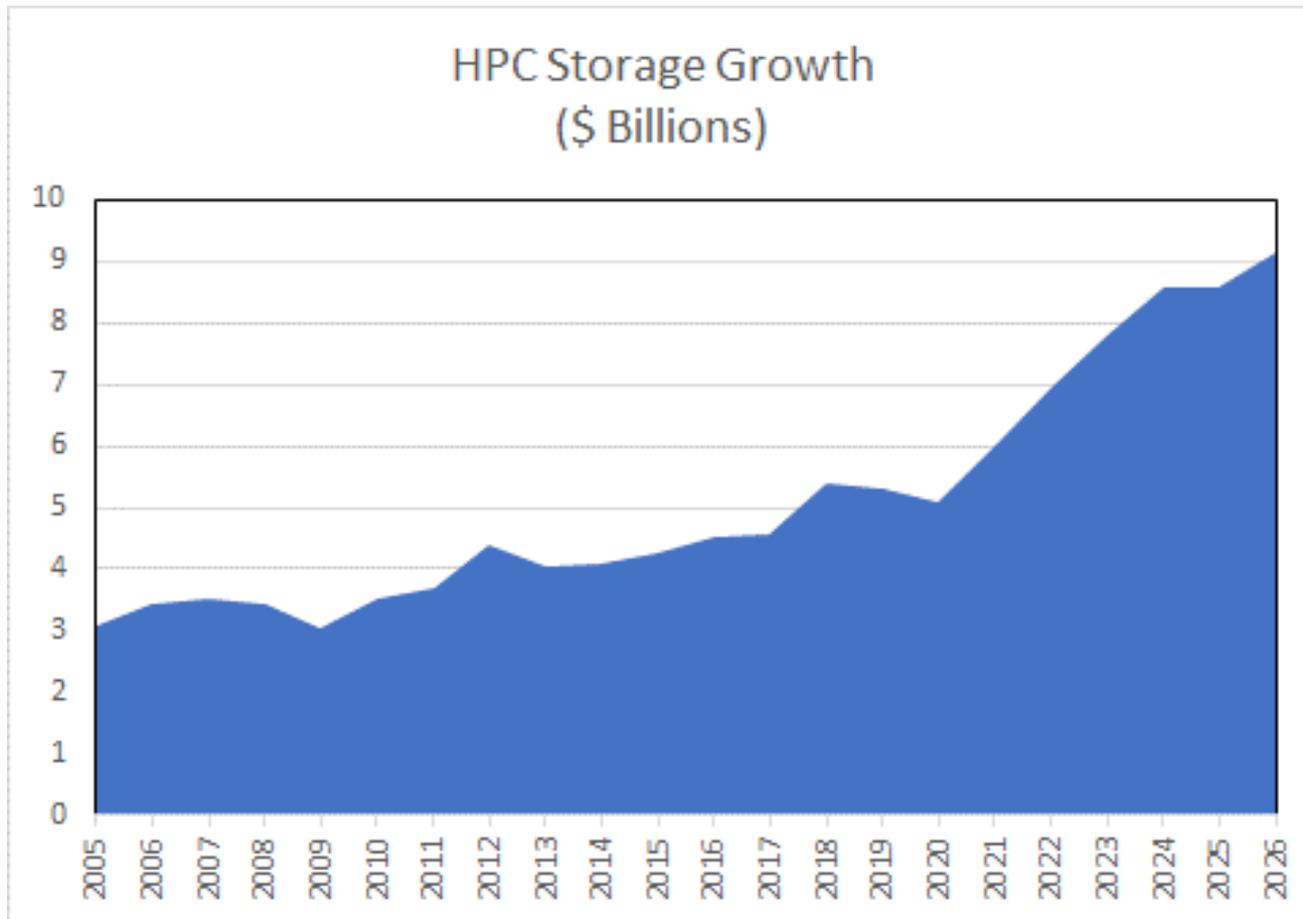
How Our Five Year On-prem Server Forecast Has Changed Overtime

Covid had less of an impact than what was originally expected



HPC Storage Growth Rates

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



First US Exascale System in 2022

2. The global exascale rollout will officially begin with the acceptance of the first US exascale system

- **The official rollout of exascale-class systems will begin in earnest in 2022**
 - The first US system, the Frontier at DOE's Oak Ridge National Laboratory will be fully assembled in early 2022 and is slated for turnover for full user access by the end of 2022
- **The status of the first three Chinese exascale systems hasn't been made public, but include:**
 - The Sunway system bound for the National Supercomputer Center (NSCC) in Wuxi, the Tianhe-3 for the NSCC in Tianjin, and the Sugon system for the NSCC in Shenzhen
 - For this year at least, China may or may not choose to enter those or other potential exascale systems for recognition as Top500 HPCs

The HPC Cloud Market Will See Strong Growth in 2022

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

- **In 2021 HPC & AI buyers for the first time, 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 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

The HPC Cloud Market Will See Strong Growth in 2022

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

TABLE 2

How will your plans for using external/public clouds affect the choice of your next on-premises HPC system?

Question Responses	Responses	Percent
I will stop buying any on-prem HPC resources	7	5.0%
I will buy less on-prem HPC resources and use the extra money in the cloud	42	29.8%
I will delay on-prem HPC purchases and use the extra money in the cloud	19	13.5%
I will buy a different on-prem HPC system than previously planned because of my cloud usage	16	11.3%
None of the above	46	32.6%
Not certain/don't know	32	22.7%

Note: n = 141, multiple responses were allowed.

Source: Hyperion Research, 2022

Global Competition Will Increase

9. Global competition and tensions in leadership-class HPC will intensify

- **The current global emphasis on indigenous HPC technology development will continue to grow**
 - For this most recent round of exascale development, nearly every major HPC player, China, the EU and its member states, Japan, and the US worked hard to domestically develop key components of those systems from indigenous technology
 - The reasons for this trend varied, but in many cases at the national level there was more than one justification for advancing indigenous HPC technology capabilities
- **For China and other nations (e.g., India, Russia, Iran) that fall under some of the most stringent regulations of the US export control regime, indigenous development is seen as a way to avoid national policy issues centered on the control or even denial of critical technology needed to build HPCs**

Global Competition Will Increase

9. Global competition and tensions in leadership-class HPC will intensify

- **For the EU and a number of its member states, the substantial imbalance between the size of the EU HPC market and EU-based HPC supplier revenues is seen as a potential opportunity for the EU to help its domestic HPC sector**
 - EU leadership increasingly see HPC as way to bolster overall economic prospects and business competitiveness across its industrial base such as in the automotive and advanced manufacturing sectors
- **For Japan, with its long experience with successful HPC design, the decision was made to base its near exascale HPC on a custom architecture using indigenous technologies**
- **For the US, the imperative to maintain or even extend its HPC technology ecosystem, for both national security as well as competitive advantage, is seen by the US Government as a key feature of exascale HPC development**

HPC Expertise Shortage

10. The growing scarcity of HPC experts to implement new technologies will be the number one roadblock for many HPC sites

- **Two major trends:**
 - 1) A shrinking HPC workforce
 - 2) A massive increase in system complexity
- **Increasing workload sizes are creating more demand for HPC expertise**
 - Enterprise IT users entering HPC space
 - Increasing HPC systems per site
- **Increasingly complex workloads are difficult for existing talent to manage**
 - Augmenting traditional modeling/simulation with AI and big data
 - Incorporating multiple processor types, co-processors, accelerators, and other specialized hardware
 - Balancing on-prem and cloud
 - Investing in necessary training can exacerbate existing staff shortages short-term

HPC Expertise Shortage

10. The growing scarcity of HPC experts to implement new technologies will be the number one roadblock for many HPC sites

- **HPC experts are an aging workforce**
 - Pipeline of new HPC staff entering the workforce does not adequately match the outflow of retirees, let alone the anticipated needs of increased demand
 - Difficulties in hiring and onboarding replacements can disrupt continuity in HPC centers
- **Competition for HPC staff will intensify**
 - Sites with limited budgets may opt for part-time arrangements (e.g., cost-sharing, consulting)
 - Uncertainty about global travel restrictions is also limiting the ability to attract foreign employees
- **HPC users need major improvements in ease-of-use, ease-of-selection, & ease-of-optimization**

In Summary

Conclusions

- **The pandemic was expected to impact 2020 by ~8% decline, but Fugaku made 2020 a growth year!**
 - 2021 was also a strong growth year at over 9%
 - 2022 is expected to be strong growth year
 - Exascale systems will drive growth in 2022 to 2024
 - AI, HPDA, big data are hot growth areas
 - HPC in the cloud will lift the sector writ large
- **New technologies are showing up in larger numbers:**
 - Processors, AI hardware & software, memories, etc.
- **The cloud has become a viable option for many HPC workloads**
- **Storage will likely see major growth driven by AI, big data and the need for much larger data sets**

QUESTIONS?



**Questions or comments
are welcome.**

**Please contact us at:
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