FUJITSU

# White Paper

## Is software or hardware defining your data center? Or is it your business?

Contents

# The impact of digitalization on data center architectures

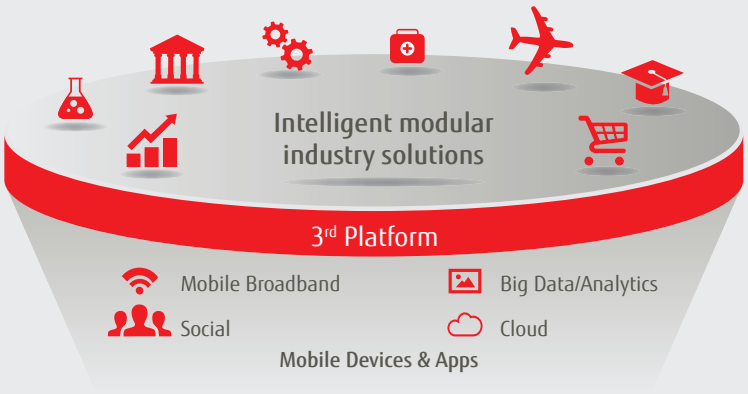
The emergence of the software-defined data center (SDDC) raises a lot of key questions. For example: How will the new software-defined paradigm impact the platform architecture of modern data centers? Which technologies are suited to address the requirements of specific scenarios? How can you be sure that you have the best solution for your business? This white paper provides you with a brief overview and outlines crucial aspects of the SDDC.

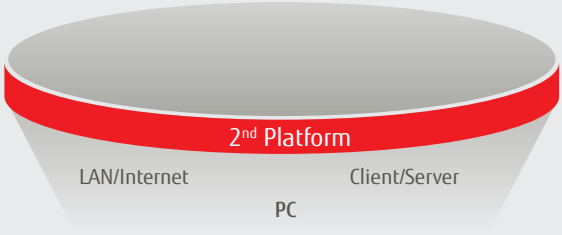
As we all know, the digitalization of our world is progressing at breathtaking speed. Connected cars, smart homes, a large array of new intelligent devices and the increasing number of sensors are examples of the ongoing fusion of the physical and digital worlds. All of the data generated today is collected, aggregated and analyzed to help people make much better decisions. In the long run digitalization will lead to an intelligent, human-centric society, allowing us to improve our business processes and our private lives as well.

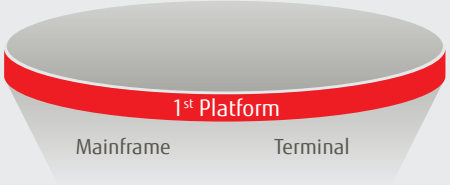
This progress will have a huge impact on our IT systems. In addition to the predominant IT architectures we have today, the so-called first platform based on mainframe environments and the second platform with client/server environments, a third platform is currently taking shape in the IT world. This third platform, a term coined by IDC analysts, is the enabler of the cloud, big data, enhanced mobility and the integration of social media.

Not surprisingly, the third platform needs to deliver extreme and flexible scalability – which is known as "hyperscalability." It has to deal with billions or trillions of connected users, devices and things. The third platform will be powered by modular industry-standard servers. And it will demand new types of hyper-scale storage. Finally, the third platform will transform a network into meshed fabrics that are called the "new IP."

The new third platform has to be built for unpredictable amounts of data, connected users, devices and things. It's about creating "fast IT" for delivering fast scalability in transporting, processing and storing new dimensions of data. This requires the hardware-independent provisioning of IT resources, thus resulting in a software-defined data center.




| | Users & Things | Compute | Storage | Network |
|---|---|---|---|---|
| 3rd Platform | Billions/ Trillions | Modular x86 | HW independent hyper-scale | "The new IP" network |
| 2nd Platform | Millions | x86 RISC | integrated HW & SW vendor-specific scale-up & scale-out | IP, LAN/WAN |
| 1st Platform | Thousands | Mainframe systems | specialized Mainframe Connectivity | Systems Network Architecture (SNA) |

# Software-defined data center
## The building blocks

**The software defined data center requires the right hardware platforms in order to fulfill the intended purpose. When it comes to computing power, the agile aggregation of performance is absolutely vital. This works best with very modular, virtualized industry-standard servers. In addition, software-defined systems are on the rise in order to meet the demands of hyper-scale storage. What's more, networks need to be capable of allocating bandwidth flexibly and under the control of sophisticated software.**

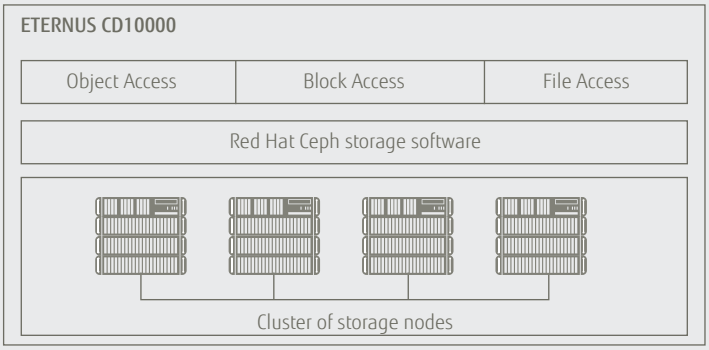
Servers in the SDDC should be completely modular to allow for the online expansion of processing power. Since large numbers of servers will be running in hyper-scale environments, high density is a key requirement for achieving small footprints and reducing the cost of space in data centers. It goes without saying that efficient power consumption and low heat dissipation are also essential. Furthermore, servers should be extremely flexible and dynamic in terms of their network connectivity. For hyper-converged scenarios – combining storage and computing functionalities in one box – servers should be based on a flexible building-block concept. In hyper-converged environments, new modular servers will replace blade servers in order to achieve the next level of agility. The **PRIMERGY CX cloud server** line has been designed to support these new usage scenarios.

SERVERS

NETWORK

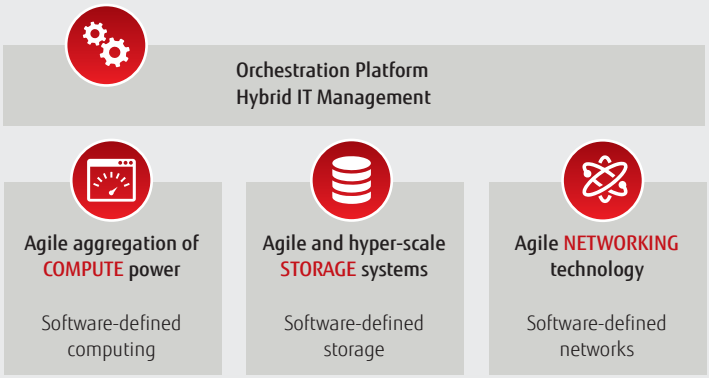
A lot of new requirements have to be fulfilled by networking technology. SDDC networks must enable the movement of data and virtual machines across public and private cloud resources. They need to support flexible connectivity of any device from any place in a secure way. They should provide an automated quality of service management when assigning bandwidth to various application scenarios because manual allocation is too slow and cannot keep pace with the dynamics of hyperconvergence. This will lead to a transformation of hierarchical structures into a fully meshed fabric.

To cope with unpredictable data growth, storage systems need to provide linear capacity and performance scalability. Since the migration of huge volumes of data is becoming a major headache, system hardware will have to be refreshed online in the future. This will make complex migration projects obsolete, or at least less frequent, when hardware components reach end of life. However, online refresh will only be possible if data management is decoupled from the hardware to create a software-defined storage system. Ideally the software that controls data management is based on open source and thus supported by a large community of developers. This ensures fast innovation and longevity. One example is Ceph, an open-source and hyper-scale storage platform that provides cutting-edge scalability. The support of object storage is part of its design and is essential to support extreme data volumes. With this in mind, Fujitsu offers **ETERNUS CD10000,** a complete, ready-to-run storage solution based on Ceph.



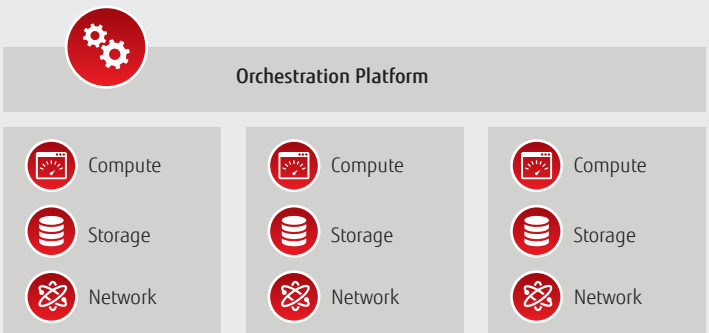

STORAGE

A complete SDDC is comprised of several core building blocks. On the platform level it is powered by an array of very modular servers which are virtualized, either with hypervisor technology or with new approaches like containers. These containers will have the potential of boosting agility to new levels, much higher than ever before. Users will be able to move workloads among their own data centers or external cloud data centers without any dependency on a particular hypervisor technology. A software-defined and hyper-scale storage platform is connected to the servers via the fully meshed fabric network.




An essential element for operations is an orchestration platform which provisions and manages the server, storage and networking resources. Ideally it should also control the resources in the cloud to enable hybrid IT operation. Today vendor-specific management suites are already available – for example, vRealize from VMware or Microsoft System Center – which are increasingly supporting third-party platforms and cloud resources as well. OpenStack technology has the potential of playing a leading role in the management of the SDDC. By defining an API framework, it will also allow for the coordination of vendor-specific management and orchestration tools to create higher interoperability. Infrastructure resources can be assigned to applications in a very flexible way, and adapting to new workload requirements will be possible at unprecedented speeds.

Whereas the previously described architecture is ideal for workload-independent environments, another SDDC approach can be very efficient for specific application areas. In this hyper-converged approach, computing and storage functions are not separated in different hardware elements, but are instead provided out of one building block with one embedded management system. Scalability is achieved by adding more blocks. One example is the VSAN approach from VMware, which can be a great solution for medium-sized and large VMware environments.

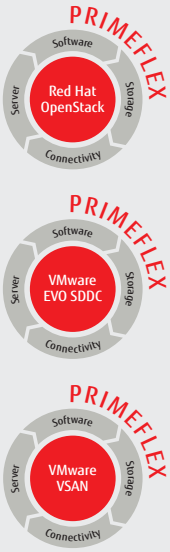



The usage scenario influences the decision as to which type of software-defined IT architectures should apply – for example, by connecting hyper-scale software-defined storage systems with very flexible and modular compute nodes, or by merging storage and computing functionalities together in one system.

# Leverage the potential of fast IT
## Optimize your robust IT

**The SDDC approach is ideal when fast provisioning and hyper-scale environments are required. The new software-defined architecture will coexist alongside robust IT well into the future. At the end of the day, the right architecture is defined by the extent of scalability required and by the applications that are deployed.**

## INTEGRATED SYSTEMS – THE FAST TRACK TO SDDC




The SDDC will pose some new challenges. As management functions – which are deeply integrated in hardware technologies – are replaced by generic functions, substantial integration work will be required on the software layers. A possible remedy for this problem can be integrated systems, either converged or hyper-converged, for boosting efficiency through pre-integration. For various types of SDDC approaches, Fujitsu offers integrated systems under the PRIMEFLEX brand. These are ready-made solutions for VMware- or Red Hat OpenStack-based environments.

As always, new types of architectures will never be immediate replacements for traditional ones. The software-defined data center is ideal for environments where you need hyper-scalability. However, it will demand higher integration and maintenance workloads at the middleware level on top of the hardware platform. This should not be underestimated. Another issue must also be addressed: Not all existing applications will support these software-defined platforms. In some cases applications will have to take over high-availability functions which were previously delivered from the platform underneath.

This is much different from other vendor-specific environments where a lot of the management and high-availability functions are already embedded in the hardware platform or in the system-near middleware – all perfectly aligned with the platform. Be it proprietary or not, this can make implementation and maintenance much simpler and more robust. That's why it's called robust IT. However, scalability across technologies from different vendors is much more difficult to achieve as in SDDC concepts.

## RECOMMENDATIONS FOR OPTIMIZING ROBUST IT

As there is common agreement that the software-defined data center will coexist alongside other forms of IT, let us now look at what can be optimized in robust IT architectures. Robust IT typically consists of discrete server storage and network technologies. Each vendor typically offers management and high-availability options that are tightly coupled and optimized for a particular platform. Scale-up and scale-out scenarios are supported on the server side, whereas the storage side typically has scale-up storage implementations and moderate scale-out for smaller installations. However, they typically do not have the hyper-scale capabilities of software-defined designs. The predominant set of virtualization technologies are comprised of vendor specific-solutions, mainly from VMware and Microsoft. The networking structures are typically hierarchical, with parallel usage of SAN and IP, and partly iSCSI. By contrast, the SDDC is IP-based only.

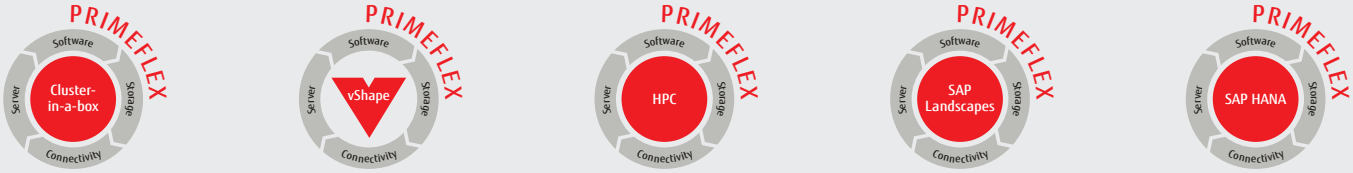
Storage has great optimization potential, especially when it comes to consolidation. In many IT organizations you find a lot of underutilized hardware. One of the root causes of this is the fear of performance bottlenecks or performance resource conflicts between data in different applications within the storage system. This can lead to massive overprovisioning. In order to drive consolidation, we recommend looking at modern storage technologies with strong end-to-end performance architectures, along with strong capabilities for automated prioritization of storage performance. Fujitsu, for example, offers a number of very convincing innovations. Also remember that performance discussions are also among the factors that are generating the new hype about all-flash storage systems. However, experience has shown that the latest general-purpose storage systems, fully equipped with SSDs, can often compete with specialized all-flash concepts at a lower price level. Furthermore, they offer richer management and availability functions. Also keep in mind that a performance test can save a lot of money!

When consolidating more data on one system, precautions should be taken to safeguard against complete system failures. And here's the good news: Fujitsu has introduced a new, simple-to-use and cost-efficient technology for fast failover between storage systems if one of the systems should fail. This helps users reduce the cost of business continuity significantly.

## OPTIMIZATION POTENTIAL FOR SERVER ENVIRONMENTS

In production environments with business applications, Fujitsu's PRIMERGY x86 rack systems and the new modular servers are ideal choices for robust and fast IT. In the area of business analytics, which run entirely in the main memory, scale-out architectures will add latency due to the linkage between systems. Thus, scale-up systems like Fujitsu's PRIMEQUEST, with large-scale main memory expandability, are perfect for running these applications at maximum speed.

## INTEGRATED SYSTEMS ARE ALSO BENEFICIAL FOR OPTIMIZING ROBUST IT




When it comes to robust IT, integrated systems are available from Fujitsu for a wide range of usage scenarios that will enable you to reduce project time and the risks of IT innovation.

The main drivers for transitioning to software-defined data centers are scalability needs. To fully benefit from SDDC approaches, be sure to look for optimized server storage and network architectures. The new software-defined fast IT will emerge alongside of the traditional robust IT – thus resulting in bimodal IT. But be aware that there is a lot of marketing talk about bimodal IT – so be careful about stereotyped categorizations. Classical robust IT still has a lot of advantages, even if it requires ongoing optimization.

In conclusion we can say that neither hardware nor software defines your data center – it is ultimately defined by your business!

# Business-Centric Data Center – the right solution for your business needs

On premise · Hybrid IT · In the Fujitsu cloud

Managed by yourself · Managed by Fujitsu

Robust IT · Bimodal IT · Fast IT

**Business-Centric Integrated Systems**

**Business-Centric Storage**

**Business-Centric Computing**

**Contact**
Fujitsu Technology Solutions GmbH
Mies-van-der-Rohe-Straße 8
80807 Munich