

# Fujitsu Reference Architecture for VMware Cloud Foundation

For enterprises demanding more responsive IT support, the Fujitsu Reference Architecture for VMware Cloud Foundation delivers a next-generation software-defined data center architecture that's simple to deploy, operate and maintain, while providing a perfect foundation for hybrid cloud.

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## Introduction

Businesses today are putting enormous pressure on IT organizations to create environments in which flexibility and speed are paramount. At the same time, they expect IT to keep an eye on costs. Those data center operations still running traditional hardware-defined data center architectures find it increasingly difficult to live up to all these requirements. They are looking at new approaches that enable them to become more business-centric and thus better positioned to meet future business challenges. This white paper outlines how the Fujitsu Reference Architecture for VMware Cloud Foundation helps IT organizations deliver more responsive IT support while reducing operational costs by introducing a software-defined data center infrastructure that's easy to deploy, operate and maintain.

### Datacenter architecture in transition

While the virtualization of computing resources has greatly improved data center operations over the past decade, many organizations are now looking to extend virtualization to other IT resources. They focus especially on a strategy to establish the Software-Defined Data Center (SDDC), which provides the operational efficiency and agility necessary to cope with the ever-increasing demand for more responsive and cost-efficient IT support. An SDDC is based on a fully virtualized infrastructure, and it is centrally managed using extensive automation technology.

### Supporting the move to hybrid cloud

Besides streamlining their existing on-premises data center infrastructure, many IT organizations are starting to build their IT sourcing strategy on a mix of options across cloud and non-cloud IT with the goal to achieve the best of both worlds: the control of on-premises deployments and the cost-effectiveness of cloud. Therefore, they are looking at solutions that enable them to integrate their on-premises private cloud environment with off-premises resources from the public cloud. VMware Cloud Foundation can be consumed as-a-service through various cloud service providers like Amazon Web Services, Microsoft Azure or Google Cloud Platform – enabling a true hybrid cloud based on a common and compatible platform that stretches from on premises to off premises. The remainder of this white paper focusses on the deployment of an on-premises VMware Cloud Foundation environment.

### Challenges in making SDDC happen

Building an SDDC environment with a do-it-yourself approach can be a complex, time-consuming and error-prone process. There are several phases in the development of a software-defined data center infrastructure. Each has its own challenges. Customers must select the right set of server, storage, and networking hardware resources and ensure that the hardware is compatible with the SDDC software stack. Once the hardware is selected, ordered, and received, customers must install and configure the hardware and software stacks. Then the IT department must patch and upgrade existing pools of resources – as well as add new pools of resources – to keep the infrastructure highly available and conforming to performance requirements. Existing silos within IT make the quick deployment of resources especially challenging. All resources must satisfy performance specifications and comply with infrastructure security requirements. In addition, even after intensive preparation, best practices on new technology are not always understood. Thus, configurations may not be optimal in terms of performance and availability for customer workloads. Finally, when operational issues do arise, a single point of contact to reduce the mean time to resolution is required. Given these challenges, enterprises often struggle to achieve the agility, economy of scale and efficiency of large-scale software-defined data center infrastructures.



## Fujitsu Reference Architecture for VMware Cloud Foundation

In order to reduce risk, Fujitsu and VMware have been working together to provide a reference architecture for VMware Cloud Foundation including a set of hardware and software components validated by Fujitsu experts to rapidly deploy a large-scale, software defined data center infrastructure. The reference architecture is based on the Fujitsu Integrated System PRIMEFLEX Essentials for VMware vSAN, offering a broad range of certified Fujitsu vSAN ReadyNodes and VMware Cloud Foundation™, the industry's most advanced hybrid cloud platform providing a complete set of software-defined services for computing, storage, networking, security, and cloud management to run your enterprise apps – traditional or containerized – in private or public cloud environments.



### Key outcomes customers can gain when introducing Fujitsu's Reference Architecture for VMware Cloud Foundation:

- Faster time to production with 90%+ time savings on planning and deployment efforts through use of PRIMEFLEX Essentials for VMware vSAN systems and automated initial start-up.
- New levels of agility and productivity with 58% less time spent on routine IT activities thanks to the completely virtualized environment in combination with automated life cycle management.
- Significant CAPEX and OPEX savings with 45% reduction in TCO over a traditional three-tier alternative thanks to a smaller hardware footprint (i.e., no external storage necessary) and the streamlined operation environment.



## VMware Cloud Foundation™ software stack

VMware Cloud Foundation delivers an enterprise-ready cloud infrastructure by combining VMware's highly scalable hyper-converged software, comprised of vSphere® and vSAN™, with the network management efficiency of NSX®. Hyper-converged infrastructures are rapidly emerging as the ideal building block for SDDC thanks to its ability to deliver greater elasticity, simplicity, and performance at a lower cost. However, unique to VMware Cloud Foundation is the ability to converge not just compute and storage capacity – just as any other hyper-converged infrastructure solution in the market does – but also NSX's network virtualization directly from the hypervisor using modular x86 servers and standard top-of-rack switches.

For the logical infrastructure, the familiar VMware virtualization and management components are augmented by a new component, the VMware SDDC Manager, which serves as the single interface for managing the logical and physical infrastructure. The cloud administrator uses this console to provision new private cloud resources, monitor changes to the physical and logical infrastructure, plus manage the life cycle and other operational activities. Private cloud customers can now expect to consume their resources in a manner consistent with the public cloud. SDDC Manager provides a REST-based application interface (Cloud Foundation API) to integrate with the existing data center management and monitoring tools.

The VMware SDDC Manager relies on Hardware Management Services (HMS) to configure and manage the underlying hardware. HMS is a hardware abstraction layer that interfaces with the hardware components such as servers and switches. It is responsible for discovery, inventory, monitoring, configuration, and life cycle management of individual servers or switches. For example, HMS processes hardware events (e.g., alarms, sensor data threshold triggers) and state changes. HMS then exposes events and state changes to the rest of the VMware Cloud Foundation solution in a hardware independent manner. HMS is part of a dedicated management infrastructure running in each physical rack.

VMware Cloud Foundation integrates vRealize Operations to provide advanced monitoring and analytics across the physical and virtual infrastructure including NSX. It also integrates vRealize Log Insight to enable easier problem diagnosis and repair from unstructured data. In addition, customers can separately purchase a VMware Horizon add-on, and the full VMware vRealize Suite to address VDI or IaaS use cases.



**Solution packaging**

An initial order for VMware Cloud Foundation is a minimum of 4 servers for the management domain. Beyond that, additional workload domains of a minimum of 3 servers or more per cluster are recommend.

Beyond the initial order, customers can later incrementally add capacity with one server granularity.

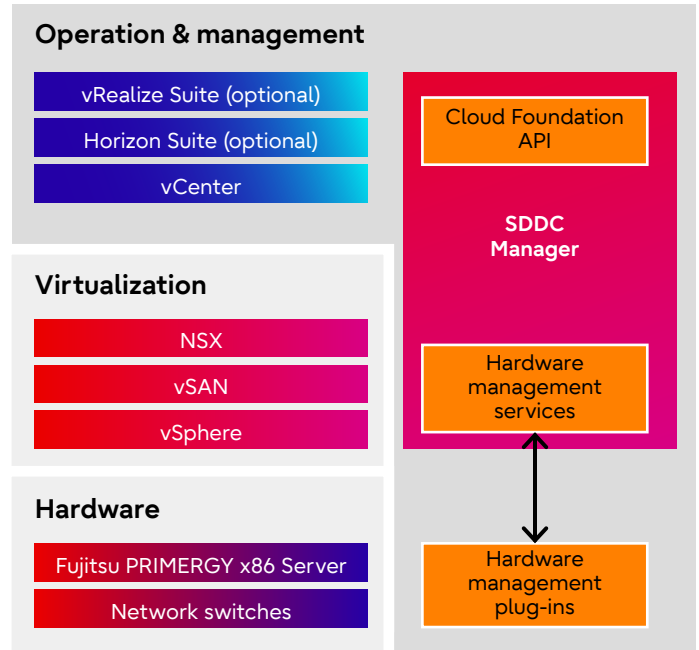
We recommend that the network infrastructure Top-of-Rack (ToR), Spine, and Management switches are also included in the initial order to get the solution up and running and for future expandability.

Optionally, you can also order the PRIMECENTER M2 Rack to rack mount all equipment for the solution.

**Licensing**

VMware Cloud Foundation is licensed on a per processor (CPU) perpetual license model. Licenses can be bought in bundles from VMware depending on the Cloud Foundation software requirements. Alternatively, customers who possess unused licenses for individual components (vSphere, vSAN or NSX) can transfer them towards a Cloud Foundation deployment and complete the licensing of the Cloud Foundation environment by purchasing the respective upgrade license. VMware SDDC Manager is only available through VMware Cloud Foundation. In situations where customers bring their own licenses of vSphere, vSAN and

NSX, a VMware SDDC Manager license can be purchased as an upgrade. As VMware vCenter is not included in VMware Cloud Foundation, customers are required to bring their own vCenter Server licenses to a VMware Cloud Foundation environment. The requirement is one vCenter Server license per SDDC Manager instance.



## Compute and storage infrastructure

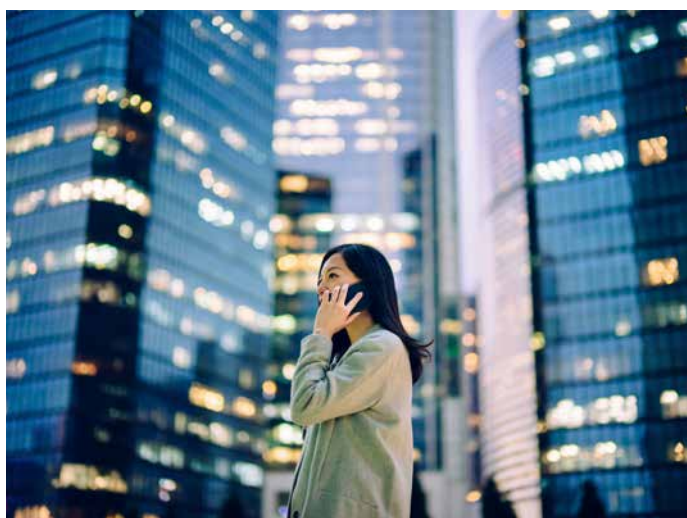
The Fujitsu Reference Architecture for VMware Cloud Foundation is based on a hyper-converged infrastructure foundation, which means that compute and storage capacity are delivered from the same x86 server platform – Fujitsu Server PRIMERGY vSAN Ready Nodes. Especially when serving workloads in VMware environments, Fujitsu x86 servers provide maximum performance proven by a long track record of outstanding VMware VMmark results.

### Virtual compute

The market-leading VMware vSphere Enterprise Plus software serves as the virtualization layer enabling VMware vMotion®, Distributed Resource Scheduler®, High Availability and Network IO Controller and many more features. While SDDC Manager builds and manages the virtualization environment, administrators continue to have full administrative access to the ESXi™ hypervisor and vCenter.

### Virtual storage

VMware vSAN is a distributed layer of software that runs natively as a part of the ESXi hypervisor. vSAN aggregates local or direct-attached capacity devices of a host cluster and creates a single storage pool shared across all hosts in the vSAN cluster. While supporting VMware features that require shared storage, such as HA, vMotion, and DRS, vSAN simplifies storage configuration and virtual machine provisioning activities when compared to external storage options. Based on simplified availability and performance policies, the SDDC Manager provisions and configures VMware vSAN. For additional flexibility, Ethernet-based external storage may be connected through the data center network – just visible to ESX hosts, but not managed by SDDC Manager.



## Network infrastructure

VMware Cloud Foundation deploys, configures, and manages two layers of networking: the physical network and the virtual network overlay.

### Physical network design

From a physical network point of view, VMware Cloud Foundation includes a prescriptive network design within and across racks. The design requires a leaf-spine topology that comprises of top-of-rack and spine switches. This network architecture offers a number of benefits in the modern data center, such as scale-out networking design, lower latency between hosts, reduction in congestion points compared to three-tier architectures, and isolation from the existing corporate network so that there is a well-defined single point of attachment to the existing corporate network to carry north-bound traffic and enforce security and access control policies.

Each physical rack contains two redundant Extreme VDX or Juniper QFX top-of-rack switches for aggregated connectivity to the servers, and an optional Extreme VDX or Juniper EX management switch for out-of-band connectivity to the management consoles on the servers, top-of-rack, and spine switches. With scale-out across multiple racks, east west traffic is fully self-contained. Connectivity between racks is provided by using two Extreme VDX or Juniper inter-rack spine switches. In addition, customers connect to existing datacenter infrastructures using L2/L3 uplinks through the top-of-rack switches.

### Virtual network

VMware NSX is a software networking and security virtualization platform that delivers the operational model of a virtual machine for the network. Virtual networks reproduce the Layer2 - Layer7 network model in software, allowing complex multi-tier network topologies to be created and provisioned programmatically in seconds. NSX also provides a new model for network security. Security profiles are distributed to and enforced by virtual ports and move with virtual machines. NSX includes a library of logical networking services – logical switches, logical routers, logical firewalls, logical load balancers, logical VPN, and distributed security. SDDC Manager deploys and configures these logical networking services. For example, in VDI deployments, SDDC Manager enables micro-segmentation to secure each virtual desktop from unauthorized access or the spreading of network-based worms. Virtual networks are programmatically provisioned and managed independent of networking hardware. This decoupling from hardware introduces agility, speed and operational efficiency that can transform data center operations.

## Fujitsu data protection solutions

A backup solution within the same system does not protect your data against disaster, system failure, data corruption, or deletion. Therefore, it is mandatory to store business-critical data separately. Fujitsu offers a broad data protection portfolio to protect your business against outages and cyberattacks. This includes such advanced storage management capabilities as deduplication, replication, archiving, and a cross-media mix. We provide a solution for every business, whether small, medium-size, or enterprise-scale.

### Modern data management and protection

Fujitsu offers a comprehensive data protection portfolio with a wide range of products (appliances, tape storage, backup software) and various service levels depending on your needs. Quickly protecting and consolidating your business-critical data across edge, core, or cloud. Our portfolio provides comprehensive functionality for multi-cloud platforms, physical, and virtual environments, including backup, archiving, deduplication, disaster recovery, replication, snapshot, and tape support.

### Automated backup and recovery

Our solutions automate backup, disaster recovery, and testing across multiple platforms (clouds, physical or VMs) with reduced cost, effort, and risk. Advanced automation of repetitive or highly complex tasks streamlines operations and minimizes human error and data loss. Granular recovery gives you the flexibility to restore your environment from full databases, VMs, or a single file. Data protection software from our partners Commvault, Veritas, and Veeam leverages deep integration for all modern hypervisors and many cloud storage options across public and private clouds. Making the recovery of mission-critical applications fast and easy to manage.

### Rich data lifecycle management

Our policy-based data protection offers you a rich lifecycle management and ensures that all your business-critical data remains protected. You can define storage policies and retention periods to archive or remove outdated data. For example, you can include or exclude VMs for data protection, shut them down, relocate them to secondary storage or automatically archive stale VMs. Different kinds of data must be protected with different SLAs, determining how many copies have to be kept for how long, and whether the strongest protective measures are always necessary. This is why you can also optimize the recovery speed and retention period of the backup data, combining multiple storage media (disk, dedupe disk, flash, tape, or in the cloud) according to your requirements.

### Efficient disaster recovery

Our data protection portfolio enables flexible local, central, and remote backup and disaster recovery concepts – allowing you to backup to disk, tape, or cloud, or copy data to another remote appliance with the integrated replication feature. All these capabilities guarantee uninterrupted operations, minimize planned and unplanned downtime, and ensure business continuity should disaster strike.

### Compliance regulations

For compliance issues your administrator can define customized policies to prevent unauthorized access, defining who can access and share specific files and folders. Analytics and reporting features provide data insights to ensure that your sensitive business data remains safe while fulfilling compliance regulations (including GDPR), and built-in data encryption minimizes the risk of information being stolen or lost.



## Key features and benefits

In addition to the core features and capabilities provided by the individual components of the software stack, VMware Cloud Foundation adds several unique capabilities when deploying an on-premises software-defined data center infrastructure.

### Natively integrated software-defined stack

VMware Cloud Foundation delivers a natively integrated software-defined data center stack starting with the core infrastructure virtualization, vSphere, vSAN and NSX, in addition to the SDDC Manager for life cycle management automation. Customers can flexibly upgrade individual components in the stack to higher editions and optionally deploy VMware vRealize Suite and VMware Horizon

### Day 0 to day 2 automated operations

VMware Cloud Foundation automates Day 0 to Day 2 operations of the entire VMware software stack. The solution is implemented with the Cloud Builder Virtual Appliance, the Cloud Builder leverages its knowledge of the hardware and user-provided environment information (e.g., DNS, IP address pool, etc.) to initialize the solution. Time savings will vary by customer, but up-front setup time is estimated to be reduced from several weeks to as little as two hours due to the automation of certain previously manual functions related to provisioning workloads, including automated provisioning of networks, allocation of resources based on service needs and provisioning of end points. When the process is complete, the customer has a virtual infrastructure ready to start deploying vSphere clusters and provisioning workloads.

### Simplified resource provisioning

Extensive coordination is required across networking, server, and storage silos to build private clouds that are highly available and meet performance requirements. With the VMware Cloud Foundation, a cloud administrator will need only to create and manage pools of resources targeted at each workload. For this purpose, the VMware Cloud Foundation introduces a new abstraction, known as workload domains, for creating resource pools across compute, storage, and networking capacities. Workload domains are a policy-driven approach for capacity deployment where each workload domain provides the needed capacity with specified policies for performance, availability, and security. For instance, a cloud administrator would create a separate workload domain for a dev/test workload that has different performance (balanced) and availability (low) requirements than a separate workload domain for a production workload requiring high availability and high performance. SDDC Manager provides and automatically implements a deployment workflow to

translate the workload domain specifications into the underlying pool of resources. For example, based on availability policy, SDDC Manager would choose hosts from one or more fault domains. A cloud administrator need only focus on specifying policies and capacity needs and treat each workload domain as a separate, atomic entity for the purpose of operational management. Workload domains relieve a cloud administrator from having to research and implement best practices needed to achieve the operational goals.

### Automated life cycle management

Data center upgrades and patch management are typically manual, repetitive tasks that are prone to configuration and implementation errors. The reason for this is that validation testing of software and hardware firmware to ensure interoperability among components (when one component is patched or upgraded) requires extensive quality assurance testing in staging environments. Often strapped for time, IT must sometimes make the difficult decision of deploying new patches before they are fully vetted or of deferring new patches, which slows down the rollout of a new feature or security and bug fixes. Both situations increase risk for the private cloud environment. SDDC Manager automates upgrade and patch management for both the logical and physical infrastructure, thereby freeing resources to focus on business-critical initiatives, while improving reliability and consistency. VMware and Fujitsu test all components of the Cloud Foundation technology stack together before shipping new patches to the customer. Cloud Foundation's life cycle management can be applied to the entire infrastructure or to specific workload domains one at a time and is designed to be non-disruptive to tenant virtual machines (VM). By utilizing VM live migration, SDDC Manager can patch servers and the Cloud Foundation software to improve infrastructure security and reliability, while maintaining tenant uptime.

### Scalability and performance

VMware Cloud Foundation delivers a private cloud instance that can be easily deployed within an existing corporate network. Based on a scale-out, hyper-converged architecture, a VMware Cloud Foundation implementation can start as small as four nodes and can scale out to multiple racks. Additional capacity and performance can easily be added linearly in increments as small as one server node at a time within a single rack, scaling out to eight full racks per SDDC Manager instance. This enables IT organizations to better align CAPEX spend with business needs. VMware Cloud Foundation automatically discovers any new capacity and adds it to the larger pool of capacity available for use.



### Integrated management of physical and virtual infrastructure

SDDC Manager understands the physical and logical topology of the SDDC and the underlying components' relation to each other, and efficiently monitors the infrastructure to detect potential risks, degradations, and failures. SDDC Manager provides alert management to prevent notification spam on problem detection. Each notification includes a clear description of the problem and provides remediation actions needed to restore service. Degradations or failures are aggregated and correlated to workload domains to enable a clear view of the impact of any issue to the business services being deployed within a domain. Therefore, the SDDC Manager can greatly reduce the mean time to resolution across organizational and technology silos.



## Conclusion

With the Reference Architecture for VMware Cloud Foundation, Fujitsu helps you to transition with confidence to a new IT infrastructure based on a Software-Defined Data Center architecture that's more responsive while delivering increased operational efficiency, productivity and reduced TCO. However, in a landscape that is increasingly turning hybrid, with workloads running on-premises and in the public cloud, it is extremely important that all systems in your IT infrastructure are hybrid cloud-enabled. For all organizations who want to extend their on-premises deployment, VMware Cloud Foundation allows for an easy integration into a hybrid cloud environment that spans edge, core, and cloud systems.

By choosing Fujitsu for your Software-Defined Data Center project, you will profit from Fujitsu's strategic partnership with VMware and a track record of over a decade in deploying large VMware infrastructure projects.

For more information about the Fujitsu Reference Architecture for VMware Cloud Foundation, please see: [www.fujitsu.com/global/fj-ra-for-vcf](http://www.fujitsu.com/global/fj-ra-for-vcf)

### With Fujitsu you get:

- A trusted platform that is certified and validated by Fujitsu experts significantly reducing complexity, time, risks, and costs when building the software-defined foundation of your hybrid cloud environment
- The most powerful VMware virtualization platform based on Fujitsu PRIMERGY standard x86 servers – 20+ years of development and production know-how resulting in extremely low failure rates below market average; #1 in 70% of all VMmark 2.x benchmark categories and continuing to lead in VMmark 3.x
- The experience of a global technology and service provider that has a 30+ years track record in deploying and operating large data center infrastructures running over 100 data centers worldwide.

White paper

# Fujitsu Reference Architecture for VMware Cloud Foundation

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2022-09-28 WW EN

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