

Intel® Cloud Builders Guide: Cloud Design and Deployment on Intel® Platforms

FUJITSU PRIMERGY*
VMWARE VCLLOUD DIRECTOR*



Intel® Xeon® Processor 5500 Series
Intel® Xeon® Processor 5600 Series

AUDIENCE AND PURPOSE

This reference architecture seeks to simplify the deployment and operation of a cloud. We built a cloud with VMware vCloud* Director and the cloud eXtension platform, PRIMERGY CX1000, on an Intel® Xeon® processor-based server platform and documented the work involved with this particular cloud configuration.

The content is targeted to IT professionals responsible for the design, implementation, validation, and utilization of cloud structures. We describe details on the hardware configuration, software configuration, and results from specific test cases we implemented that demonstrate basic operational capabilities.

This paper should complement product documentation and is provided as a starting point for the actual development of an enterprise or service provider cloud.



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Executive Summary

With the arrival of cloud computing, IT decision makers have been given a unique opportunity to lead their organizations through challenging times.

Cloud computing brings with it a level of flexibility, efficiency and cost-control that was impossible even a few short years ago.

This approach abstracts applications and information from the complexity of underlying infrastructure, so IT can support and enable business value. Cloud computing architectures are built on the foundation of virtualization. Fujitsu Dynamic Cloud* is built on the Dynamic Infrastructures strategy. Based on that strategy, Fujitsu has developed customer-centric solutions, which enable you to use Cloud Computing in your enterprise in ways that are easy and secure. It is a very flexible concept that helps IT organizations meet the challenges posed by their IT more effectively.

Dynamic Cloud Services include standardized IT services from the cloud, which you can use within a very short space of time. And this is possible without having to deal with complex hardware and software. Furthermore, for enterprises that would like to implement their own cloud infrastructure, Fujitsu offers Dynamic Cloud Infrastructures that already have pre-integrated and tested infrastructures.

This reference architecture builds upon innovative scale-out cloud server infrastructure platform, the PRIMERGY CX1000 and the virtualization technology of VMware vCloud Director, forming a foundation for such a Dynamic Cloud Infrastructure.

Fujitsu Dynamic Cloud is the most cost-effective and flexible model offered by Fujitsu for provisioning information technology and IT services.

Cloud Computing has caused a paradigm shift, which has profoundly changed the way in which IT supports business processes.

IT is thus evolving into a needs-based service that an enterprise can use for business purposes as required. The Internet, with its ubiquitous availability, is accelerating this development.

If one takes a closer look at the technologies behind this trend, one will clearly see that Cloud Computing is not a technological revolution, but rather the next evolutionary step in the development of IT. This development is the logical result of IT standardization and open source, along with virtualization and automation technologies. Elastic concepts with load-dependent scaling, models for billing performance according to usage, plus resource pools and shared use of infrastructures along with a high degree of automation for provisioning: All of these elements have proven themselves in dynamic data centers for some time now.

This guide, as part of the Intel® Cloud Builders Program, provides a comprehensive solution overview that covers technical planning as well as deployment considerations.

Introduction

Fujitsu's Intel Cloud Builders Reference Architecture

Fujitsu Dynamic Cloud reference architecture is the continuing development of the Dynamic Infrastructures strategy. Based on that strategy Fujitsu has developed customer-centric solutions which enables you to use Cloud Computing in your enterprise in ways that are easy and secure. Within the wider frame of Fujitsu Dynamic Cloud, customers have the option to either use our trusted cloud services or build their own cloud on the basis of pre-integrated and tested infrastructure.

Taking Fujitsu's Intel Cloud Builders Reference architecture ahead we defined the Fujitsu Dynamic Cloud Infrastructure as a dedicated environment always consisting of a build in billing, provisioning and security functionality that also bridges into our Dynamic Cloud Services enabling a hybrid cloud scenario bridging between Trusted and Private Clouds.

The reference architecture itself is built upon innovative scale-out cloud server infrastructure platform the PRIMERGY CX1000. It enables to scale big by packaging 38 industry standard x86 server nodes, based on Intel® Xeon® processor, into a dedicated datacenter rack unit with shared cooling architecture and low footprint. PRIMERGY CX1000 provides massive scale-out computing power and optimizes the data center DENSITY, POWER consumption and HEAT dissipation problems in a one step approach. Its innovative shared cooling architecture Cool-Central™ enables to build new economics into scale-out Cloud Data Centers by significant reduction of energy consumption coupled with dramatic savings in data center space – thus removing the strong inhibitors for cloud data center setup.

VMware vCloud™ Director has been chosen as the software solution stack in this reference architecture, since it builds upon customer proven, industry wide accepted virtualization technology and enables for pooled IT resource allocation and consumption. Moreover, it also enables for new economics in the data center by maximizing efficiency without compromising service delivery, and at the same time it accelerates an organization's transition to the cloud.

The VMware vCloud™ Director evolutionary product feature set for setting up multi-tenant Private Clouds perfectly combines with the new economic benefits that PRIMERGY CX1000 Cloud servers provide, resulting in a pragmatic approach to enable the benefits of cloud computing as they turn today's data center into secure private clouds at affordable costs.

A completely automated on-premise compute cloud. Providing a one-stop virtual data center management solution, it isolates customers from the operational and hardware complexity associated with deploying and managing compute resources in a private data center.

The VMware vCloud Director™ Cloud Solution

VMware vCloud Director enables customers to build secure private clouds, transforming the way IT delivers and manages infrastructure services and the way users access and consume these services.

- Increase business agility by empowering users to deploy pre-configured services or custom-built services with the click of a button
- Maintain security and control over a multi-tenant environment with policy-based user controls and VMware vShield security technologies external compute capacity.

- Reduce costs by efficiently delivering resources to internal organizations as virtual datacenters to increase consolidation and simplify management
- Follow an evolutionary path to the cloud by leveraging existing investments and open standards for interoperability and application portability between clouds

VMware vCloud Director provides the interface, automation, and management features that allow enterprises and service providers to supply vSphere resources as a Web-based service.

VMware vCloud Director is a software solution that enables enterprises to build secure, multi-tenant, private clouds as they pool infrastructure resources into virtual data centers (VDCs) and expose them to users through web-based portals and programmatic interfaces as fully-automated, catalog based services. Internal IT organizations can build secure and cost-effective private clouds with VMware vSphere and VMware vCloud Director, and thus act as true service providers for the businesses they support. As such, they can drive innovation and agility, and at the same time increase IT efficiency and enhance security. This solution provides a pragmatic path to cloud computing because it gives customers the power to use existing investments and the flexibility to extend capacity between clouds.

Key Features and Benefits

- **Deliver Infrastructure as a Service:** VMware vCloud Director enables IT organizations to deliver resources to internal users as VDCs. IT organizations can logically pool compute, storage, and network capacity into Virtual Data Centers, to manage resources more efficiently, with complete abstraction between consumption and delivery of IT services. Instead of providing users or organizations with siloed physical infrastructures, IT teams can deliver

isolated VDCs that draw resources from a common physical infrastructure. By pooling these physical resources on the back end, hardware utilization and consolidation increases. Similarly, underlying infrastructure can be pooled into tiers and offered to users at distinct service levels and prices.

▪ **Consume Infrastructure as a Service:**

VMware vCloud Director also changes the way that users consume IT services. There is no need to file service desk tickets and wait in queues; instead, application and line-of-business owners can utilize self-service portals to access their own VDC. VMware vCloud Director enables users to consume these resources as a catalog based service through a web portal and programmatic interfaces. IT teams can define multiple consumption models that use the same infrastructure, which range from capacity-as-you-go to reserved pools. These can be delivered at an appropriate cost model with VMware vCenter* Chargeback, which helps drive accountability and enables granular usage monitoring. Ultimately, IT organizations maintain control with permissions, quotas, and leases governed by role-based access controls that utilize existing LDAP directory services.

▪ **Support Multi-Tenant Environments:**

Administrators can group users into organizations that may represent any policy group, such as business unit, subsidiary company, sales group or accounting. Each group has isolated, virtual resources, independent LDAP authentication, unique catalogues of resources and policy controls. These features allow for secure multi-tenancy and safe sharing of resources.

- Deliver Standardized Infrastructure and Application Services:

- Users are enabled to deploy and consume pre-configured infrastructure and application services such as virtual machines, virtual appliances, OS images and other media from central or group specific catalogues,

▪ **Improved Security:**

Integrated VMware vShield edge security technologies such as perimeter protection, port-level firewalling, network address translation and DHCP services offer virtualization aware security, simplify application deployment and enforce boundaries required by compliance standards.

The use of the VMware Private Cloud Solution Stack leads to valuable competitive advantages, like:

- vCloud™ Director 1.0 enables enterprises to build secure, multitenant private clouds
- Pooled virtual resources are exposed to users via fully automatic, catalog based services
- Integrated vShield™ Edge technologies provide virtualization aware security and multi-tenancy
- vCenter Chargeback 1.5 enables IT organization to meter and charge users based on policies
- Internal IT organizations can build secure and cost effective Private Clouds, acting as a true service provider.

The Fujitsu Cloud Server Platform PRIMERGY CX1000

- Despite the continuously growing performance of individual x86 processor chip technologies from Intel, the demand for aggregated data center compute capacity is continuously rising as well. This is especially true for companies using new and emerging technologies such as Web 2.0, SOA architectures, Virtualization, and Cloud Computing to enlarge their current business processes or provide new

ways of delivering "IT as a service" to their internal or external clients.

- For High Performance Computing, the use of hundreds of parallel processing Intel Xeon processor-based server units, running parallel application programs for physical modeling, forecasting and scientific research in a combined cluster has already become a de facto design standard.
- Hosting providers deliver various services and hosting models to different client segments, based on x86 technologies combined with virtualization and associated service levels, that are based upon scale-out computing farms of hundreds or thousands of Intel Xeon processor-based servers.
- Large enterprises are starting their cloud computing initiatives, setting up their private cloud scenarios to test-drive the cloud computing software technologies and the promoted benefits.
- Other enterprises are already implementing public cloud services to expand or create new business models with "xxx as a service" offerings.
 - Social networks like Facebook, Twitter etc, and functional hosting services (example: Windows Azure) are cloud implementations that proof-point rapid adoption and are geared for massive growth.
- What is in common to those different industry scenarios is the fact, that they require massive scale-out server computing resources that take advantage of Intel Xeon processor-based servers to compete in and benefit from the rapid growth of those markets.

▪ On the other side, traditional Data centers facilities do not easily keep pace with those massive compute capacity demands, since they have to master additional challenges:

- Increased power envelopes and cooling requirements for those servers and related infrastructure
- Limitation in data center floor space, and the requirement for more computing power in a limited amount of space
- Limited budgets enforcing minimized initial purchase costs and subsequent maintenance costs and operational spending
- The need for more efficient manageability and less complexity in operation of massive scale-out compute resources

The problem thus has four dimensions:

- **Scale out compute power:** Scale out as business workloads dynamics grow up
- **Data Center Density:** Run more compute power with less operational footprint in the current DC space
- **Power/Heat Economics:** energy consumption per Rack has moved up from some 2-3 kW/rack to typically 12-15 kW/rack today. And since heat dissipation is directly aligned with server power consumption, the power/heat economics of traditional data centers are at their critical physical limits – or at least have become critical cost factors. And even if energy costs are not the problem of “IT”-since it is in the facility budgets-, in many parts of the world legal and governmental legislation shows up to demand new “green” economics.

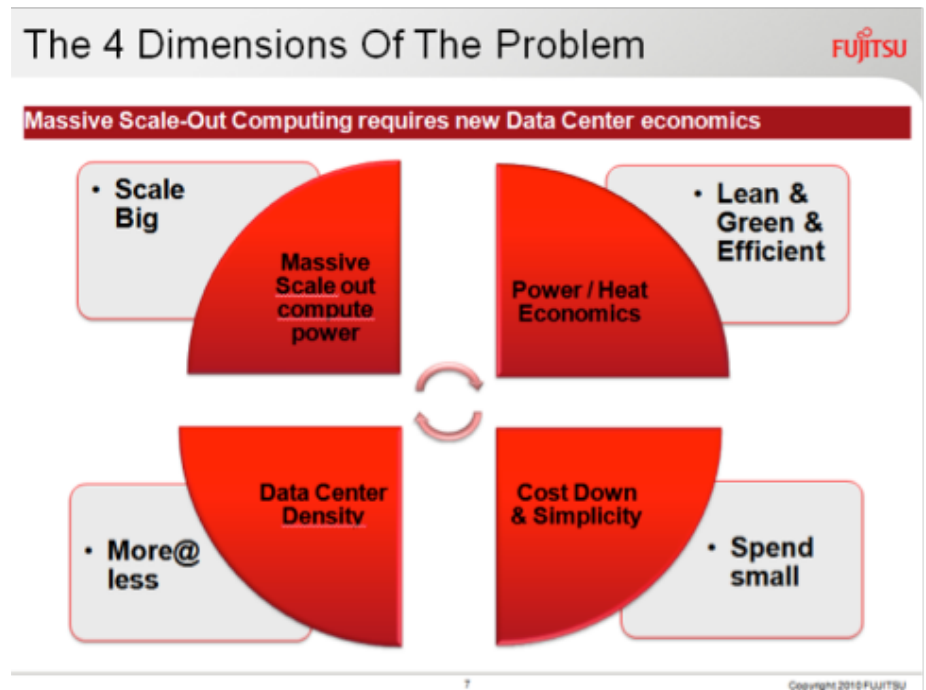


Figure 1: Scale-out data center problems

- **Cost Down & Simplicity:** Running businesses that can best perform on small-but scale- out server building blocks will generate more server units- virtual or physical- to be managed and surveyed, so simplicity for management of a complete rack server farm rather than the individual server unit is a cost cutting factor driving OPEX down. In addition, by using less featured server nodes- with small or only little variances, the initial acquisition costs can be significantly lowered and the packaging density per square meter in the data center can be expected to be lifted up- this will contribute to the CAPEX down budget policy.

PRIMERGY CX1000- expanding the product family into the Scale-Out Data center

PRIMERGY CX1000 is a new Product Category within the PRIMERGY server family. Its focus is on providing large data centers with massive scaling using Intel Xeon processor-based server power while at the same time delivering new economics for density, power, heat and acquisition costs.

The PRIMERGY CX1000 is our solution to deliver a cloud- enabled server infrastructure platform, targeting Internet scale-out data centers, Managed Domains, "As- a-Service" providers, Hosting industries, cloud computing and also HPC markets.

The PRIMERGY CX1000 platform is designed to exactly solve the 4 dimensions problem to deliver new cloud data center economics:

- PRIMERGY CX1000 is a new server-infrastructure platform that solves the 4 dimension problem in a unified approach.
- PRIMERGY CX1000 enables scale-out computing from 100s to 1000s of server nodes- easily with industry x86 standards using Intel Xeon processors and replicable building blocks. New power and heat economics are achieved by the innovative Cool-Central design of CX1000 which enables up to 20 % power consumption saving versus standard Rack server technologies.
- Data center footprint space is reduced by up to 40 % compared with Rack servers- and even a higher data center compute density than with Blade servers may be achieved by back-to-back setup of the PRIMERGY CX1000 server racks and the Cool-Central cooling technology. Cost down design & simplicity of management and operation are implemented to provide CAPEX savings of up to 20 % versus traditional Rack server design.

PRIMERGY CX – Cloud eXtension

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New Cloud-Server Infrastructure Platform for Scale-out Data Centers

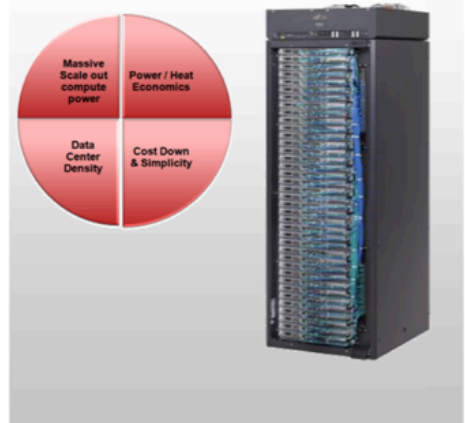
Objectives

- Optimize 19" rack and server standards for massive scale-out datacenters and Clouds
- Remove "hardware overhead" of classical datacenter infrastructure

Address the needs for

- High scaling and lowest power consumption by utilizing shared cooling & simplified server design
- Double DC density with innovative cooling and minimized "working footprint"
- Cut down CAPEX by rip & replace server node design
- Simplicity for management, maintenance & operation by Customer Replaceable Server (CRS)

Solves the 4 Dimension Problem



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Figure 2: PRIMERGY CX-Cloud eXtension

All those achievements have been packed into the new PRIMERGY CX1000 Cloud Extension product range.

The PRIMERGY CX1000 addresses the MORE@LESS challenge resulting in more computing power at up to 40 % less data center footprint. Its unique Cool-Central airflow system eliminates the need for spacey "Hot Aisle" zones in the DC floor plan. And thus Data center Density is improved by enabling more compute power at 40 % less space vs conventional Rack server deployment. (see a sample comparison for datacenter space requirements of CX1000 setup for 5000 nodes in the appendix).

The server nodes in scale-out Cloud scenarios have different customer requirements to fulfill than "general purpose" Rack or Blade form factor servers. Instead of providing a "built-in redundancy" as with conventional Rack servers, a server failure in scale-out server Clouds is typically handled by software that will relocate/reload the application services onto another server unit- or just initiate a restart of the server unit. Thus the CX server nodes can follow a minimalistic design approach, eliminating the need for local fans, hot-swap components or redundancy functions within the node. While this does not make a difference in server node performance, it pays back into lower CAPEX with PRIMERGY CX1000, and up to 20 % less costs as compared to a conventional Rack configuration with 38 rack servers can be achieved depending upon the detailed system configuration.

PRIMERGY CX1000 is positioned as New Cloud-Server Infrastructure Platform for Scale-out Data Centers.

Focusing on those targets, PRIMERGY CX1000 significantly differs from the traditionally well known product categories of Tower Servers (PY TX), Rack servers (PY RX) or Blade servers (PY BX).

As a consequence the PRIMERGY product family is now enhanced with the CX Product group (Cloud-servers) to enable "best fit" new product offerings to the internet scale-out data centers, Cloud data centers, Managed Domains, High Performance Computing, Hosting, Service Providers and other scale-out computing markets.

Cloud Computing is predicted to become a very important market within the next few years. Gartner predictions state that not only will cloud computing change the way IT will be delivered, it will also have a potential to make up for almost 28 percent of x86 server unit shipments until 2012. Yet there are many Cloud concepts and a wide range of application areas, management stacks, hardware infrastructures and related services.

Public Clouds have already become a reality, looking at the mega data centers run by Google, Amazon and Microsoft and their related offers and business models. Those have mostly built up their current infrastructures by their own, using low cost, commodity and ubiquitous servers, having low level IPMI as common management part.

Private Clouds are showing up to be constructed in the Large Enterprise markets, and new services are prepared to be used by other clients as well as by the own business groups of those enterprises. Many customers are preparing to identify their appropriate cloud solution stacks and run their initial projects.

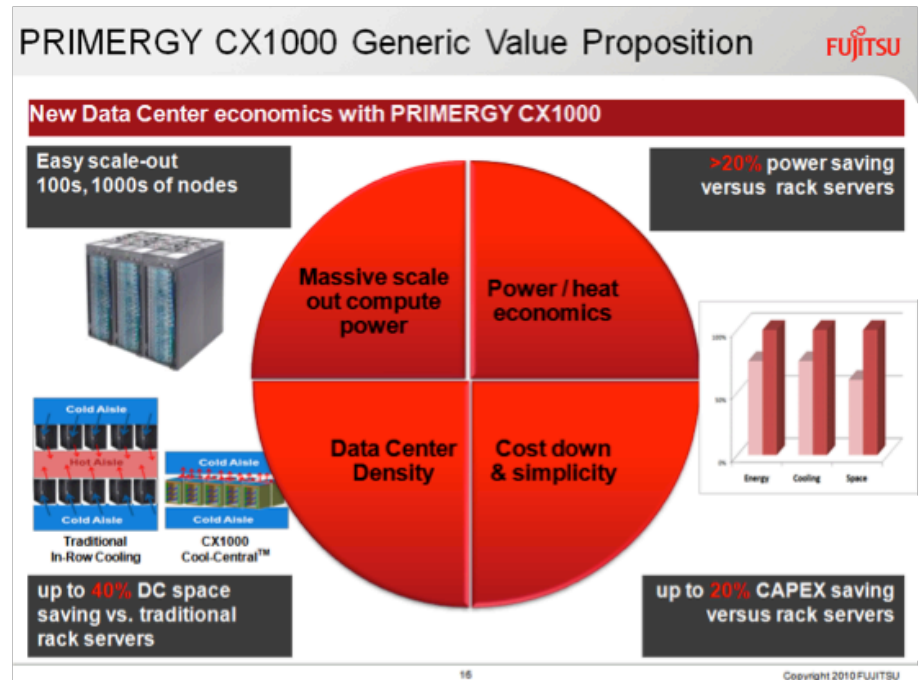


Figure 2: PRIMERGY CX1000 New Data Center Economics

This is where this guide will provide valuable guidance and insight in to building up a Cloud Computing based Dynamic IT infrastructure.

Cloud Computing is generating a massive customer interest, from public to telco to private large enterprises – and this will emphasize the need for new cloud-ready platform products such as the PRIMERGY CX1000 Cloud eXtension product category within the PRIMERGY server family.

With its 100% compatibility to the industry x86 server standards, including Intel Xeon processors, PRIMERGY CX1000 is enabled to run the different cloud architecture solutions stacks that cloud architects will select for their cloud models - without risk.

In addition, it perfectly fits to the demands for massive scale-out computing by solving the 4 dimension problem in a one-step approach. PRIMERGY CX1000 addresses Cloud providers, Service Providers, Hosting industries, "As-A-Service" industries, Outsourcers and High Performance Computing customers with its unique value contributions.

PRIMERGY CX1000 solves some of today most "hot and burning" large Data Center challenges: Scale Big and Spend Small!

Test Bed Overview

Physical Architecture

Figure 3 indicates the physical architecture of the test bed used for the testing done in this whitepaper. All VMware ESXi* hypervisor nodes have three separate network interface cards (NICs) for management, virtual machine, and storage network interfaces. For the sake of cost effectiveness and simplicity, a single network file system (NFS) store was used as shared storage for virtual machine images. Both VMware vCenter* Server and VMware vCenter Database were installed on the same machine with the default database setting. VMware vShield* Manager 4.1 was deployed with the OVF template on one of the hosts within the VMware ESXi host cluster.

In this configuration, we used the Intel® Xeon® processor E5506 for the ESXi* hypervisor nodes, which provides a foundation to design more efficient cloud data centers that can achieve greater performance and at the same time use less energy and space, to dramatically reduce operating costs.¹ For the PRIMERGY CX1000 both Intel Xeon 5500 and 5600 series processors are released and can be used in such vCloud solutions.

The Intel® Xeon® processor 5600 series delivers substantial increases in performance and energy efficiency over the previous generation Intel® Xeon® processor 5500 series, while it continues to support features from the previous generation that enable it to respond intelligently to workloads.

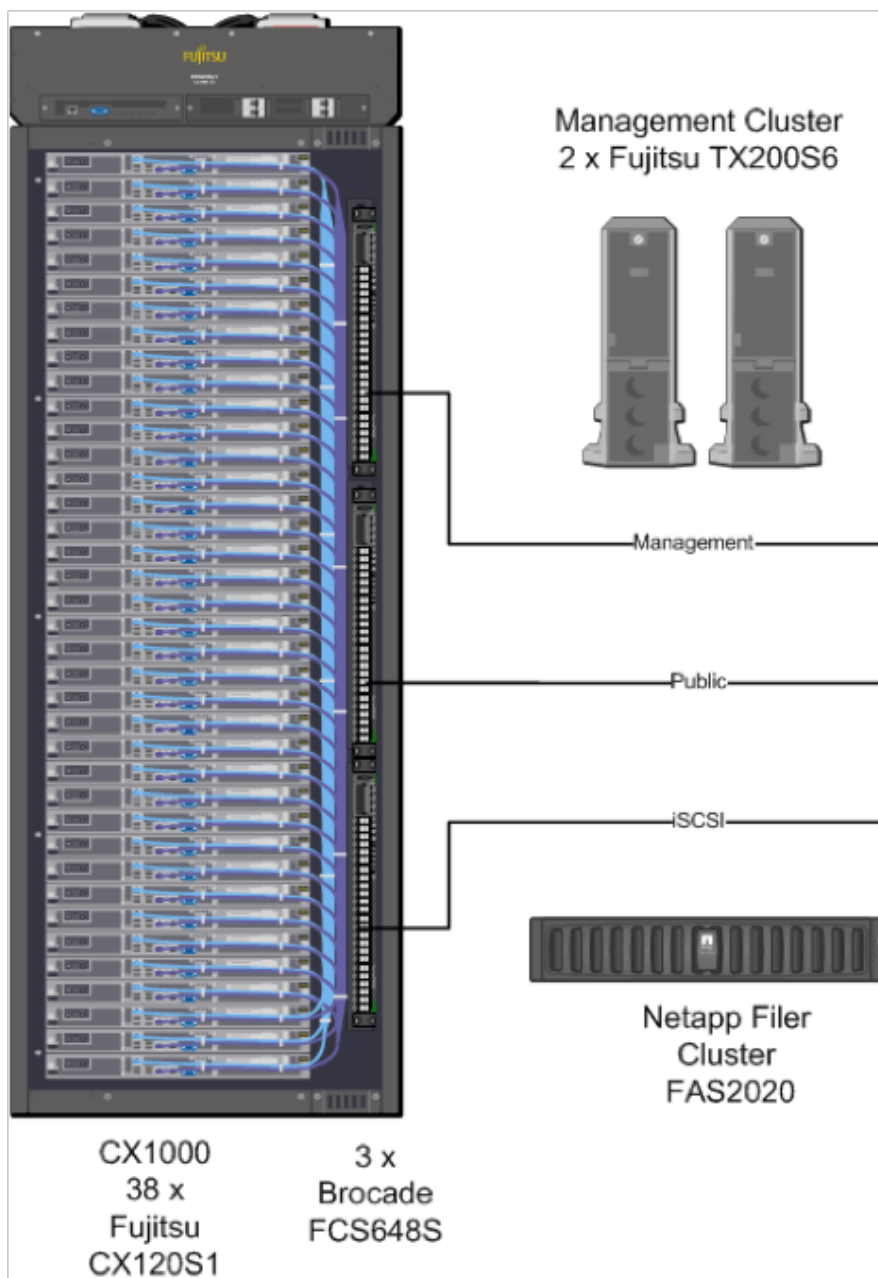


Figure 3: Test Bed Physical Overview

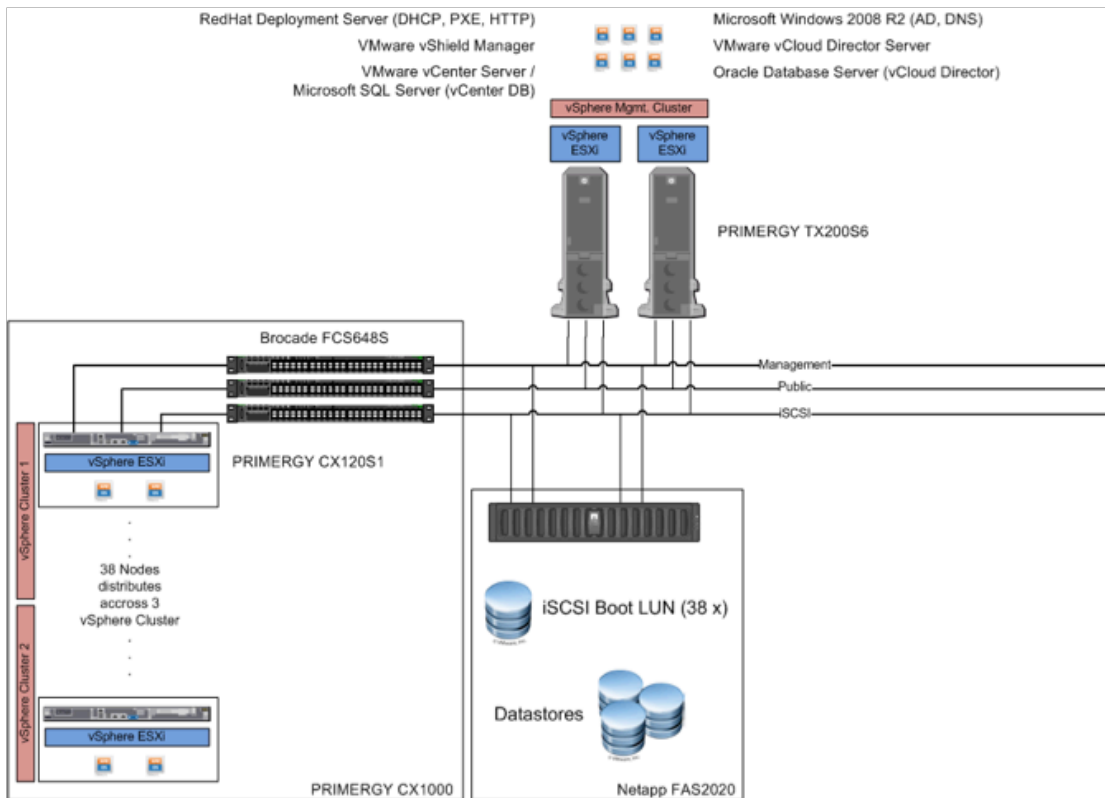


Figure 4: Test Bed Physical Architecture

- Intel® Virtualization Technology² increases manageability, security, and flexibility in IT environments, and improves system utilization as it consolidates multiple compute environments. The abstraction of the underlying hardware enables new usage models which reduce costs, increase management efficiency, alleviate security issues, and improve computing infrastructure resiliency
- Intel® Turbo Boost Technology boosts performance as needed through dynamic adjustments to core frequency to increase execution speed for peak workloads.
- Intel® Intelligent Power Technology adjusts core frequencies to conserve power when demand is lower.
- Intel® Trusted Execution Technology (Intel® TXT) is a hardware solution that validates the behavior of key components within a server or PC at startup. Known as the “root of trust,” the system checks the consistency in behaviors and launch time configurations against a “known good” sequence. Using this verified benchmark, the system can quickly assess whether any attempts to alter or tamper with the launch time environment have been made.
- Intel Advanced Encryption Standard-New Instructions (AES-NI) is a set of seven new instructions that speed encryption and are part of the Intel Xeon processor 5600 series. The result is faster, more secure encryption, and to help prevent software side channel attacks, and make encryption feasible where it was not possible before due to the performance penalty incurred.
- Intel® Hyper-Threading Technology improves throughput and reduces latency for multithreaded applications and for multiple workloads that run concurrently in virtualized environments.

Each host in a VMware vCloud Director cluster must meet certain software and hardware prerequisites. In addition, a database must be available for use by all hosts in the cluster. Each cluster requires access to VMware vCenter Server, VMware vShield Manager, and one or more VMware ESXi hosts. For more information on configuration, software prerequisites, supported databases, disk, memory and network requirements please see VMware vCloud Director Installation and Configuration Guide (http://www.vmware.com/pdf/vcd_10_install.pdf).

Table 1: shows specifications of systems used to build the cloud test bed.

System	Processor Configuration	Detail Configuration
PRIMERGY CX120 S1	Intel® Xeon® Processor E5506	Form Factor: 1U Rack Mount Server Processor: Intel® Xeon® processor E5506; 2.13 GHz; 2-way x 4 cores = 8 cores Memory: 16 GB RAM Storage: no local storage Network: 2 x 1Gbit/s onboard NICs (82576)/Kawela Software: VMware vSphere Hypervisor (VMware ESXi 4.1.0)
Management Station PRIMERGY TX200 S6	Intel® Xeon® Processor E5620	Form Factor: Tower Server Processor: Intel® Xeon® processor E5620; 2.4 GHz; 2-way x 4 cores = 8 cores Memory: 32 GB RAM Storage: 4x 146 GB disks (RAID 5) Network onboard: 2 x 1Gbit/s (82574L) Network PCIe Card: 2 x 1Gbit/s (82546EB)
Storage NetApp FAS2020 & Expansion Shelf		Form Factor base shelf: 2U Rack Mount Form Factor expansion shelf: 3U Rack Mount Base Shelf: 12 disks each 136 GB Expansion Shelf: 14 disks each 400 GB Connection: 4 x 1 Gbit/s network Controllers: 2 x controllers with each 2 NIC ports
Network Infrastructure Brocade FCX648S		Form Factor: 1 U Rack Mount Ports: 48 Switching Bandwidth: 200 Gbit/s Stacking Ports: 2 Features: L2/L3 Switch including High Availability; QoS; Management and Security features
VMware vCloud* Director Database	Virtual Machine	Windows Server* 2008 R2 (64-bit) Oracle* 11g Enterprise Edition
VMware vCenter* Server and VMware vCenter* Database VMware vCenter* Server 4.1.0	Virtual Machine	
VMware vCloud* Director	Virtual Machine	RHEL 5.4 (64-bit) Update 4

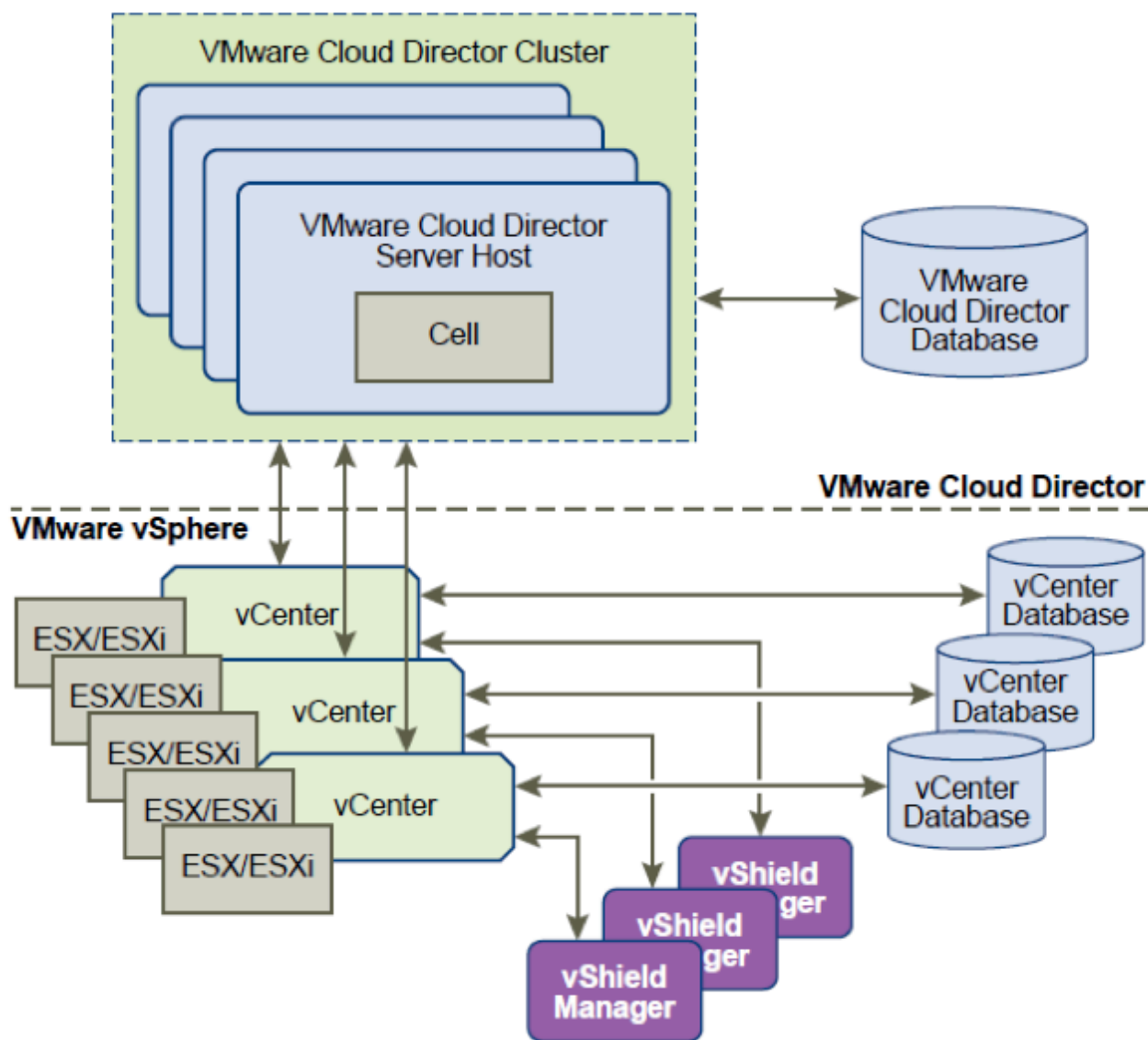


Figure 5: VMware vCloud* Director Architecture Diagram

Logical Architecture

In a cloud infrastructure, a VMware vCloud Director cluster is linked with one or more VMware vCenter Server installations, a VMware vShield Manager server, and an arbitrary number of VMware ESXi hosts. The VMware vCloud Director cluster and its database manage access to VMware vCenter resources by VMware vCloud clients. Figure 4 is a schematic representation of a simple cloud infrastructure. The diagram shows a VMware vCloud Director cluster of four server hosts. Each host runs a group of services called a VMware vCloud cell. All hosts in the cluster share a single database. The entire cluster is connected to three VMware vCenter instances and the VMware ESX hosts they manage. Each VMware vCenter instance is connected to a VMware vShield Manager host, which provides network services to the cloud. The VMware vCloud Director installation and configuration process establish an initial set of connections to a VMware vCenter Server, VMware ESX hosts, and VMware vShield Manager. Additional VMware vCenter, VMware vShield Manager, and VMware ESX hosts can be connected to the VMware vCloud Director cluster at any time.

Technical Review

Installation and Configuration

In the test bed, a single instance of VMware vCloud Director was configured to a single VMware vCenter installation with three hypervisor nodes. The sections that follow provide a brief overview of the above steps. Detailed instruction on the setup can be obtained from VMware's website, at http://www.vmware.com/pdf/vcd_10_install.pdf

VMware vSphere Hypervisor

VMware vCloud Director installation relies on the compute, storage, and network capacity provided by the underlying VMware ESX or VMware ESXi 4.0 Update 2 or 4.1 nodes. In the test bed installation, both types of VMware hypervisors co-existed without any issues. Refer to VMware vSphere Hardware Compatibility Guide, <http://www.vmware.com/resources/compatibility>, for the list of VMware certified hardware.

VMware vCenter* Server

Install VMware vCenter Server 4.0 Update 2 or 4.1 and VMware vSphere Client 4.1 Update 2 or higher on a Windows Server* 2008 R2 system. Create a cluster and add the VMware ESX/ESXi hosts created in the above step. Configure the VMware Distributed Resource Scheduler (DRS) setting based on the requirements, and setup "Enhanced vMotion Compatibility (EVC)" based on the processors in the VMware ESX hosts that will be added into the clusters. Ex: If your clusters will just contain Intel Xeon 5500 and 5600 series servers, you can choose "Intel® Xeon® Core™ i7" – this branding is not quite correct – appreciate you can double check on this – it's either Xeon or Core i7, but not both at same time as your EVC Mode configuration. This mode will support flex migration of VMs between the 5500 and 5600 systems. Ensure that all required configurations necessary for live VM migration of virtual machines between the hosts are completed.⁴

VMware vShield Manager

VMware vShield Manager provides the required network and security services to the VMware vCloud Director. A separate instance of VMware vShield Manager (version 4.1) is required for each VMware vCenter that is added to the VMware vCloud Director. VMware pre-bundles VMware vShield Manager as an OVF template, which can be imported into VMware vCenter. After network configuration, the VMware vShield Manager VM is up and running.

Oracle Database

VMware vCloud Director requires a database to store the information and share it with other VMware vCloud Director cells⁵ within the VMware vCloud Director cluster. VMware supports both Oracle* 10g Standard/Enterprise Release 2 and Oracle* 11g Standard/Enterprise. In the test bed, we used the Oracle 11g Enterprise edition installed on a Windows 2008 R2 system. Ensure that all the required privileges are assigned to the new user created as per the installation document.⁶ This user will be employed during configuration of the VMware vCloud Director to establish the link with the Oracle database.

VMware vCloud* Director Installation and Configuration

Ideally a VMware vCloud Director cluster will have several hosts, each of which will run the VMware vCloud services and each of which is called a VMware vCloud Director cell. All these individual cells will be connected to the same Oracle database created in the above step. These individual hosts will run Red Hat* Enterprise Linux* (RHEL) 5 Update 4 or Update 5. After the installation of the VMware vCloud Director services, configure the network and database settings. To connect to the database, use the credentials of the new user created during the installation of the database. Do not use the SYSTEM account for this step.

Connecting VMware vCloud Director with VMware vCenter and VMware vShield Manager

Once the network and database configuration is completed successfully, login to the VMware vCloud Director with the credentials configured. Now we need to add VMware vCenter Server instance(s) to this VMware vCloud Director cell, which will provide the required compute, storage, and network resources, and to VMware vShield Manager for the network and security services. The following figures show the VMware vCloud Director's verification flow to configure VMware vCenter Server and VMware vShield Manager.

Once you are logged into the vCloud Director with an administrative account, you are able to attach the vSphere resources.

The welcome screen will guide you through the necessary steps to build up your own Cloud Service.

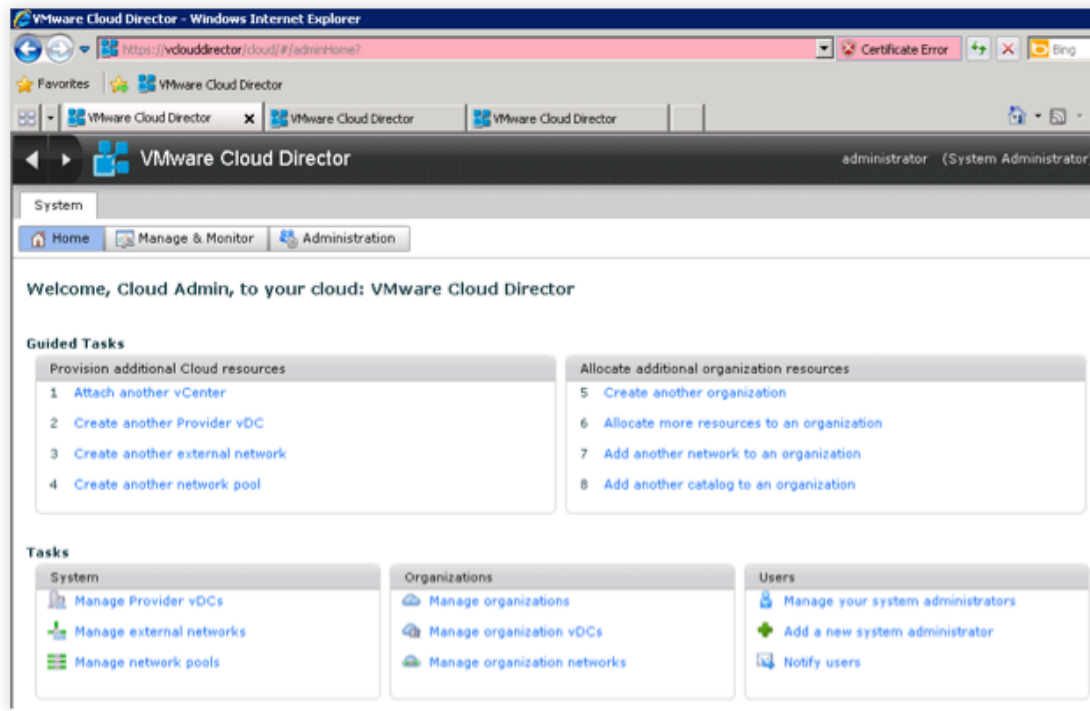
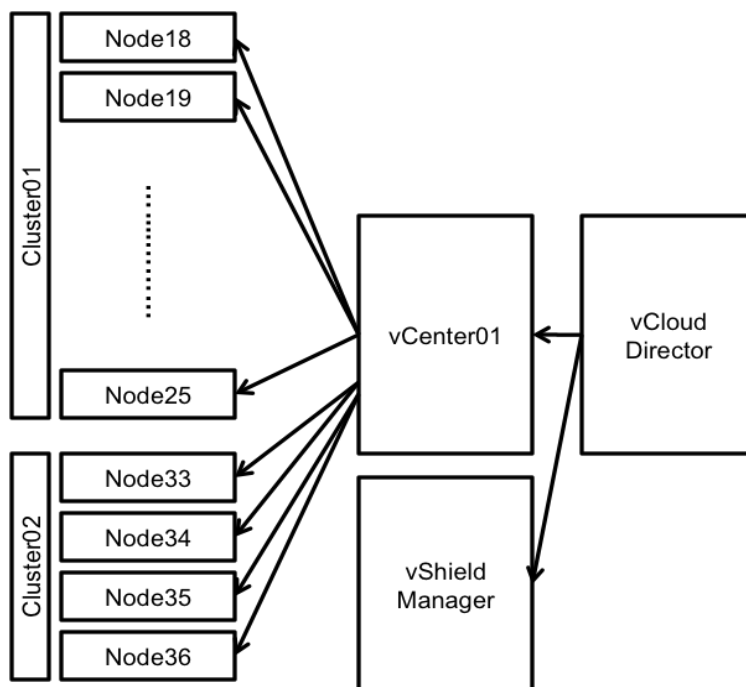


Figure 4: Welcome screen

Attach vCenter Server

The first step is to attach a vCenter Server, this action allows the VCD (VMware vCloud Director) to control the vSphere resources allocated to it as well as automate the management of network provisioning and security tasks using vShield Manager and its built-in vShield Edge capabilities.



Attach New vCenter

Name this vCenter

Enter the connection information, name, and description for the new vCenter as you want it to appear in VCD.

Host name or IP address: vcenter01.visit2010.local *

Port Number: 443 *

User name: Administrator *

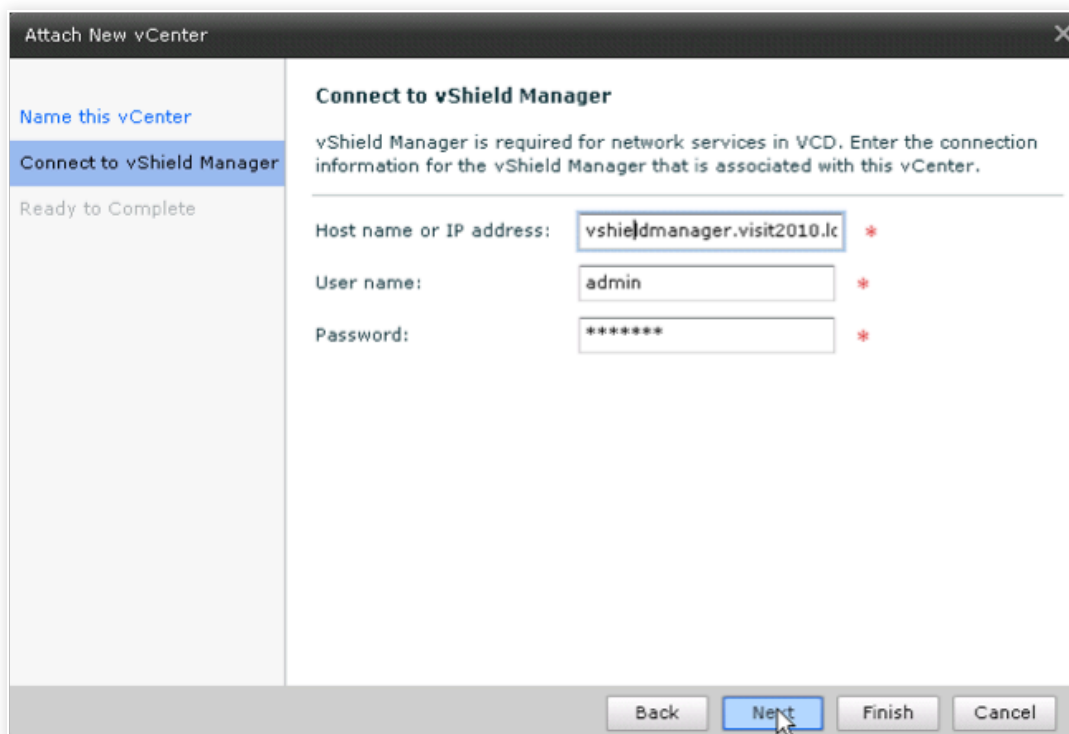
Password: ***** *

vCenter name: FujitsuCloudvcenter01 *

Description:

Back Next Finish Cancel

Connect to vShield Manager



Attach New vCenter

[Name this vCenter](#)
[Connect to vShield Manager](#)
 Ready to Complete

Connect to vShield Manager

vShield Manager is required for network services in VCD. Enter the connection information for the vShield Manager that is associated with this vCenter.

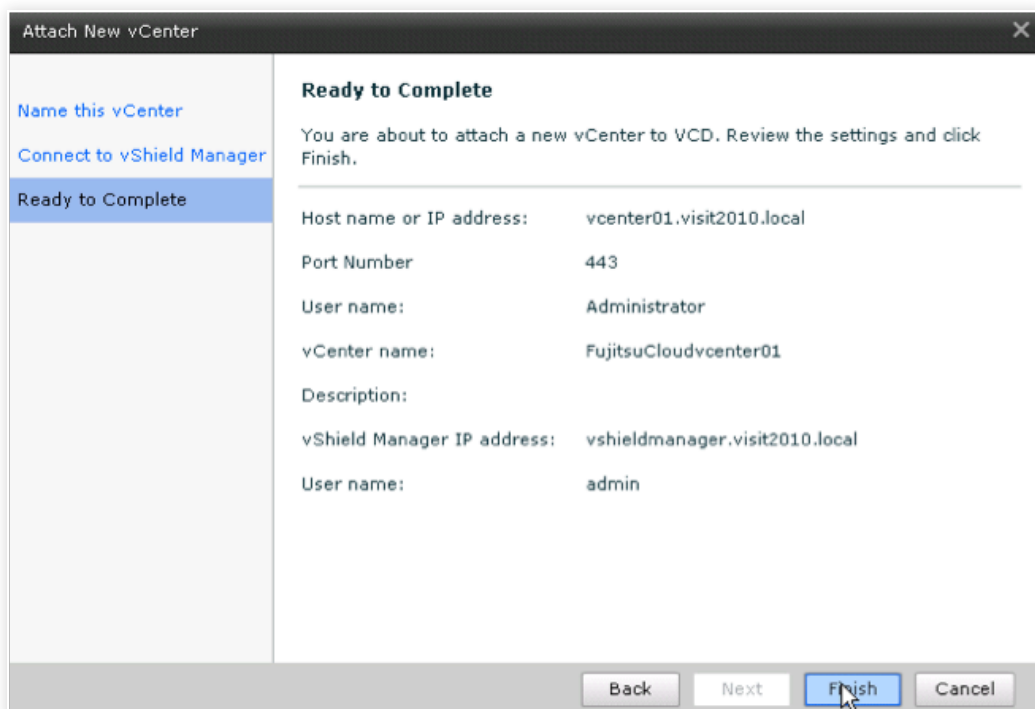
Host name or IP address: *

User name: *

Password: *

Back Next Finish Cancel

VCD will now process the attachment of this vCenter and its companion vShield Manager



Attach New vCenter

[Name this vCenter](#)
[Connect to vShield Manager](#)
 Ready to Complete

Ready to Complete

You are about to attach a new vCenter to VCD. Review the settings and click Finish.

Host name or IP address: vcenter01.visit2010.local

Port Number: 443

User name: Administrator

vCenter name: FujitsuCloudvcenter01

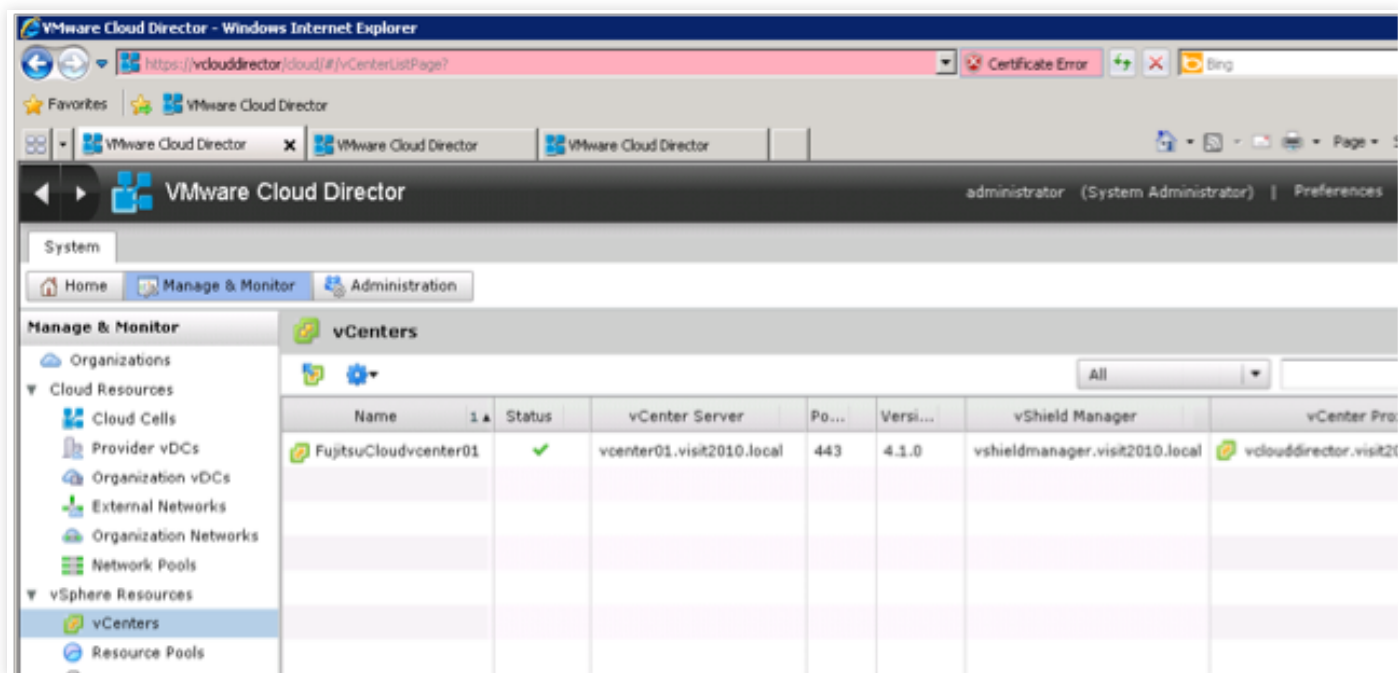
Description:

vShield Manager IP address: vshieldmanager.visit2010.local

User name: admin

Back Next Finish Cancel

Verify vCenter Server has been successfully added.



Use Case Details

The following use cases describe brief scenarios what a cloud administrator has to do in order to set up the cloud services.

Preconfigured User Roles:

Cloud Administrator -> provides resources to the cloud

Organization Administrator -> can manage organizations and can create catalogs

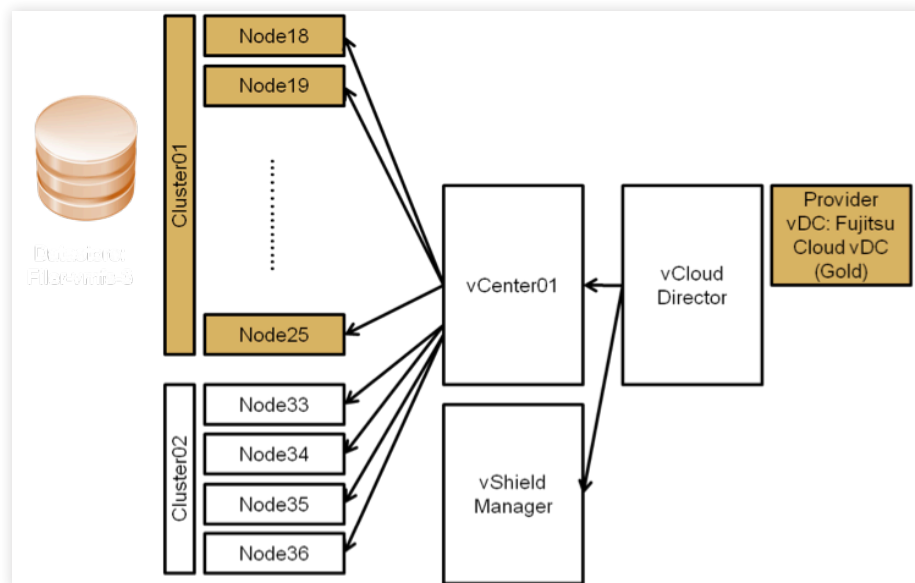
End User -> can browse the Catalog of vApps via a Web-browser portal and use IT as a service

Overview

1. Provider vDC creation
2. External Network creation
3. Network pool creation
4. Organizations and Users
5. Organization vDCs
6. Organizational Networks
7. Create Catalogs
8. vAppTemplate creation
9. Use of Infrastructure as a Service (IaaS)
10. Dynamic Scaling of Compute Resources
11. Termination of vApp or Service
12. Separation of Duties
13. Notifications and Alerts

Use Case 1: Provider vDC creation

The first service offering will combine compute, storage and network resources together. This resource grouping is called a Provider Virtual Data Center (vDC).



1. Create a Gold Provider vDC.

Add Provider vDC

Name this Provider vDC

A Provider vDC is a group of compute, memory, and storage resources from one vCenter. You can allocate portions of a Provider vDC to your organizations using Cloud Director.

Name: *

Description:

☒ **Enabled**
 Disabling a Provider vDC stops additional allocation of resources from this vDC. You cannot create new Organization vDCs. Organization vDCs that are currently backed by this Provider vDC are also disabled. New vApps cannot be run in these Organization vDCs.

Back Next Finish Cancel

2. Select the vCenter Server and the appropriate resource pool for a Gold Service.

Add Provider vDC

Select Resource Pool

The resource pool of the Provider vDC supplies compute and memory resources, memory, and vCenter services, such as high availability (HA) and fault tolerance (FT).

Select a vCenter and a resource pool: If it is not listed, you must attach a vCenter.

vCenter	Resource Pool	VC Path
FujitsuCloudvcenter01	node20.visit2010.local	node20.visit2010.local
	CloudCluster01	CloudCluster01

The following external networks are available to the resource pool you selected:

Network	Gateway	Subnet	DNS

Selected resource pool: CloudCluster01

Back Next Finish Cancel

3. Select the datastore for the Gold vDC.

Add Datastores

Add at least one datastore that supplies storage for the new provider vDC.

All

Datastore	Type	Enabled	Capacity (Used/Total)	Provisioned (Provisioned/Total)
filer-vmfs-3	VMFS	✓	80.41 GB / 1023.75 GB	257.73 GB / 1023.75 GB

11-11 of 11

Adding read-only datastores to provider vDCs used for deploying VMs is not supported.

Back Next Finish Cancel

4. Finally prepare the ESXi hosts; the VCD will install an agent on the ESXi hosts. On this screen you can give a single set of credentials for all ESXi hosts or you can enter credentials for each host individually if they are unique.

Prepare Hosts

To use the selected resource pool's hosts in Cloud Director, the system needs to install the Cloud Director agent on each host. This installation requires root privileges for each host.

Resource Pool CloudCluster01 has 7 host(s) that need to be prepared.

☒ One credential for all hosts:

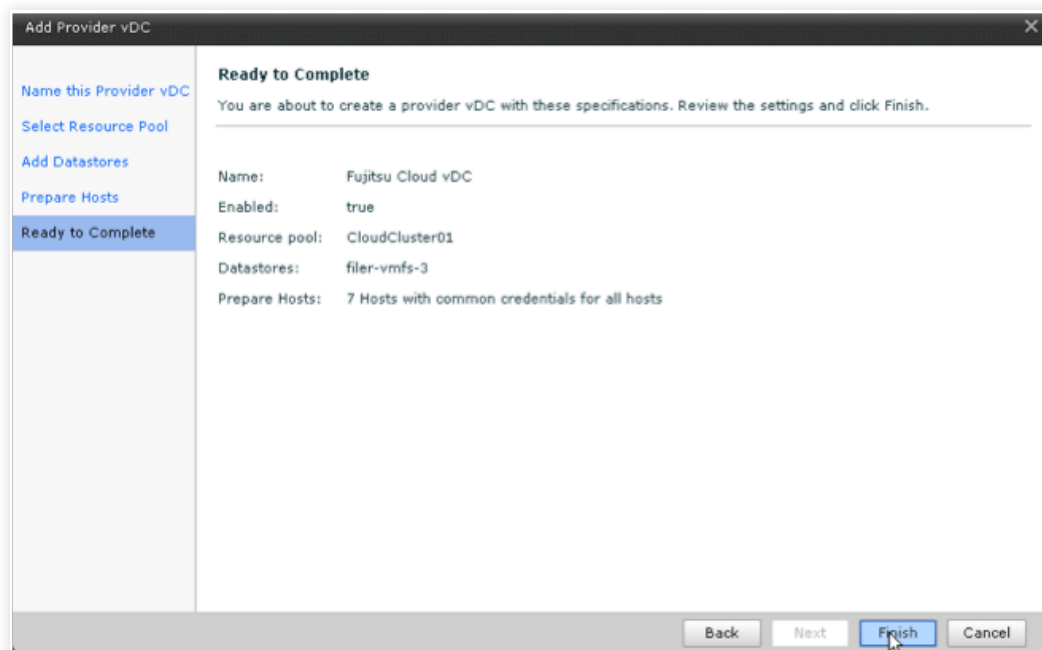
root User Name: root

Password: *****

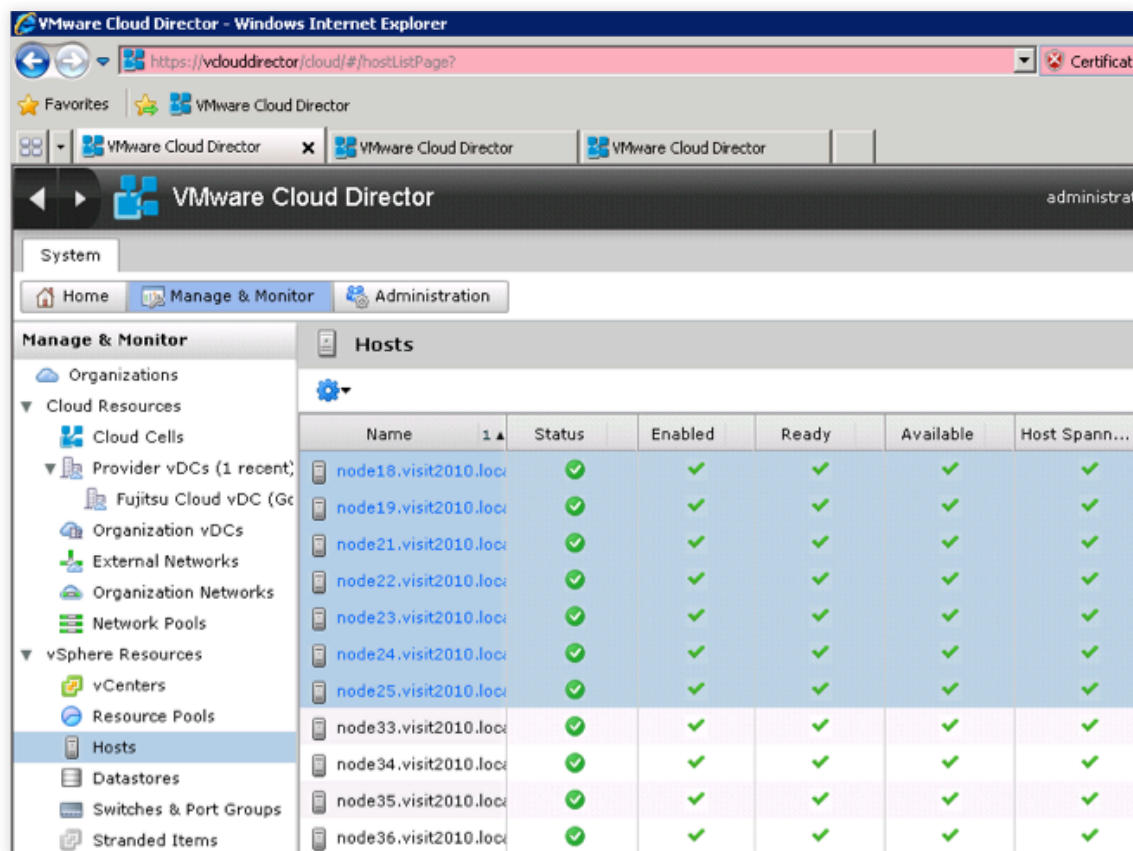
☐ A different credential for each host:

Host	Status	root User Name	Password
node18.visit2010.local	✓	root	
node19.visit2010.local	✓	root	
node21.visit2010.local	✓	root	

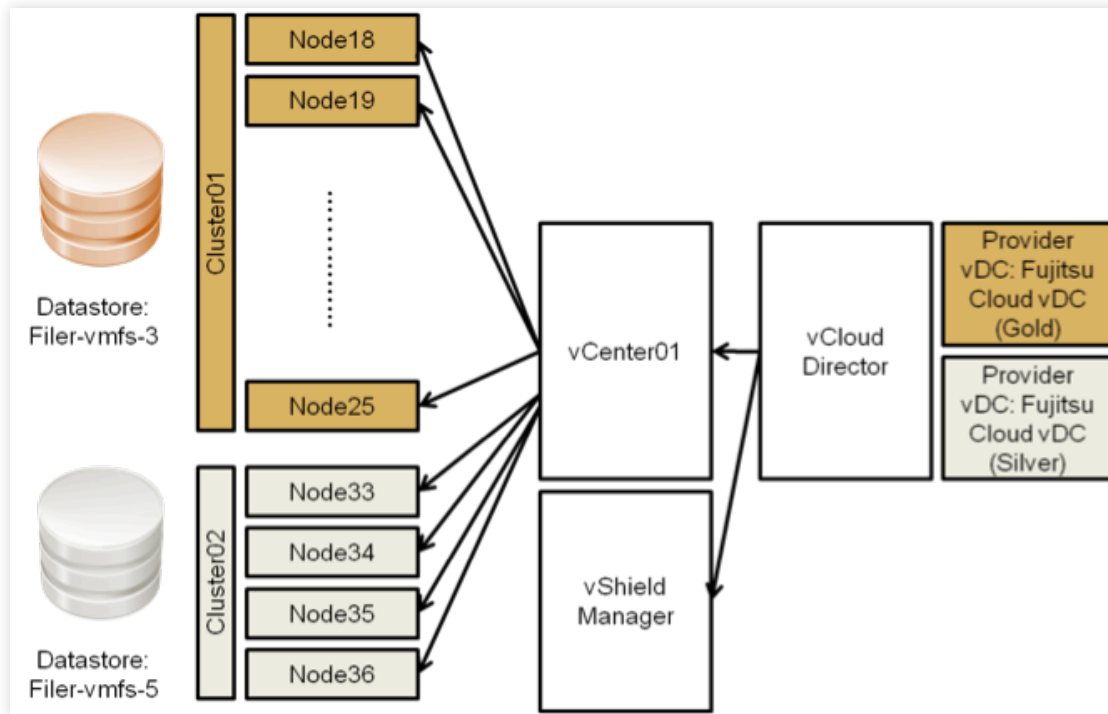
Back Next Finish Cancel



5. Verify that all nodes can now be seen within vCloud Director.



6. Optional: Feel free to repeat the above mentioned steps in order to create a "Silver" Provider vDC.



Use Case 2: External network creation

VMware vCloud Director is capable of supporting complex virtual networking scenarios within a hosted Organization, and ultimately most workloads will need to communicate with the outside world and so it is required to give the VCD the ability to connect to a physical network whether it is a public facing network to the internet or a private network within the same organization.

VCD makes it easy for organizations to consume and release resources and networking is no different, VCD uses Network Pools to dynamically create and release network resources to Organizations and their VMs. This removes the need for Network Admin intervention as new networks can be created when needed by the organization dynamically by VCD and when no longer being used they can be un-deployed and their resources will be returned to the network pool for re-use by other organizations.

An External Network describes how an Organization network can be connected to the physical world.

New External Network

Select vSphere Network

An external network uses a network in vSphere to connect to a network outside of your cloud. The network can be a public network such as the Internet, or even an external VPN network that connects to a given organization.

If you don't see the vCenter you need: [attach a different vCenter](#)

Select vCenter and vSphere Network

vCenter	1 ▲ ...	vSphere Network	1 ▲	VLAN	Datacenter	...
FujitsuCloudvcenter01		dvPortGroup_private		0	FujitsuCloud	
		dvPortGroup_Public_Mgmt		0	FujitsuCloud	
		dvPortGroup_vmotion		0	FujitsuCloud	

1-1 of 1

1-3 of 3

⚠ This port group has a fixed number of ports. If you try to use more ports than are available, virtual machine deployments will fail. You can try using ephemeral port groups.

These provider vDCs will connect to this new external network:

Fujitsu Cloud vDC

Back Next Finish Cancel

1. To connect a VM's vNIC to the External Network, VCD needs to assign a valid NAT IP address on the External Network; therefore it is required to define a pool of IP addresses that can be allocated to VMs.

The screenshot shows the 'New External Network' wizard with the 'Configure External Network' step selected. The left sidebar has three options: 'Select vSphere Network', 'Configure External Network' (highlighted), and 'Name this External Network'. The main area contains the following fields and controls:

- Network mask:** 255.255.255.0 (with a red asterisk)
- Default gateway:** 192.168.201.21 (with a red asterisk)
- Primary DNS:** 192.168.201.21 (with a red asterisk)
- Secondary DNS:** (empty field)
- DNS suffix:** (empty field)
- Static IP pool:**
 - Instruction: Enter an IP range (format: 192.68.1.2 - 192.68.1.100) or IP address and click Add.
 - Table with 2 entries:

192.168.201.190 - 192.168.201.191	Add
192.168.201.190 - 192.168.201.191	Modify
 - Buttons: Add, Modify, Remove.
 - Total: 2

At the bottom are buttons: Back, Next (highlighted), Finish, and Cancel.

2. Define a meaningful name for the network.

The screenshot shows the 'New External Network' wizard with the 'Name this External Network' step selected. The left sidebar has three options: 'Select vSphere Network', 'Configure External Network', and 'Name this External Network' (highlighted). The main area contains the following fields and controls:

- Name this External Network:**
 - Instruction: Enter a name and description for the new external network.
 - Network name:** FujitsuExternalNetwork (with a red asterisk)
 - Description:** (empty text area)

At the bottom are buttons: Back, Next (highlighted), Finish, and Cancel.

3. Click Finish.

New External Network

Select vSphere Network
Configure External Network
Name this External Network
Ready to Complete

Ready to Complete

You are about to create an external network. Review these settings and click Finish to create it.

Network name: FujitsuExternalNetwork

Description:

vSphere network: dvPortGroup_Public_Mgmt

Network mask: 255.255.255.0

Default gateway: 192.168.201.21

Primary DNS: 192.168.201.21

Secondary DNS:

DNS suffix:

Address pool for static IP allocation: 192.168.201.190 - 192.168.201.191

Back Next **Finish** Cancel

4. Finally verify the status of the created external network.

VMware Cloud Director - Windows Internet Explorer

https://vclouddirector.cloud/#/adminLogicalNetworksPage? Certificate Error Bing

VMware Cloud Director administrator (System Administrator) | Preferences

System

Home Manage & Monitor Administration

Manage & Monitor

- Organizations
- Cloud Resources
 - Cloud Cells
 - Provider vDCs
 - Organization vDCs
 - External Networks**
 - Organization Networks
 - Network Pools

Networks

All

Name	Status	VLAN	Default Gateway	IP Pool (Used/Total)	vSphere Network
FujitsuExternalNetwork	OK	0	192.168.201.21	0%	Public_Mgmt

Use Case 3: Network pool creation

A Network Pool is a collection of Virtual Machine networks available to be consumed by virtual datacenters to create vApp networks and by organizations to create organization networks. Network traffic on each network of a network pool is isolated at layer 2 from all other networks

1. Configure a “VLAN-backed” network pool.

Create Network Pool Wizard

Network Pool Type

A network pool is a collection of virtual machine networks that are available to be consumed by vDCs to create vApp networks and by organizations to create organization networks. Network traffic on each network in a pool is isolated at layer 2 from all other networks.

Select a network pool type from the list below:

- ☒ **VLAN-backed**
Create a network pool backed by a range of VLAN IDs. The VLANs must be pre-provisioned.
- ☐ **VCD network isolation-backed**
Create a network pool backed by Cloud isolated networks. A Cloud isolated network spans hosts and provides traffic isolation from other hosts. The system provisions Cloud isolated networks automatically.
- ☐ **vSphere port group-backed**
Create a network pool backed by a vSphere port group. The port group must be pre-provisioned.

Back Next Finish Cancel

2. Add a valid range of VLANs and assign it to a distributed virtual switch.

The screenshot shows the 'Create Network Pool Wizard' window, specifically the 'Configure VLAN-backed Pool' step. The left sidebar shows the progress: 'Network Pool Type' (selected), 'Configure VLAN-backed Pool', and 'Name this Network Pool'. The main area is titled 'Configure VLAN-backed Pool' and contains the following sections:

- Enter the settings for the new network pool below:**
 - VLAN ID Range:** A text input field contains '60 - 70'. Below it are 'Add', 'Modify', and 'Remove' buttons. A red asterisk indicates a validation error.
 - Select vNetwork Distributed Switch:** Two tables are shown. The first table, under 'vCenter', lists 'FujitsuCloudvcenter01'. The second table, under 'vDS', lists 'Public Network' and 'FujitsuCloudvcenter01'.
- These provider vDCs will connect to networks allocated from this new network pool:**
 - A list box labeled 'Provider vDC' contains 'Fujitsu Cloud vDC (Silver)' and 'Fujitsu Cloud vDC (Gold)'.

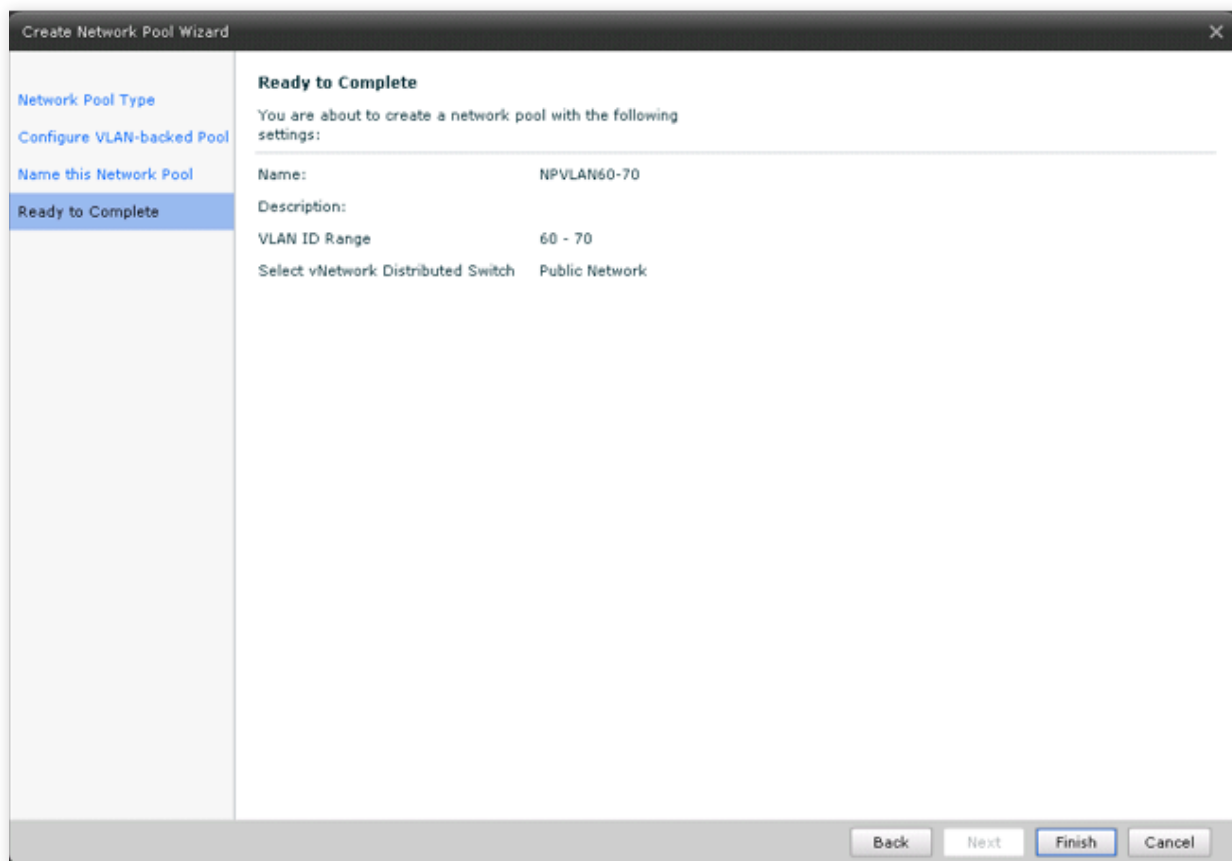
Navigation buttons at the bottom include 'Back', 'Next' (highlighted), 'Finish', and 'Cancel'.

3. Use a meaningful name.

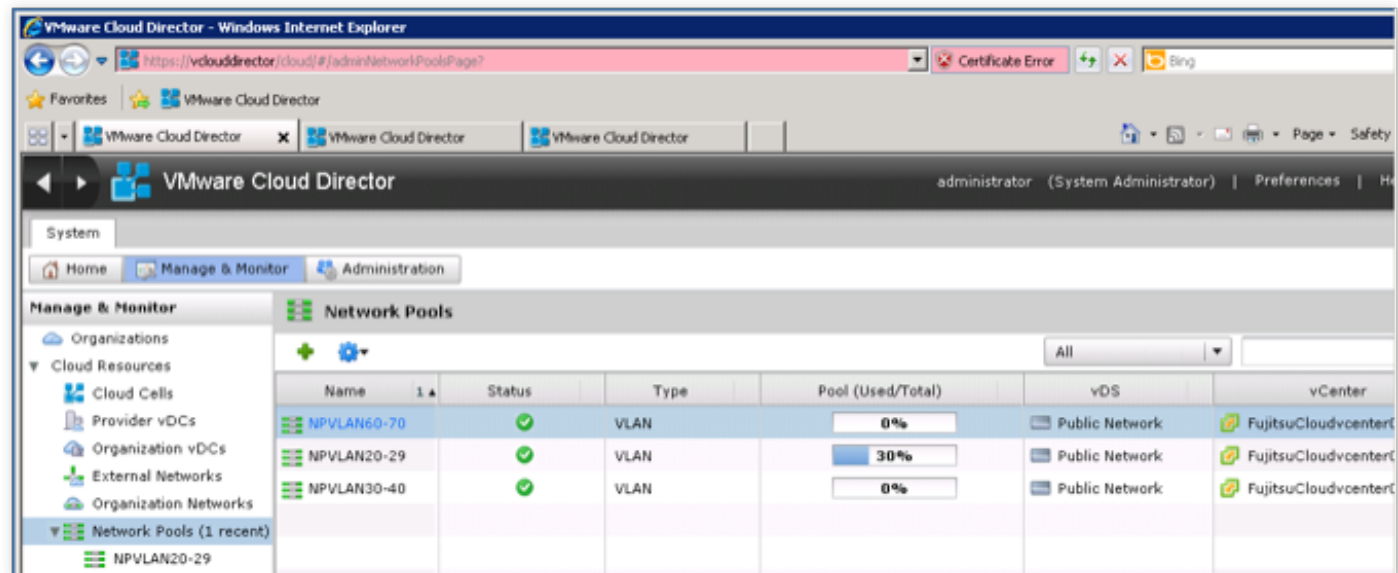
The screenshot shows the 'Create Network Pool Wizard' window, specifically the 'Name this Network Pool' step. The left sidebar shows the progress: 'Network Pool Type', 'Configure VLAN-backed Pool', and 'Name this Network Pool' (selected). The main area is titled 'Name this Network Pool' and contains the following sections:

- Enter profile settings for the new network pool below:**
 - Name:** A text input field contains 'NPVLAN60-70'. A red asterisk indicates a validation error.
 - Description:** An empty text input field.

Navigation buttons at the bottom include 'Back', 'Next' (highlighted), 'Finish', and 'Cancel'.



4. Finally verify the status of the created network pool.



Use Case 4: Organizations and Users

VMware vCloud Director is now ready to start offering Cloud resources to Fujitsu Business units. For example the Fujitsu-Finance division has a new Finance application in development and the Project team wants to test out the flexibility that the Cloud will offer as they develop their new application. To do so create an organization for the Fujitsu-Finance division and build an Organization Virtual Datacenter using some resources from the Gold Service.

Organization's name is Fujitsu-Finance notice as you type in the Organization's URL dynamically changes to show what you're typing and will finish with <http://vclouddirector/cloud/org/Fujitsu-Finance/>. The Organization's Full name is Fujitsu-Finance as well.

New Organization

Name this Organization

LDAP Options
Add Local Users
Catalog Publishing
Email Preferences
Policies
Ready to Complete

Name this Organization

An Organization is the fundamental VCD grouping. An Organization contains users, the vApps they create and the resources the vApps use. An organization can be a department in your own company or an external customer you're providing Cloud resources to.

Organization name:
 *

The unique identifier in the full URL with which users log in to this organization. You can only use alphanumeric characters.

Default organization URL:
<https://vclouddirector/cloud/org/Fujitsu-Finance/>

Organization full name:
 *

Appears in the Cloud application header when users log in. An organization administrator can change this full name.

Description:

An organization administrator can change this description.

Back Next Finish Cancel

VCD can take identity and logon credentials from an existing LDAP or Active Directory source on a per Organization basis (VCD System LDAP Service). To keep the example simple LDAP services are not used.

The screenshot shows the 'New Organization' dialog box with the 'LDAP Options' tab selected. The left sidebar contains a list of options: 'Name this Organization', 'LDAP Options' (selected), 'Add Local Users', 'Catalog Publishing', 'Email Preferences', 'Policies', and 'Ready to Complete'. The main area is titled 'LDAP Options' and contains the following text: 'An organization can use an LDAP service as the directory of users and groups that can be added to the organization.' Below this, it asks 'What is the source of users for this organization?' and provides three radio button options:

- Do not use LDAP**: The organization administrator creates VCD users who are private to the organization. Groups cannot be created.
- VCD system LDAP service**: Use when this organization is a member of your Cloud provider company. It includes a text field for 'Distinguished name for OU:' with an example: 'ou=Users,dc=example,dc=local'.
- Custom LDAP service**: Use when you've arranged with the organization to use their own directory service. Before you can use this option, you must configure your Cloud system LDAP service to link to their LDAP service.

 At the bottom right, there are four buttons: 'Back', 'Next' (highlighted with a mouse cursor), 'Finish', and 'Cancel'.

1. Add an organizational Administrator user for Fujitsu-Finance Organization.

The screenshot shows the 'New Organization' dialog box with the 'Add Local Users' tab selected. The left sidebar is the same as in the previous screenshot. The main area is titled 'Add Local Users' and contains the text: 'Even if you use an LDAP service, you can create local users.' Below this, there is a table with columns 'User Name' and 'Password'. A 'New User' sub-dialog box is open over the main dialog. The 'New User' dialog has the following sections:

- Credentials**: Fields for 'User name:' (containing 'ffadmin'), 'Password:' (masked with asterisks), and 'Confirm password:' (masked with asterisks). There is a checkbox for 'Enable' which is checked.
- Role**: A dropdown menu for 'Roles available to this user:' with 'Organization Administrator' selected.
- Contact Info**: Fields for 'Full name:', 'Email address:', 'Phone:', and 'IM:'.
- Quotas**: (This section is partially visible at the bottom).

 At the bottom of the 'New User' dialog are 'OK' and 'Cancel' buttons. The 'New Organization' dialog also has 'Next', 'Finish', and 'Cancel' buttons at the bottom right.

2. Done with adding administration users to the organization.

The screenshot shows the 'New Organization' wizard with the 'Add Local Users' step selected in the left sidebar. The main area has a title 'Add Local Users' and a note: 'Even if you use LDAP, you should create at least one local user who can log in if LDAP is unavailable. If necessary, you can create a local user who will be the organization administrator.' Below this, a table lists 'Local users:' with columns 'User Name' and 'Role'. The first row shows 'ffadmin' as the 'Organization Administrator'. At the bottom right of the table are buttons 'Add...', 'Edit...', and 'Remove'. At the bottom of the wizard are buttons 'Back', 'Next', 'Finish', and 'Cancel'. A mouse cursor is pointing at the 'Next' button.

User Name	Role
ffadmin	Organization Administrator

3. Allow publishing catalogs to all organizations,

The screenshot shows the 'New Organization' wizard with the 'Catalog Publishing' step selected in the left sidebar. The main area has a title 'Catalog Publishing' and two questions. The first question is 'Will this organization supply catalogs to all other organizations?' with a 'Next' button. The second question is 'Can this organization publish catalogs that all other organizations can use?' with two radio button options. The first option is 'Cannot publish catalogs.' with a description: 'This case is typical for a customer organization that only uses services from your VCD.' The second option is 'Allow publishing catalogs to all organizations.' with a description: 'Use when this organization is a member of your VCD service provider or a customer organization that provides catalogs to other organizations. Organization Administrators select the catalogs they want from the list of available catalogs.' At the bottom of the wizard are buttons 'Back', 'Next', 'Finish', and 'Cancel'. A mouse cursor is pointing at the 'Next' button.

Catalog Publishing

Will this organization supply catalogs to all other organizations?

Can this organization publish catalogs that all other organizations can use?

☐ Cannot publish catalogs.
This case is typical for a customer organization that only uses services from your VCD.

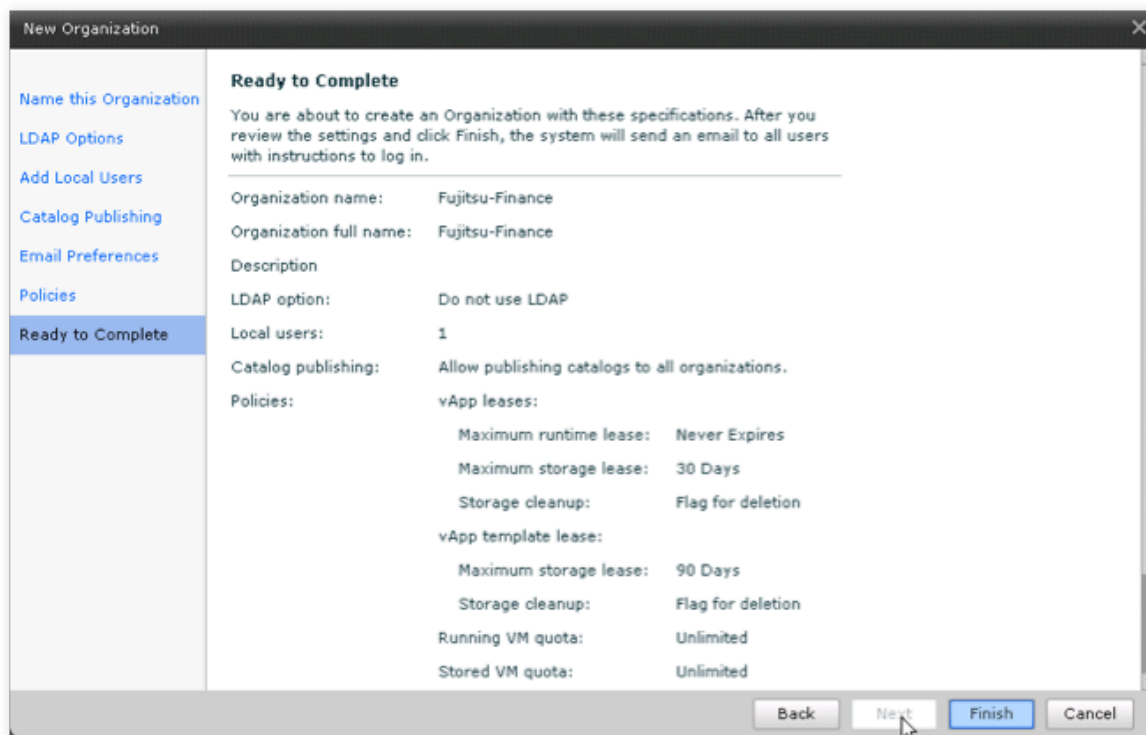
☒ Allow publishing catalogs to all organizations.
Use when this organization is a member of your VCD service provider or a customer organization that provides catalogs to other organizations. Organization Administrators select the catalogs they want from the list of available catalogs.

4. Stay with the defaults concerning notifications (email).

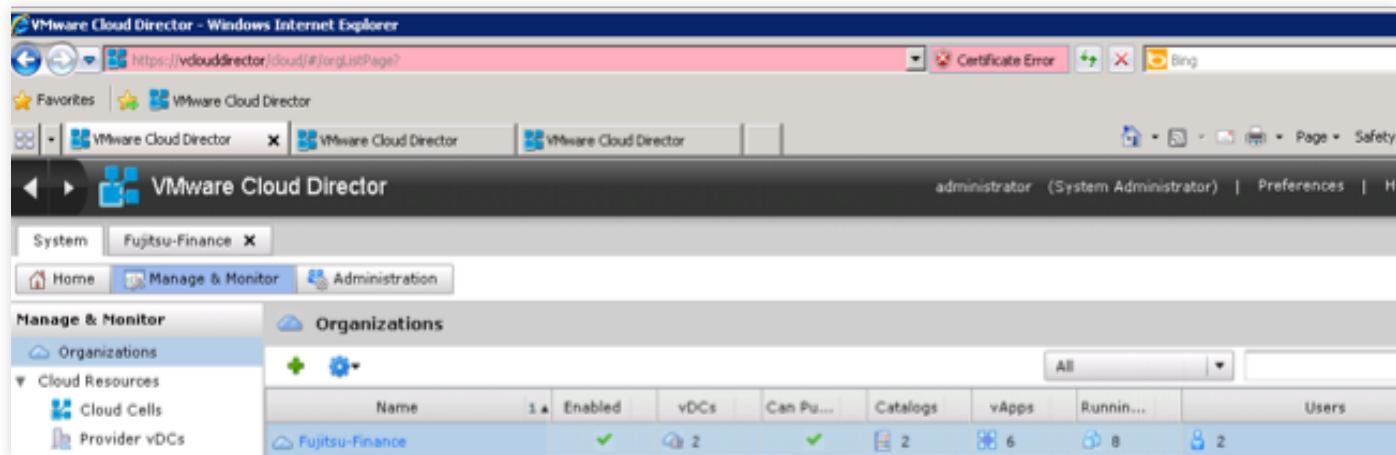
The screenshot shows the 'New Organization' wizard at the 'Email Preferences' step. The left sidebar has 'Email Preferences' selected. The main area is titled 'Email Preferences' with the instruction 'Configure email preferences that are used to send notifications for this organization.' Below this are two sections: 'SMTP Server' and 'Notification Settings'. In the 'SMTP Server' section, the 'Use system default SMTP server' radio button is selected. In the 'Notification Settings' section, the 'Use system default notification settings' radio button is selected. At the bottom, the 'Next' button is highlighted with a mouse cursor.

5. Stay with the defaults concerning policies.

The screenshot shows the 'New Organization' wizard at the 'Policies' step. The left sidebar has 'Policies' selected. The main area is titled 'Policies' with the instruction 'Configure policies for this organization.' Below this are two sections: 'Leases' and 'Quotas'. In the 'Leases' section, the 'vApp leases' are configured with 'Maximum runtime lease' set to 'Never Expires' and 'Maximum storage lease' set to '30 Days'. The 'vApp template lease' is configured with 'Maximum storage lease' set to '90 Days'. Both sections have 'Storage cleanup' set to 'Move to Expired Items'. At the bottom, the 'Next' button is highlighted with a mouse cursor.



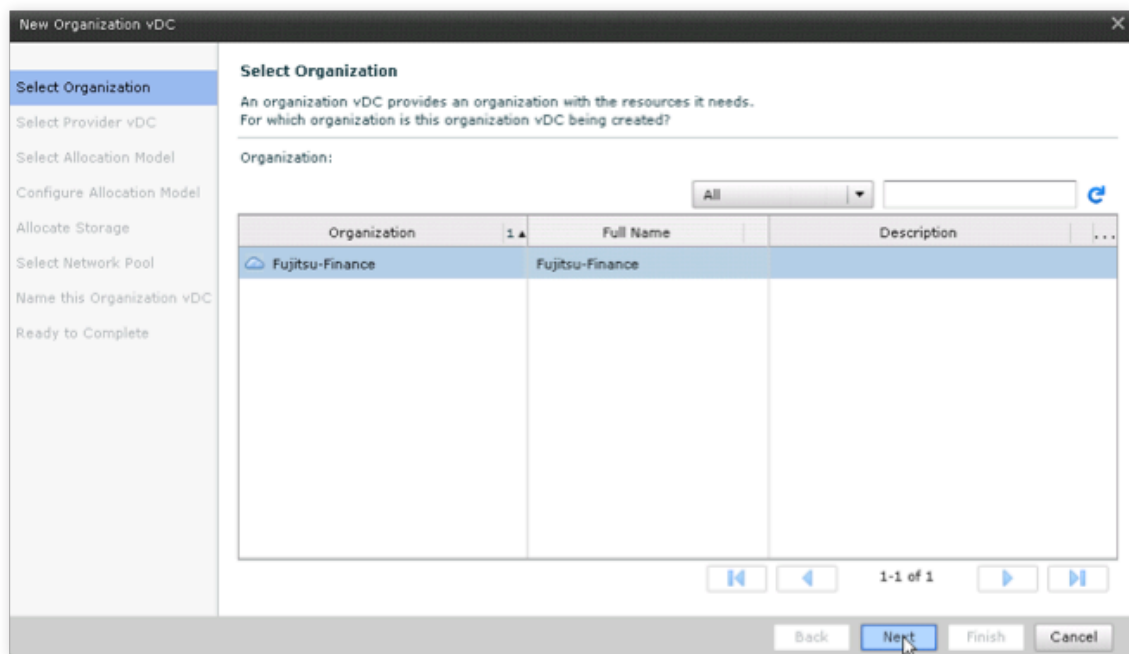
6. Finally verify the status of the newly created organization.



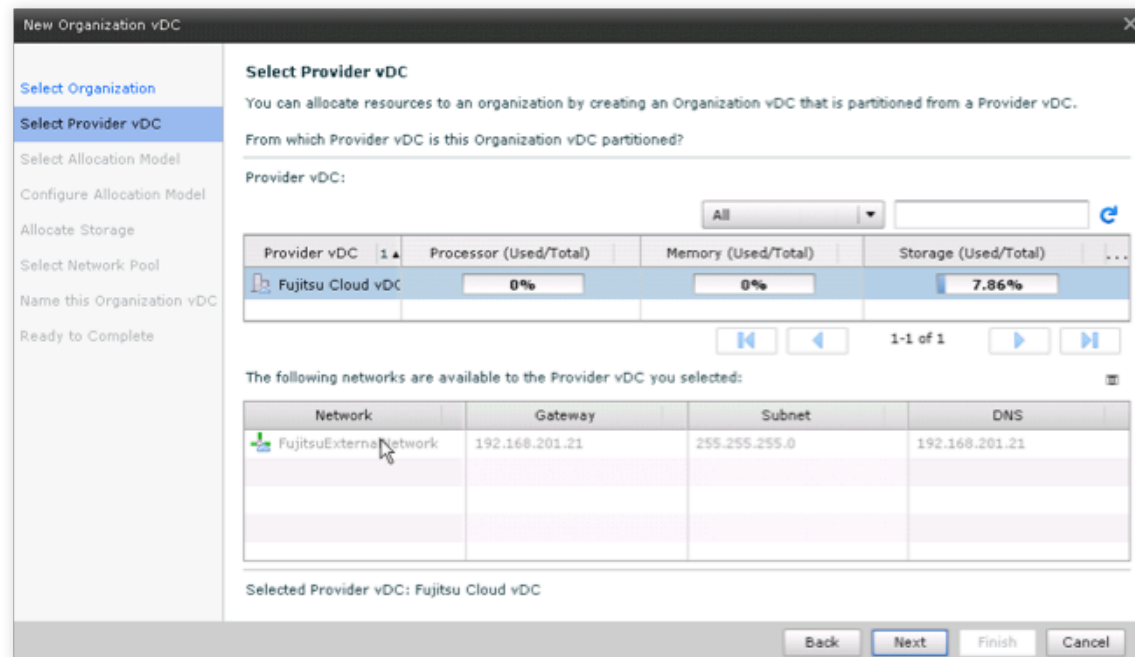
Use Case 5: Organization vDCs

The Organization for the Fujitsu-Finance division was created. You can now take some of the resources from the Fujitsu Cloud Gold Service (Provider vDC) and allocate them to the Fujitsu-Finance organization.

1. Select the organization.



2. Select the appropriate Provider vDC (Gold).



3. On the allocation model page, you can select how resources are allocated to Fujitsu-Finance. This will have an impact on how resources are allocated, reserved and charged back to the Fujitsu-Finance organization division. Select the pay-as-you-go allocation model. Resources will be added or removed dynamically on a per VM basis and Fujitsu-Finance will only be charged for the actual resources used.

The screenshot shows a wizard window titled "New Organization vDC". On the left is a sidebar with a list of steps: "Select Organization", "Select Provider vDC", "Select Allocation Model" (which is highlighted with a blue background), "Configure Pay-As-You-Go Model", "Allocate Storage", "Select Network Pool", "Name this Organization vDC", and "Ready to Complete". The main area of the window is titled "Select Allocation Model" and contains the following text: "The Organization vDC's allocation model allows you to control the quality of the service you're providing and the cost of providing these resources." Below this text are three radio button options: "Allocation Pool" (with a description: "Only a percentage of the resources you allocate are committed to the organization vDC. The system administrator controls overcommitment of capacity on the following pages."), "Pay-As-You-Go" (which is selected, indicated by a filled radio button and a description: "Resources are committed only when vApps are created in the organization vDC. The system administrator controls commitment of capacity on the following pages."), and "Reservation Pool" (with a description: "All of the resources you allocate are committed to the organization vDC. Users can control the overcommitment of capacity at any time."). At the bottom right of the window are four buttons: "Back", "Next" (which is highlighted with a blue border), "Finish", and "Cancel".

4. With the use of the Pay-As-You-Go model you can specify how much of a VM resource is reserved, whether there should be caps on CPU or Memory and how many VMs can be deploy in this Org vDC. Leave CPU resource guaranteed at 0%.

Set the vCPU speed to 1 GHz, this sets a defined performance characteristic on any VM created in this Org vDC, so ensuring a consistent performance profile, regardless of the Cloud's load. Set memory resources guaranteed to 25 %, this ensures we have at least a 1/4th of the VM's memory allocation guaranteed to it. The VM can burst into the additional capacity up to 100 % of its defined memory allocation, but the additional 75 % of memory is not guaranteed to be there when the VM needs it. Finally set the Maximum number of VM's to 100 to limit the number of VM's that can be deployed in this Org vDC.

The screenshot shows the 'New Organization vDC' wizard with the 'Configure Pay-As-You-Go Model' step selected. The left sidebar lists the steps: Select Organization, Select Provider vDC, Select Allocation Model, Configure Pay-As-You-Go Model (highlighted), Allocate Storage, Select Network Pool, Name this Organization vDC, and Ready to Complete. The main panel is titled 'Configure Pay-As-You-Go Model' and contains the following settings:

- CPU resources guaranteed:** 0 %
- vCPU speed:** 1 GHz
- Memory resources guaranteed:** 25 %
- Maximum number of VMs:** 100 (radio button selected, 'Unlimited' is also an option)

Below the settings, there is a summary section:

The committed resources from Provider vDC, 'Fujitsu Cloud vDC' using these allocation settings:
0 GHz CPU reservation, 103.77 GHz free
0 GB Memory reservation, and 87.16 GB free

The typical number of vApps or VMs you can expect using these allocation settings at this time:
100 'small' VMs (0.26 GHz CPU, 0.51 GB Memory)
100 'medium' VMs (0.51 GHz CPU, 1.02 GB Memory)

At the bottom right, there are four buttons: Back, Next (highlighted), Finish, and Cancel.

5. Storage allocation is simple, please limit the amount of storage and enable “thin provisioned” virtual disks.

The screenshot shows the 'New Organization vDC' wizard window. The left sidebar contains a list of steps: 'Select Organization', 'Select Provider vDC', 'Select Allocation Model', 'Configure Pay-As-You-Go Model', 'Allocate Storage' (which is highlighted), 'Select Network Pool', 'Name this Organization vDC', and 'Ready to Complete'. The main area is titled 'Allocate Storage' and contains the following text: 'As the service provider, you control the storage allocation to the organization by setting a limit and enabling thin provisioning of live storage.' Below this text, there is a 'Storage limit:' section with two radio buttons. The first radio button is selected and is followed by a text box containing the number '100'. The second radio button is labeled 'Unlimited' and is followed by the text 'GB (1% of 943.31 GB available)'. Below the storage limit section, there is a checkbox labeled 'Enable thin provisioning' which is checked. At the bottom right of the window, there are four buttons: 'Back', 'Next' (which is highlighted), 'Finish', and 'Cancel'.

New Organization vDC

Select Organization
Select Provider vDC
Select Allocation Model
Configure Pay-As-You-Go Model
Allocate Storage
Select Network Pool
Name this Organization vDC
Ready to Complete

Allocate Storage

As the service provider, you control the storage allocation to the organization by setting a limit and enabling thin provisioning of live storage.

Storage limit: ☒ 100 ☐ Unlimited GB (1% of 943.31 GB available)

☒ Enable thin provisioning

Back Next Finish Cancel

6. On the Select Network Pool screen, select the Network Pool created earlier during VLAN Network Pool creation and change the quota for this organization to 11 and press TAB to clear the warning message. This means that the Fujitsu-Finance department has a self-service capability to create 11 Layer 2 isolated networks based on VLANs without having to raise a change request.

The screenshot shows a window titled "New Organization vDC" with a sidebar on the left and a main content area on the right. The sidebar contains a list of steps: "Select Organization", "Select Provider vDC", "Select Allocation Model", "Configure Pay-As-You-Go Model", "Allocate Storage", "Select Network Pool" (which is highlighted), "Name this Organization vDC", and "Ready to Complete". The main content area is titled "Select Network Pool" and contains the following text: "Select the network pool that provides vApp networks to this organization vDC and specify the vApp network quota from this pool." Below this text, there are three fields: "Network pool:" with a dropdown menu showing "NPVLAN60-70", "Total available networks:" with a text box containing "11", and "Quota for this organization:" with a text box containing "11". At the bottom right of the window, there are four buttons: "Back", "Next" (which is highlighted), "Finish", and "Cancel".

New Organization vDC

Select Network Pool

Select the network pool that provides vApp networks to this organization vDC and specify the vApp network quota from this pool.

Network pool: NPVLAN60-70

Total available networks: 11

Quota for this organization: 11

Back Next Finish Cancel

7. Define a meaningful name.

The screenshot shows the 'New Organization vDC' wizard window. The left sidebar contains a list of steps: 'Select Organization', 'Select Provider vDC', 'Select Allocation Model', 'Configure Pay-As-You-Go Model', 'Allocate Storage', 'Select Network Pool', 'Name this Organization vDC' (which is highlighted), and 'Ready to Complete'. The main area is titled 'Name this Organization vDC' and contains the instruction 'Enter the name and description for this new Organization vDC.' Below this, there is a 'Name:' text box containing 'Fujitsu-Finance-vDC-Prod' with a red asterisk to its right, and a 'Description:' text box which is empty. A checkbox labeled 'Enabled' is checked, with a note below it: 'Disabling an organization vDC stops new vApps from being deployed to the vDC. Running vApps continue to run, but additional vApps cannot be started.' At the bottom right, there are four buttons: 'Back', 'Next', 'Finish', and 'Cancel'.

New Organization vDC

Select Organization
Select Provider vDC
Select Allocation Model
Configure Pay-As-You-Go Model
Allocate Storage
Select Network Pool
Name this Organization vDC
Ready to Complete

Name this Organization vDC
Enter the name and description for this new Organization vDC.

Name:
Fujitsu-Finance-vDC-Prod *

Description:

☒ **Enabled**
Disabling an organization vDC stops new vApps from being deployed to the vDC. Running vApps continue to run, but additional vApps cannot be started.

Back Next Finish Cancel

The screenshot shows the 'New Organization vDC' wizard window at the 'Ready to Complete' step. The left sidebar is the same as the previous screenshot, but 'Ready to Complete' is now highlighted. The main area is titled 'Ready to Complete' and contains the instruction 'You are about to create an Organization vDC with these specifications. Review the settings and click Finish.' Below this, there is a table of specifications. At the bottom right, there is a checkbox labeled 'Add networks to this organization after this wizard is finished.' and four buttons: 'Back', 'Next', 'Finish', and 'Cancel'.

New Organization vDC

Select Organization
Select Provider vDC
Select Allocation Model
Configure Pay-As-You-Go Model
Allocate Storage
Select Network Pool
Name this Organization vDC
Ready to Complete

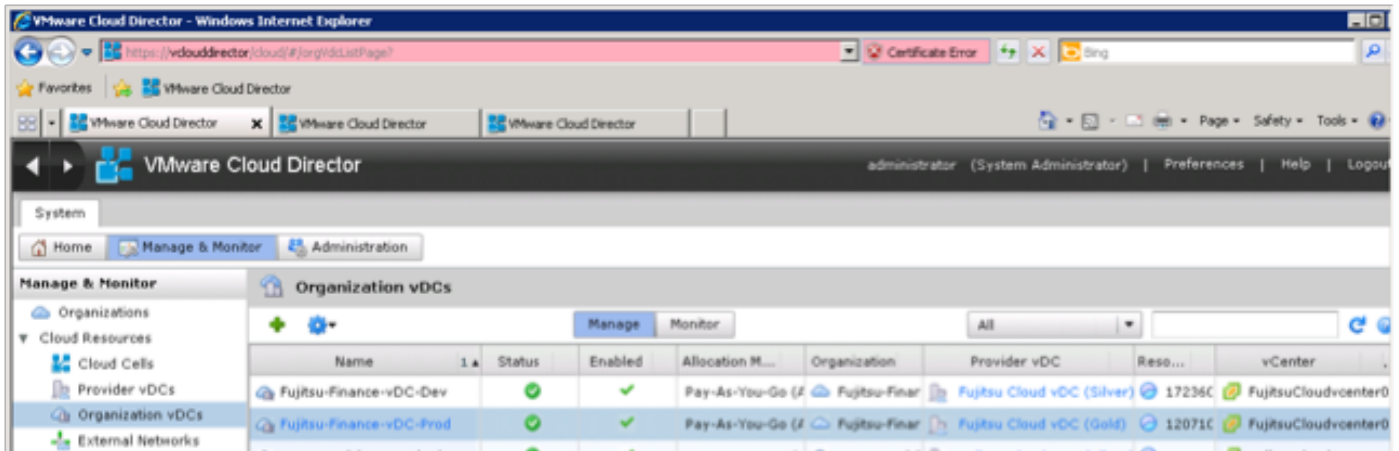
Ready to Complete
You are about to create an Organization vDC with these specifications. Review the settings and click Finish.

Name:	Fujitsu-Finance-vDC-Prod
Enabled:	true
Organization:	Fujitsu-Finance
Provider vDC:	Fujitsu Cloud vDC (Gold)
Allocation model:	Pay-As-You-Go (Allocation vApp)
CPU configuration:	Unlimited, 0% guaranteed, and every running vCPU will have 1 GHz.
Memory configuration:	Unlimited, where 25% of any allocated resources are guaranteed
Storage configuration:	Limited up to 100 GB
Maximum number of VMs:	Unlimited
Network pool:	NPVLAN60-70
Maximum provisioned networks:	11

☐ Add networks to this organization after this wizard is finished.

Back Next Finish Cancel

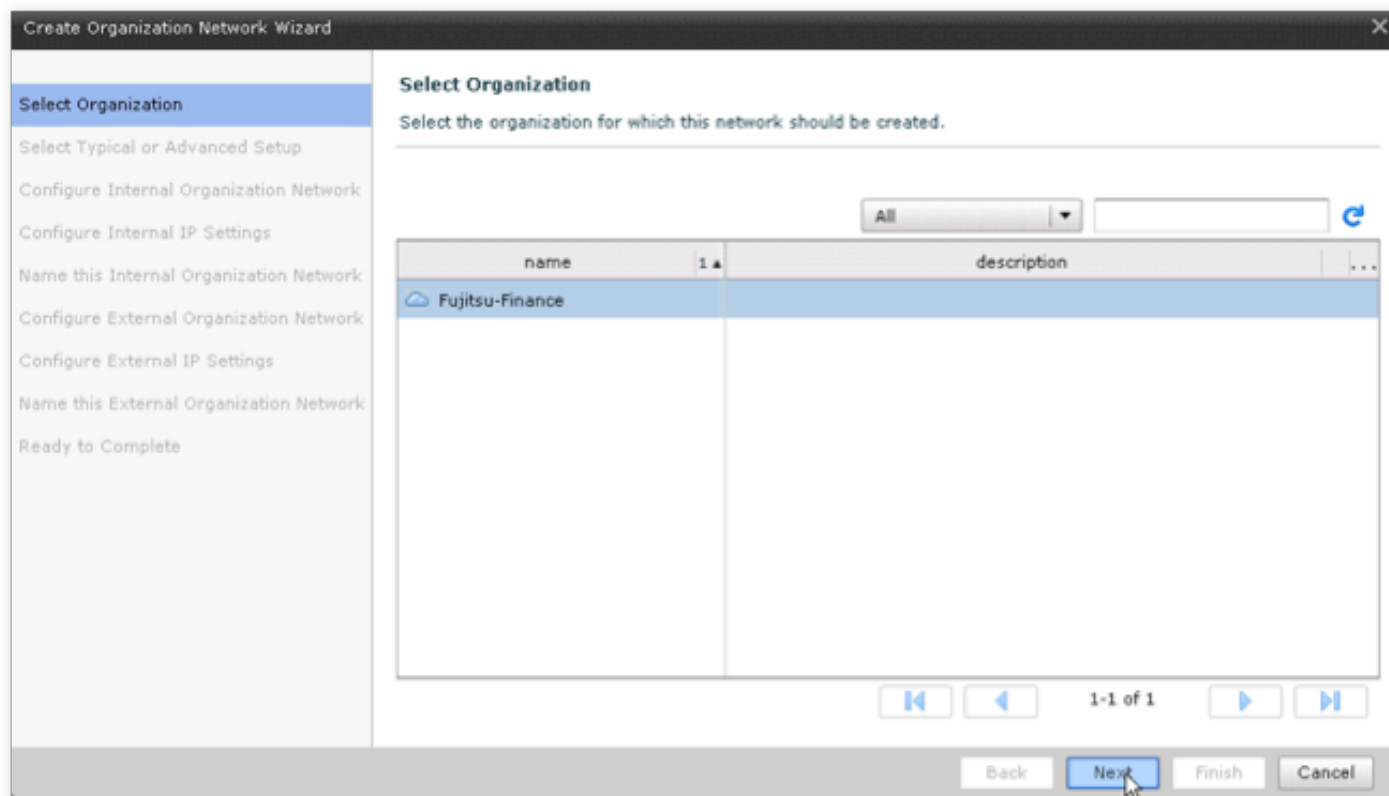
8. Finally verify the status of the newly created organization vDC



Use Case 6: Organizational Networks

The next task is to give the Fujitsu-Finance organization's VMs the ability to communicate with the outside world. Adding the External Network created earlier to the Fujitsu-Finance organization does this.

1. Decide how VMs within the organization will connect to the physical network. VCD helpfully provides a diagram on the Create Organization Network dialog to show how vApps will connect to the External Network. The default shows how VCD will create internal organization networks, external organization networks and how they each can connect to an external physical network. An internal organization network is accessible only by the Finance organization. It provides the Finance organization with a private network to which multiple vApps can connect to.



2. An external organization network provides Fujitsu-Finance with external connectivity, such as to the Internet or a physical internal network within Fujitsu's Data Center. Virtual machines from multiple organizations or business units can communicate over this network.

Create Organization Network Wizard

Select Organization

Select Typical or Advanced Setup

Configure Internal Organization Network

Configure Internal IP Settings

Name this Internal Organization Network

Configure External Organization Network

Name this External Organization Network

Ready to Complete

Select Typical or Advanced Setup

The default options are the most common setup for a new organization.

What type of network access do you want to give this organization?

☒ **Typical**
The quickest and most common way to set up networks for an organization.

☒ Create an internal network

☒ Create an external network via: Direct connection ▼

The diagram illustrates the network setup for an organization. At the top, a box labeled 'Organization' contains two vApps, 'vApp1' and 'vApp2'. Below this, a horizontal line represents the 'Internal organization network'. Both vApps are connected to this internal network. Below the internal network is another horizontal line representing the 'External organization network (direct)'. A vertical line connects the internal network to the external network. Below the external network is a final horizontal line representing the 'External network'. A vertical line connects the external organization network to the external network.

An internal organization network is accessible only by this organization. It provides the organization with a private network to which multiple vApps can connect. An external organization network provides an organization with external connectivity, such as to the Internet. Virtual machines from multiple organizations can communicate over this network.

☐ **Advanced**
Add a new network and specify its detailed settings.

Back Next Finish Cancel

3. Set up the Internal Organization Network, think of this as a private network that allows multiple applications to communicate with each other securely. You can use a Network Pool to create this network. Remember, the Network Pool is to be backed by a pool of VLANs, so one of these VLANs will now be allocated automatically to host this Internal Network for the Fujitsu-Finance Organization.

Create Organization Network Wizard

Select Organization
Select Typical or Advanced Setup
Configure Internal Organization Network
Configure Internal IP Settings
Name this Internal Organization Network
Configure External Organization Network
Name this External Organization Network
Ready to Complete

Configure Internal Organization Network
Select the network pool that allocates the internal network.
If you don't see the network pool you need: [create a new network pool](#)
☒ Only use networks that are accessible by this organization.

Select Network Pool

All [Refresh]

Name	vCenter	Type	Network (Used/Total)
NPVLAN20-29	FujitsuCloudvcenter01	VLAN	3 / 10 30%
NPVLAN30-40	FujitsuCloudvcenter01	VLAN	0 / 11 0%
NPVLAN60-70	FujitsuCloudvcenter01	VLAN	0 / 11 0%

1-3 of 3

Back Next Finish Cancel

4. The Network Spec for this Internal Network needs to be defined to create a Static IP Pool which is used to allocate IPs to VM vNICs that need to connect to the Internal Network.

The screenshot shows the 'Create Organization Network Wizard' window, specifically the 'Configure Internal IP Settings' step. The left sidebar lists the steps: Select Organization, Select Typical or Advanced Setup, Configure Internal Organization Network, **Configure Internal IP Settings**, Name this Internal Organization Network, Configure External Organization Network, Configure External IP Settings, Name this External Organization Network, and Ready to Complete. The main area is titled 'Configure Internal IP Settings' and contains the following fields and sections:

- Enter the network settings of the new organization network below:**
 - Network mask: 255.255.255.0 *
 - Default gateway: 192.168.100.1 *
 - Primary DNS: 192.168.201.21 *
 - Secondary DNS: (empty)
 - DNS suffix: (empty)
- Static IP pool:**
 - Enter an IP range (format: 192.168.1.2 - 192.168.1.100) or IP address and click Add.
 - 192.168.100.100 - 192.168.100.199 (Add button)
 - 192.168.100.100 - 192.168.100.199 (Modify button)
 - 192.168.100.100 - 192.168.100.199 (Remove button)
 - Total: 100

At the bottom are buttons for Back, Next, Finish, and Cancel.

5. Use a meaningful name for the internal organization network.

The screenshot shows the 'Create Organization Network Wizard' window, specifically the 'Name this Internal Organization Network' step. The left sidebar lists the steps: Select Organization, Select Typical or Advanced Setup, Configure Internal Organization Network, Configure Internal IP Settings, **Name this Internal Organization Network**, Configure External Organization Network, Configure External IP Settings, Name this External Organization Network, and Ready to Complete. The main area is titled 'Name this Internal Organization Network' and contains the following fields:

- Enter a name and description for your new organization network.**
 - Name: FFInternal *
 - Description: (empty)

At the bottom are buttons for Back, Next, Finish, and Cancel.

6. Now configure the External Organization Network, this Network is still a virtual network within vSphere, but allows the VM's to have either direct or NAT routed access to the physical network.

Select the External Physical Network you want to connect to.

Create Organization Network Wizard

Select Typical or Advanced Setup
Configure Internal Organization Network
Configure Internal IP Settings
Name this Internal Organization Network
Configure External Organization Network
Name this External Organization Network
Ready to Complete

Configure External Organization Network
Select the external network to connect to.

If you don't see the external network you need: [create a new external network](#)

☒ Only use networks that are accessible by this organization.

Select External Network

All

Name	1 V.	Default ...	Netwo...	Prim...	v...	IP Pool (...)	...
FujitsuExternalNetwork	0	192.168.201.1	255.255.255.0	192.168.20	FujitsuC	0 / 11 0%	

1-1 of 1

Back Next Finish Cancel

7. Define external IP settings for this external organization network

The screenshot shows the 'Create Organization Network Wizard' window. The left sidebar lists the steps: Select Organization, Select Typical or Advanced Setup, Configure Internal Organization Network, Configure Internal IP Settings, Name this Internal Organization Network, Configure External Organization Network, **Configure External IP Settings**, Name this External Organization Network, and Ready to Complete. The main area is titled 'Configure External IP Settings' and contains the following fields:

- Network mask: 255.255.255.0 *
- Default gateway: 192.168.101.1 *
- Primary DNS: 192.168.201.21 *
- Secondary DNS: (empty)
- DNS suffix: (empty)

Below these fields is the 'Static IP pool' section. It includes the instruction: 'Enter an IP range (format: 192.168.1.2 - 192.168.1.100) or IP address and click Add.' There are two entries in the pool:

- 192.168.101.100 - 192.168.101.199 (with an 'Add' button and a red asterisk)
- 192.168.101.100 - 192.168.101.199 (with 'Modify' and 'Remove' buttons)

At the bottom right, there are buttons for 'Back', 'Next' (highlighted with a mouse cursor), 'Finish', and 'Cancel'.

8. Use a meaningful name for the external organization network

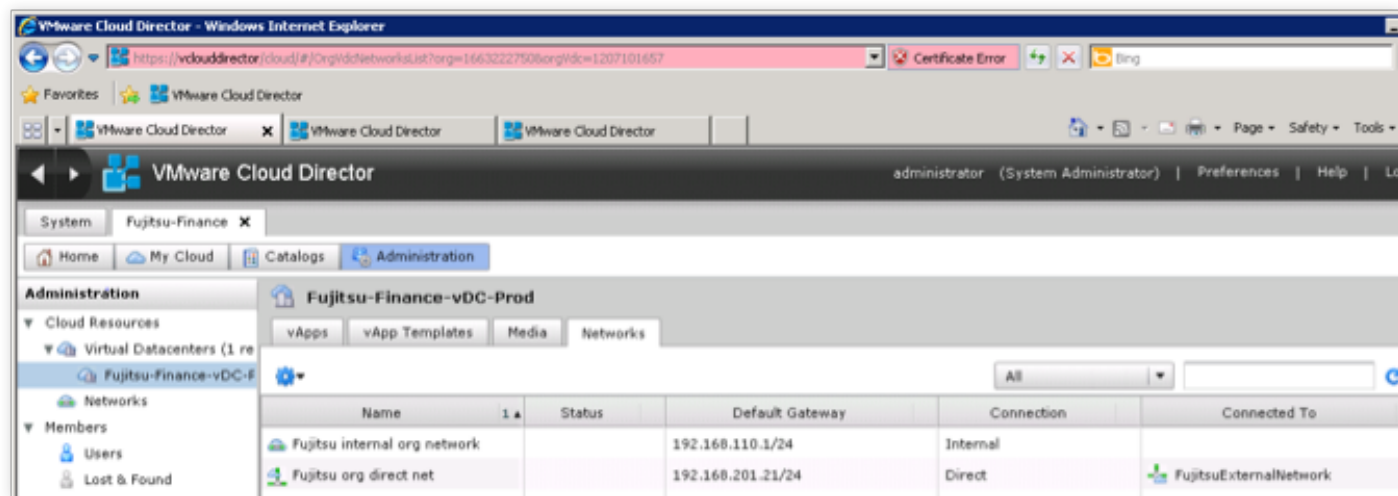
The screenshot shows the 'Create Organization Network Wizard' window. The left sidebar lists the steps: Select Organization, Select Typical or Advanced Setup, Configure Internal Organization Network, Configure Internal IP Settings, Name this Internal Organization Network, Configure External Organization Network, Configure External IP Settings, **Name this External Organization Network**, and Ready to Complete. The main area is titled 'Name this External Organization Network' and contains the following fields:

- Name: FFEternal *
- Description: (empty)

At the bottom right, there are buttons for 'Back', 'Next' (highlighted with a mouse cursor), 'Finish', and 'Cancel'.

Two networks are created for the Fujitsu-Finance Organization. An Internal Network where Finance applications can talk securely to each other and an External Network direct routed to the physical world so Fujitsu-Finance applications can interact with other business units, as well as access the external network.

9. Finally verify the status of the newly networks for this vDC.



Use Case 7: Catalogs

Catalogs are used to offer vApps and media to end users for self-service. IT can build standardized offerings of VM and application environments and upload them to the catalog. Catalogs are created by organization administrators or catalog authors, and can be shared or published. When a catalog is shared, it can be setup to be accessible by one or more members of an organization. When a catalog is published, it can be accessed by other authorized organizations in the private cloud.

1. Select an organization.

The screenshot shows the 'New Catalog' wizard in vCloud Director. The 'Select Organization' step is active, showing a table with one organization: 'Fujitsu-Finance'. The 'Next' button is highlighted.

New Catalog

Select Organization
Select the organization for which this catalog should be created.

Organization Filter: All [Search]

Name	Description
Fujitsu-Finance	

Navigation: 1-1 of 1

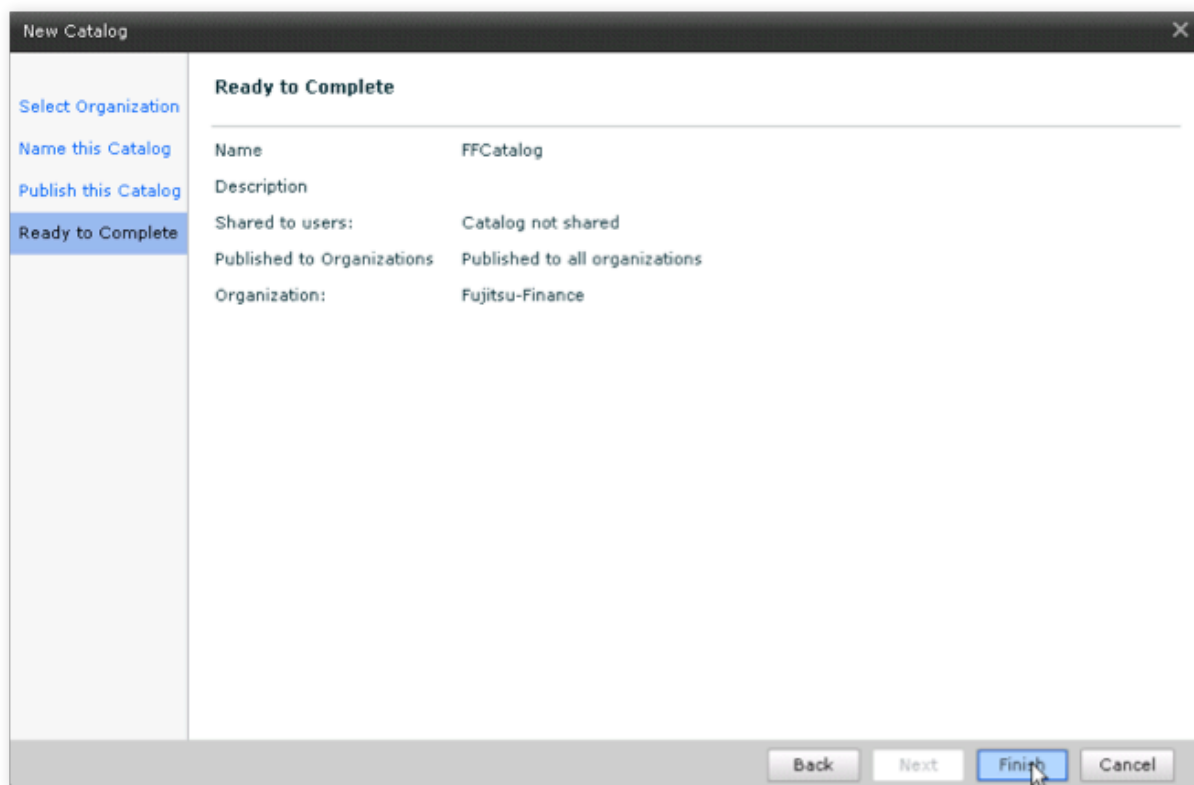
Buttons: Back, **Next**, Finish, Cancel

2. Use a meaningful name.

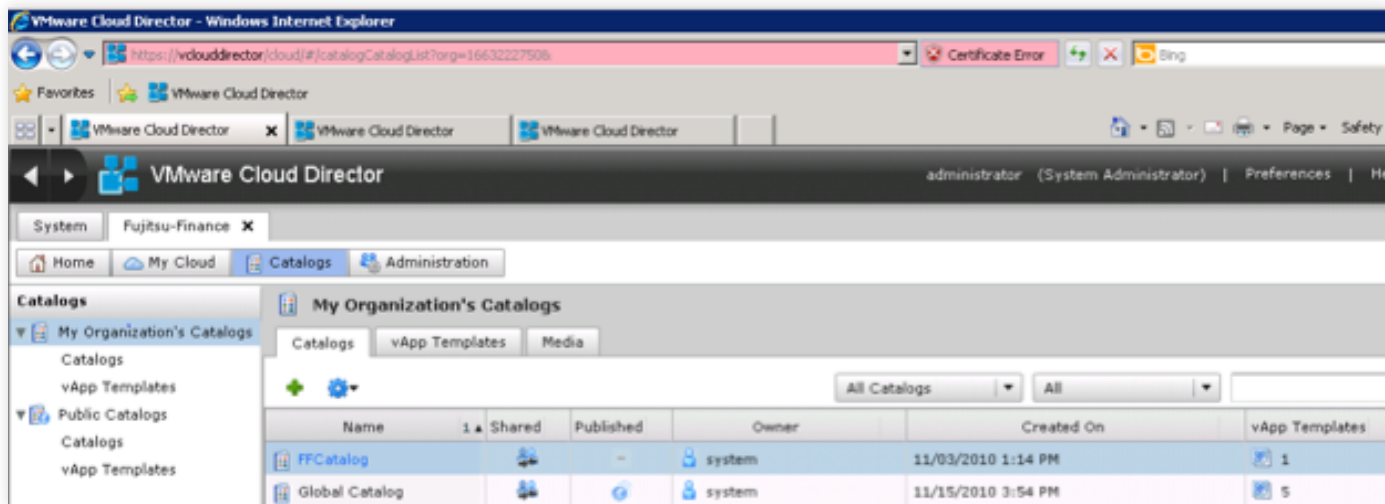
The screenshot shows the 'New Catalog' wizard window. On the left, a vertical sidebar contains four steps: 'Select Organization', 'Name this Catalog' (highlighted in blue), 'Publish this Catalog', and 'Ready to Complete'. The main area is titled 'Name this Catalog' and includes a descriptive paragraph: 'A catalog allows you to share vApp templates and media with other users in your organization. You can also have a private catalog for vApp templates and media that you frequently use.' Below this, there are two input fields: 'Name' and 'Description'. The 'Name' field contains the text 'FFCatalog' and has a red asterisk to its right, indicating it is required. The 'Description' field is empty. At the bottom right, there are four buttons: 'Back', 'Next' (highlighted in blue with a mouse cursor), 'Finish', and 'Cancel'.

3. Allow to publish this catalog to other organizations.

The screenshot shows the 'New Catalog' wizard window at the 'Publish this Catalog' step. The left sidebar now highlights 'Publish this Catalog'. The main area is titled 'Publish this Catalog' and contains the text: 'You can publish this catalog to other organizations in your service provider's VCD. If you are not yet ready to publish this catalog, you can publish it later.' Below this text are two radio button options. The first option is 'Do not publish this catalog to other organizations.' with the subtext 'Other organizations will not see this catalog.' The second option is 'Published to Organizations' with the subtext 'All other organizations can see and use items in this catalog.' The 'Published to Organizations' option is selected, indicated by a filled radio button. At the bottom right, there are four buttons: 'Back', 'Next' (highlighted in blue with a mouse cursor), 'Finish', and 'Cancel'.



4. Verify the successful deployed catalog.

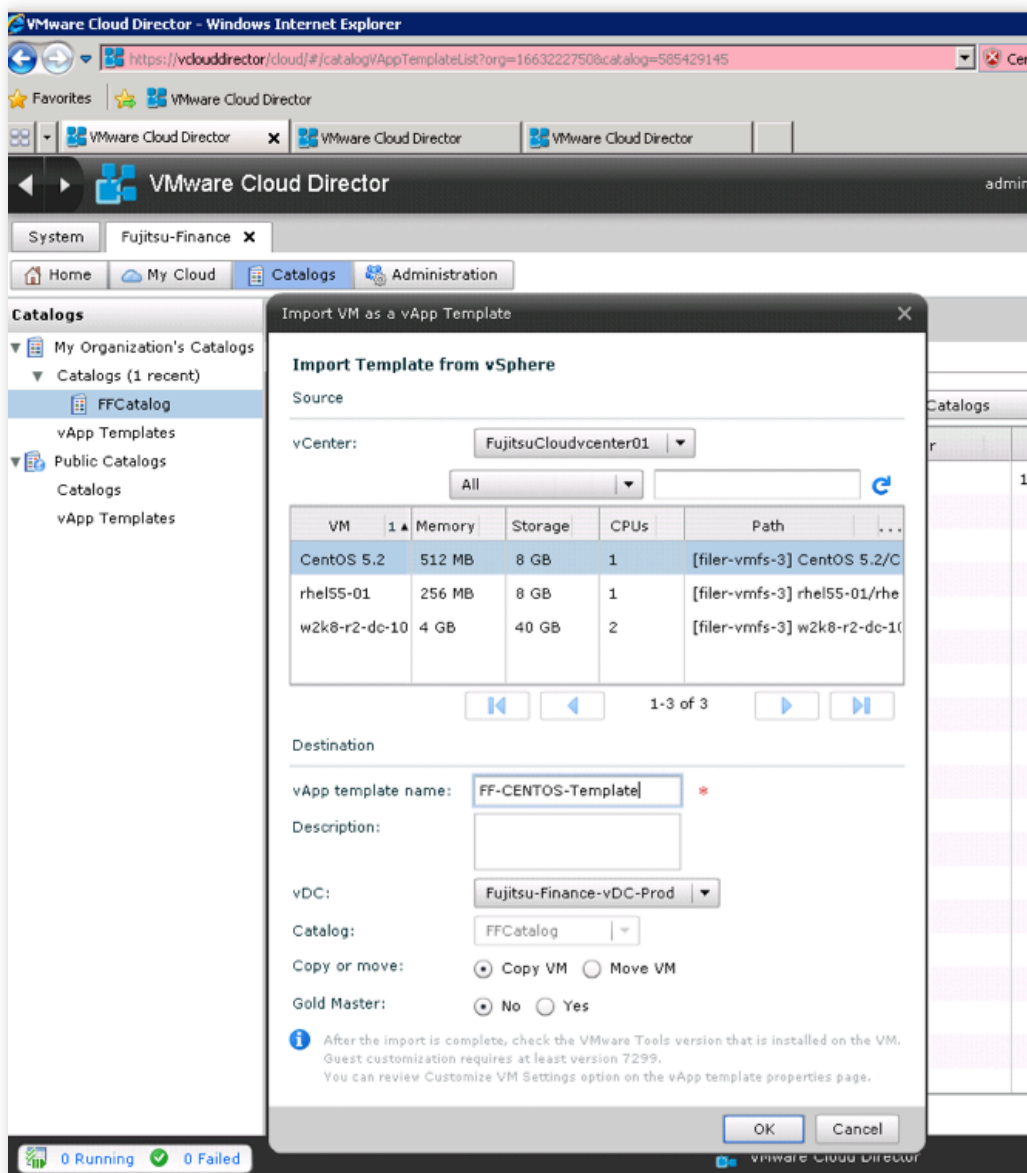


Use Case 8: vApp Template creation

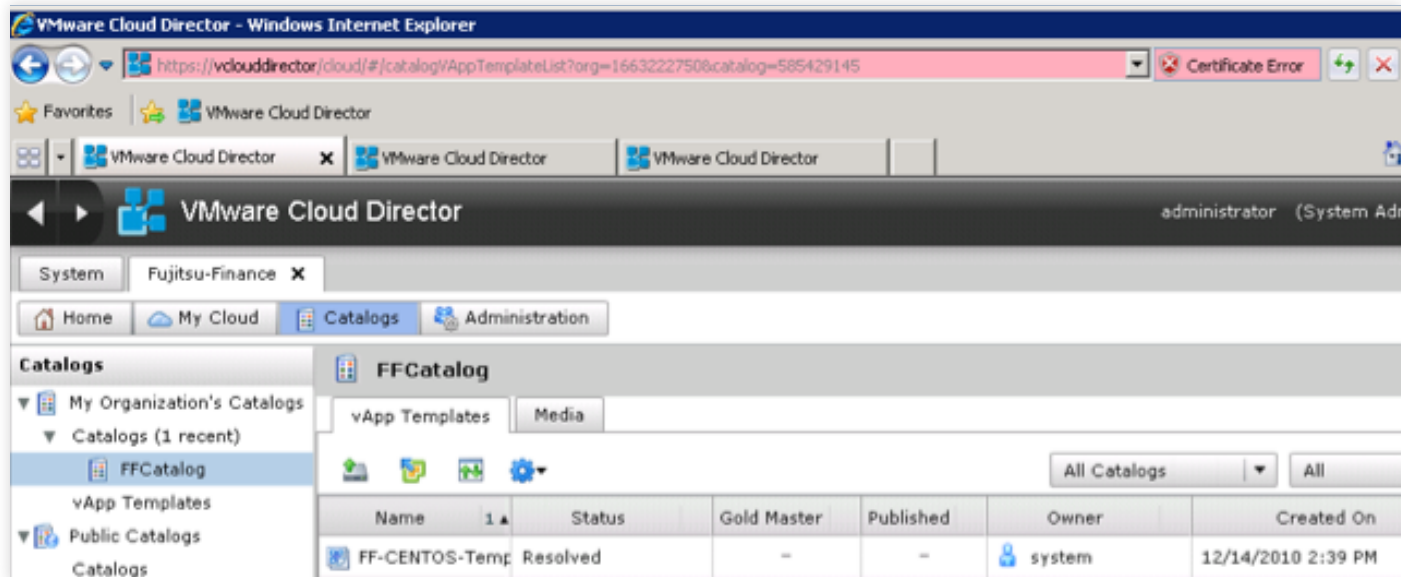
vApps can be created in organization catalogs using three methods:

1. A cloud administrator can copy VMs and templates from the underlying VMware vSphere infrastructure.
2. An organization administrator can copy a vApp in OVF format from local disk to the private cloud.
3. An organization administrator, catalog author, or vApp author can create vApps from scratch in the private cloud. They can create VMs and install the guest operating system (GOS) and application. Only organization administrators and catalog authors can add items to the catalog.

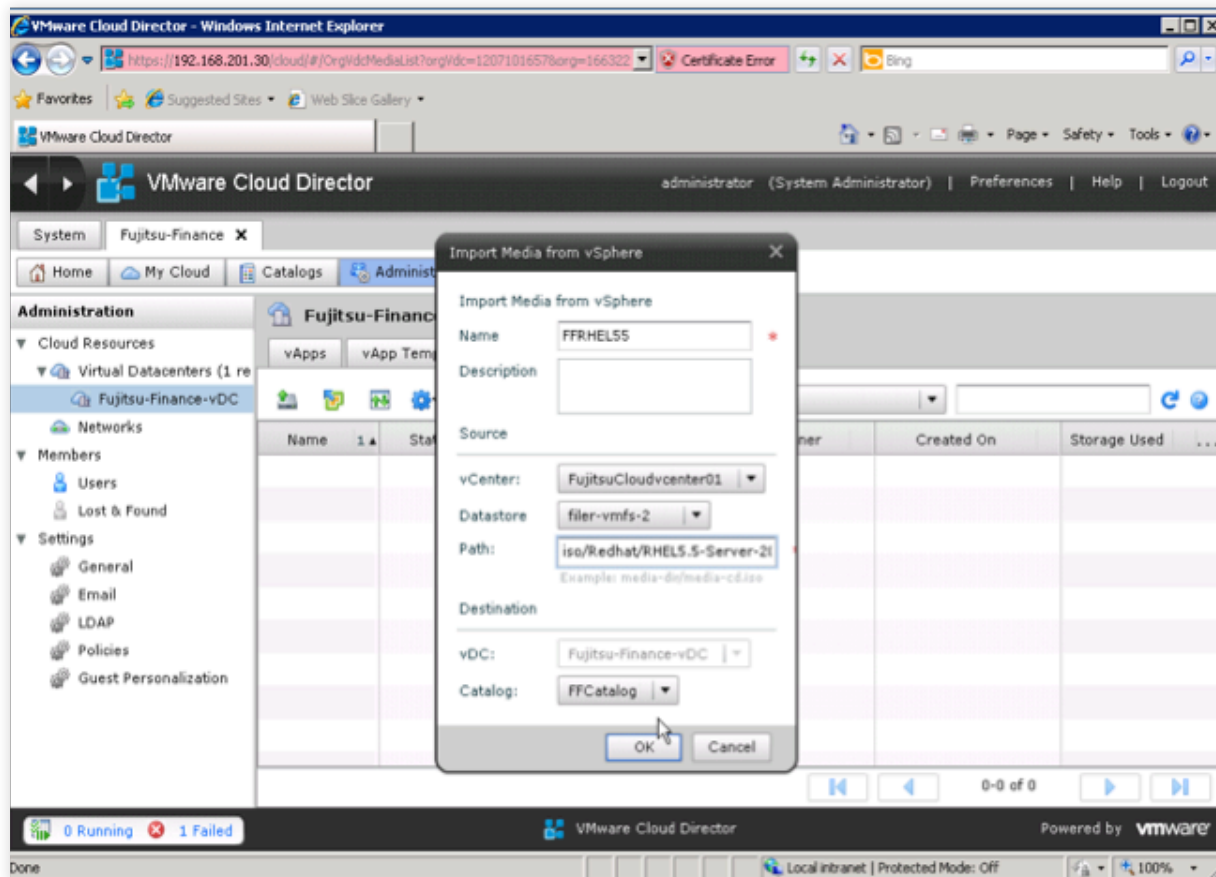
You can import VMs (Sample: CentOS 5.2) from VMware vSphere. This assumes that you have prepared a template available in your VMware vSphere environment to import into VMware vCloud Director.



Verify the successful deployment of the template.



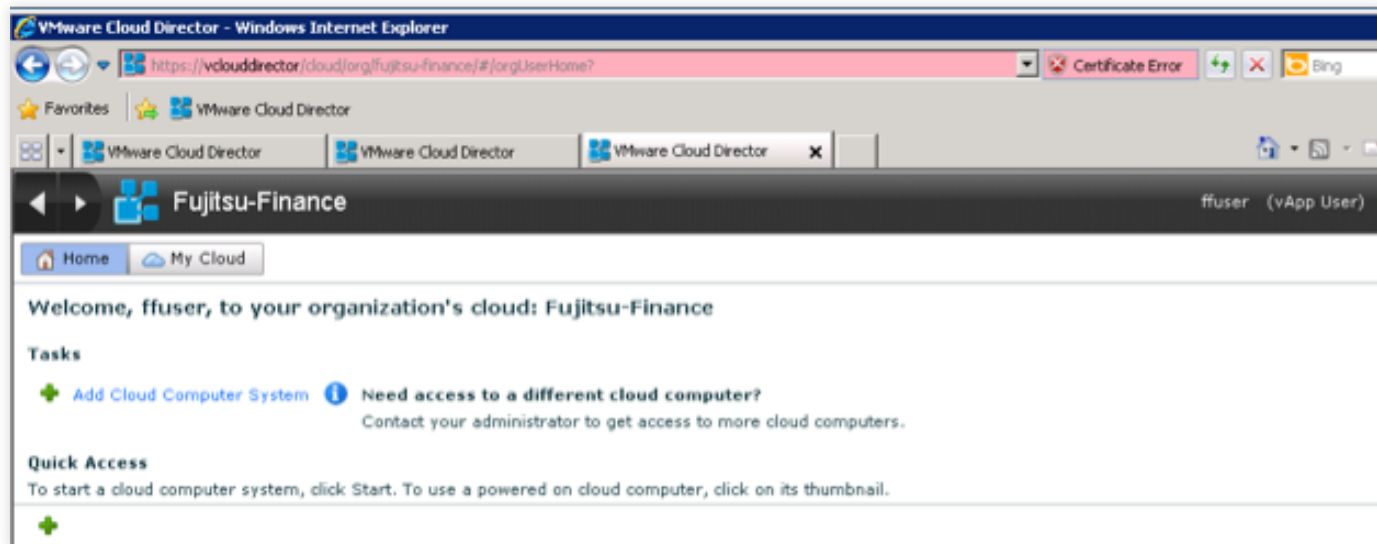
Optional: Import media from vSphere



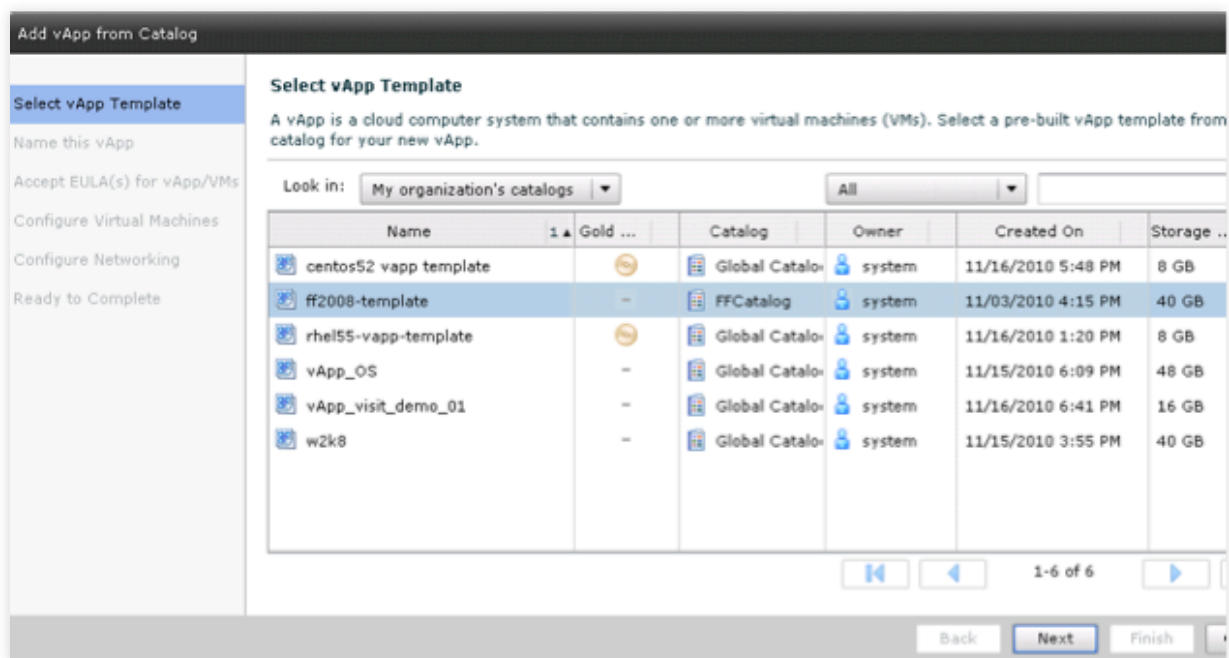
Use Case 9: Use Infrastructure as a Service (IAAS)

In this use case please login as a user to the Fujitsu-Finance organization, browse the catalog, adding vApp template from the catalog to the user's cloud (self-service), and connect the vApp to an Fujitsu external network.

1. Logon to the home URL of the Fujitsu-Finance organization in order to "Add Cloud Computer System."



2. Select an appropriate template.



3. A wizard kicks off to guide you through the deployment process. Define a meaningful name and provide valid leases.

Add vApp from Catalog

Select vApp Template

Name this vApp

A vApp is a cloud computer system that contains one or more virtual machines (VMs). Name and describe this vApp and set its leases.

Name: *

Description:

Leases

Runtime lease: Days Expires on: Tue Dec 14 15:58:26 GMT+0100 2010 *

How long this vApp can run before it is automatically stopped.

Storage lease: Days Expires on: Tue Dec 14 15:58:29 GMT+0100 2010 *

When this vApp is stopped, how long it is available before being automatically cleaned up.

Back Next Finish Cancel

4. Configure the VMs itself and provide valid network settings.

Add vApp from Catalog

Select vApp Template

Name this vApp

Configure Virtual Machines

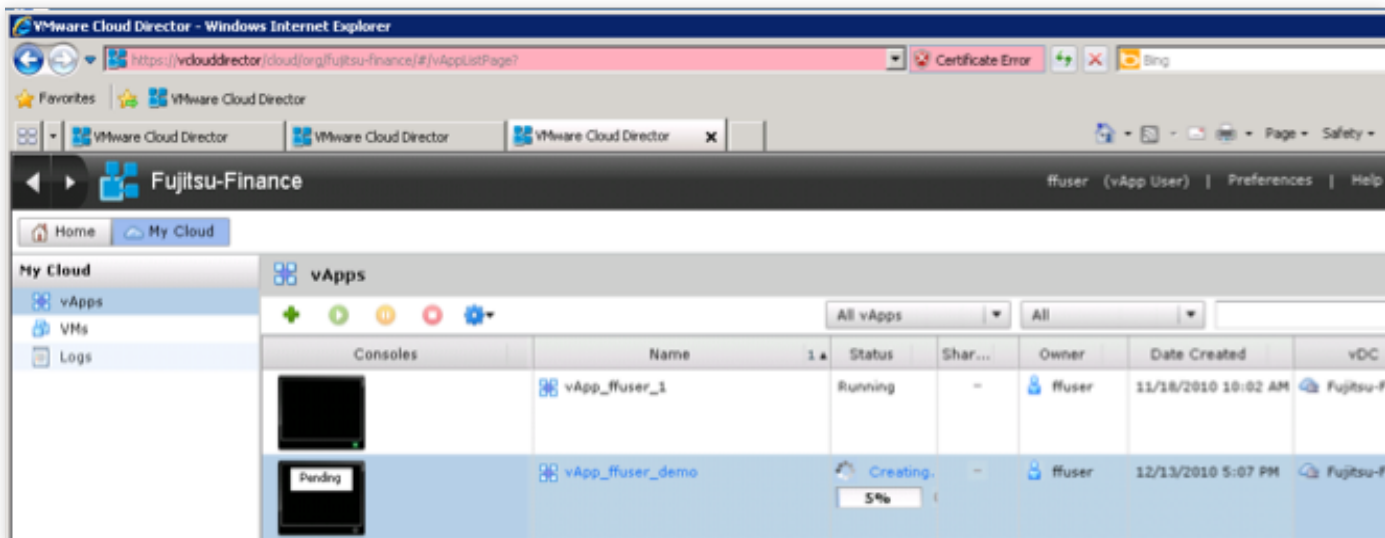
Select the vDC in which this vApp is stored and runs when it's started. Name each virtual machine and select the network to which you want it to connect. You can configure additional properties for virtual machines after you complete this wizard.

Select vDC:

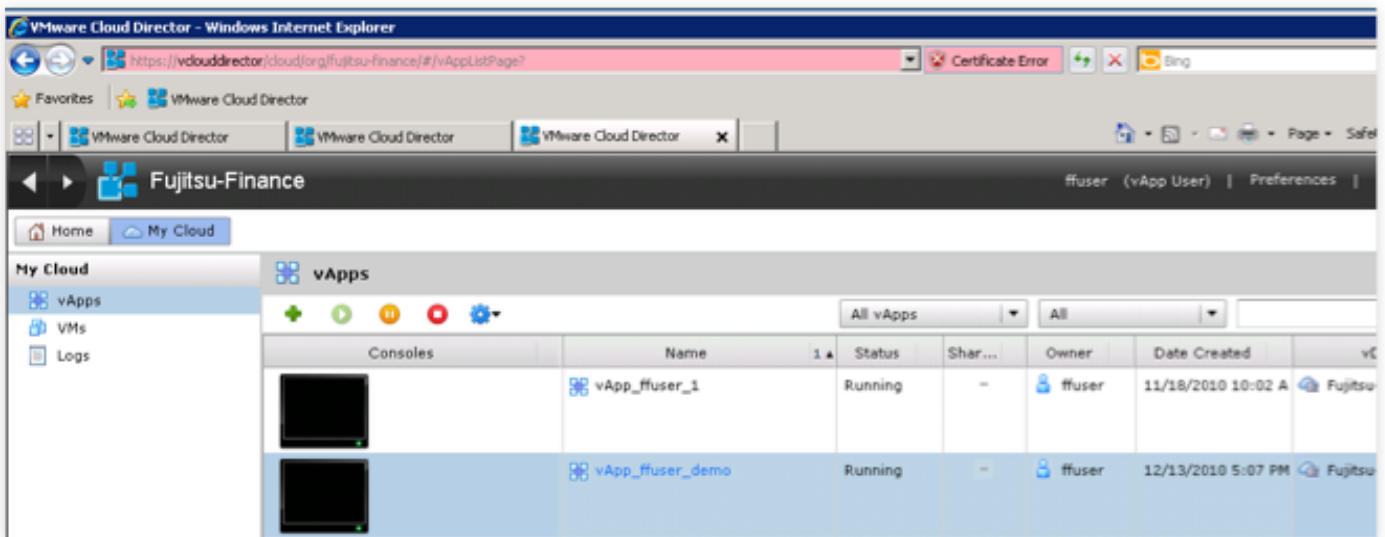
Full Name	Computer Name	Primary NIC	Network	IP Assignment
ff2008-demo *	ff2008-demo	NIC 0	Fujitsu org direct net	DHCP *

Back Next Finish Cancel

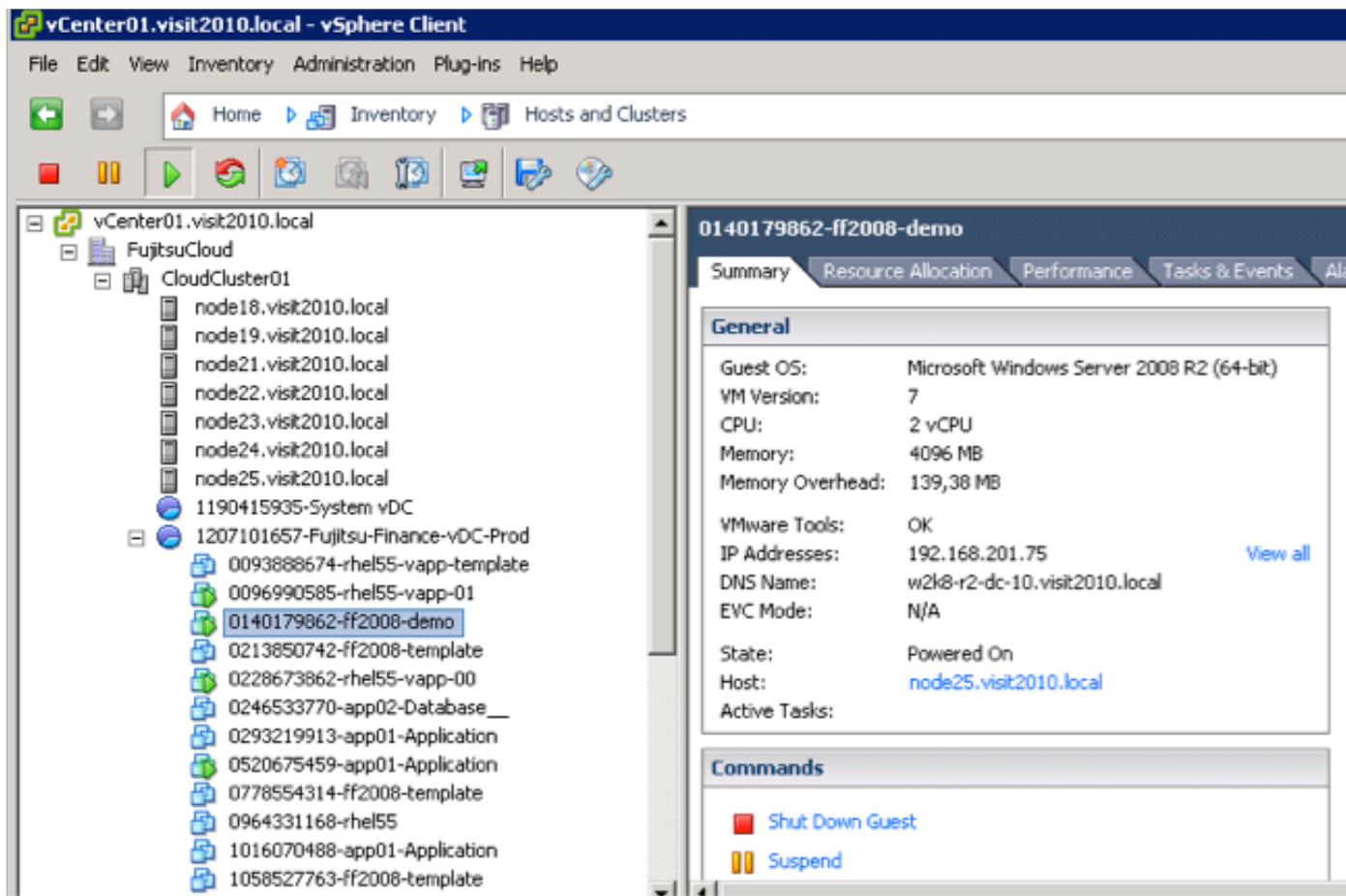
5. Wait until the deployment process finishes.



6. Now you can power on the vApp and click the thumbnail, if you like to get access to the console.



7. Option: Have a look into vSphere to verify the successful deployment process.



Use Case 10: Dynamic Scaling of Compute Resources

This use case illustrates the option to extend the compute resources within a vSphere cluster.

1. Add a new node to the existing cluster and ensure that the node has been joined the cluster without any warnings or error messages.

The screenshot shows the vSphere Client interface with the following details:

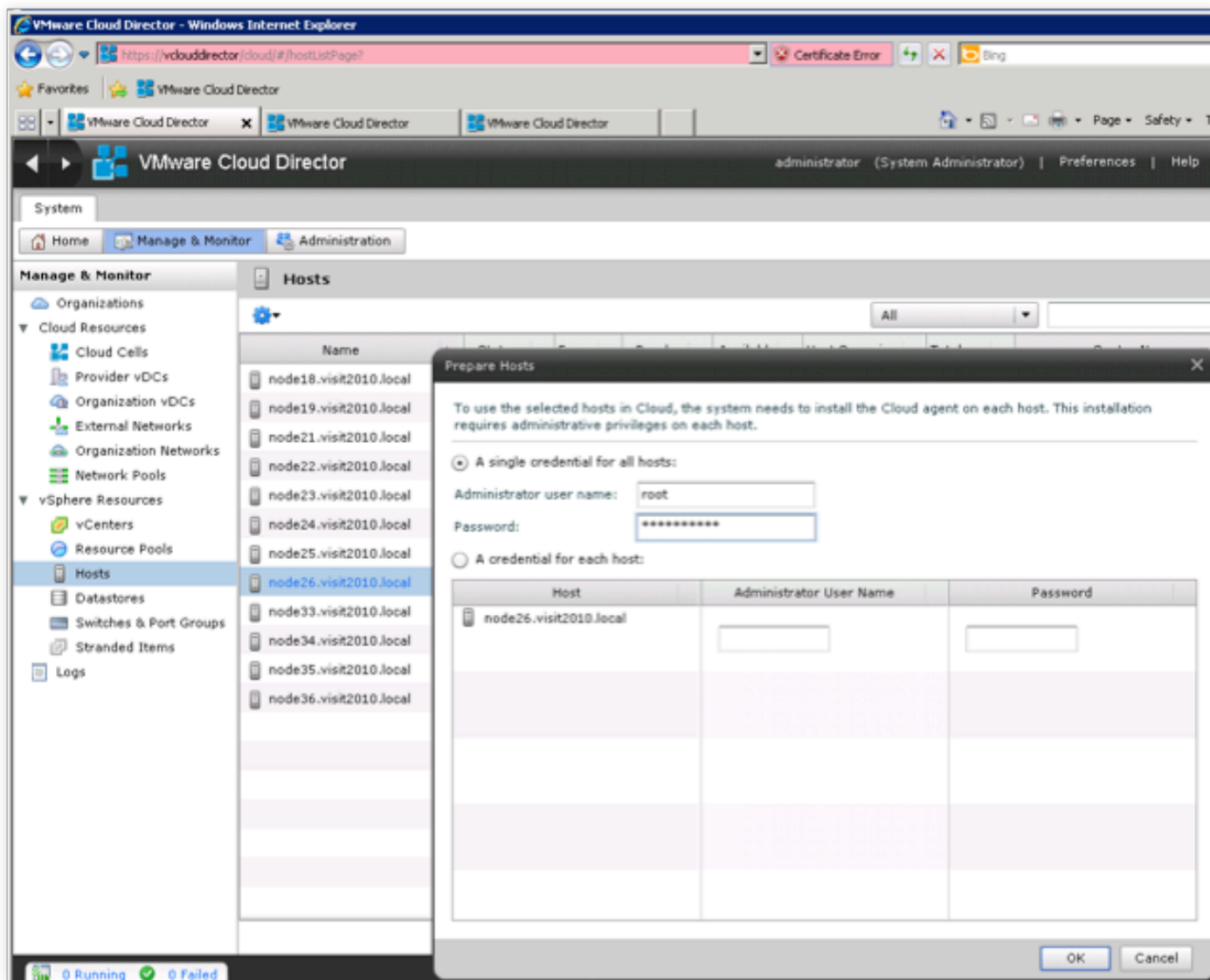
- Left Panel (Inventory):** Shows a tree view of the vCenter inventory. Under 'FujitsuCloud', 'CloudCluster01' is expanded, showing a list of nodes including 'node26.vist2010.local'.
- Right Panel (Summary):** Displays the configuration for 'node26.vist2010.local VMware ESX, 4.1.0, 260247'.
 - General Tab:**
 - Manufacturer: FUJITSU
 - Model: PRIMERGY CX120 S1
 - CPU Cores: 8 CPUs x 2,133 GHz
 - Processor Type: Intel(R) Xeon(R) CPU E5506 @ 2.13GHz
 - License: vSphere 4 Enterprise Plus Licensed for 2 physical CPU...
 - Processor Sockets: 2
 - Cores per Socket: 4
 - Logical Processors: 8
 - Hyperthreading: Inactive
 - Number of NICs: 2
 - State: Connected
 - Virtual Machines and Templates: 0
 - vMotion Enabled: No
 - VMware EVC Mode: Disabled
 - Host Configured for FT: No
 - Resources Tab:**
 - CPU usage: 1235 MHz (Capacity: 8 x 2,133 GHz)
 - Memory usage: 1080,00 MB (Capacity: 16323,18 MB)
 - Datastore Table:**

Datastore	Status	Capacity	Free
datastore1 (12)	Normal	5,00 GB	4,...
filer-vms-2	Normal	99,75 GB	28,...
filer-vms-3	Normal	1.023,75 G	749,...
 - Network Table:**

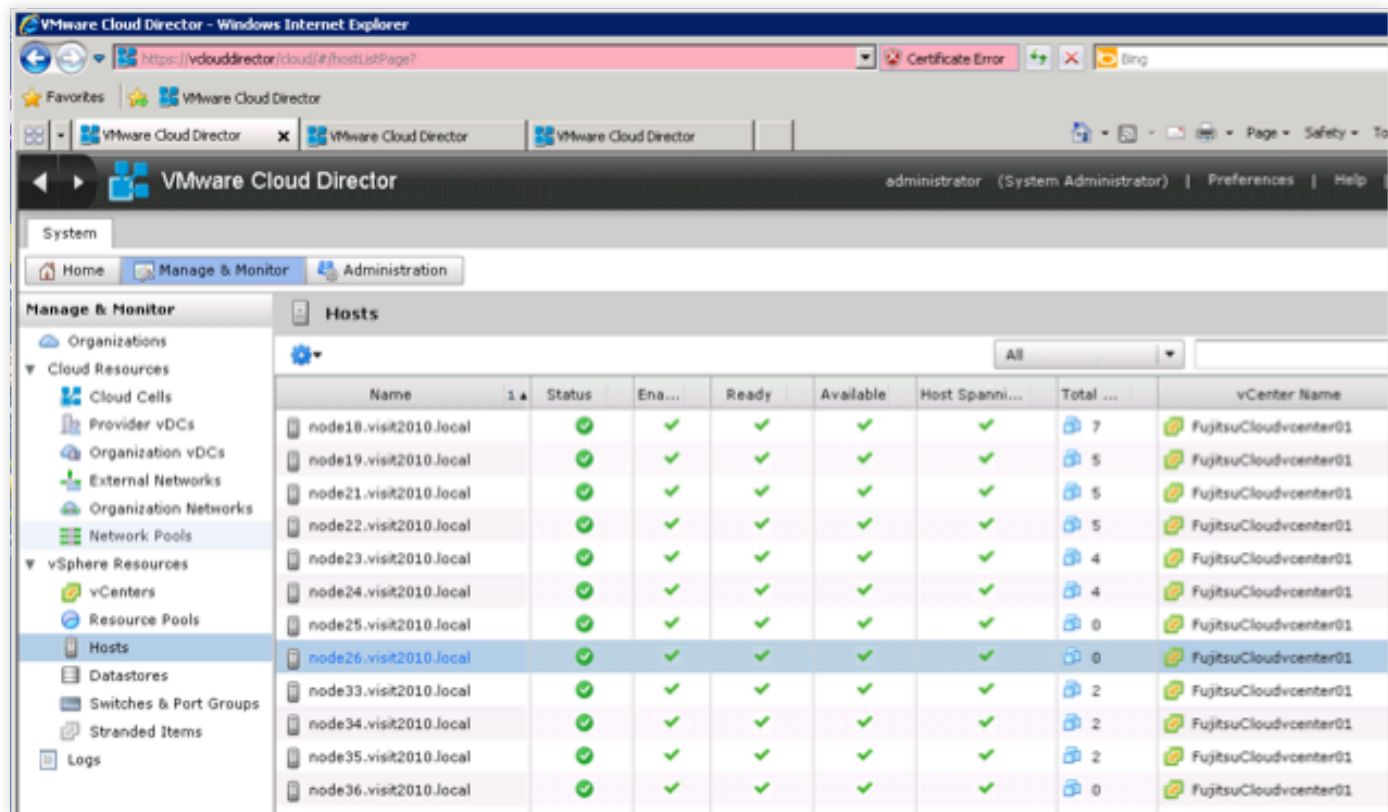
Network	Type	Size
[Empty table body]		
 - Fault Tolerance:** Fault Tolerance Version: 2.0.1-2.0.0-2.0.0
- Recent Tasks:** A table showing the history of tasks performed on the host.

Name	Target	Status	Details	Initiated by	vCenter Server	Requested Start Time	Start Time
Exit maintenance mode	node26.vist2010.local	Completed		VISIT2010(p...	vCenter01.vist...	13.12.2010 10:32:26	13.12
Add host	CloudCluster01	Completed		VISIT2010(p...	vCenter01.vist...	13.12.2010 10:32:12	13.12

2. vCloud Director recognizes the new host and the node is seen as “available.” In order to utilize this new resource it is required to “prepare” the newly added host.



3. Now the vCloud Director can leverage the new compute resources.



The screenshot shows the VMware Cloud Director web interface in a Windows Internet Explorer browser. The address bar displays <https://vcloudirector/cloud/#/hostListPage?>. The interface includes a navigation pane on the left with categories like Organizations, Cloud Resources, vSphere Resources, and Hosts. The main content area is titled 'Hosts' and displays a table of host information.

Name	Status	Ena...	Ready	Available	Host Spanni...	Total ...	vCenter Name
node18.visit2010.local	✓	✓	✓	✓	✓	7	FujitsuCloudvcenter01
node19.visit2010.local	✓	✓	✓	✓	✓	5	FujitsuCloudvcenter01
node21.visit2010.local	✓	✓	✓	✓	✓	5	FujitsuCloudvcenter01
node22.visit2010.local	✓	✓	✓	✓	✓	5	FujitsuCloudvcenter01
node23.visit2010.local	✓	✓	✓	✓	✓	4	FujitsuCloudvcenter01
node24.visit2010.local	✓	✓	✓	✓	✓	4	FujitsuCloudvcenter01
node25.visit2010.local	✓	✓	✓	✓	✓	0	FujitsuCloudvcenter01
node26.visit2010.local	✓	✓	✓	✓	✓	0	FujitsuCloudvcenter01
node33.visit2010.local	✓	✓	✓	✓	✓	2	FujitsuCloudvcenter01
node34.visit2010.local	✓	✓	✓	✓	✓	2	FujitsuCloudvcenter01
node35.visit2010.local	✓	✓	✓	✓	✓	2	FujitsuCloudvcenter01
node36.visit2010.local	✓	✓	✓	✓	✓	0	FujitsuCloudvcenter01

Use Case 11: Termination of vApp or Service

The deployed vApps within an organization could be terminated either automatically or manually. When the vApp is initially deployed, the lease period for the vApp could be defined. After the lease period is completed, the vApp is automatically stopped and the resources are freed up. The administrator or the vApp user also has privileges to delete the vApp at any point in time.

Edit vApp Properties

General Running Sharing

Name: vApp_visit_demo_01 *

Description:

vDC: Fujitsu-Finance-vDC-Prod

Leases

☒ Reset leases

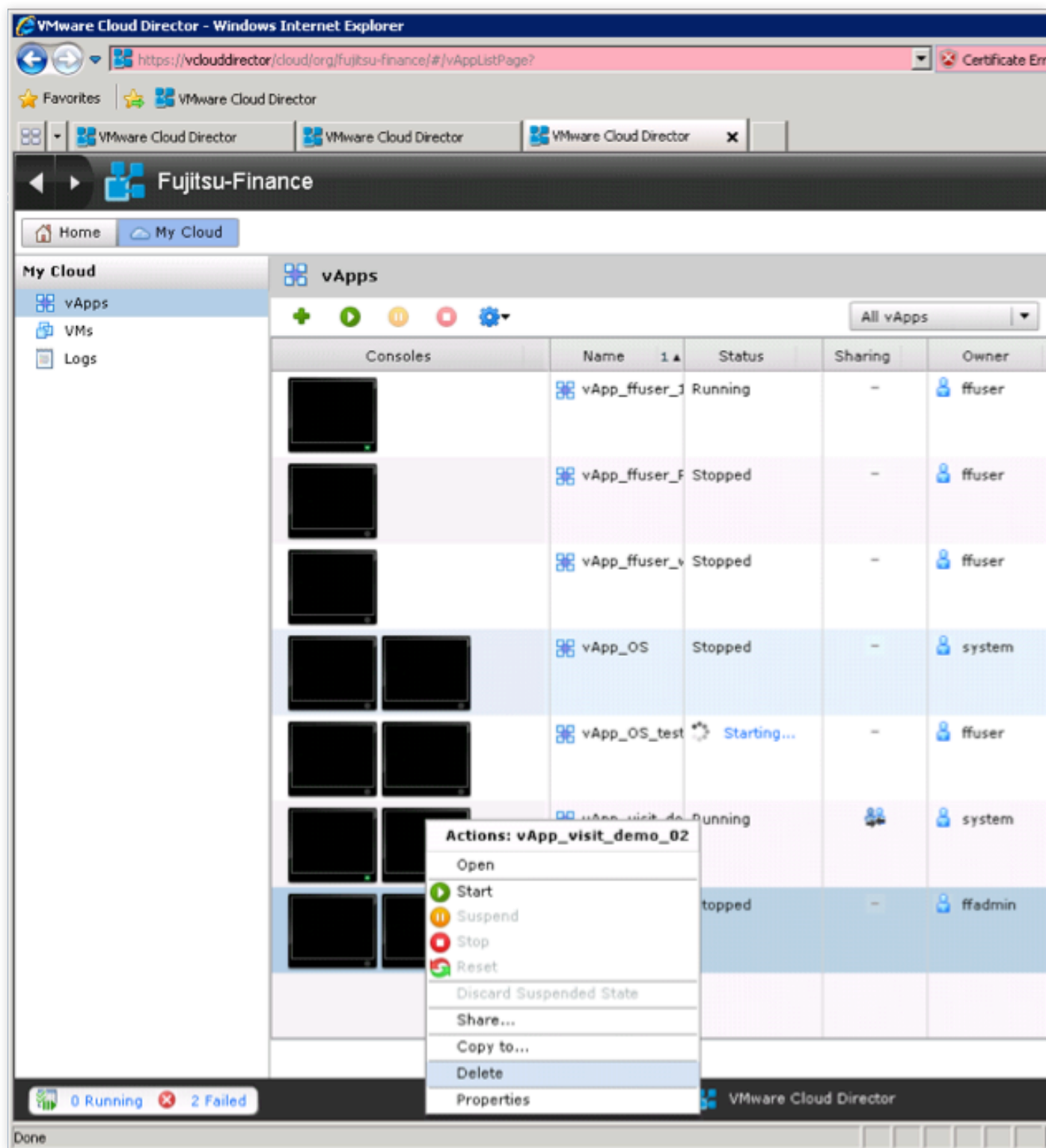
Runtime lease: 7 Days *

How long this vApp can run before it is automatically stopped.

Storage lease: 7 Days Expires on: Mon Dec 20 14:26:17 GMT+0100 2010 *

When this vApp is stopped, how long it is available before being automatically cleaned up.

OK Cancel

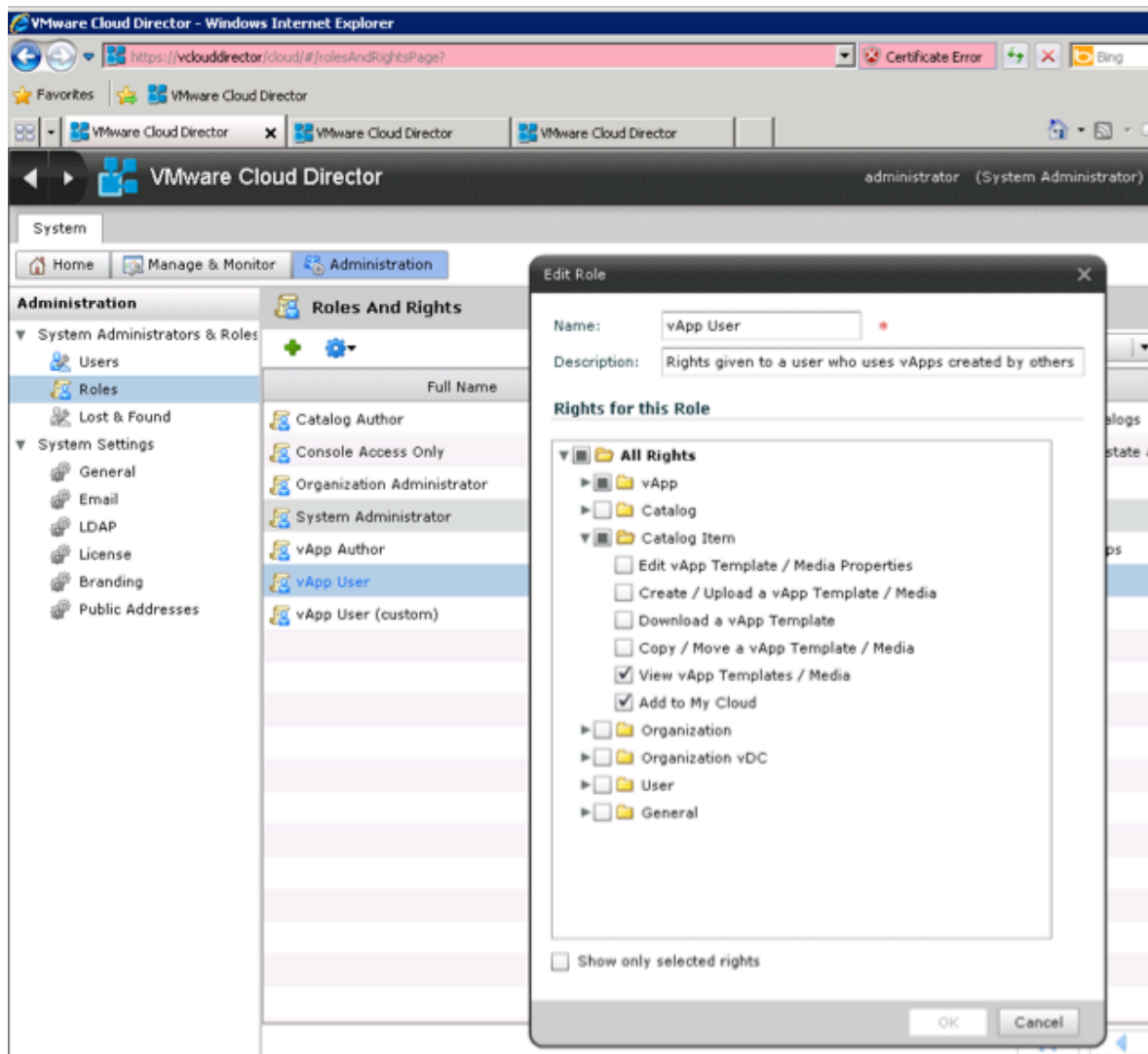


Use Case 12: Separation of Duties

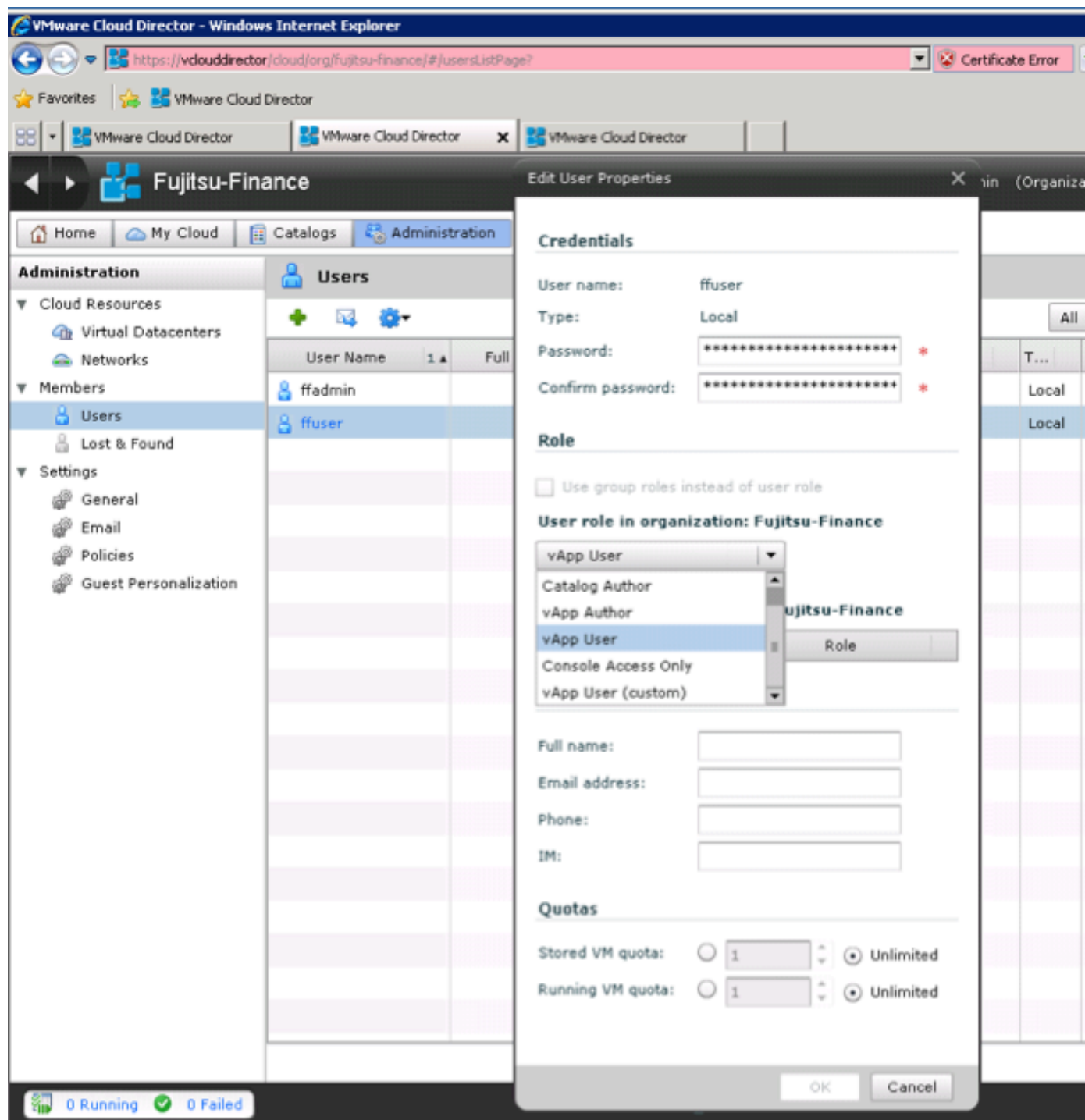
There are three main types of roles in the cloud:

1. Cloud administrators set up the cloud infrastructure and organizations. They access the underlying vSphere infrastructure during initial cloud setup and on an ongoing basis to manage the cloud infrastructure. They are root users of the cloud.
2. Each organization has an organization administrator. Organization administrators manage their own organizations in the cloud. They set up users and permissions and manage catalogs. They are root users for an organization. They cannot access or modify cloud infrastructure. They do not access underlying vSphere infrastructure.
3. End users are basic users in the cloud. They use the workloads that are made available to them in their organization via catalogs. They cannot make modifications to organizations or cloud infrastructures. They do not have access to underlying vSphere infrastructure.

Five default roles exist in Cloud Director. Each role represents “rights”, giving the administrator the option to adjust specific rights to user roles.



Users are going to be assigned to “roles” in order to give human beings the requested number of rights



Use Case 13: Notification

Cloud Director requires an SMTP server to send user notification and system alert emails. You can send an email notification to all the users in the entire installation, all system administrators, or all Organization administrators. You can send an email notification to let users know about upcoming system maintenance, for example. Cloud Director sends system alert emails when it has important information to report. For example, Cloud Director sends an alert when a datastore is running out of space. Organizations can use the system notification settings, or use custom notification settings. Users can configure email notification to receive a message before a runtime or storage lease expires.

Notify Users

Send a message to users in Fujitsu-Finance

To: All organization users

Subject: All organization users

Message: Organization administrators

Send Email Cancel

Planning Considerations

Hardware

A full discussion of processor and overall server performance considerations is beyond the scope of this paper. However, it is important to note that the performance of virtual machines that use a virtualized platform is heavily influenced by factors of processor architecture and specific feature sets available in the processor. The use of high performance server processors equipped with virtualization and IO support feature sets, such as the Intel Xeon processor 5600 series, which also supports Intel® Intelligent Node Manager, Intel AES-NI and Intel Trusted Execution Technology (Intel TXT), is recommended. For more details on Intel Virtualization technologies, Intel Node

Manager, Intel AES-NI and Intel TXT please refer to http://download.intel.com/business/resources/briefs/xeon5500/xeon_5500_virtualization.pdf

Network Technology Architecture

For the infrastructure test bed, 1 GbE connections were used for service console/virtual machine and storage. Depending on the customer requirements and usage, production environments might benefit from using 10 GbE for virtual machine networks.

Storage Architecture

For the sake of cost effectiveness and simplicity, a NFS store was used as a shared storage to store virtual machine images. For production deployments, other alternatives might need to be chosen based on the performance, cost, and other factors. The performance of the storage nodes and hypervisor nodes (when local storage is utilized), as well as the overall power consumption of the cloud deployment, may be favorably impacted by the use of SSDs. This was not specifically tested.

Security

Security is one of the key considerations in today's virtualized or bare-metal server deployments. In a cloud deployment scenario, from the perspective of both service provider and service consumer, recommendations include systems that support Intel Advanced Encryption Standard-New Instructions (AES-NI) for faster encryption and Intel TXT (available with Intel Xeon Processor 5600 series) and software like VMware vSphere Hypervisor (VMware ESXi 4.1) to ensure protection against hacking and unauthorized access.

Software

This guide is not meant to substitute for product documentation. For detailed information regarding installation, configuration, administration, and usage of VMware products, please refer to the online documentation. You may also consult the online Knowledge Base if you have any additional questions. Should you require further assistance, please contact a VMware sales representative or channel partner. Below are some links to online resources, documentation and self-help tools:

VMware vSphere and VMware vCenter Server Resources:

Product Overview: <http://www.vmware.com/products/vSphere>

Product Documentation: http://www.vmware.com/support/pubs/vs_pubs.html

VMware vSphere Documentation (including hardware compatibility guides): http://www.vmware.com/support/pubs/vs_pages/vsp_pubs_esx40_vc40.html

Whitepapers and Technical Papers
VMware VMware vSphere Evaluator guide: <http://www.vmware.com/resources/techresources/10020>

VMware vCloud Director Resources:

Product Overview: <http://www.vmware.com/products/cloud-director>

Product Documentation: http://www.vmware.com/support/pubs/vcd_pubs.html

Installation and Configuration Guide: http://www.vmware.com/support/pdf/vcd_10_install.pdf

Administrator's Guide: http://www.vmware.com/support/pdf/vcd_10_admin_guide.pdf

User's Guide: http://www.vmware.com/support/pdf/vcd_10_users_guide.pdf

VMware vCloud Director Community: <http://communities.vmware.com/community/vmttn/vcd>

Support Knowledge Base: <http://kb.vmware.com>

VMware vCenter Server, VMware vShield Manager and VMware vCloud Director

This guide assumes that you have the following software. You have at least one evaluation or licensed VMware vCenter Server Standard. You have at least two VMware vSphere Enterprise Plus evaluations or licensed VMware ESXi/ESX Servers. You have one or more VMs in your VMware vSphere environment with guest operating system (GOS) installed which will be imported into VMware vCloud Director.

For details on installation and configuration of VMware vCenter Server and VMware ESXi/ESX Servers and creation of VMs, please refer to VMware vSphere documentation.

You have VMware vShield Manager 4.1 deployed, licensed, and configured in your VMware vCenter Server. A license for the VMware vShield Edge components of VMware vCloud Director is included with your VMware vCloud Director evaluation. For details on installation of VMware vShield Manager, please refer to the

VMware vCloud Director Installation and Configuration Guide.

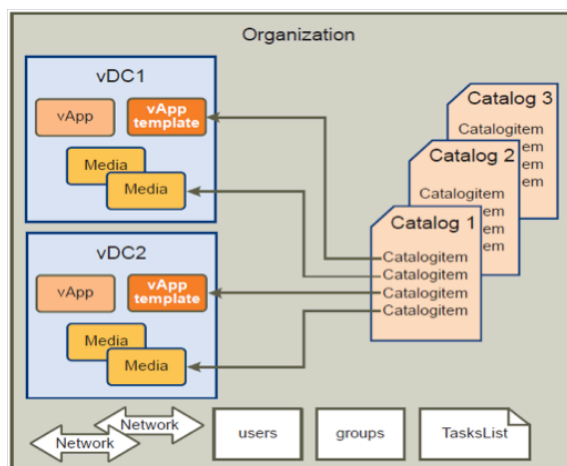
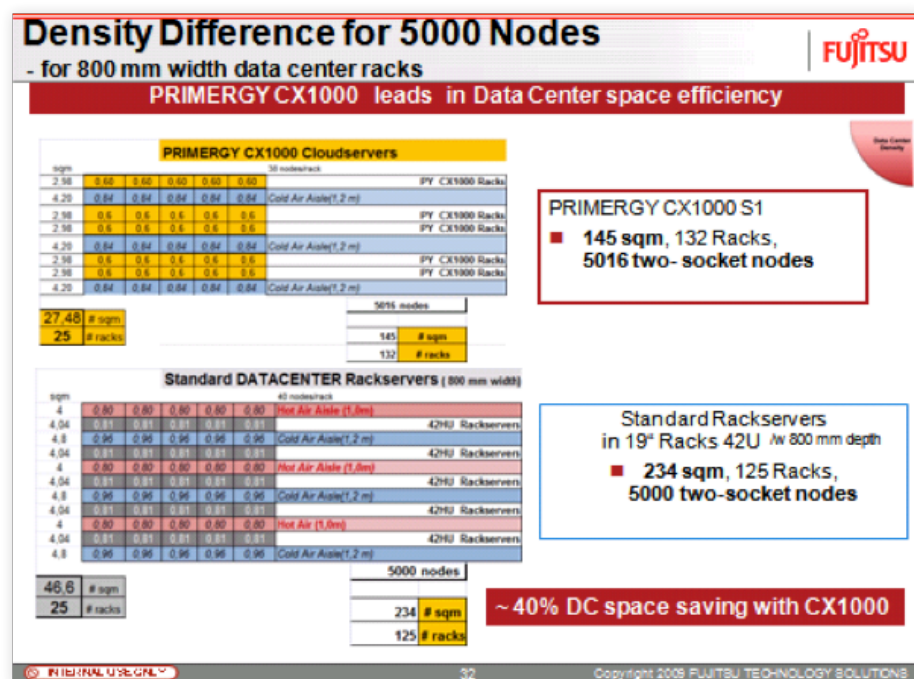
You have VMware vCloud Director installed and running in a VM or physical machine. For details, refer to the VMware vCloud Director Installation and Configuration Guide.

Additional Info

Intel Cloud Builders: <http://www.intel.com/cloudbuilders>

Intel Xeon processors: <http://www.intel.com/xeon>

Appendix: PRIMERGY CX1000 Datacenter Space Comparison



Logical Definition Map.

Glossary

To avoid ambiguity about the terms used, here are the definitions for some of the specific concepts used in this paper⁷:

Organization: An organization in VMware vCloud Director is a unit of administration for a collection of users, groups, computing resources, and deployment of service.

VMware vCloud Users and Groups: An organization can contain an arbitrary number of users and groups. Users can be created by the organization administrator or imported from a directory service such as LDAP. Groups must be imported from the directory service. Permissions within an organization are controlled through the assignment of rights and roles to users and groups.

VMware vCloud Networks:

An organization can be provisioned with one or more networks. These organization networks can be configured to provide services such as DHCP, NAT, and firewalls.

VMware vCloud VDC: A VMware vCloud VDC is an allocation mechanism for resources such as storage, processors, and memory. In a VDC, computing resources are fully virtualized, and can be allocated based on demand, service level requirements, or a combination of the two. There are two kinds of VDCs:

- **Provider VDCs:** These VDCs contain all the resources available from the VMware vCloud service provider. Provider VDCs are created and managed by VMware vCloud system administrators.
- **Organization VDCs:** These VDCs provide an environment where virtual systems can be stored, deployed, and operated. They also provide storage for virtual media, such as floppy disks and CD ROMs.

VMware vCloud Catalogs: Catalogs contain references to virtual systems and media images. A catalog can be shared to make it visible to other members of an organization, and can be published to make it visible to other organizations.

vApp: A vApp contains one or more individual virtual machines, along with parameters that define operational details such as:

- How the contained virtual machines are connected to each other and to external networks.
- The order in which individual virtual machines are powered on or off.
- End-user license agreement terms for each virtual machine.
- Deployment lease terms (typically inherited from the containing organization) that constrain the vApp's consumption of VDC resources.
- Access control information which specifies which users and groups can perform operations such as deploy, power on, modify, and suspend on the vApp and the virtual machines it contains.

Endnotes

1. Intel® Xeon® Processor 5500 series Software Industry Testimonials, <http://www.intel.com/business/software/testimonials/xeon5500.htm>
2. Intel Virtualization Technology, <http://www.intel.com/technology/virtualization/> and http://download.intel.com/business/resources/briefs/xeon5500/xeon_5500_virtualization.pdf
3. Intel® Xeon® Processor 5000 series product support: <http://www.intel.com/support/processors/xeon5k/>. Intel® Xeon® Processor 5600 series product information: <http://ark.intel.com/ProductCollection.aspx?series=47915>
4. VMware vMotion® Requirements: http://pubs.vmware.com/vi3/resmgmt/wwhelp/wwhimpl/common/html/wwhelp.htm?context=resmgmt&file=vc_create_cluster.7.4.html
5. VMware vCloud Director Product Page: <http://www.vmware.com/products/vcloud-director/>
6. VMware vCloud™ Director Installation and Configuration Guide: http://www.vmware.com/pdf/VMware_vCloud™_Director_10_install.pdf
7. VMware vCloud API Programming Guide: http://www.vmware.com/pdf/VMware_vCloud*_Director_10_api_guide

Disclaimers

ΔIntel processor numbers are not a measure of performance. Processor numbers differentiate features within each processor family, not across different processor families. See www.intel.com/products/processor_number for details.

Hyper-Threading Technology requires a computer system with an Intel processor supporting Hyper-Threading Technology and an HT Technology enabled chipset, BIOS and operating system. Performance will vary depending on the specific hardware and software you use. See <http://www.intel.com/info/hyperthreading/> for more information including details on which processors support HT Technology.

◊Intel® Virtualization Technology requires a computer system with an enabled Intel® processor, BIOS, virtual machine monitor (VMM) and, for some uses, certain platform software enabled for it. Functionality, performance or other benefits will vary depending on hardware and software configurations and may require a BIOS update. Software applications may not be compatible with all operating systems. Please check with your application vendor.

No computer system can provide absolute security under all conditions. Intel® Trusted Execution Technology (Intel® TXT) requires a computer system with Intel® Virtualization Technology, an Intel TXT-enabled processor, chipset, BIOS, Authenticated Code Modules and an Intel TXT-compatible measured launched environment (MLE). The MLE could consist of a virtual machine monitor, an OS or an application. In addition, Intel TXT requires the system to contain a TPM v1.2, as defined by the Trusted Computing Group and specific software for some uses. For more information, see <http://www.intel.com/technology/security/>

Intel® Turbo Boost Technology requires a PC with a processor with Intel Turbo Boost Technology capability. Intel Turbo Boost Technology performance varies depending on hardware, software and overall system configuration. Check with your PC manufacturer on whether your system delivers Intel Turbo Boost Technology. For more information, see <http://www.intel.com/technology/turboboost>.

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