FUJITSU

White Paper
Data Center Systems for the Digital World

Companies today are under enormous pressure to digitize their business processes. The data center is where everything comes together in the digital world – and it is also where the course is set for a sustainable future. To successfully meet these challenges, data center solutions must have a comprehensive design. A sophisticated mix of high-performance hardware, IT architecture concepts, innovative sourcing models and professional services are needed. This white paper provides an overview of relevant developments and technologies.

Content

How to make the data center fit for the digital world

Drivers of change

Emerging trends
- IoT, AI, Machine Learning, AR, Big Data, Robotic Process Automation (RPA)

Data growth driven by digitalization

Skills gaps, staff and budget constraints

DC Innovation

Next Gen DC

Enablers of change

New technologies
- Flash, NVMe, GPU, Containers

New IT architectures
- HCI, SDDC

New sourcing options
- Cloud, Hybrid IT

Data Center Services
- Consult, design, build, operate, automate, maintain

Integrated systems

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.

However, products and technologies are not enough. Integrated services that consistently accompany the entire life cycle of a data center are also extremely important. This approach enables companies to make better use of the many different possibilities of new concepts, technologies and solutions and benefit from their data centers' maximum value creation capability.

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
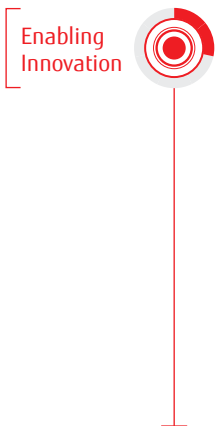
A lot of new technologies have been made available or are on the horizon to enhance the capabilities of servers, storage and networks, not to mention the common management of all three. On the hardware level it is all about processing, storing and transporting more data to cope with the bourgeoning volumes 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
■ Modular, scalable design	■ All-Flash	■ Fabric architecture	■ Complete abstraction
■ Performance headroom for diverse workloads	■ Scale-out storage	■ Higher bandwidth	■ Agile provisioning
■ NVMe DIMM/SSD	■ NVMe and NVMe-oF	■ Automated QoS	■ Automation
■ Low energy, low heat	■ Storage-class memory	■ Traffic analytics	■ Integration in virtualized and software-defined architectures
■ FPGA	■ Software-defined storage	■ Virtualization	
■ Graphics and GPU support	■ Quality-of-Service Management	■ Software-defined network	

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.
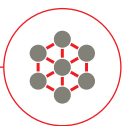
Fujitsu is integrating latest network technologies through strong partnerships

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.
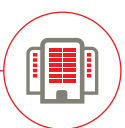
Fujitsu infrastructure management paves the way for SDDC

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

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.

Any application
SDDC platform

Any x86 server
Any storage
Any IP network

Agile environment

Reduce Capex & Opex

Simplified scalability
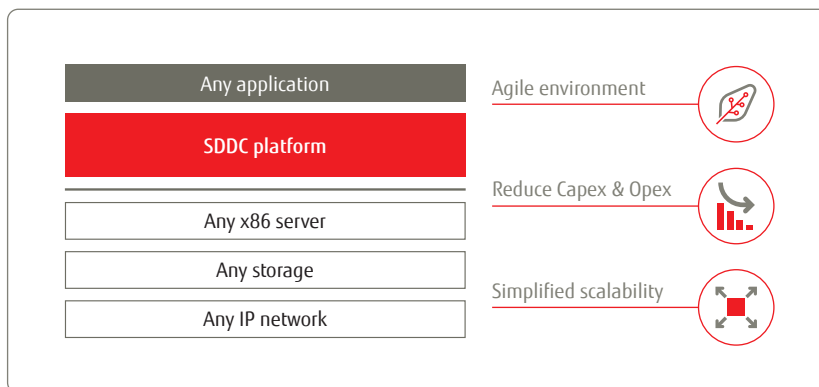
The great advantage of SDDC is that system management is decoupled from a vendor-specific hardware, thus enabling the faster exchange of underlying hardware and faster provisioning or expansion. However, because many hardware and software products from different vendors need to be integrated, lock-in 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

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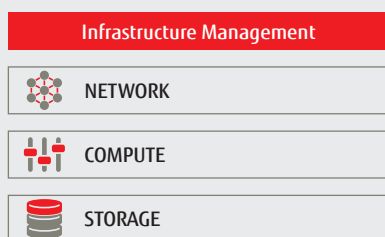
Hyper-converged scalability approach
- Software-controlled building blocks with integrated network, storage and compute functions – **integrated scalability**
- Ideal for new modular applications

Infrastructure Management

	NETWORK
	COMPUTE
	STORAGE

Infrastructure Management		

	NETWORK		NETWORK		NETWORK
	COMPUTE		COMPUTE		COMPUTE
	STORAGE		STORAGE		STORAGE

Enabling Innovation
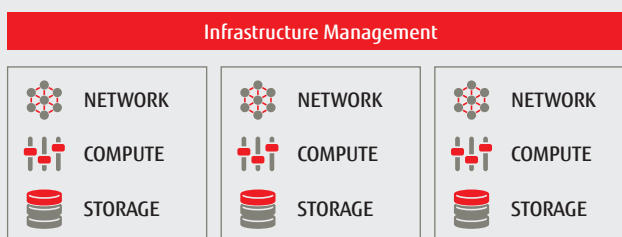
Workload should determine the sourcing model

Complexity		
Retire	**On-premises** ■ High level of customization ■ Security, privacy ■ Compliance ■ Latency ■ Keep control	
Off-premises ■ Hosted/Co-lo ■ Outsource on price	**Cloud** ■ Agility and cost	
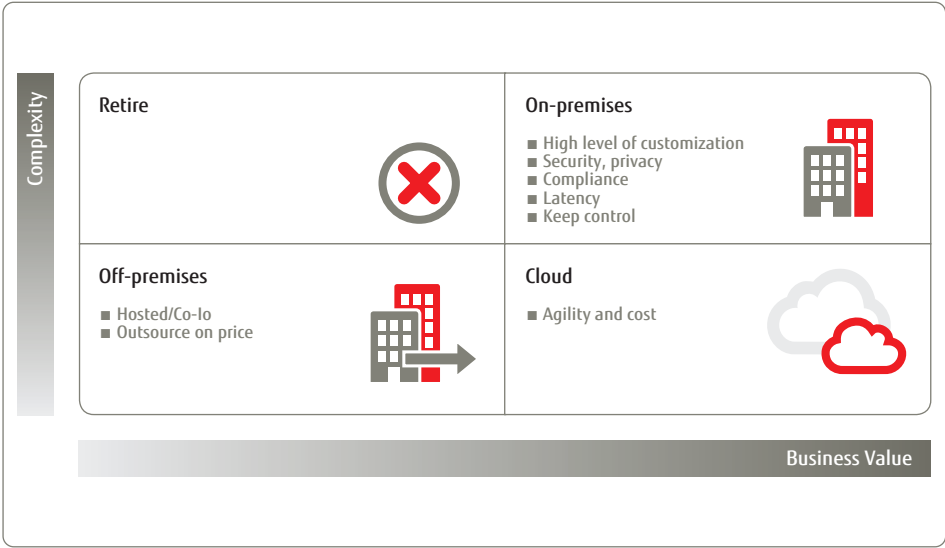
Business Value

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.

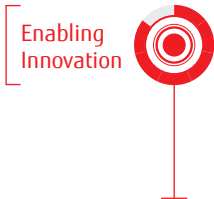■ For services with low business value and low complexity, other off-premise models like hosting or co-location may be more suitable.

■ 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.

On-premises	Off-premises	Cloud

Hybrid IT Consulting Services / Workload Migration Services

Service Catalog Management

Hybrid IT Enabled

Managed Infrastructure Services	Cloud Services
Product Related Services	
Integrated Systems	

Servers	Storage	Network	Software
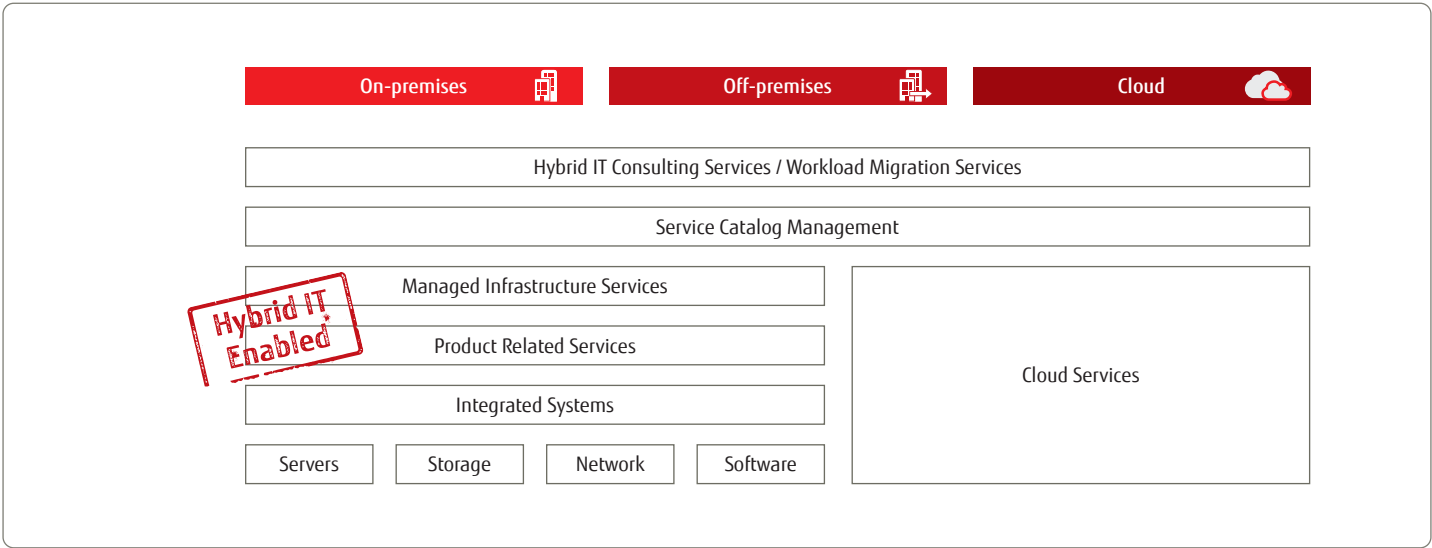
Integrated Systems:
The fast track to data center innovation

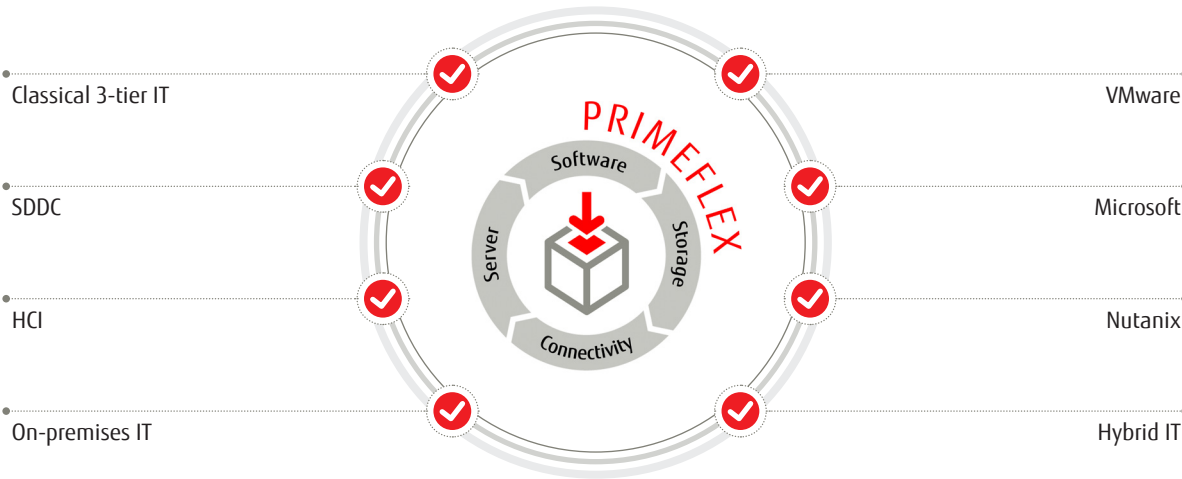When looking at all the new demands being made on data center infrastructures, and all the new options which might be instrumental in coping with them, it is obvious that only a very few IT organizations can fully rely on a do-it-yourself (DIY) approach. For example, look at the work involved in realizing 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

D.I.Y
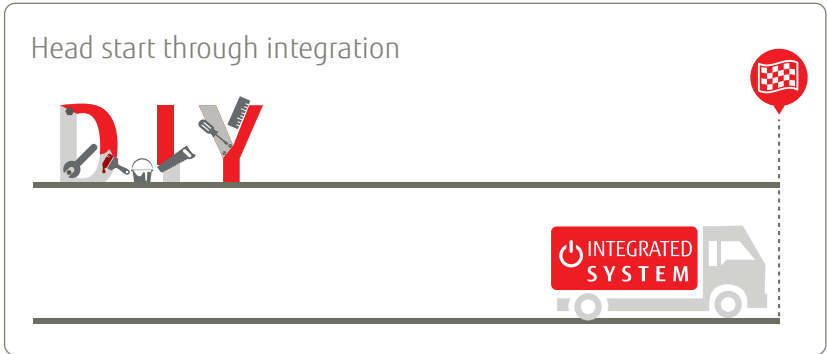
INTEGRATED
S Y S T E M

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.

Classical 3-tier IT

SDDC

HCI

On-premises IT

PRIMEFLEX

Software
Server
Storage
Connectivity

VMware

Microsoft

Nutanix

Hybrid IT

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

Enabling Innovation

A comprehensive service approach for your data center

To accompany you successfully on your way to the digital transformation, Fujitsu offers high-performance infrastructure components and integrated systems as well as the right services for your data center. With our data center services, you benefit from a comprehensive service portfolio.

Hybrid IT for the data center of the future

We have the expertise needed to provide you with professional consulting services, to design and build suitable data center solutions as well as to operate and maintain your entire infrastructure. Together with our cloud services, the data center services form the basis for our hybrid IT strategy, which combines traditional data centers with the infrastructures of the future.

Whether you want to continue operating your own data center infrastructure or outsource this service to a co-location partner, we help you do this with a professional and consistent service package. Your data is therefore always in a safe place, and you remain up to date on legal regulations. Our data center services help you make your data center ready for digitalization.

The entire value chain from a single source

Fujitsu has experienced experts in all data center disciplines. You therefore receive all services you need from a single source – from efficiency analysis to planning, design and building construction, including reliable operation with 24x7 support and managed maintenance. Our service package includes not only classic IT components, such as servers, storage systems, software and network technologies, but also the facility infrastructures.

Your benefits at a glance:

- Comprehensive data center services portfolio from a single source
- Support throughout your data center's entire life cycle
- Consistent hybrid IT strategy, including cloud services
- Stable and reliable IT base for your data
- Covers all compliance requirements
- Your data center will be ready for the digital future

The five pillars of Fujitsu Data Center Services

Consult	Design	Build	Operate	Maintain
■ Process optimization	■ Planning and conception	■ Construction	■ Stable and fail-safe operation	■ Professional technical support
■ Efficiency improvement	■ Modernization	■ Property monitoring	■ 24x7 support	■ Managed Maintenance for Server, Storage and Software
■ Facility services	■ Facility services	■ Inclusion of engineers and experts	■ Compliant	■ Standardized SLAs for IT and facility infrastructure
■ Risk assessment	■ Integration of existing and new components	■ Optimization of power supply and cooling	■ On site or remote	■ Flexible contract design
■ Strategy consulting	■ Testing	■ Implementation of security strategies		

Automation with AI is the trump card
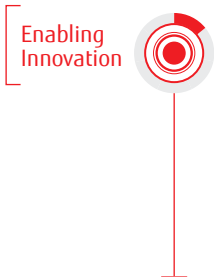
Bring more efficiency, agility, flexibility and speed to your data center! For this purpose, we offer a range of standardized, easily expandable and comprehensible management and automation solutions as part of our service portfolio.

These include modern technologies and automation solutions based on artificial intelligence (AI), known as Artificial Intelligence for IT Operations (AIOps), which can be effectively combined. This approach gives you many benefits:
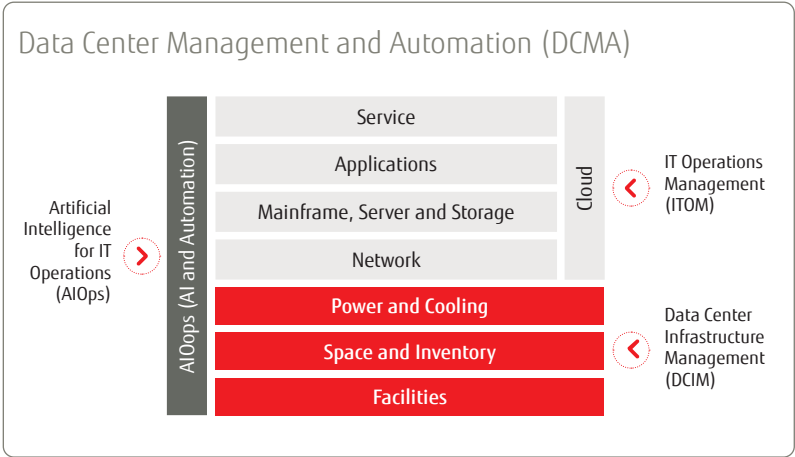
- You significantly reduce the cost, complexity and risk of your data center processes.
- You use artificial intelligence to identify looming problems before they occur.
- You ensure smooth and reliable IT operation at all times.
- You establish service quality management that optimally supports your business processes.
- You reliably ensure compliance and governance.

Data Center Management and Automation (DCMA)

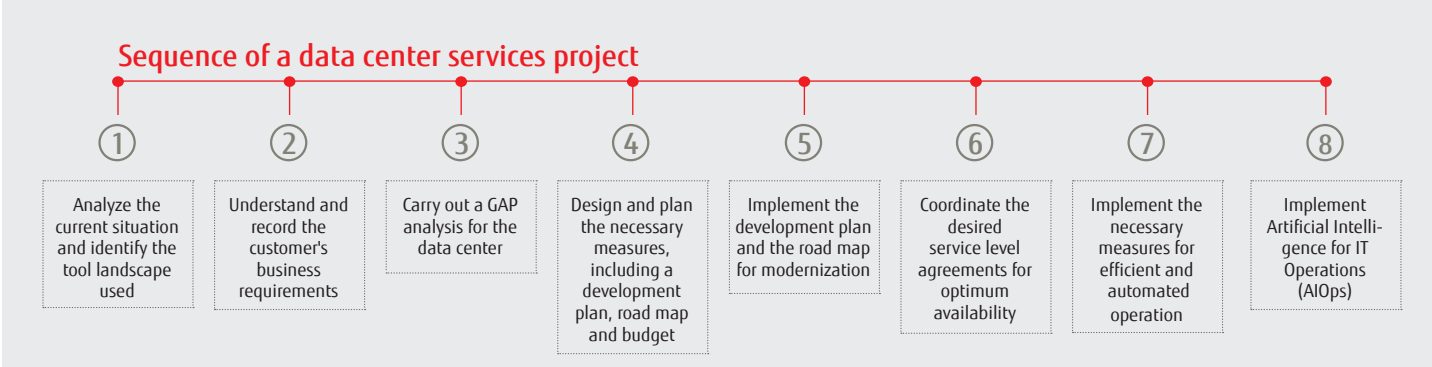| Artificial Intelligence for IT Operations (AIOps) | AIOps (AI and Automation) | Service | Cloud | IT Operations Management (ITOM) |
		Applications		
		Mainframe, Server and Storage		
		Network		
		Power and Cooling		Data Center Infrastructure Management (DCIM)
		Space and Inventory		
		Facilities		

Our smart services help you take a crucial step forward toward automating and digitally transforming your data center into a self-driving data center. As a result, you raise your IT operations to a new level of efficiency, security, flexibility and reliability.

More efficiency through qualified consulting

Professional consulting is essential to powerful and future-proof data centers that meet the requirements of digitalization. Our data center consultants take a conceptional approach and work closely with you to draft a promising road map. Based on an analysis of existing infrastructures, they develop new technically sound strategies, evaluate the location, weigh the risks and prepare specifications for design, planning and implementation. Our experts also prepare and implement certifications.

Sequence of a data center services project

①	②	③	④	⑤	⑥	⑦	⑧
Analyze the current situation and identify the tool landscape used	Understand and record the customer's business requirements	Carry out a GAP analysis for the data center	Design and plan the necessary measures, including a development plan, road map and budget	Implement the development plan and the road map for modernization	Coordinate the desired service level agreements for optimum availability	Implement the necessary measures for efficient and automated operation	Implement Artificial Intelligence for IT Operations (AIOps)

Secure IT environment through risk assessment

As part of our facility services, we check energy efficiency and develop modernization and consolidation proposals for existing data centers. We prepare the groundwork and potential for optimization by realistically assessing risks such as fire, climate influences, power and cooling supply as well as security equipment. As a result, you benefit from a secure and stable environment for operating your systems.

A future-oriented design for your data center

In planning and designing data centers, the experts performing the work must meet particularly strict requirements in terms of their knowledge and skills. Fujitsu collaborates with highly qualified engineers, who have many years of experience in successfully implementing projects for renovating data centers or building new ones. The goal is to design the infrastructure in such a way that maximum benefit can be derived from the interplay between existing systems and the integration of new facility components.

Planning and Conception

- ❯ Planning new Data Centers
- ❯ Modernization of Data Centers
- ❯ Advice for building owners
- ❯ Quality Assurance
- ❯ Qualified Acceptance
- ❯ Data Center start up tests

You benefit from
- much greater availability and reliability of all facility components
- more efficient supply systems
- optimized power consumption
- resource-conserving, sustainable operation and low CO_2 emissions
- an audit- and certification-compliant data center (EN50600, TÜV, BSI KRITIS)
- future-proof investments in cutting-edge data center technologies

Enabling Innovation

Combined practical knowledge for building your data center

Fujitsu not only handles the planning and design of your data center but also the practical implementation, building construction and property management activities. Our team of experts assists you in constructing new buildings as well as in modernizing and upgrading existing capacities. All renovation measures can be carried out without impairing ongoing operations. We also offer professional solutions for securely housing your IT infrastructure, including a modular, flexible and individually scalable server room.

Data Center Build

- ❯ Retrofit/expansion during operation
- ❯ New construction incl. housing
- ❯ Fujitsu Rack Data Center
- ❯ Fujitsu Modular Data Center
- ❯ Fujitsu Scalable Data Center Cell

- ❯ Electrical power technology
- ❯ Cooling technology
- ❯ Security technology
- ❯ Racks with housing
- ❯ Cabling

Turnkey data center for efficient operation from the very beginning

We also provide the entire peripheral equipment. For this purpose, we supply integrated solutions for uninterruptible power supply, infrastructure for cooling and air conditioning, security technologies, racks and cabling. You receive a turnkey data center that ensures efficient operation from day one, regardless of the structural conditions.
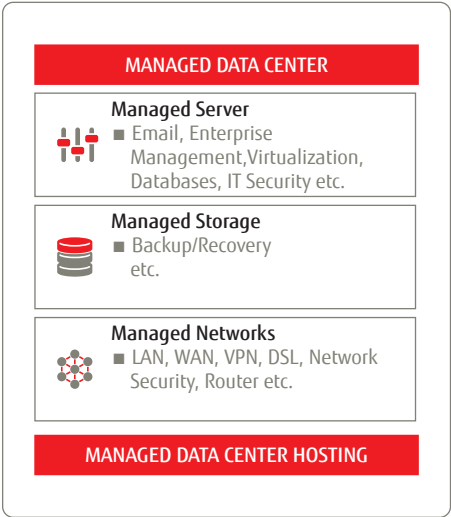
Services and Anything as a Service (XaaS) for optimized operation

Enabling Innovation

Fujitsu helps you ensure your company's business continuity, taking into account all legal requirements and security aspects – remotely or on site. You benefit from 24x7 support with rapid response times. Not only do we offer managed data center services for your own data center infrastructure, but you also have the option of outsourcing your DC infrastructure to our state-of-the-art data centers in Frankfurt am Main and having us operate them there. We also offer managed data center services for server, storage and network components of different manufacturers.

Managed data center hosting services for hybrid IT strategies and XaaS solutions

With our managed data center hosting services, we also provide a robust and flexible platform for implementing hybrid IT strategies. This enables you to optimally combine physical IT resources and cloud solutions with each other and move workloads individually. In the future, we will also offer these services via our service hub as a fully integrated XaaS solution. You thus lower your costs and maximize the performance of your systems at the same time. Fujitsu contributes its entire experience in operating more than 140 data centers worldwide.
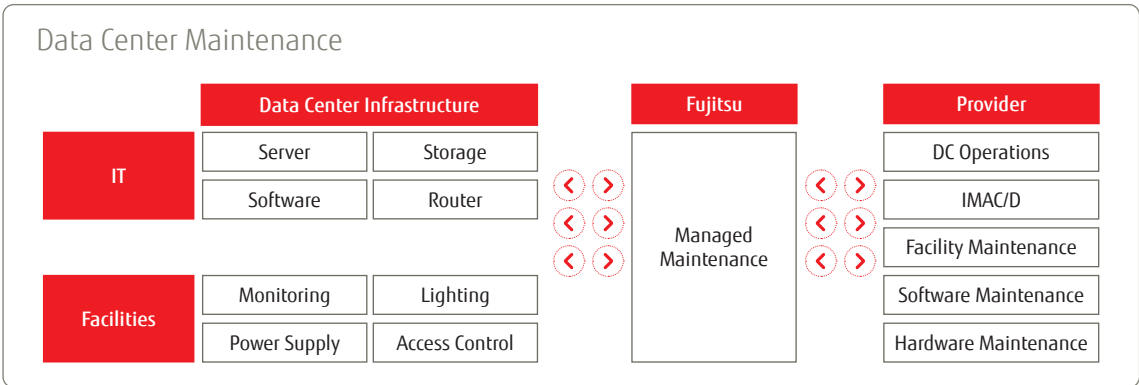
MANAGED DATA CENTER

Managed Server
■ Email, Enterprise Management,Virtualization, Databases, IT Security etc.

Managed Storage
■ Backup/Recovery etc.

Managed Networks
■ LAN, WAN, VPN, DSL, Network Security, Router etc.

MANAGED DATA CENTER HOSTING

Gaining full control over technology

Enabling Innovation

Continuously stable and fault-free operation of your data center requires ongoing maintenance and upkeep. To do this, our technical experts always keep an eye on your entire infrastructure: the classic IT systems as well as the facility components. With our managed maintenance concept, you benefit from a comprehensive full-service package from a single source. It includes numerous modular services that completely cover all challenges in your data center.

A standard and flexible contract concept

We handle the maintenance of your server, storage, software and network systems as well as monitoring, access control, lighting and power supply. The special feature: Fujitsu combines all individual IT maintenance service agreements into a standard and flexible contract concept.

Data Center Maintenance

	Data Center Infrastructure			Fujitsu		Provider
IT	Server	Storage				DC Operations
	Software	Router		Managed Maintenance		IMAC/D
						Facility Maintenance
Facilities	Monitoring	Lighting				Software Maintenance
	Power Supply	Access Control				Hardware Maintenance

With our managed maintenance services, you benefit from:

■ one agreement for your entire infrastructure
■ a single point of contact
■ standardized service level agreements
■ a consistent interface

We take complete responsibility for service activities, so that you can focus your full attention on managing your data center.
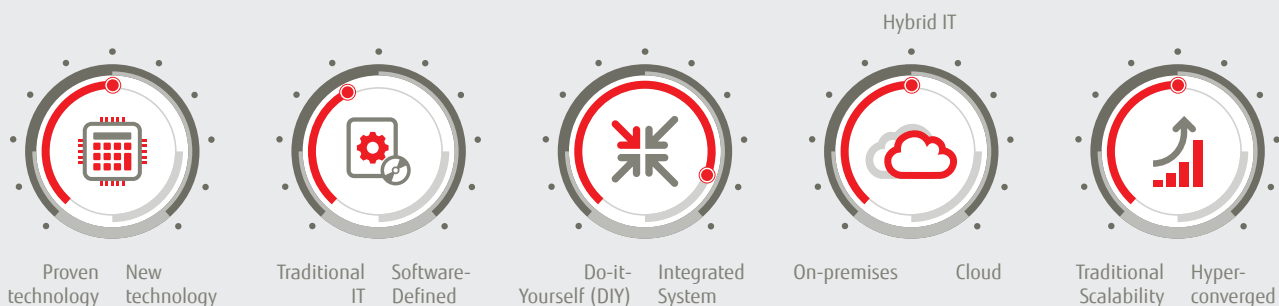
Enabling
Innovation

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?
- **What services do you need to derive maximum benefit from data center infrastructure?** To what extent can your company profit from a complete range of services made up of consulting, design, construction, operation and maintenance? What specific added value can be achieved with optimization?

With Fujitsu you will find the right mix for your business

Hybrid IT

| Proven technology | New technology | Traditional IT | Software-Defined | Do-it-Yourself (DIY) | Integrated System | On-premises | Cloud | Traditional Scalability | Hyper-converged |

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

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