



How HPC Managed Services Drives Growth Across Verticals



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Executive summary

In the age of big data, more and more enterprises rely on HPC resources to tackle the massive amounts of information that they're processing. Before they can analyze, synthesize and manipulate data to deduce meaningful conclusions, IT departments must focus on collecting, processing and storing the data. However, the time and resources necessary to run and maintain hardware and data center infrastructure distract from the meaningful interpretation that actually drives the desired outcomes.

Innovative HPC vendors provide maintenance, support and management services to help organizations implement, update, troubleshoot and scale their HPC systems. When an HPC managed services provider handles infrastructure management and maintenance, there's more time for organizations to focus on their core business. Support and monitoring services also generally include a 24/7 manned network to protect equipment and promote optimal performance at all times. What's more, outsourcing computing storage and network infrastructure can eliminate the overhead of facilities management staff, as well as cost-effectively refresh HPC resources and support business growth.

With a powerful ability to process massive amounts of data at more profitable speeds and simplify complex business procedures, HPC services are increasingly attractive to a wide array of organizations across varying industries. HPC managed services can especially reduce the stress of fully in-house HPC workloads and eliminate cost and management concerns.

Government entities, defense agencies, academic institutions, energy companies and utilities organizations are among the verticals expected to continue adopting HPC systems, according to the latest market report from Grand View Research.¹ The report further indicated that increased demand for advanced services, software and solutions will drive strong market growth in upcoming years. The predictions propose that the HPC market will expand at a compound annual growth rate of 7.2% from 2018 to 2025, steadily increasing from a global market size valued at \$34.62 billion in 2017.

More specifically, the services segment accounted for 10% of the market share in 2017 and is expected to expand at a CAGR of more than 4% from 2018 to 2025. The report also noted that support and maintenance solutions especially drive demand in the segment, although design, consulting, integration and deployment services are also available.

As HPC services continue to expand, organizations with a strong need to process, store and analyze information can partner with HPC vendors to support their IT departments and augment performance.

¹ <https://www.grandviewresearch.com/industry-analysis/high-performance-computing-market>

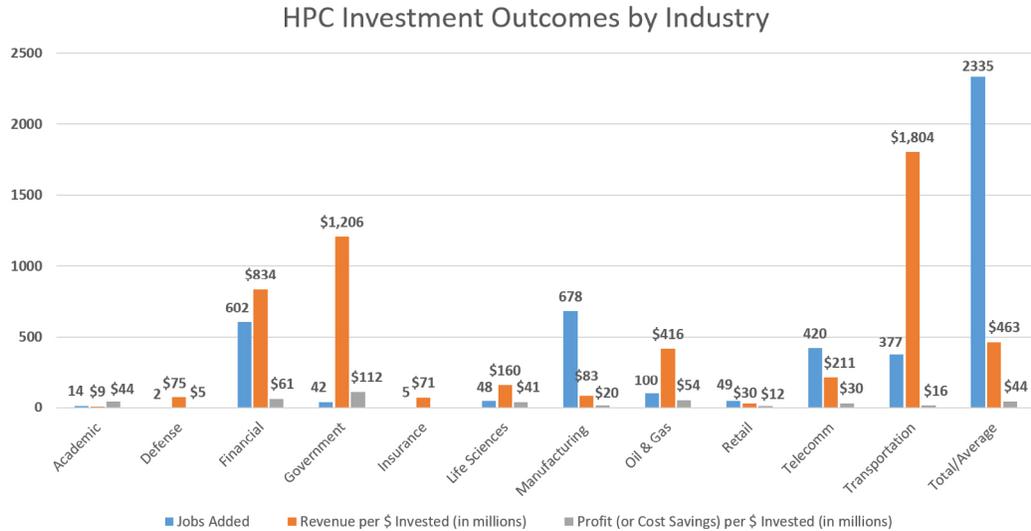
The benefits of HPC managed services for business growth

Business leaders and IT professionals enable their companies with advanced computing tools to drive informed decisions, reveal meaningful insight, explore unknown territories and update business models. In many cases, HPC managed services is necessary for organizations to stay ahead of industry changes and developments.

The benefits of partnering with an HPC services provider stems from eliminating the distractions of running an in-house data center, which, in turn, allows IT departments to optimize their processes, assets and infrastructure to scale. Employees can reveal necessary insight with greater speed, allowing leaders to implement strategic changes that drive growth and propel the organization ahead of their competition.

No longer limited to large enterprises and niche verticals, HPC systems can also help small and midsize organizations enhance their competitive edge, and cost-effective managed services can make it a more financially feasible endeavor.² End-to-end solutions further facilitate HPC opportunities for companies that lack the robust IT resources and expertise needed to build clusters and implement HPC processes from the beginning.

Regardless of the size and scope of a particular company, investing in HPC can support expansion efforts by generating substantial returns. Ongoing research funded by the U.S. Department of Energy Office of Science, Office of Advanced Scientific Computing Research and the National Nuclear Security Administration reported an average revenue increase of \$463 per dollar invested in HPC. Each invested dollar also yields an average \$44 increase in profit (or cost savings).³



Source: Economic Models for Financial ROI and Innovation from HPC Investments, Hyperion Research

² <https://www.cio.com/article/3261117/why-hpc-matters-increasing-smb-competitiveness.html>

³ <https://www.hpcuserforum.com/ROI/>

Furthermore, HPC managed services can prevent old servers, outdated technology and legacy systems from slowing organizations down. Most providers will continually update HPC systems with the latest components, such as servers, software, storage, equipment and security. A service-based HPC configuration also allows companies to move away from the steep costs of owning equipment. Instead, organizations can lease the latest equipment and devices from the service provider, which makes it possible for companies to refresh their existing HPC resources and continuously update their technology.

When monitoring and security measures are in place, HPC managed services protect organizations from costly downtime by identifying potential faults or dangers throughout the day. If problems do occur, the provider can also work to solve the issue so IT employees can continue focusing on other responsibilities.

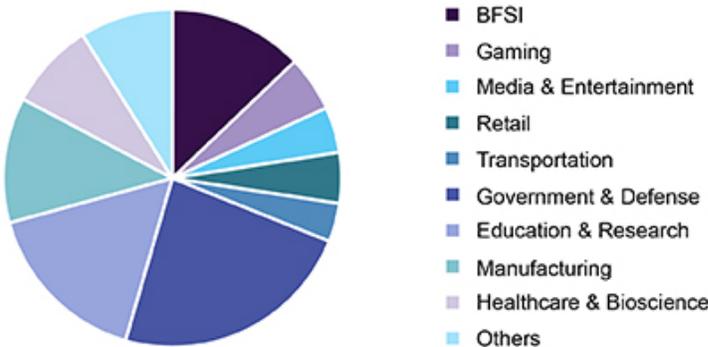
Ultimately, HPC managed services help organizations operate efficiently with greater speed and agility. With maximized time and resources, forward progression ensues naturally.

The widespread utilization of HPC solutions

While earlier applications of HPC were primarily limited to academic research and government projects, HPC now stretches across several verticals and markets, including commercial, industrial and consumer use cases. Also known as the democratization of HPC, this widespread use of advanced computing is largely due to the rising importance of data analytics, cloud-based access to HPC clusters, increased interest in artificial intelligence solutions and the convenience of HPC managed services.⁴

The reality is that HPC is essentially responsible for much of today’s product development, which is why the use cases spread across a diverse and highly engaged landscape. Here’s a look at how companies in varying verticals leverage HPC systems and services to enhance performance and drive business growth.

Global High Performance Computing (HPC) market share, by end use



Source: www.grandviewresearch.com

⁴ <https://www.cio.com/article/3183523/democratizing-high-performance-computing.html>

Higher education and research

HPC solutions provide a level of computational power that supports high-end, large-scale research projects in a variety of subject matter, including - but certainly not limited to - structural analysis, mathematical modeling, biology, chemistry, genetics, physics, climate change and psychology.

In fact, advanced computing power is so essential to research projects that universities actively work to optimize their HPC resources to support more academic and scientific analysis opportunities. This includes strengthening the networks and creating central inventories for projects so the research holdings aren't limited to data islands. Harvard University is among the institutions responding to this need to optimize, largely due to the institution's rapidly growing research computing department needing stronger infrastructure to support data-intensive workloads and collaboration.

"With three data centers, networking becomes a big focus," explained Scott Yockel, Harvard's director of research computing. "Networking can be a limiting factor to creating good collaboration because you have to move the data. Otherwise, you end up with small islands of storage and compute without the economy and advantages of aggregating data."⁵

An advanced HPC network also serves research teams at Montana State University as well. In one case, an MSU electrical and computing engineer researcher was able to share hundreds of gigabytes of data with colleagues at the University of California, San Diego to conduct collaborative research on marmoset vocalizations.⁶ Their combined studies could develop auto-signal detecting algorithms that improve human hearing aids. To further their reach, MSU connected the Montana-based researchers with 500 students at a Family Science Night. This combination of research, instruction and outreach created opportunities beyond the lab, all of which were made possible by overcoming data islands.

Yockel also noted that upgrading equipment can facilitate a tenfold increase in data, considering instruments and workstations have an average 10-year lifecycle and outdated systems can slow processes.⁷ While this is certainly positive, it also means that the workload for system networks is increased tenfold, thereby limiting the impact of the new HPC investment. HPC managed services teams take a holistic analysis of your HPC infrastructure and needs before making costly investment decisions. Academic research teams can then feel confident that they are taking the appropriate steps in refreshing instruments, workstations and operating systems and increasing computational efficiency. Ongoing system monitoring and security support can also help universities protect the intellectual property of their researchers.

⁵ <https://edtechmagazine.com/higher/article/2018/07/big-data-networks-connect-higher-education-researchers>

⁶ <https://edtechmagazine.com/higher/article/2018/08/universities-work-optimize-high-performance-computing-resource>

⁷ <https://edtechmagazine.com/higher/article/2018/07/big-data-networks-connect-higher-education-researchers>

Science and biotech

Advanced computing is a necessary tool in scientific research environments and often plays a prominent role in accelerating the rate at which researchers can discover groundbreaking solutions for society's most pressing challenges.

The medical applications of HPC drive research to better understand the diseases and conditions that plague patients, as well as develop the technology, devices, equipment and therapies to address those challenges. For instance, the Centers for Disease Control use a supercomputer to better understand the hepatitis C virus, which is one of the major causes of liver disease. By developing a detailed model of the virus, the researchers paved the way for new therapies. Researchers at The Mary Bird Perkins Cancer Center in Baton Rouge, Louisiana used supercomputer simulations to conduct clinical trials. Not only did the HPC simulation save the team more than \$12 million in research costs, but the results from the trial also helped improve success rates for long-term, advanced cancer care. The researchers made headway in lowering the incidence of second cancers in children who received radiation therapy.⁸

Along with conducting original research, data scientists use computing solutions that already exist to develop more advanced systems that can facilitate more effective applications of the technology. For example, the National Nuclear Security Administration and the Office of Science - both of which are part of the U.S. Department of Energy - launched a collaborative project dedicated to elevating HPC. The goal is to develop an exascale ecosystem, which performs billions of calculations per second and features advanced simulations and modeling solutions. Led by senior scientists, project management experts and engineers from six of the largest DOE national laboratories, the Exascale Computing Project aims to develop breakthrough modeling and simulation systems that can address the most critical challenges in scientific discovery, energy assurance, economic competitiveness and national security by 2021.⁹

The Grand View Research report noted that programs like the Exascale Computing Project will make significant contributions to the growth and advancement of the HPC market in the coming years.¹⁰ Companies that leverage HPC managed services to augment the work internal HPC and IT teams are doing to elevate their HPC systems are able to be more competitive, agile, and effective.

Engineering

The acceleration and enhancement of analysis abilities are among the most effective applications of HPC solutions in engineering. HPC can run computer simulations, stress and strain analysis, heat thermal examinations and computational fluid dynamics with much greater speed than average workstations. Multiphysics simulation, for instance, requires time-consuming and complex calculations. Rather than engineers tackling the equations, HPC systems can complete the calculations to speed up the process. They can also support engineers with research, complex

⁸ <https://www.hpcuserforum.com/downloads/HPCSuccessStories.pdf>

⁹ <https://www.exascaleproject.org/>

¹⁰ <https://www.grandviewresearch.com/industry-analysis/high-performance-computing-market>

computing architectures, data processing, code optimization, application execution and large data transfers.

A subset of electronics engineering, semiconductor design is largely reliant on HPC-enabled solutions, especially due to the increasing demand for smart electronic devices. Advanced simulation and modeling tools allow engineers to test more design iterations in less time, which improves product designs while also decreasing time to market in a highly competitive environment.

Engineers also utilize HPC solutions for more advanced generative design projects. For instance, Airbus used generative design to reimagine commercial plane designs. In one instance, the company determined that it was possible to engineer compartment partitions that were lighter than the current ones, but also much stronger. Getting to the conclusion required creating a multitude of iterations of the product, which is where HPC expedited the process.¹¹

Arup, an international engineering and design firm that provides services for building and infrastructure projects, uses cloud-computing services to run applications for seismic engineering and building-structure evaluation. HPC reduced the time required to run the necessary structural analysis, allowing Arup to conduct several large-scale projects at the same time. High-speed storage also supports the complex structural calculations.¹²

HPC managed services allow engineering firms to complete scalable, automated and cost-effective projects. HPC solution providers also support teams with system maintenance and operational security, ensuring firms can avoid project delays and costly downtime.

Manufacturing

In the manufacturing industry, HPC applications span product research and development, supply chain management and operations. Modeling, simulation and data analysis for industrial processes can especially reduce product costs and accelerate time to market. Research from MarketsandMarkets noted that manufacturers need HPC solutions to speed access to data and improve computing speed, efficiency and overall performance, which will drive significant growth in the HPC market in the next few years.¹³

Accelerated big data analysis is also of high value to manufacturers. HPC-enabled systems constantly collect and analyze data, which informs real-time adjustments to tools and processes within the manufacturing flow. This can improve product quality, shorten time to market and boost the company's competitive edge.¹⁴

¹¹ <https://www.engineering.com/Hardware/ArticleID/12764/What-Is-High-Performance-Computing-and-How-Can-Engineers-Use-It.aspx>

¹² <https://searchcio.techtarget.com/feature/High-performance-computing-use-cases-and-benefits-in-business>

¹³ <https://www.marketsandmarkets.com/Market-Reports/Quantum-High-Performance-Computing-Market-631.html>

¹⁴ <https://www.hpcwire.com/2018/07/16/hpc-for-everyone-comes-to-manufacturing/>

The DOE Advanced Manufacturing Office launched a dedicated High Performance Computing for Manufacturing program in 2015, which connects U.S. manufacturers with national laboratories. The DOE's National Labs house highly advanced HPC resources - including some of the fastest supercomputers in the world - that can enable impactful industry research. The goal of HPC4Mfg, therefore, is to advance the technology through optimizing designs, predicting performance and reducing the number of testing cycles during the development stage.¹⁵

A recent HPC4Mfg project focuses on integrated HPC modeling, simulation and visualization capabilities for steel manufacturing. Creating complex reactive flows or 3D simulations generally takes 30 days or more to complete, which limits efforts to increase the energy efficiency of blast furnaces. However, the DOE partnered the University of Purdue-Calumet and the Lawrence Livermore National Laboratory with an integrated steel mill so the researchers could transfer the existing codes to HPC clusters. Using HPC computers, they're also running simulations under varying conditions to analyze blast furnace operations. If successful, there's potential for their work with HPC to improve simulation resolution and times by a factor of 100, optimizing the blast furnace process enough to save the iron and steel industry \$80 million each year.¹⁶

With increasingly affordable and accessible HPC systems and services, manufacturers of all sizes and specialties can benefit from advanced computing power. For instance, small manufacturers and component designers can use HPC modeling and simulations to execute more efficient product-design testing in research and development facilities, eliminating the cost and time associated with creating several physical prototypes. No matter the size of the manufacturing company, HPC systems and services can make a significant impact through resolving operational challenges and increasing efficiencies.

Oil and gas

Oil and gas companies have to manage and store massive amounts of seismic data, plus analyze the information to infer optimal drilling locations. HPC solutions can deliver those real-time analytics, implementing a data processing speed that allows companies to drill new wells before their competitors get there. More than identifying the locations, the additional computing power can aid in reservoir and basin modeling, optimizing production, minimizing environmental risks and increasing operational safety.

This need to process so much data led Devon Energy Corporation to use an HPC application for fast and accurate seismic analysis.¹⁷ It's also why BP, one of the major companies in the sector, has an entire team of seismic researchers and computer scientists at a dedicated Center for High-Performance Computing. BP's computational abilities led to the discovery of an estimated 200 million barrels of oil reserves in a drill field in the Gulf of Mexico.¹⁸ The Italian oil and gas company Eni is said to own the most powerful supercomputer in commercial use, with the ability to simulate 15 years of oil reservoir product in about 28 minutes.¹⁹

¹⁵ <https://www.energy.gov/eere/amo/high-performance-computing-advanced-manufacturing>

¹⁶ <https://www.energy.gov/eere/amo/high-performance-computing-advanced-manufacturing>

¹⁷ <https://searchcio.techtarget.com/feature/High-performance-computing-use-cases-and-benefits-in-business>

¹⁸ <https://www.hpcwire.com/2018/01/14/close-look-worlds-largest-hpc-system-commercial-research/>

¹⁹ <https://www.hpcwire.com/2018/05/03/eni-gpu-based-hpc4-speeds-oil-reservoir-simulations/>

Financial services

HPC is especially relevant in the banking, financial services and insurance industry for myriad reasons, such as predicting stock trends, improving fraud protection, managing operational risks, achieving sustainable growth, providing new competencies and complying with regulatory requirements.

A financial services firm, for instance, can use HPC to increase risk analysis accuracy and automate manual tasks.²⁰ HPC can also help investment management firms, banks and other financial institutions make informed decisions about anything from default risks on bonds to how major societal, environmental and political events will affect stock prices. When combined with artificial intelligence and machine learning, HPC can help banks analyze customer debit and credit card purchases to implement methods to reduce churn and fraud costs as well as boost customer support efforts.²¹ For instance, if a bank picks up on a charge in a different city, the advanced technology can determine that the customer is at low risk of fraud because they booked a flight to that location on the same card. This saves the bank from automatically declining the card and irritating the customer.

With massive amounts of sensitive consumer data on file, financial services organizations often use HPC to securely analyze and store confidential information. As such, organizations in an increasingly complex BFSI industry can utilize HPC managed services to improve operational accuracy, efficiency and security.

AI and machine learning

Developers use massive data sets to train machine learning models, and advanced computing power accelerates the process and allows for larger and more complex models. As such, the convergence of AI, machine learning and HPC can drive major tech innovations, including credit card fraud protection solutions, voice recognition software and autonomous vehicles.

One self-driving car, for example, generates terabytes of data each day.²² HPC systems are required to process such massive amounts of data at a rate that allows the autonomous vehicles to make quick decisions that mimic the ones people have to make behind the wheel.

With AI impacting organizations in several industries, there are multiple opportunities for HPC systems and services to improve processes in areas like precision medicine, personalized marketing, business intelligence and technological innovation.

²⁰ <https://searchcio.techtarget.com/feature/High-performance-computing-use-cases-and-benefits-in-business>

²¹ <https://blog.cdw.com/data-center/for-financial-services-firms-hpc-is-money-well-spent>

²² https://www.cio.com/article/3253570/why-hpc-matters-autonomous-vehicles.html#_edn4

Media and entertainment

Rooted in technological capabilities, media and entertainment companies can use HPC clusters for advanced editing, visual effects and gamification. For instance, visual effects studios utilize HPC to render complex animations for movies and games and create computer-generated imagery for major motion pictures.

High-performance media servers are also essential for the large format high-definition video displays at major entertainment venues that support concerts, performances, sports games, award shows, live virtual reality and other high-profile events. They provide increased bandwidth networking, ultra-fast flash storage and live-stream support that allow the screens to display high-resolution images in real time.²³

Government and defense

While not new to advanced computing, the government and defense sector is still experiencing some of the most rapid adoptions of HPC systems and services. The Grand View Research HPC market report predicted the segment will experience the fastest growth between 2018 and 2025, expanding at a CAGR of more than 8%.²⁴

Government agencies implement HPC to improve computing efficiency, promote economic development and support digitization initiatives. Defense agencies are especially interested in using HPC for cutting-edge IT solutions that enhance efficiency in real-time data acquisition and analysis, emergency preparations, disaster modeling and analysis, security and surveillance, encryption and decryption of confidential information as well as situational simulations.²⁵

Scientists can also use HPC resources to develop, test and analyze military tools and technologies, such as vehicles, weapons and armor. For instance, supercomputers at the U.S. Army Research Laboratory fuel innovations.

“Supercomputing provides a technological advantage for DOD projects,” according to Dr. Raju Namburu, the director of the ARL Department of Defense Supercomputing Resource Center. “It helps to reduce costs by reducing reliance on expensive and destructive live experiments and prototype demonstrations. We empower researchers to solve the most difficult military operational challenges through advanced computing.”

In fact, army researchers leveraged HPC resources to develop a vehicular armor upgrade kit for military personnel stationed in Iraq. The speedy computations resulted in a 20% reduction in fatalities, as well as three to four times faster deployment rates of the upgraded kits.²⁶

²³ <https://insidehpc.com/2019/01/major-media-and-entertainment-oem-orders-4-million-hpc-gear-from-one-stop-systems/>

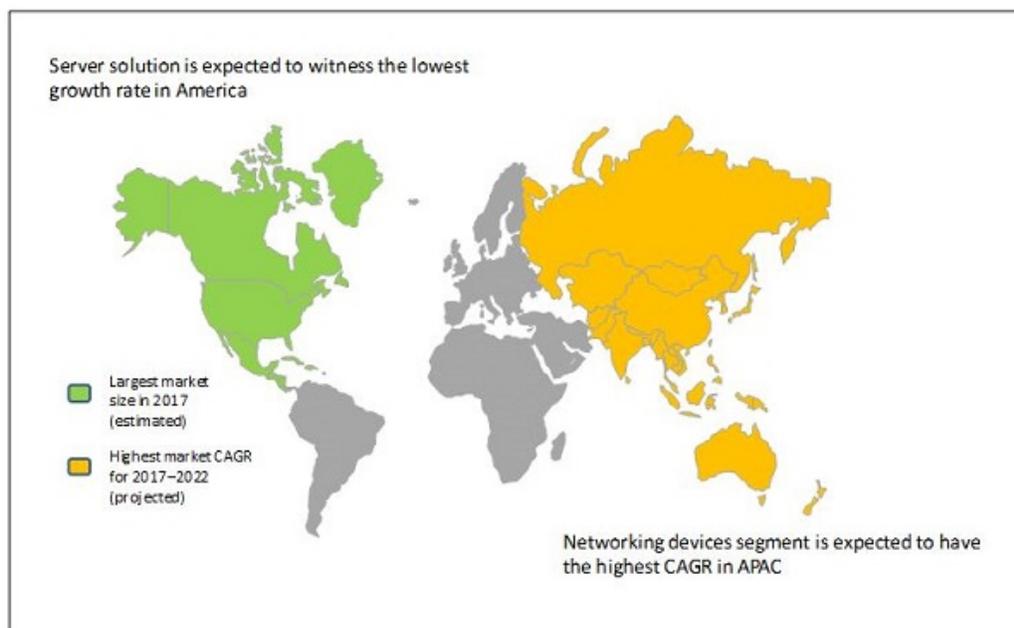
²⁴ <https://www.grandviewresearch.com/industry-analysis/high-performance-computing-market>

²⁵ <https://www.marketsandmarkets.com/Market-Reports/Quantum-High-Performance-Computing-Market-631.html>

²⁶ <https://www.arl.army.mil/www/?article=2998>

Federal governments also generally have programs in place with funding dedicated to big data initiatives, such as the National Strategic Computing Initiative in the U.S. These dedicated programs are one of the primary reasons why North America is home to the largest share of the HPC market, although the Asia-Pacific region is quickly catching up.

High Performance Computing Market by Region, 2017–2022



Source: MarketsandMarkets Analysis

Drive growth with end-to-end HPC services

With unending volumes of data, enterprises can no longer rely on legacy technology to process, analyze and store information. What's more, tech-savvy customers' abilities and preferences are steadily rising, putting pressure on companies to exceed heightened expectations. Highly competitive landscapes give organizations more reason to adopt the latest advancements in computing power to make informed business decisions and deliver the products and services that drive the desired growth and success.

As such, implementing the latest HPC resources is a smart investment for today's organizations. HPC managed services enable organizations to gather the insights they need from solutions without burdening internal teams with infrastructure sourcing, management and maintenance. Outsourcing time consuming elements reveal a cost-effective, high core count, performance-based HPC environment that empowers organizations with seamless scalability and increased security.



WHY SAMSUNG SDS?

Samsung SDS offers end-to-end managed HPC services and solutions that allow IT departments to focus on the tasks they do best, including managing applications, services and data. [As a reliable extension to the IT team, Samsung HPC solution architects source, build and manage to meet organization-specific needs.](#) The suite of services also include comprehensive management and security, plus fault-tolerant operation with 24/7 manned network operation centers.

Samsung SDS' industry-agnostic managed services solution can help organizations in varying verticals grow exponentially based on business demand. Partnering with Samsung SDS grants companies world-class infrastructure and HPC solutions.

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