FUJITSU

White paper
FUJITSU Integrated System
PRIMEFLEX for VMware Cloud Foundation

For enterprises demanding more responsive IT support, PRIMEFLEX for VMware Cloud Foundation delivers a next-generation IT infrastructure based on a Software-Defined Data Center architecture that's simple to deploy, operate and maintain.

www.fujitsu.com/global/products/computing/integrated-systems/vmware-vcf.html

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 PRIMEFLEX for VMware Cloud Foundation helps IT organizations deliver more responsive IT support while reducing operational costs by introducing a turnkey software-defined data center infrastructure that's easy to deploy, operate and maintain.

Data center 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 infra-structure, and it is centrally managed using extensive automation technology. The solution can be deployed on-premise or off-premise, meaning that IT resources can be consumed from a private, public or hybrid cloud. For an in-depth discussion on strategic aspects of the transformation to SDDC, the architectural model, major benefits and possible limitations, please read this white paper: "Software-Defined Data Center – infrastructure for enterprise digital transformation".

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 infra-structure. 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 is security requirements. In addition, even after intensive preparation, best practices on new technology are not always under-stood. 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 innocence 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 Integrated System PRIMEFLEX for VMware Cloud Foundation

In order to reduce risk, Fujitsu and VMware have been working together to provide a turnkey factory-integrated system, with all the hardware and software required for rapidly deploying a large-scale hyperconverged software-defined data center infrastructure, which enables IT organizations to run highly scalable general purpose server virtualization environments, virtual desktop infrastructures or Infrastructure as a Service deployments. Based on a high-performance Fujitsu/Cisco®/QCT™ hardware platform and market-leading VMware software technology, featuring software-defined compute, storage and networking in combination with integrated management of physical and virtual resources, PRIMEFLEX for VMware Cloud Foundation is ideal for enterprises and service providers demanding fast time to production, reduced management complexity and lower TCO.

New research from a user survey on data center infrastructure deployment options conducted in April 2017 shows that customers increasingly realize the value of integrated systems. When asked about their delivery model preferences, the survey revealed that overall 56% and even 76% of the best performing IT organizations[1] see the use of pre-integrated systems as an important part of their platform mix. Indeed, there are indications that the best performers are increasingly adopting a "self-build by exception" policy.

→ For the user survey, **click here.**

> **!** The key outcomes customers can gain when introducing PRIMEFLEX for VMware Cloud Foundation include[2]:

■ Faster time to production with 90%+ time savings on planning and deployment efforts through factory-integrated delivery 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

1) IT organizations scoring best on a performance scorecard based on the following criteria: meeting service level expectations, response to new or changing needs, management of costs and overheads, control of IT related risks
2) Taneja Group Technology Analysts, For Lowest TCO and Maximum Agility Choose VMware Cloud Foundation, The SDDC Platform For Hybrid Clouds, October 2016

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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.
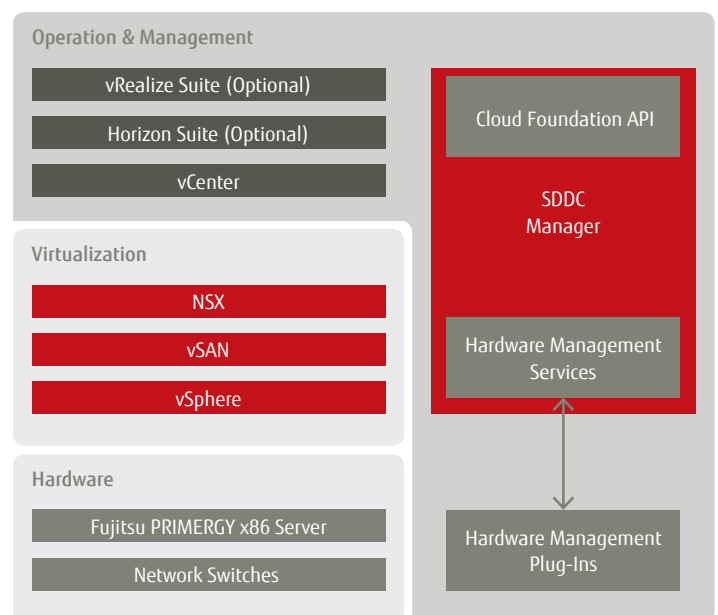
For the logical infrastructure, the familiar VMware virtualization and management components are augmented by a new component, the VMware SDDC Manager, which serves as the single interface for managing the logical and physical infrastructure. The cloud administrator uses this console to provision new 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, switches, PDUs and other physical devices. It is responsible for discovery, inventory, monitoring, configuration, and life cycle management of individual servers or switches. For example, HMS automatically discovers new servers, bootstraps or resets them, and 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 PRIMEFLEX for VMware Cloud Foundation in a hardware-independent manner. HMS also supports rack-level boot-up sequencing of hardware components and provides services such as the secure, remote, hard reset of these components. 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.

Packaging and licensing

An initial order per rack for a product environment requires a minimum of 8 servers. Beyond that, also half rack (12 servers) and full rack (24 servers) configurations are available. Beyond the initial order, customers can later incrementally add capacity with one server granularity. PRIMEFLEX for VMware Cloud Foundation is licensed on a per processor (CPU) perpetual license model. 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, Virtual SAN 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.

Operation & Management

- vRealize Suite (Optional)
- Horizon Suite (Optional)
- vCenter

Virtualization

- NSX
- vSAN
- vSphere

Hardware

- Fujitsu PRIMERGY x86 Server
- Network Switches

Cloud Foundation API

SDDC Manager

Hardware Management Services

Hardware Management Plug-Ins

Compute and storage infrastructure

PRIMEFLEX 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 RX2530 M2. These dual-socket rack servers provide the high performance of the new Intel® Xeon® processor E5-2600 v4 product family and expandability of up to 10x 2.5-inch storage devices – all in a 1U space-saving housing. Especially when serving workloads in VMware environments, Fujitsu x86 servers provide maximum performance proven by a long track record of outstanding VMware VMmark results. As of the writing of this white paper, Fujitsu x86 servers are leading 16 out of 21 VMmark benchmark categories.

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. In PRIMEFLEX for VMware Cloud Foundation, each PRIMERGY RX2530 M2 server node contains ten disks in two separate vSAN disk groups configured as a hybrid storage configuration, with two Solid State Drives (SSDs) for the cache tier and eight Hard Disk Drives (HDD) for the capacity tier. As of the writing of this white paper, the specification of the pre-qualified vSAN Ready Node based on the FUJITSU Server PRIMERGY RX2530 M2 system currently used in PRIMEFLEX for VMware Cloud Foundation includes the following components: CPU: 2x Intel Xeon E5-2650v4, 12 cores / Memory: 384 GB or 512 GB / Capacity: 8x HDD SAS 1.2 TB / Cache: 2x SSD SAS 800 GB. For further details, please refer to the data sheet.

→ For the data sheet, **click here.**

Network infrastructure

PRIMEFLEX for 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, PRIMEFLEX for VMware Cloud Foundation includes a prescriptive network design within and across racks. The design requires a leaf-spine topology that comprises 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 Cisco Nexus® 93180YC-EX top-of-rack switches for aggregated connectivity to the servers, and an QCT QuantaMesh® BMS T1048-LB9 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 Cisco Nexus® 9332PQ 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.

Backup

A data copy within the same virtualized environments doesn't protect the data against disaster, system failure, data corruption or deletion. Therefore, it is mandatory to store business-critical production data on a separate backup solution. FUJITSU Storage ETERNUS CS200c with integrated Commvault software is ideally suited to protect data of virtual environments (traditional, converged or hyper-converged). ETERNUS CS200c is an all-in-one backup solution including the right-sized Fujitsu hardware, Commvault software and the necessary licenses for the various capacity requirements. The industry-leading Commvault software is perfectly aligned with powerful Fujitsu technology in order to deliver the right performance for the selected capacity range. The out-of-the-box solution is suited for the backup and archive data of business applications and virtualized environments, and especially for all-in-one hyper-converged infrastructures like PRIMEFLEX for VMware Cloud Foundation.

■ **Fast and easy setup – ready to go**
The pre-loaded, pre-configured and customizable solution is ready to go, right out of the box. ETERNUS CS200c enables the hassle-free setup of a comprehensive backup and archiving environment in less than one hour from power-up to backup (depending on the customer environment). The appliance reduces the implementation time by up to 60% versus do-it-yourself implementations.

■ **Automated VM backup and recovery**
ETERNUS CS200c provides comprehensive functionality for physical and virtual environments including backup, archiving, deduplication, disaster recovery, replication, snapshot, tape and cloud support. Integrated Commvault software leverages deep integration into the virtual infrastructure to deliver advanced data management capabilities and automate the protection of VMs. The solution protects all of your VMs quickly and unifies the data protection of physical and virtual environments. Policy-based auto-protection of virtual machines ensures that no VM will be at risk. The recovery of mission-critical applications is fast and simple.

■ **Rich life cycle management capabilities for VMs**
Administrators can define storage policies to include or exclude VMs for data protection, shut down VMs, relocate VMs to secondary storage or to automatically archive stale VMs. In addition, you can optimize recovery and retention of files, virtual machines, and virtualized applications. The software provides user-friendly self-service access to the data of virtual machines making the data management much simpler. The user can create, manage and recover VMs across the entire life cycle.

■ **Powerful scalability and flexibility**
ETERNUS CS200c starts from1 TB up to 165 TB per appliance supporting plug and play scaling without having to reconfigure your environment. You can add storage capacity (disk, tape, or in the cloud), advanced software capabilities or combine multiple appliances depending on your growing needs. This simple, cost-effective expandability enables future data growth and delivers investment protection.

→ For more information on ETERNUS CS200c, **click here.**

Key features and benefits

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

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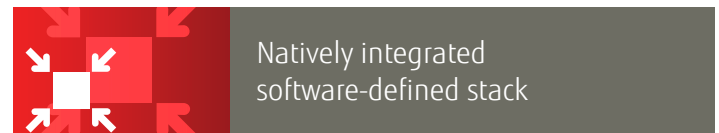
PRIMEFLEX for VMware Cloud Foundation delivers a natively integrated software-defined data center stack starting with the core infrastructure virtualization, vSphere, vSAN and NSX, in addition to the SDDC Manager for life cycle management automation. Customers can flexibly upgrade individual components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

Day 0 to Day 2
automated operations
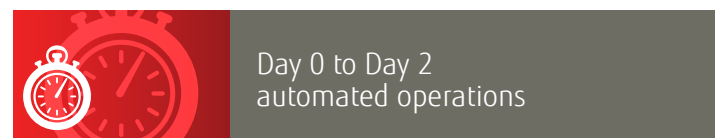
PRIMEFLEX for VMware Cloud Foundation automates Day 0 to Day 2 operations of the entire VMware software stack. Once the rack is installed and power and networking are provided to the rack, the SDDC Manager leverages its knowledge of the hardware bill of materials and user-provided environment information (e.g., DNS, IP address pool, etc.) to initialize the rack. 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 PRIMEFLEX for VMware Cloud Foundation, a cloud administrator will need only to create and manage pools of resources targeted at each workload.

For this purpose, the PRIMEFLEX for 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 ca-pacity 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, switches and the Cloud Foundation software to improve infrastructure security and reliability, while maintaining tenant uptime.

Scalability and performance

PRIMEFLEX for VMware Cloud Foundation delivers a private cloud in-stance that can be easily deployed within an existing corporate network. Based on a scale-out, hyper-converged architecture, a PRIMEFLEX for VMware Cloud Foundation implementation can start as small as eight 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. PRIMEFLEX for 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, degra-dations 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 aggre-gated 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

PRIMEFLEX for VMware Cloud Foundation enables customers 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. 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.

With Fujitsu you get:
- The most powerful VMware virtualization platform based on Fujitsu x86-servers leading 16 out of 21 VMmark benchmark categories
- A trusted platform that is engineered, manufactured, managed, supported and sustained as ONE product
- Turnkey factory-integrated delivery that significantly mitigates deployment risk
- First-class support with a single point of contact for support covering the complete hardware and software stack
- 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

PRIMEFLEX for VMware Cloud Foundation is part of the FUJITSU Integrated System PRIMEFLEX® portfolio, a family of pre-defined, pre-integrated and pre-tested combinations of data center components from Fujitsu and its leading technology partners. Based on proven reference architectures and factory-integrated ready-to-run deployment options, PRIMEFLEX helps customers introduce new IT services or modernize existing IT infrastructures quickly without spending valuable staff resources on tedious procurement, integration of servers, storage, network connectivity and software, as well as testing and deployment tasks. PRIMEFLEX is supported by flexible service options throughout all phases of a system's life cycle and covers a broad range of virtualization, private cloud, big data, high-performance analytics and SAP use cases. For information about FUJITSU Integrated System PRIMEFLEX please see: **www.fujitsu.com/primeflex**