

White Paper

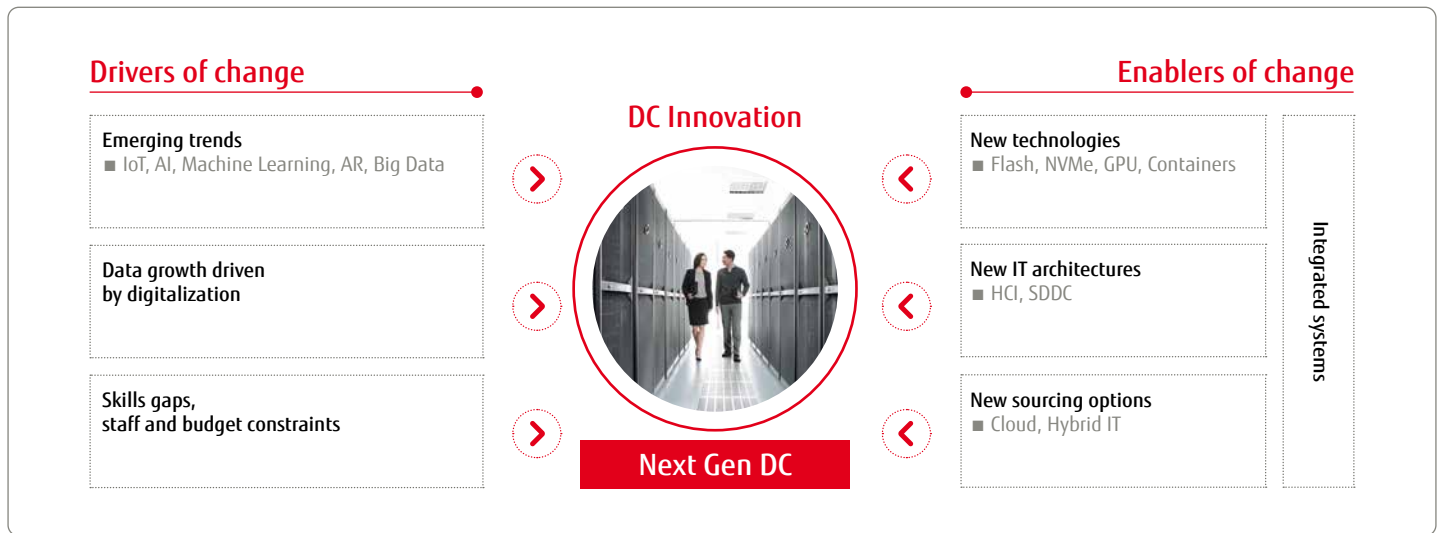
Data Center Systems for the Digital World

Enterprises are under enormous pressure to digitize business processes. Hence in the digital world all threads come together in the data center – this is where action is needed to forge a sustainable future. Fortunately there are some new developments in technology, IT architecture and sourcing that can help. This white paper provides an overview of these developments and guides you through the seemingly daunting technologies and options now available.





How to make the data center fit for the digital world



Adoption of digitalization – incorporating technologies such as IoT, artificial intelligence, machine learning, augmented reality and big data – is rapidly driving data center transformation and scalability into larger dimensions. But this comes at a time when many IT organizations are facing skills gaps plus staff and budget constraints that degrade their ability to deal with multiple change requests.

Fortunately there are several new developments that can help: new technologies at the system and component level, and innovative IT architectural models offering new potential for scalability and agility. One prime example is the Software-Defined Data Center (SDDC), which adopts end-to-end virtualization. Furthermore, IT managers make greater use of a blend of sourcing options, and this in turn requires a common management layer for emerging hybrid IT environments. In order to simplify the adoption of these new IT approaches, vendors are increasingly offering integrated systems which make it easier and faster to benefit from IT innovations.

But just like in reality, there are a lot of potentially confusing options – this applies equally to technologies, architecture and sourcing options. What’s more, future opportunities are often discussed with a focus on technology, which makes decision-making for IT strategists even more complex.

Fujitsu believes that the only purposeful approach to leverage the potential of new developments for data center innovation is to start with your specific business or organizational needs. We call this approach the Business-Centric Data Center.

Fujitsu is one of the very few vendors offering a full range of technology products, solutions and services worldwide. From our holistic perspective, we outline new developments and focus on their business impact in the chapters that follow.

<http://business-datacenter.global.fujitsu.com/>



The potential of new technologies and innovative system designs

A lot of new technologies have been made available or are on the horizon to enhance the capabilities of servers, storage and networks, not to mention the common management of all three. On the hardware level it is all about processing, storing and transporting more data to cope with the burgeoning volumes now being generated by digitalization. These technologies have features and functions that allow for higher scalability and flexible deployment of resources along with just the right quality of service. Automation is also a factor that is vital when simplifying operations. It goes without saying that Fujitsu always keeps system and solution designs up-to-date. Here is a brief overview of major developments:

Fujitsu always keeps system and solution designs up-to-date



Servers	Storage	Network	Infrastructure Management
<ul style="list-style-type: none"> Modular, scalable design Performance headroom for diverse workloads NVMe DIMM/SSD Low energy, low heat FPGA Graphics and GPU support 	<ul style="list-style-type: none"> All-Flash Scale-out storage NVMe and NVMe-oF Storage-class memory Software-defined storage Quality-of-Service Management 	<ul style="list-style-type: none"> Fabric architecture Higher bandwidth Automated QoS Traffic analytics Virtualization Software-defined network 	<ul style="list-style-type: none"> Complete abstraction Agile provisioning Automation Integration in virtualized and software-defined architectures

Business impact of new technologies and system designs

- Flexible scalability
- Agile provisioning
- Operational efficiency
- Quality-of-Service Management
- Reliable operations

Fujitsu servers embracing the latest technologies

Fujitsu has worked extremely hard in terms of building new types of highly modular servers that provide the next level of flexibility. These servers also deliver much higher performance thanks to their latest processor and memory technology. Today servers are being increasingly used for extreme number crunching in order to analyze the new data streams of the digital world, where graphical

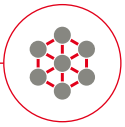
processing units (GPUs) play a big role. For flexible usage of computing power, field-programmable gate arrays (FPGAs) are becoming increasingly important for the next level of digitalization. There are also emerging technologies for tearing down the borderlines between super-fast volatile main memory and slow persistent memory, thus laying the groundwork for the next dimension of performance.

Fujitsu storage systems are pioneers in leveraging the full potential of new technologies

Fujitsu is supporting customers in the rapid transition to all-flash, delivering the performance headroom necessary for future data growth and minimizing operational costs. Other areas in which Fujitsu is pushing storage to deliver greater user benefits include automated storage operations, optimized quality of service management and high availability to further reduce the total cost of ownership.

New software-defined storage solutions reduce the cost of data storage for the fast-growing volumes of unstructured data and online archives. NVMe technology that enables storage systems to handle large data streams in parallel is in the works at Fujitsu. NVMe is the technology of choice here, eliminating the bottleneck of limited parallel data access inherent in traditional SCSI and SATA/SAS interfaces. Combining NVMe with scale-out storage architectures will make storage fit for the Internet of Things.

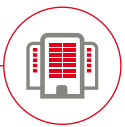




Fujitsu is integrating latest network technologies through strong partnerships

Fujitsu has developed a suite of top-of-rack switches that support flexible and efficient scale-out server infrastructures, especially in combination with new modular servers. This approach results in several improvements, including infrastructure efficiency for cloud computing, end-to-end virtualization and consolidation. Close partnerships with network technology partners complement the portfolio for building complete IT infrastructures. Storage-area networks (SANs) will continue to be the backbone of the data center network

for the next investment cycle, but they need enhancements in terms of bandwidth and management functions. To do this, Fujitsu partners with Broadcom, which recently acquired Brocade, the leading provider of SAN switches. And a lot of new use cases are based on Ethernet networks, with bandwidths of up to 100 Gbit and increasingly virtualized fabric architectures for building dynamic data centers. Fujitsu also partners with Extreme Networks, the rising star in the Ethernet camp. And it goes without saying that Fujitsu server and storage systems are fully compatible with products from all important network switch vendors, including Cisco.



Fujitsu infrastructure management paves the way for SDDC

To support the trend toward the SDDC, it is important to abstract the server, storage and network technology. Fujitsu meets this requirement with its Infrastructure Manager (ISM), which simplifies the management of all underlying hardware, provides increased agility to provision IT resources

and, by abstracting the IT infrastructure layer, enables the use of service-level-driven orchestration tools (e.g. from Microsoft, VMware or Nutanix) and hybrid cloud approaches. All resources can be controlled as one entity and integrated in hybrid IT environments thanks to the Infrastructure Manager.

Cloud/Hybrid IT Management with Enterprise Service Catalog Manager (ESCM)

Infrastructure Management with ISM

 Industry-standard x86 servers	 Mission-critical x86 servers	 Network switches from Fujitsu and partners	 All-flash/Hybrid storage	 Software-defined storage
 SPARC/UNIX servers	 BS2000 mainframes		 Backup-to-disk appliances	 Tape Libraries

Complete hybrid IT enabled portfolio from a single source

Fujitsu provides all the building blocks needed to realize innovative IT architectures which are extremely flexible and lean to manage, such as SDDC and hyper-converged infrastructures. The portfolio comprises industry-standard, yet extremely reliable mission-critical x86 servers. Fujitsu is a leading provider of SPARC UNIX servers and BS2000 mainframes for customer-developed applications. The complete storage portfolio covers all modern storage categories: flash and hybrid systems, software-defined storage, backup-to-

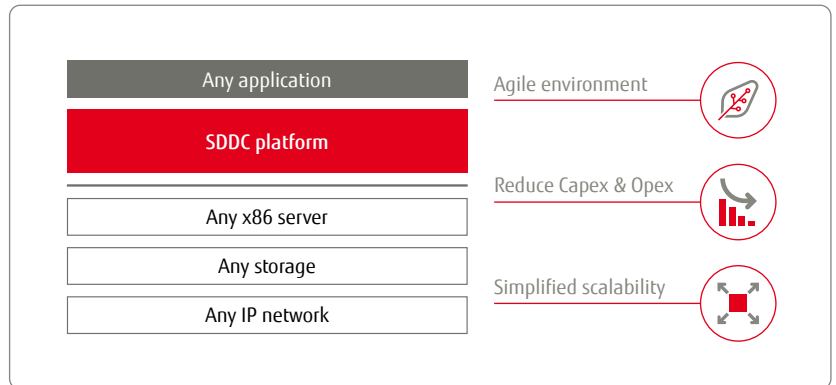
disk appliances and tape libraries. Alliances with network technology partners complement the server and storage portfolio. And with the Infrastructure Manager, all systems can be controlled as one entity and integrated in hybrid IT environments. To enable the seamless management of on-premises equipment with resources in external clouds, the Fujitsu Enterprise Service Catalog Manager (ESCM) provides a unified portal allowing IT users to access IT resources without having to know whether they are hosted in data centers – on-premise or off-premise – or in the cloud.

SDDC – a new IT architecture option

Enabling Innovation



Besides the traditional three-tier architecture, the SDDC IT architecture is growing in importance. It extends the use of virtualization from servers to the entire infrastructure. Essentially SDDC represents the complete abstraction of IT infrastructure hardware in combination with end-to-end management tools, severing the hardwired vendor-specific linkage between software and hardware environments. It creates an environment in which IT resources can be provided on demand, while reducing operational effort and costs while supporting the pooling and consolidation of IT systems to reduce investment and deliver simplified scalability.



The great advantage of SDDC is that system management is decoupled from a vendor-specific hardware, thus enabling the faster exchange of underlying hardware and faster provisioning or expansion. However, because many hardware and software products from different vendors need to be integrated, lock-in is shifted from the hardware to the software level. Furthermore, not all applications benefit from highly-virtualized environments. Ultimately the specific use case defines whether the traditional or the SDDC architecture is the best for a particular scenario. Fujitsu supports customers in deploying both approaches and believes SDDC will coexist alongside traditional architectures, thus resulting in a so-called "bimodal" IT.

IT infrastructure – scalability choices

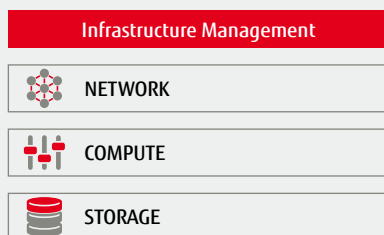
Enabling Innovation



An IT infrastructure can be implemented as a traditional or hyper-converged infrastructure, resulting in different scalability approaches. The traditional approach is based on discrete compute, storage and network entities which can be scaled independently. This concept makes sense for business applications that need independent scalability. By contrast, hyper-converged is a fast-growing new approach offering integrated scalability of building blocks containing compute, storage and network functions. This concept is particularly suited for new modular applications.

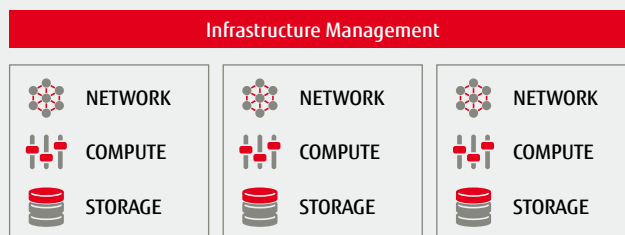
Traditional scalability approach

- Discrete compute, storage and network entities – **independent scalability**
- Ideal for classical business applications



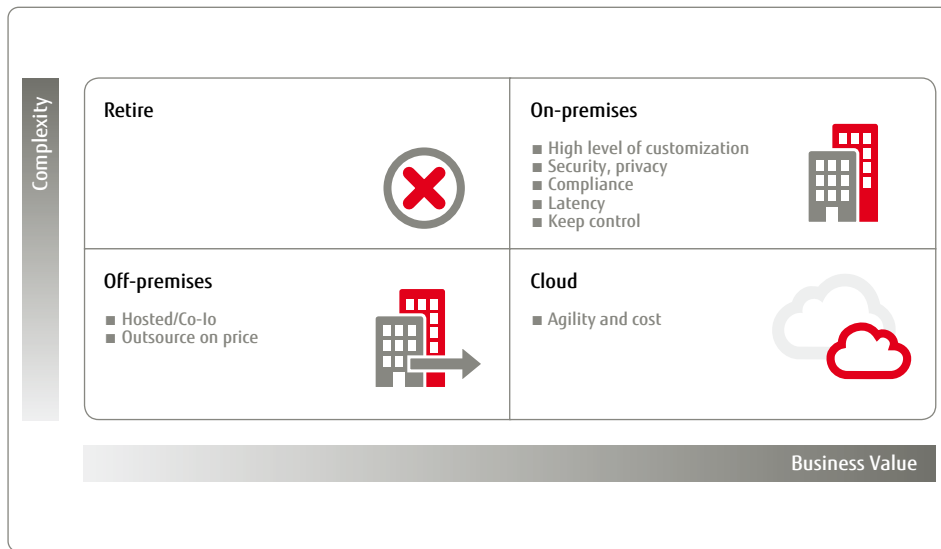
Hyper-converged scalability approach

- Software-controlled building blocks with integrated network, storage and compute functions – **integrated scalability**
- Ideal for new modular applications





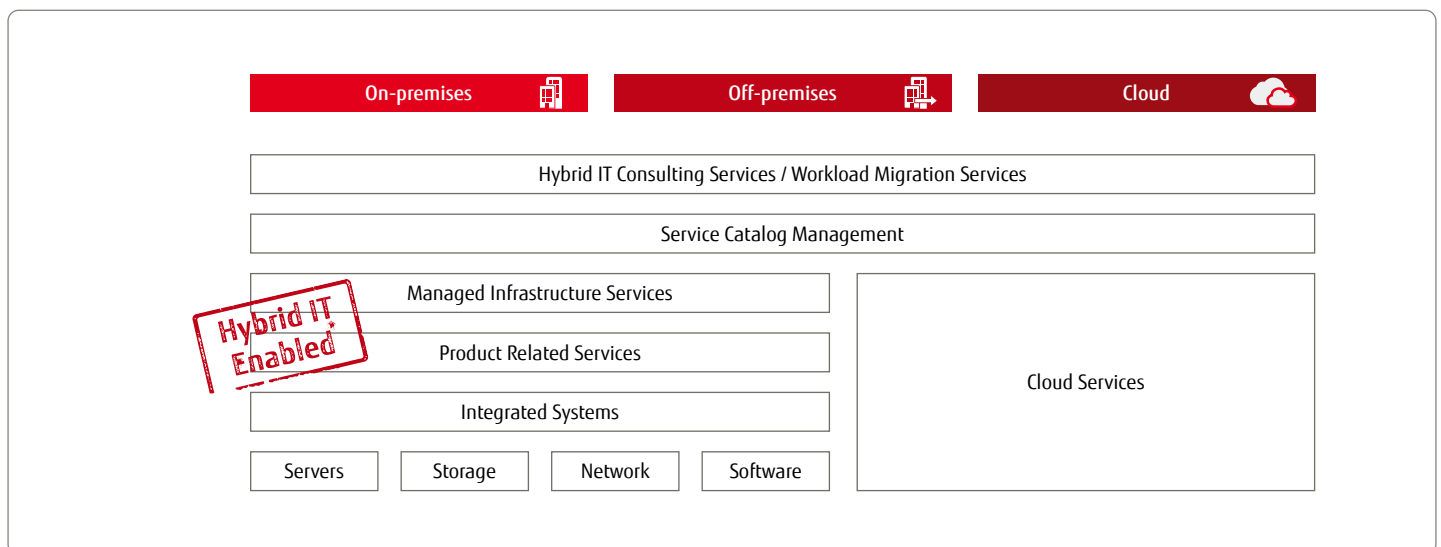
Workload should determine the sourcing model



A blend of on-premises and cloud IT will be the norm in the near future. The decision whether to operate IT on-premises or in the cloud depends on the business value of the specific IT service in question and its complexity.

- In the case of a low-complexity, high-business-value service, the cloud may be the most attractive model.
- For high-complexity, high-business-value services, on-premises IT should be preferred.
- For services with low business value and low complexity, other off-premise models like hosting or co-location may be more suitable.
- Any IT service that provides low business value, but creates intense effort due to its complexity, should be retired or replaced as soon as possible.

Fujitsu provides all sourcing options for its customers: We can deliver IT systems for on-premises usage or host IT solutions in Fujitsu data centers. And we are a cloud provider for infrastructure-as-a-service (IaaS), platform-as-a-service (PaaS) and software-as-a-service (SaaS). Comprehensive service offerings, including consulting about the right sourcing model, as well as managing IT on-premises, co-located or in hybrid environments complements the Fujitsu offering. And to enable the seamless management of on-premises solutions with resources in external clouds, the Fujitsu Enterprise Service Catalog Manager provides a unified portal where users can access IT resources without having to know where they are hosted.





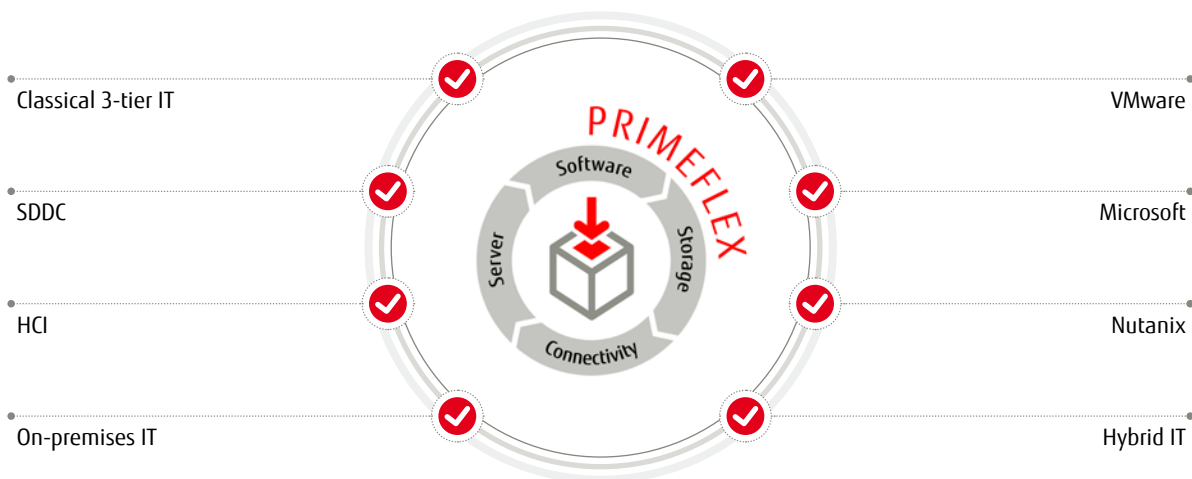
Integrated Systems: The fast track to data center innovation

When looking at all the new demands being made on data center infrastructures, and all the new options which might be instrumental in coping with them, it is obvious that only a very few IT organizations can fully rely on a do-it-yourself (DIY) approach. For example, look at the work involved in realizing an SDDC project, which is a complex, error-prone and time-consuming task that requires deep knowledge and involves many risks.

Head start through integration

Fujitsu was a pioneer with integrated systems at the turn of the millenium. Under the brand PRIMEFLEX Fujitsu is today offering a comprehensive and continually growing range of powerful integrated systems that are pre-defined, pre-integrated and pre-tested. PRIMEFLEX represents a proven approach to rapid, low-risk data center integration and has global priority.

The great advantage of integrated systems is that they provide a very fast and efficient track to data center innovation. Fujitsu can support all architectures by offering a wide variety of integrated systems: classical three-tier, new software-defined and/or hyper-converged infrastructures. Fujitsu enables on-premises IT as well as hybrid IT – and on the platform level it supports VMware, Microsoft and Nutanix. So regardless of strategic choices, integrated systems from Fujitsu can speed up innovation while reducing risk and cost.



<http://www.fujitsu.com/fts/products/computing/integrated-systems/>

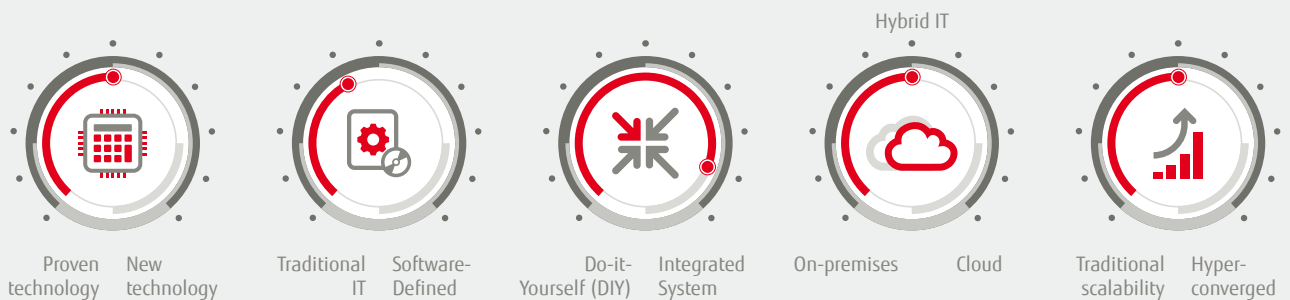


How to turn a technology-defined data center into a business-centric data center

Technology is often the predominant discussion point in data center innovation projects. However, the use of a particular technology only makes sense within the context of IT service levels for concrete business environments. In order to gain clarity about the future orientation, IT strategists should answer the following questions:

- **Where should the workload reside?** On-premises? Off-premises? In the cloud? Or a combination of these – in other words, hybrid IT?
- **Which architecture should be used?** Software-Defined Data Center (SDDC), hyper-converged or traditional architecture?
- **How do I get to the desired new state as quickly, reliably and economically as possible?** Should the infrastructure be managed in-house or by a managed services provider? Should it be built from scratch or start with an integrated system? And last but not least, which technologies make the most sense?

With Fujitsu you will find the right mix for your business



It is important to be cognizant of the fact that there is never a “one-size-fits-all” solution. The specific business scenario will define the option you should go for. And yes, making the right choice from the array of complex choices is sometimes really hard. But fortunately you can make life easier by relying on Fujitsu’s expert advice. Based on a comprehensive set of products, solutions, software and services, Fujitsu follows a co-creation process with its customers to find the right mix of IT technologies, architectures and sourcing options for the digital world. Just contact Fujitsu to realize the right approach for your business.

For more information, please visit <http://www.fujitsu.com>