

# Media Backgrounder

## Data Center Infrastructure: The Business-Centric Data Center

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The argument is over. Digital vision and strategy are now paramount in business, and those who haven't or don't intend to pursue this path are tomorrow's business school case studies of missed opportunities. Even organizations that implement their strategy too slowly, or on infrastructure that fails to deliver, are in serious trouble. If there is a single place where this all comes together it is in the data center – where all the technological elements needed to deliver a digital vision reside.

Adoption of digitalization – incorporating technologies such as IoT, Artificial Intelligence, machine learning, augmented reality and big data - is driving ever-larger dimensions of data center transformation and of scalability. But this comes at a time when many IT organizations are facing skills gaps and staff and budget constraints that degrade their ability to deal with multiple change requests. The pressure is therefore on to find new data center architectures that deliver more with less.

### Help is coming

If the challenge sounds daunting, fortunately there are several new developments that can help. There are new technologies at the system and component level, such as all-flash storage, new flash implementations such as NVMe (Non-Volatile Memory Express – a communications protocol for SSDs), graphical processing units which can be used for large-scale data analytics and lean virtualization technologies like containers. In addition, there are innovative IT architectural models offering new potential for scalability and agility, with the highlight example being the Software Defined Data Center (SDDC), which adopts end-to-end virtualization. The most rapidly expanding form of SDDC is the hyper-converged infrastructure, which is currently growing by about 70% per year.

When it comes to overcoming budget and skills constraints, IT managers are increasingly turning to automation and to Hybrid IT - a blend of on-premises and cloud IT under a common management layer. And in order to simplify the adoption of all these new IT approaches, vendors are increasingly offering pre-integrated solutions, called integrated systems, which make it easier to benefit from IT innovations faster. The end result of all these developments is higher scalability, greater IT efficiency, more agile deployment and a better quality of service.

### Towards the Business Centric Data Center

Given the stakes involved with digitalization, and the technological challenge of meeting the demand for scale and efficiency, it's not surprising that data centers are in massive transition. There are three questions dominant in the minds of IT strategists:

- Where should the workload reside? On-premises? Off-premises? In the cloud? Or a mixture of these – in what we call Hybrid IT?
- What architecture to use? There are a lot of potentially confusing options and labels that have to be considered by IT strategists today – Fast IT, the Third Platform, the Software-Defined Data Center (SDDC), hyper-converged or classical architectures, OpenStack, bi-modal – to name a few.
- How do I get to the desired new state as quickly, reliably and economically as possible? Should the system be managed in-house or by a managed services provider (MSP)? Should it be built from scratch or using an integrated system with compute, software and networking components pre-integrated?

When these questions are discussed, specific technological solutions are often proposed, almost as articles of faith. Fujitsu believes that the right solution depends on the use case – in other words your specific business or organizational needs. We call this approach “the Business-Centric Data Center”.

## 1. Data Center workload placement

The view that there is a straight choice between either on-premises or cloud-based infrastructure is false. As flexible scalability is key for the business-centric data center, it will simply not be economical to run all IT services on-premises. Furthermore, a lot of IT applications and services will be provided only as external cloud services. The implication is that a blend of on-premises and cloud IT will become the norm. According to analysts, off-premise and cloud IT will replace two thirds of on-premises IT over time, leading to a hybrid model, and Fujitsu believes that 95 percent of data centers will be operating this way as soon as 2021.

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-premises 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: it can deliver IT equipment for on-premises usage, host IT equipment in Fujitsu data centers and it is a cloud provider for infrastructure- and platform-as-a-service. It also offers comprehensive service offerings, including consulting about the right sourcing model, as well as managing IT on-premises, co-located or in hybrid environments. And to enable the seamless management of on premise equipment with resources in external clouds, the Fujitsu Service Catalog Manager provides a unified portal where IT users can access IT resources without having to know where they are hosted.

## 2. Architecture choices

In the search for data center functional flexibility, scalability and reliability, the classical three-tier architecture of Robust IT, based on server, network and storage, is being superseded by the Software-Defined Data Center (SDDC), which is often, although not always, based on a hyper-converged architecture.

There are, in fact, two possible architectures for SDDCs: functional, which has discrete, software-defined compute, storage and network entities and is ideal for general purpose infrastructures; and hyper-converged, which mixes software-controlled building blocks with integrated network, storage and compute functions and is ideal for many, but not all, use cases.

Essentially SDDC means 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 is possible to provide IT resources on demand, while reducing operational effort and costs and allows pooling and consolidation of IT equipment to reduce investment and deliver simplified scalability.

The great advantage of an SDDC is that system management is decoupled from vendor-specific hardware, allowing faster renewal or updating 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 and scale-out environments.

On the other hand, in classical IT system management and the hardware platform typically come fully-integrated from one vendor reducing integration, troubleshooting and life-cycle management. The downside of this approach is that it increases the complexity of achieving complete IT-infrastructure virtualization and abstraction in a multivendor environment.

At the end of the day the concrete use case defines which model is the best for any particular scenario. Fujitsu is supporting customers to deploy both approaches and believes SDDC will coexist alongside traditional architectures, resulting in a so-called "bi-model" IT infrastructure. Hyper-converged architectures reduce IT costs by requiring fewer components, less space, energy and cooling, and, through simpler administration, less-qualified and therefore lower-cost staff. It is easy to scale, and easier, faster and more secure to configure than the three-tier model. These benefits go a long way to explaining the rapid growth in hyper-converged data center investment, which analyst firm Gartner put at 48% compound annual growth rate between 2016 and 2021.

Both models – functional and hyper-converged – can coexist in a "bi-modal" approach, and this has become a buzzword in infrastructure discussions, with a danger that stereotypes are emerging about which technology is for which "mode". Dr. Joseph Reger, Fujitsu Fellow and Chief Technology Officer, Fujitsu EMEA, advises against this trend: "Bi-modal does not need two infrastructures. In most cases it is best served by a single infrastructure that behaves as expected by the various upper layers. That's what software defined has been invented for."

From this array of complex choices, Fujitsu advocates an ideal IT architecture for the Digital World that comprises several core building blocks. On the platform level, it is powered by an array of virtualized modular servers featuring hypervisor technology or concepts such as containers. It may have a software-defined and hyper-scale storage platform that is connected to the servers through a fully-meshed fabric network. An

essential element for operations is an orchestration platform for provisioning and managing the server, storage and networking resources. Ideally it should also control cloud resources to enable hybrid IT operations. Prominent examples are orchestration products like VMware vRealize Suite or Microsoft System Center. The open source rising star, OpenStack, also delivers comprehensive orchestration capabilities. To integrate these platforms with underlying hardware, an intermediate infrastructure management layer – a single interface for all resources involved – is highly recommended and to meet this requirement Fujitsu has introduced the Fujitsu Software ServerView Infrastructure Manager, 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 and hybrid cloud approaches. With ServerView Infrastructure Manager the whole edifice can be controlled as one entity and integrated into hybrid IT environments.

### **3. How to get there – Integrated Systems: the fast track to the SDDC**

Building an SDDC is complex, error-prone and time-consuming. The traditional approach of putting together best-in-class components is complicated and cumbersome; it requires a deep knowledge of all components involved and an understanding of their various dependencies on each other; the integration phase, including sizing, can be very demanding; the whole edifice needs to be tested until it is fully-functional and, in the worst case, the whole project might need to be re-started, writing-off already purchased components. It is a high-risk approach.

Fujitsu recognized these constraints some time ago and developed the line-up of PRIMEFLEX Integrated Systems, a comprehensive and continually-growing choice of powerful systems that are pre-defined, pre-integrated and pre-tested. Coming as all-in-one packages, for which the necessary integration groundwork has already been conducted by Fujitsu, and combining servers, storage, network connectivity and software, PRIMEFLEX dramatically simplifies complexity, lowers project risks, and increases operational efficiency.

The first integrated systems from Fujitsu actually shipped back in 2002 under the FlexFrame brand and this now-proven approach to rapid, low-risk data center integration is a global priority. The Fujitsu Integrated System PRIMEFLEX is based on best-in-class components from Fujitsu and leading alliance partners, and incorporates best practices proven in many customer projects and in Fujitsu's public cloud operation. It also includes factory-installed, ready-to-run systems and reference architectures, which can be easily adjusted to customers' specific requirements. Additional peace of mind comes from Fujitsu's deployment and integration services, which ensure a smooth integration into any on-site environment. For simplified operation and maintenance of PRIMEFLEX solutions, Fujitsu provides support at solution level, plus further turnkey data center services including managed services and hosting.

By offering a wide variety of integrated systems Fujitsu can support all architectures: classical three-tier, new software defined and/or hyper converged infrastructures. It allows on-premises IT as well as hybrid IT and on the platform level it supports VMware, Microsoft and OpenStack. So regardless of strategic choices, integrated systems from Fujitsu can speed up innovation whilst reducing risk and cost.

#### **The PRIMEFLEX family**

Fujitsu's vision for its PRIMEFLEX Integrated Systems is to enable IT organizations to be more responsive and agile in meeting the needs of their end-users, through providing new levels of simplicity in the data center around five key areas: virtualization, private cloud, big data, High Performance Computing (HPC), and SAP.

This means that, unlike with other vendors, Fujitsu offers a wide range of options in architecture (converged or hyper-converged), virtualization technology (VMware, Microsoft or other), cloud platforms (VMware or OpenStack), delivery models (ready-to-run, reference architectures or a combination of both), storage systems (Fujitsu or NetApp), or service options throughout all phases of the integrated system's lifecycle.

#### **Server options from Fujitsu**

With a heritage in server solutions extending back decades, Fujitsu has a deep understanding of server technology that provides innovation and reliability. With any Fujitsu server platform, the highest hardware availability is paramount, and currently stands at 99.997 percent availability across current systems.

When it comes to servers, one size does not fit all. Fujitsu delivers a comprehensive and complete portfolio based on the newest technologies, allowing customers to build next generation, dynamic data centers. The portfolio comprises industry-standard, extremely reliable and mission critical x86 servers and for customer-developed applications Fujitsu is a leading provider of SPARC UNIX servers and BS2000 mainframes.

A particular new area of server usage is extreme number-crunching to analyze the vast data streams in the digital world. Graphical processing units (GPU) play a big role here, and for flexible usage of compute power field-programmable-gate-arrays (FPGA) are gaining importance. There are also emerging technologies that will tear down the walls between superfast volatile main memory and slow persistent memory, delivering the foundations for the next leap forward in performance. Fujitsu has either already included these new technologies in its server design or they are on the roadmap.

### **FUJITSU Server PRIMERGY**

Fujitsu Integrated System PRIMEFLEX (see above) is predominantly based on PRIMERGY servers, which offer an unmatched combination of performance and energy efficiency. Fujitsu PRIMERGY servers hold the world record for the most powerful platform for virtualization and have improved energy efficiency by a factor of 30 since the start of power and performance characteristic measurements in 2007. As a consequence, PRIMERGY products have consistently held world records in server energy efficiency since 2010.

PRIMERGY servers are available in cloud, rack, blade and tower configurations to deliver solutions for central and remote IT in a cost-efficient manner. The Fujitsu Server PRIMERGY CX system is optimized for office environments and small to medium businesses and provides value for new software-defined and hyper-converged infrastructures. Fujitsu's PRIMERGY TX servers are best-of-breed in the server landscape.

### **FUJITSU Server PRIMEQUEST**

Fujitsu Server PRIMEQUEST builds a bridge between fast and robust IT and has been designed to provide an ideal combination of the advantages of mainframe and x86 architectures in one system. By uniting x86 industry standards with mission-critical features, Fujitsu Server PRIMEQUEST delivers availability levels similar to those of UNIX systems – but with the cost advantages and extreme scalability of main memory, processors and I/O connection of an x86-based architecture for resource-intensive applications. This avoids the need for adding additional software layers or re-programming applications to deliver highly robust service levels and makes PRIMEQUEST highly cost-effective for business-analytics and in-memory applications.

### **Fujitsu SPARC M12**

Fujitsu M12 servers are flexible and scalable systems based on the latest SPARC64 XII ("twelve") processor, which features the world's most powerful processor core, delivering high performance and high availability for mission-critical enterprise workloads and cloud computing. Fujitsu SPARC M12-2 is the ideal server for traditional enterprise-class workloads such as large-scale online transaction processing (OLTP), business intelligence and data warehousing (BI), enterprise resource planning (ERP), customer relationship management (CRM), as well as new environments in cloud computing and big data processing.

### **Storage options from Fujitsu**

Fujitsu delivers a complete portfolio of all modern storage categories including all-flash, hybrid systems, software defined storage, backup-to-disk appliances and tape libraries. It is supporting customers in the rapid transition to all-flash, delivering the performance headroom necessary for future data growth. Besides increasing performance, all-flash technology is a powerful ally in minimizing operational costs, as all-flash systems require less space, reduce power consumption, and demand far less administrative attention. As SSDs are much more reliable than disks, access levels to business data can be increased.

Other areas in which Fujitsu is pushing storage to deliver greater user benefits include automated storage operations, covering 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 volume of unstructured data and online archives and, looking further ahead, it is enabling storage systems to handle larger data streams in parallel and to support new applications alongside traditional ones. NVMe is the technology of choice here, removing 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's ETERNUS storage portfolio has been created according to Fujitsu's "Business-centric Storage" concept, which aligns storage resources with business priorities whilst reducing costs, by providing automated quality of service functions.

The portfolio balances storage capacity, performance and costs for the complete lifecycle of data - from production, business analytics and big data, to backup and long-term archiving, and comprises:

- All-flash systems
- Hybrid disk and flash storage arrays
- Hyper-scale and software-defined storage
- Backup appliances
- Tape libraries

With this range of storage options, Fujitsu helps businesses of varying scale and with wide-ranging needs. For example, customers, including SMBs, use Fujitsu ETERNUS products to manage their daily business by removing storage complexity and offering affordable, easy-to-use solutions combined with the right service. ETERNUS DX storage systems deliver better business support at lower costs enabling these organizations to invest in additional business applications and prepare for future trends that can help them to compete. And ETERNUS AF storage solutions bring the performance, footprint and ecological benefits of All Flash memory to enterprise computing. Flash is fast – with around 500 times better response times than disks. Enterprise Flash is by factors more reliable than HDDs and is becoming increasingly

attractive – with prices in freefall, budget constraints needn't stand in the way. And flash storage is a space-efficient, eco-friendlier technology, providing higher density and consuming dramatically less energy for power and cooling than traditional drives.

At the extreme end of the scale Fujitsu's ETERNUS CD10000 S2 is a hyper-scale, software-defined storage system designed to manage vast amounts of data. A configuration can start small and grow in line with the business. The architecture allows individual storage nodes to be added, exchanged and upgraded without downtime.

And for needs such as data compliance, the Fujitsu ETERNUS CS data protection appliances deliver a unified platform for backup and archiving for radical simplification and consolidation of data protection environments. The ETERNUS CS minimizes backup times and fulfills all recovery time objectives for each business-critical environment. This enables the consolidation of storage devices for data protection thus simplifying administration, saving energy and lowering the total cost of storage, while making efficient use of the most cost-effective technologies.

For long-term and cost-efficient archiving ETERNUS LT tape libraries are the ideal storage platform. Tape is currently experiencing a revival as a last line of defense against cybercrimes like ransomware. By simply taking tape cartridges offline the data copies are safe from digital intruders.

### Networking options from Fujitsu

New network technologies are pivotal for managing the future demands of data centers. Fujitsu has developed a suite of top-of-rack switches, which enable flexible and efficient scale-out server infrastructures, especially in combination with new modular servers. This approach allows several improvements, including infrastructure efficiency for cloud computing, end-to-end virtualization and consolidation.

Fujitsu has tight partnerships with network technology partners to complement the server and storage portfolio to build 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 will need enhancing in terms of bandwidth and management functions. In this area 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 bandwidth up to hundred Gigabit and increasingly-virtualized fabric architectures to build dynamic data centers. Here Fujitsu has built a strong partnership with Extreme Networks, the rising star in the Ethernet camp, and ensures that its server and storage systems are fully compatible with all important network switch vendors, such as Cisco.

### Online resources

- Fujitsu PRIMEFLEX Integrated Systems: <http://www.fujitsu.com/fts/products/computing/integrated-systems/>
- PRIMEFLEX in Gartner Magic Quadrant: <http://www.fujitsu.com/uk/news/pr/2016/fs-20161020.html>
- PRIMEFLEX customer case studies: <http://www.fujitsu.com/global/about/resources/case-studies/articles/product/integrated-system-primeflex/>
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- Find Fujitsu on Facebook: <http://www.facebook.com/FujitsuCT>
- Fujitsu pictures and media server: <http://mediaportal.ts.fujitsu.com/pages/portal.php>
- For regular news updates, bookmark the Fujitsu newsroom: <http://ts.fujitsu.com/ps2/nr/index.aspx>

<sup>1</sup> Source: MaturityScape Benchmark: Cloud Worldwide, 2017 by IDC Research

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### About Fujitsu

Fujitsu is the leading Japanese information and communication technology (ICT) company, offering a full range of technology products, solutions, and services. Approximately 155,000 Fujitsu people support customers in more than 100 countries. We use our experience and the power of ICT to shape the future of society with our customers. Fujitsu Limited (TSE: 6702) reported consolidated revenues of 4.5 trillion yen (US \$40 billion) for the fiscal year ended March 31, 2017. For more information, please see <http://www.fujitsu.com>.

### About Fujitsu EMEIA

Fujitsu promotes a Human Centric Intelligent Society, in which innovation is driven by the integration of people, information and infrastructure. In the Europe, Middle East, India and Africa region (EMEIA), our 28,000-strong workforce is committed to Digital Co-creation, blending business expertise with digital

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technology and creating new value with ecosystem partners and customers. We enable our customers to digitally transform with connected technology services, focused on Artificial Intelligence, the Internet of Things, and Cloud - all underpinned by Security. For more information, please visit <http://www.fujitsu.com/fts/about/>

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