



The building blocks of a modern data centre

Creating an agile, efficient and well configured data centre to support your modern, digital business.

IT teams are under considerable pressure to optimise their infrastructure. For many businesses, this modern IT infrastructure means less hardware, and consolidated server, networking and storage resources.

How should a modern data centre best be configured, and what components need to be considered to support the work being done today, and by our future digital businesses? In this discussion paper, NTT Ltd. outlines the seven key components of a modern data centre to assist you in determining what you need to do to support your organisation's future needs.

The challenge of optimising a complex, hybrid IT infrastructure

IT teams are under considerable pressure to optimise their infrastructure in order to save money, reduce risk, and facilitate greater efficiency, scalability and productivity. Modern IT infrastructure needs to keep energy costs low, meet increasing security requirements, host more applications, and share resources across more departments and sites. For many businesses, this translates into less hardware, and consolidated server, networking and storage resources.

However, the modern data centre is increasingly complex and multi-dimensional – with some compute located on-premise, and some in hyperscale cloud.

In a global survey of more than 950 IT decision makers at enterprises, hybrid cloud was found to be the preferred enterprise operating model for cloud.¹ 451 Research partnered with NTT Ltd. in May and June 2020 to conduct a survey of enterprise adoption of hybrid cloud strategies, which found that workloads continue to shift toward a combination of cloud platforms. There is an ongoing transition toward an IT infrastructure comprised primarily of public (30%) and private (42%) cloud infrastructure, with non-cloud environments continuing to diminish as a portion – see Figure 1 below.

The modern data centre is increasingly complex and multi-dimensional – with some compute located on-premise, and some in hyperscale cloud.

Portion of Data Stored or Processed at Location

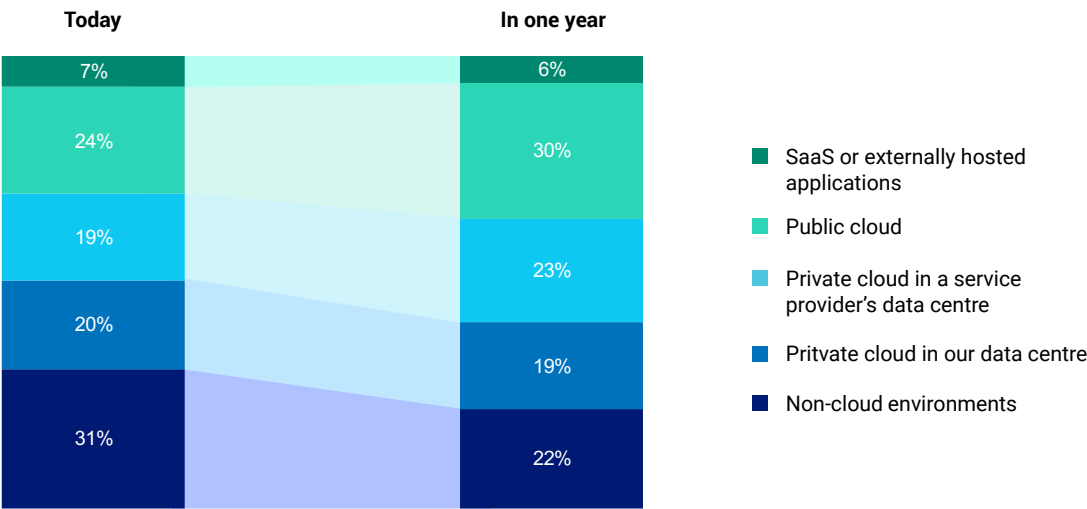


Figure 1: What percentage of your organisation's data is stored or processed in each of these environments now and one year from now?

¹451 Research NTT Ltd. Hybrid Cloud Study 2020, S&P Global Market Intelligence

Our approach to your hybrid IT

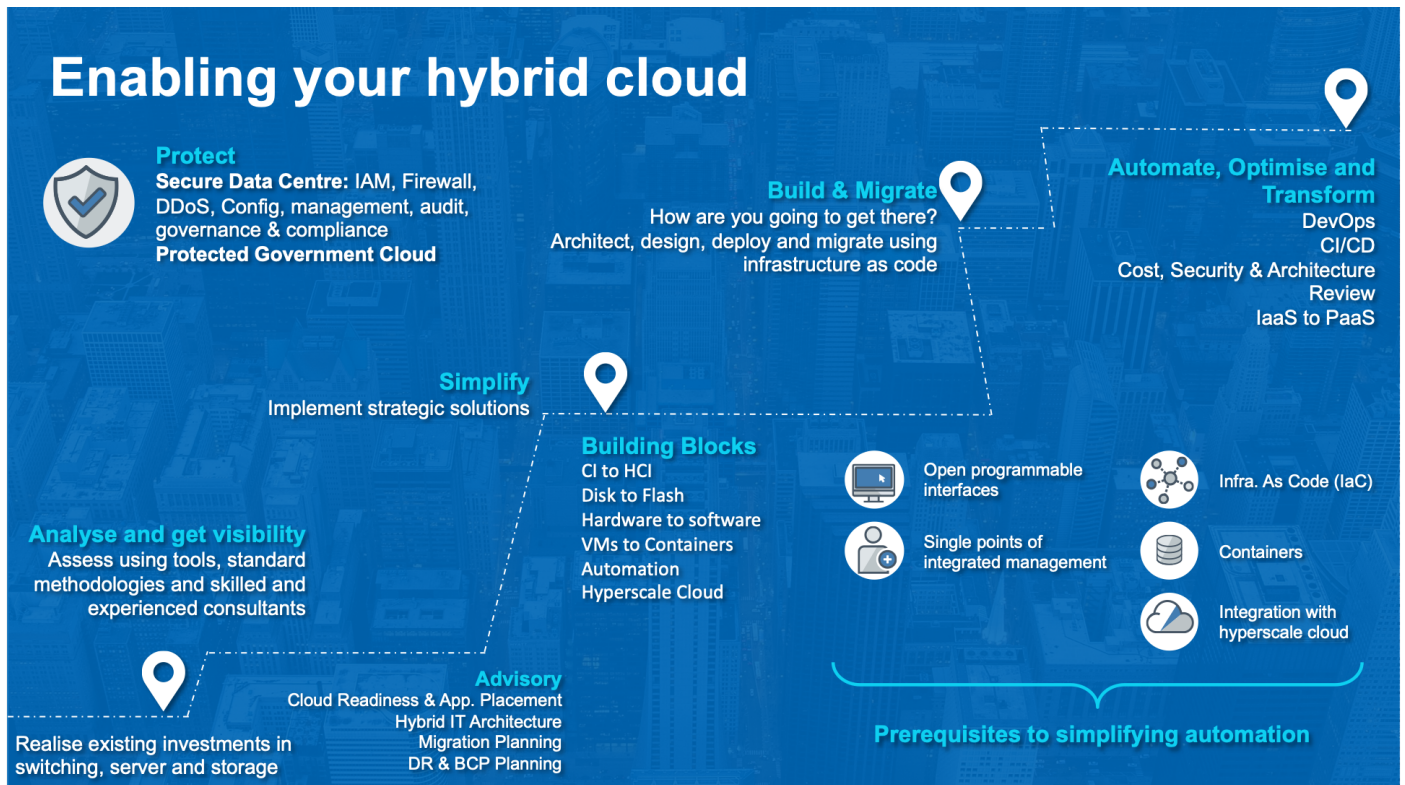


Figure 2: Our approach to your hybrid IT

Building a modern data centre

As Figure 1 above indicates, while there is a significant percentage of compute work getting done in hyper-scaled infrastructure, there is also still a significant amount occurring on-premise.

Given this level of hybrid IT complexity, how should a modern data centre best be configured? And what components need to be considered to support the work being done today, and by our future digital businesses?

In this discussion paper, we have outlined seven prevalent components of a modern data centre.

It's important to remember that most organisations will have some of these building blocks in place already. Evaluating the modern data centre is a matter of determining your organisation's current stage of process and technology maturity, what's right for your size and industry sector, and what changes you need to make in order to ensure your data centre is fully optimised to support your organisation's future needs.

Seven common components of a modern data centre

1. Flash
2. Hyperconverged infrastructure
3. Software-defined architecture
4. Automation
5. Cloud
6. Data
7. Management: automate, optimise and transform

Flash

In recent years, flash has become one of the most vital elements of the modern data centre – enabling fast, low-cost and highly efficient data storage.

Traditionally, most data centres operated with spinning disk storage. Now, to facilitate the demand for faster performance, many businesses are replacing almost all of their spinning disk storage with flash drives. Typically, flash is implemented as part of converged infrastructure or hyper-converged infrastructure solutions, or even as stand-alone storage area networks, to facilitate very high capacity, high performance, or data protection requirements.

“As the prices have come down on flash, the total cost of ownership got to the point where it was a no-brainer to buy an all-flash array,” said IDC’s Research Vice President for Storage Eric Burgener in 2018.² In many cases, flash is ideal for the modern data centre – providing optimal performance, but requiring less power and less cooling, and being simpler to operate than traditional spinning disk storage solutions.

“The all-flash data center will become a reality, and you will store more and more of your cold data in the cloud.” – Enrico Signoretti, Research Analyst, GigaOm³

Converged or hyperconverged infrastructure

Over the last decade, businesses have increasingly turned to converged infrastructure (CI) – where vendor partners work together to provide unified and fully tested solutions that are engineered to work out-of-the-box. When implemented as part of a reference architecture, CI vastly reduces deployment and operational risk, and significantly reduces the time to value for the organisation.

In the last several years, however, hyperconverged infrastructure (HCI) has also gained popularity – enabling businesses to replace their server and storage with a building block that offers server and storage within a single appliance.

HCI uses software to virtualise the storage layer, which means that if more storage capacity is required, you can simply add another node and the HCI software automatically adds the additional capacity to your organisation’s storage asset pool.

This makes HCI incredibly scalable as well as resilient. With HCI, you don’t need to worry about how servers and storage are configured – you only need to think about how much capacity and performance you need.

Through the software layer, HCI vendors provide a good deal of automation of common operational tasks out-of-the box and enable simpler integration and further tailored automation by exposing rich APIs.

FlexPod – a CI solution

FlexPod is a pre-validated data centre platform built on Cisco Unified Computing System (Cisco UCS), Cisco Nexus family of switches, and NetApp data management and storage solutions. Its configurations and workloads are published as validated designs that allow clients to deploy applications and converged infrastructure faster using proven solutions.⁴

FlexPod hosts infrastructure software and business applications in virtualised and bare-metal environments. The platform has shown proven value, agility and performance across leading hypervisors, operating systems and applications from vendors including VMware, Citrix, Red Hat, Microsoft, Oracle, SAP and Docker, and can be managed by FlexPod ecosystem partner software.

NTT Ltd. combines the proven benefits of FlexPod with services that improve application performance, simplify hybrid IT, and reduce total cost of ownership for infrastructure and applications.

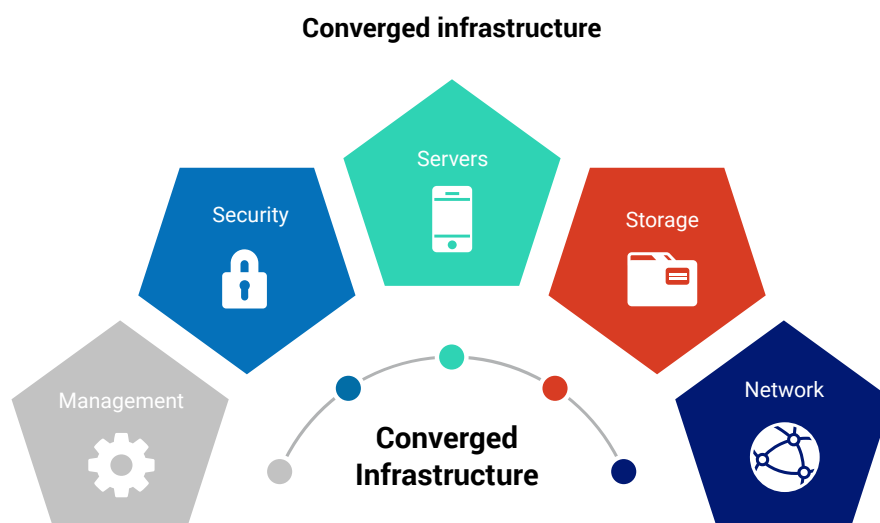


Figure 3: Converged infrastructure

²‘Enterprise Flash Storage Market Growth 2018’, Pedro Hernandez, Enterprise Storage, 2018. <http://www.enterprisestorageforum.com/storage-management/enterprise-flash-storage-market-growth-2018.html>

³‘The Hard Disk is Dead! (But Only in Your Datacenter)’, Enrico Signoretti, GigaOm Blog, 2 February 2020. <https://gigaom.com/2020/02/03/the-hard-disk-is-dead-but-only-in-your-datacenter/>

⁴FlexPod: Resources and Technical Documents, <https://flexpod.com/resources>

NetApp® HCI – enterprise-scale hyperconverged cloud

NetApp® HCI is a scalable, on-premises hyperconverged infrastructure for hybrid clouds that is capable of transforming and empowering organisations – to help them move faster, drive operational efficiency, and reduce costs.

NetApp's disaggregated hybrid cloud infrastructure allows independent scaling of compute and storage, adapting to workloads with guaranteed performance.

With NetApp® HCI in place, businesses can easily optimise and run multiple applications with the predictable performance that enterprise clients demand.

They can also scale compute and storage resources independently and deploy in minutes with a turnkey cloud infrastructure that eliminates the complex management of traditional three-tier architectures.

NetApp has been named a Leader in 2019 Gartner Magic Quadrant for Primary Storage (September 2019).⁵

Software-defined architecture

In the past, software-defined implementations in the data centre were typically limited to servers – by way of server virtualisation. Today however, storage, network, security and servers can be defined in software, enabling an entirely software-defined data centre.

Organisations can achieve a software-defined architecture simply by laying software over existing commodity servers. With a software-defined architecture, organisations can use software to alleviate the need for additional hardware – as well as facilitating agility, flexibility and enabling rapid scale. However, many clients choose to introduce software-defined storage by purchasing it as part of a hyper-converged appliance. This reduces the implementation risk and accelerates their time to value.

Application Programmable Interfaces (APIs) help to extend software-defined architecture beyond the core infrastructure functions of the data centre to encompass network, security, server and storage.

APIs enable interaction with your software-defined assets; allowing developers or operators to effectively treat your infrastructure as code.

Automation

Organisations frequently turn to automation as a means to further optimise their data centres. By automating key processes for computing, storage and the network, businesses can drive down costs, ensure greater security and protection, and also facilitate faster and more effective ways of working.

However, before your organisation automates, it's important to have the right building blocks in place. Perhaps the most important step is to ensure that as many parts of your data centre environment, as is practically possible, are defined in software. Abstracting your data centre hardware into software makes far more of your infrastructure programmable, giving you greater flexibility, visibility and interaction with your data centre environment.

It's also important to automate only what's pragmatic to do so, based on your organisation's needs and level of maturity.

"API-driven infrastructure is important. It is the goal here, and it should be the goal of infrastructure modernization."

–Paul Delory, Gartner Senior Director Analyst (2018)⁶

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⁵Gartner Magic Quadrant for Primary Storage, 17 September 2019, Roger Cox, Santhosh Rao, Joseph Unsworth, John Monroe <https://www.netapp.com/us/campaigns/gmq-primary-storage-report/index.aspx>

⁶Why API-driven infrastructure is the end goal for data center modernization', Conner Forest, TechRepublic, 5 November 2018 <https://www.techrepublic.com/article/why-api-driven-infrastructure-is-the-end-goal-for-data-center-modernization>

Cloud

Organisations are increasingly turning to the cloud as an alternative to traditional on-premise deployments. Enterprises consider cloud to be critical to meeting current and future business requirements.

The 451 Research NTT Ltd. Hybrid Cloud Study 2020 found that 94% of enterprises surveyed agree that cloud is critical to meeting their immediate business needs, and hybrid cloud is almost the universal imperative. Nearly two-thirds (61%) of organisations surveyed have hybrid cloud either in production or at the proof-of-concept stage. Only 5% of organisations indicate no plans for hybrid cloud.⁷ See Figure 4 below.

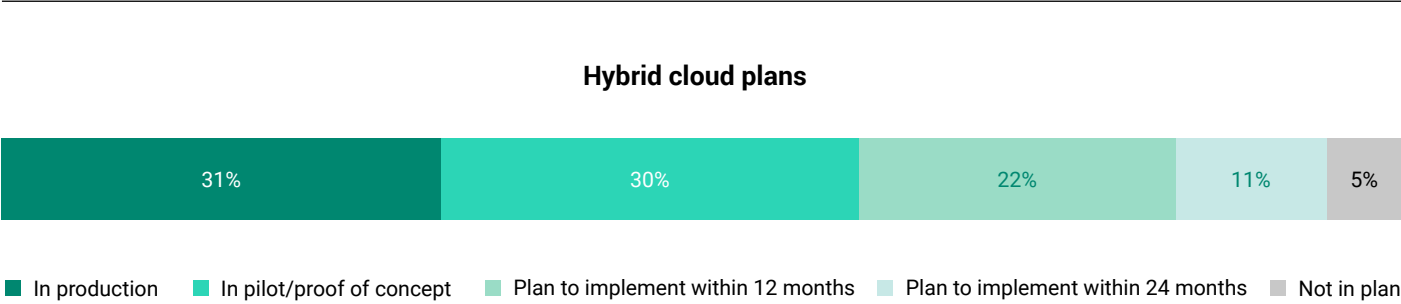


Figure 4: Which of the following best describes your organisation's status with regards to hybrid cloud (which we describe as a combination of private cloud and public cloud)?

Cloud isn't always for every application

It is important to remember that not all workloads are suited for the cloud – and many might be more suited to an on-premise environment. Large, compute-heavy applications such as SAP or Oracle may, for instance, be best suited to a converged infrastructure, whereas applications with peaky demands and fluctuating workloads may be best suited to a scalable, hyperconverged infrastructure. At the same time, applications without special identity management, security or data sovereignty requirements may be best suited to the cloud.

When considering cloud as part of an overarching data centre solution, it's important to examine each workload and determine which location will get the best results for your business.

Agility and flexibility are critical for digital business, but hybrid IT environments are difficult to manage. With applications hosted on a combination of on-premises, private cloud and public cloud, keeping an eye on everything is not easy. With systems spread out across multiple environments you need a way to manage all of these from a single interface. NTT Ltd. provides you with the visibility required to gain insight into how all your systems work together. This helps you better understand which applications can be moved to the cloud and which need to stay in their existing environment.

"Organisational roadblocks and skills gaps are seeing enterprises look to service providers for help addressing the security, connectivity, cost management and migration challenges of hybrid cloud." - 451 Research NTT Ltd. Hybrid Cloud Study 2020 (see Figure 5 below)

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⁷451 Research NTT Ltd. Hybrid Cloud Study 2020, S&P Global Market Intelligence

Barriers to hybrid cloud adoption

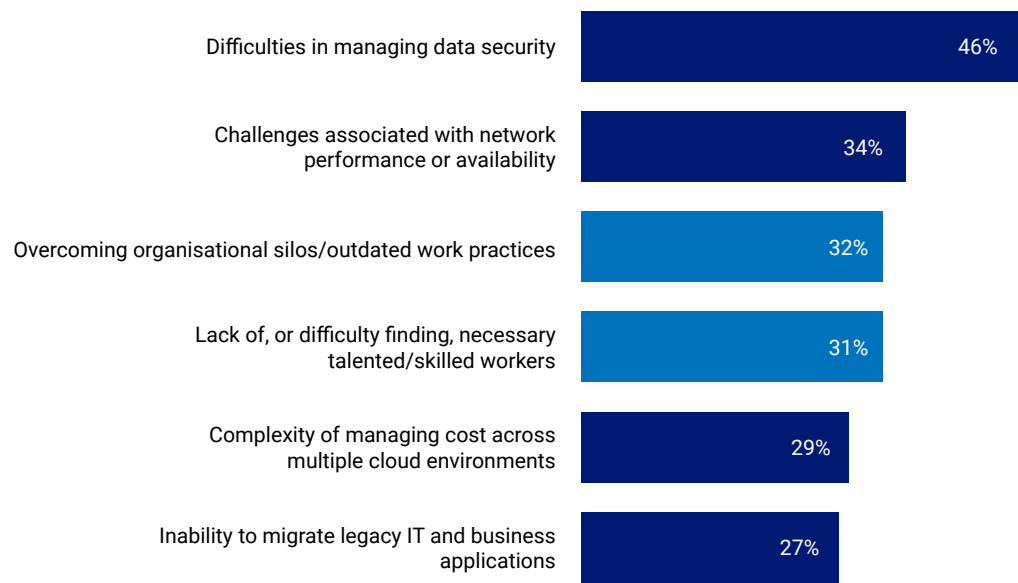


Figure 5: In your opinion, what are the greatest barriers to hybrid cloud at your company?

Data

Data is becoming one of the most vital – if not the most vital – asset of any modern business. However, though the scale and variety of data is increasing every day, finding new and innovative ways to store, handle and process that data has become critical.

When considering data handling, you need to understand where your data is and also its full scope. For instance, can your organisation currently store structured data as well as unstructured data such as images? Is your data managed in accordance with security and compliance regulations? How do you manage data through its lifecycle? And how will you cope with the ever-increasing volume?

Just as our data centre environments are hybrid in nature, data itself will reside in multiple locations. In fact, with the rise of technologies such as the Internet of Things (IoT), it's likely that we will see more data disaggregation than consolidation. The key to success is a comprehensive data management capability that can span all centres, where an organisation may store and/or process data.

As indicated by Figure 6, traditional storage (Storage Area Networks – SAN and Network Attached Storage – NAS) is giving way to ostensibly two types of storage: high performance (flash, and soon RAM-like storage) and low-cost, highly scalable cloud storage. This means organisations will need to become adept at making best use of these storage mediums to maximise their returns on storage investment.

Worldwide Traditional, Enterprise TPC and Hyperscale, and Cloud Hyperscale Storage 2015-2026 (\$B)

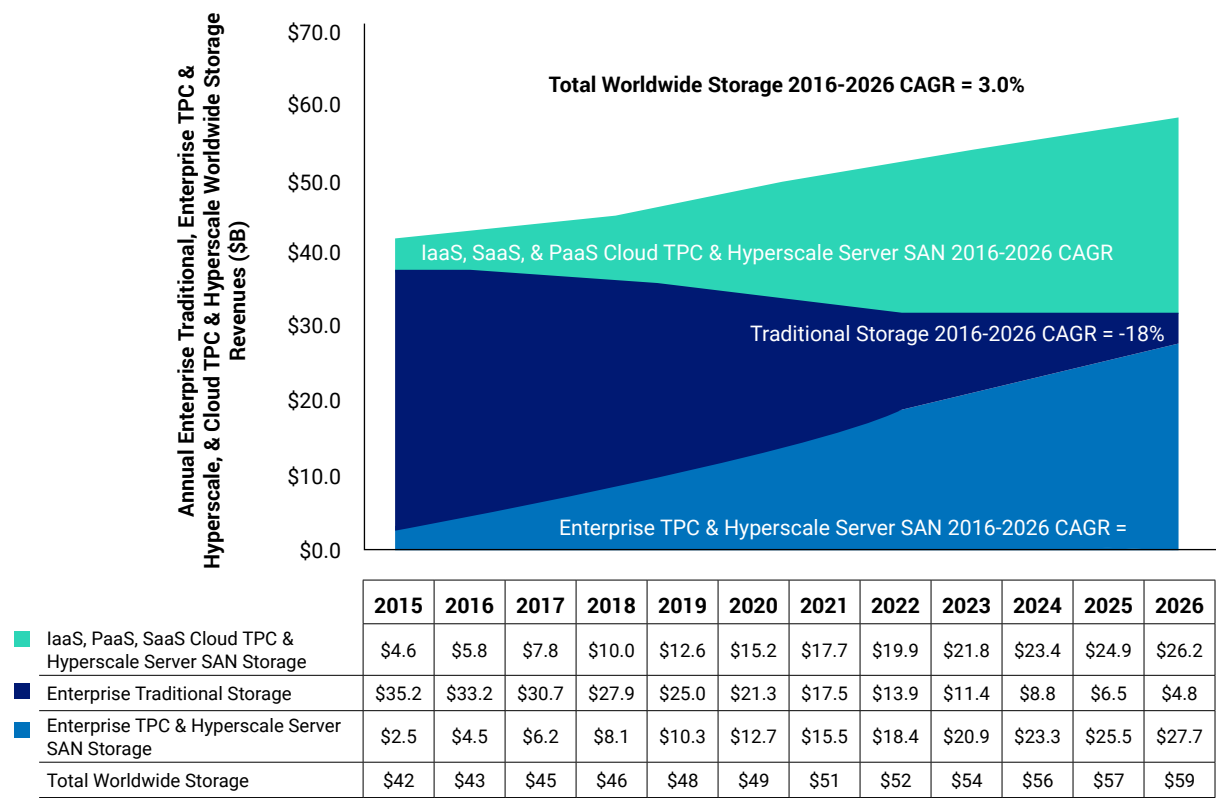


Figure 6: Hyperscale vs traditional vs hyperconverged market share⁸

Management: automate, optimise and transform

While it’s good to have an ideal combination of building blocks in your hybrid data centre, it’s also equally important to ensure you have a way of not just managing but also optimising and transforming your environment and operations over time.

As we highlighted earlier, the software-defined data centre’s scope has expanded to include not only servers but now also network, security and storage. Recently, the area of server virtualisation has undergone further transformation with the introduction of containers.

According to Gartner, by 2023 more than 70% of global organisations will be running more than two containerised applications in production, up from less than 20% in 2019.⁹ More than half (56%) of the 950 IT leaders polled for the 2020 edition of Red Hat’s State of Enterprise Open Source report said they expected their use of containers to increase in the next 12 months.¹⁰

In a next-generation data centre, containers help to achieve benefits around automation of workload provisioning and orchestration across technology. They do this by bundling an application’s code, configuration and OS dependencies into a single lightweight package.

⁸Wikibon Worldwide Projections for Traditional Storage, Enterprise Server SAN and Cloud Server SAN 2015-2026 (\$B)
Source: © Wikibon 2017 <https://wikibon.com/server-san-projections-2016-2026>

A view of Virtual Machine vs Container Technology

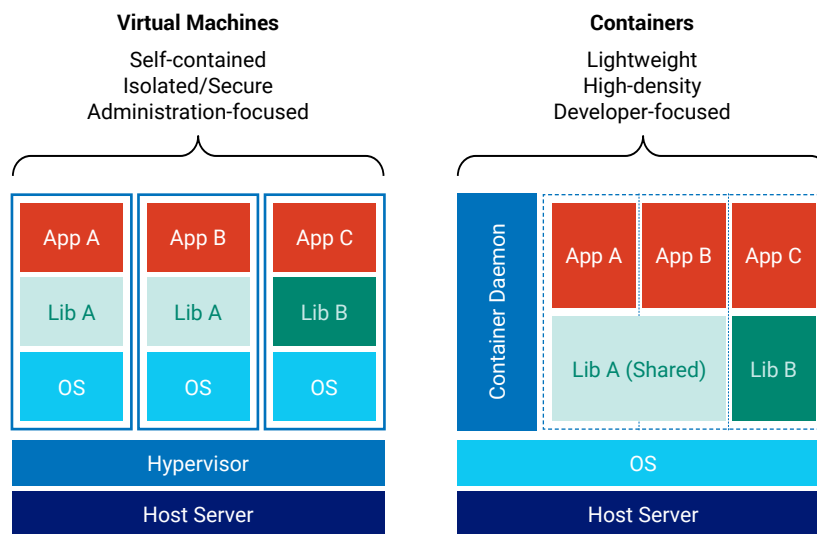


Figure 7: Virtual Machine vs Container Technology

The Shift to DevOps

Containers allow software to be delivered in a fundamentally different way. Instead of developers working independently of operations (developers delivering application artefacts to operations and then operations deploying on OS images that conform to organisational policy), containers enable developers and operations to collaborate on a single image that is composed of both OS dependencies and application artefacts. This shift to DevOps – developers and operations collaborating together during the build phase of an application – allows issues to be found much earlier in the software delivery lifecycle. This leads to a lower failure rate of new releases and faster time to recovery in the event of a new release crashing.

“With speed now widely accepted as a critical success factor for digital transformation and competitive survival, the DevOps approach by its nature is primed to produce with faster delivery as well as higher quality, quicker fixes, and lower costs.”¹¹

‘DevOps as a Service’ (DaaS)

As organisations change their development models from monoliths to microservices, the tools that support them must transform. NetApp’s DevOps as a Service (DaaS) provides automated installation, configuration, and deployment of services, and enables teams, from the time code is written to the delivery, with best practices, significantly reducing their cycle time.¹²

Containers allow software to be delivered in a fundamentally different way.

¹¹“Why DevOps, and Why Now?”, NetApp eBook, 2020 <https://www.netapp.com/us/media/ebook-netapp-unlocking-the-business-value.pdf>

¹²“Rapid and Reliable Code Delivery with DevOps as a Service (DaaS)”, NetApp Blog, 19 May 2020 https://blog.netapp.com/daas-features?dysig_tid=19ae3584fb434134b910c62318cf4e98

How can NTT Ltd. help?

When it comes to the modern data centre, NTT Ltd. can help you determine where you are now – and how you can further optimise your data centre for the future.

This involves asking several key questions, including:

- What investment have you made already and what can be retained?
- Which elements of your infrastructure are reaching their end-of-life and need to be updated?
- What services do you want to run and what applications underpin those services?
- Which applications might be better served by converged or hyperconverged architecture and which others by cloud?
- What are your security needs, independent of where you choose to operate?

We start every consultation by determining which existing investments your organisation has made in terms of switching, servers and storage, and then assess your existing infrastructure using tools, standard methodologies and our skilled and experienced team of consultants.

Our 3-step approach to your hybrid IT



Step 1

Get visibility and control



Step 2

Implement strategic solutions



Step 3

Automate and optimise



Together we do great things