vCloud Director
The Leading Cloud Management Platform for Virtual Private Cloud
All about Services
Ready for Any Customer, Any Workload, at Any Time

- Turnkey Private and Multi-tenant Cloud services
- Datacenter Extension and Hybridity Services
- Security and Compliance Services
- Operations and Monitoring services
- Cloud Management & Migration Services
- Backup, Availability and Data Protection Services

vCloud Director is accompanied by Service Design and Monetization Guidelines
Getting Started w/ VPC
VPC Architecture
Tenant Interface
Tenant Dashboard

- https://<vCD>/tenant/<org>
- Resource utilization across organization
  - Running vApps
  - Running VMs
  - CPU
  - Memory
  - Storage
- Resource utilization per datacenter
- Clickable data centers
Datacenters

- View/create vApps
- Add VMs to vApps
- Create affinity rules
- Manage networks
- Manage edges
- Manage security services
- Manage storage
Libraries

- Manage vApp templates
- Manage VDC templates
- Manage media
- Manage catalogs
Administration

- User and Group Management
- Roles
- Identity Providers
- Settings
Tenant HTML Interface

vApp Network Diagram

Global Search
vCD Core Concepts
vCloud Director: Datacenter Resource Consolidation

- Automate Policy Based Compute Pools
- Automate Creation of Tenant Networks
- Update Network Policies

Compute, Storage & Network Resource Pooling

- Compute & Memory
- Network
- Storage

Provider vDC

System Resource Pool
- CPU, Memory

Network Pool
- DvSwitch

Storage Profiles

Data Stores
vCloud Director: Software Defined Infrastructure (Automation)

Infrastructure Automation
- Automate Policy Based Compute Pools
- Automate Creation of Tenant Networks
- Update Network Policies

Service Provider Infrastructure Automation

Resource Request

Customer A

Service Provider

x Ghz CPU
x GB memory
xIOPS

Resource Allocation Policy?

vCloud Director

Resource Pool A

Resource Pool A

vCenter Resource Pools

Customer A

Customer B

Provider vDC
vCloud Director: Multi Tenant

**Multi Tenancy**
- Isolation of Compute, Storage and Network Resources
- Identity Management

Tenant Virtual Data Center Isolation

- Provider VDC
- NSX Edge/vCNS Edge
- vSphere

Org VDC 1 (Customer X)
- VM
- Virtual Machine

Org VDC 1 (Customer Y)
- VM
- Virtual Machine
vCloud Director: Self Service and Cataloging

Self Service & Cataloging
- Self Provision Virtual Machines
- Pre-Packed Applications
- Develop Standardized Virtual Machine Templates (vApps)

Customer X
- Catalogs
- My Cloud
- Administration
- http://(vcd) Customer (X)

Customer Y
- Catalogs
- My Cloud
- Administration
- http://(vcd) Customer (Y)
vCloud Director Tenancy Constructs

Efficient use of Data Center resources

- Organization
  - Tenant A
  - Tenant B
  - Tenant C
  - Tenant D

- Organization VDC
  - Tenant A Org vCD
  - Tenant B Org vCD
  - Tenant C Org vCD
  - Tenant D Org vCD

- Provider VDC
  - PvDC 01
  - PvDC 02
  - PvDC 03
  - PvDC 04

- vCloud Director (interacting with vCenter Server below)
vCD and Overlay Virtual Networks
Multi-Tenant NSX-V Integration in vCD delivers immediate value through operational efficiencies & new service opportunities.
Multi-Tenant Self-Service Networking

**Features**

- Tenants self-manage NSX Advanced edge features
- Tenant self-manage and configure NSX Distributed Firewall for micro-segmentation
- North-bound multi-tenant NSX API for service providers and tenants

**Benefits**

- Drive revenue—Service Providers can offer and monetize self-service consumption of NSX services by tenants
- Improve customer experience—NSX services on SP cloud compatible with on-premises environments

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Tenant A  Tenant B  Tenant C

vCloud Director

Multi-Tenant Managed Service

NSX

Managed Hosting  Dedicated Private Cloud  Multi-Tenant Cloud
NSX Integration enables Flexible Tenant Network Options

- Directly Connected Network
- Routed Network
- Routed Network with distributed Routing
- Isolated Network
- Fenced Network

WAN / Internet
External Network
Org VDC Networks

NSX edge, logical router, switches orchestration automated by vCD
NSX Integration offers Tenant Self-Provisioned Security

- Baseline Provider Policies (RBAC protected) & Tenant Policies (in vCD)
- Layered security approach
  - Edge firewall secures north-south traffic in and out of the VDC
  - Distributed firewall inspects the east-west traffic within VDC
- Distributed firewall allows the security policies to be aligned with the functional group of VMs independent of placement of VMs
- vCD automates distributed firewall rules segmentation per Org VDC with per-Org VDC DFW sections and per-Org VDC security groups
NSX Integration delivers new services at the Tenancy Boundary

- Org VDC networks are separate and dedicated only to one tenant
- Can be VLAN backed by port groups (typical legacy) or VXLAN backed by distributed switch
- Resource Segmentation with Edge gateway / NSX edges are dedicated to only one org VDC
- Each org VDC can have multiple edge gateways for redundancy and isolation
- All networking functions can be RBAC controlled within vCD Self Service Portal
Tenants Configure Their Own Firewall for In-cloud Workloads

...Distributed Firewall as a Service

HOW
Tenant can define DFW rules by right clicking Org vDC, manage firewall
Define Source and destination, Service type and direction

THINGS TO CONSIDER
DFW rules are applied per Org-vDC
SP need to add rights in Organization for a Tenant to enable DFW
Service type can be defined from an OOB service categories
Tenants Manage Their Own Routing/NAT Tables

...via Dynamic Routing

HOW

Tenants can define Routing protocols by right clicking Edge Gateway
-> Configure Services
OSPF, BGP protocols are supported
Automated and On-Demand Hybrid Connections
...via Layer2 VPN

**NSX L2VPN Solution**

**Enterprise**
- **L2VPN Client**
  - **Existing Router**
  - **Site A Uplink Network**
  - **Site A Standalone Edge**
  - **VLAN Trunk Interface**
  - **VLAN 50 172.16.10.0/24 Tunnel ID 5**
  - **VLAN 51 172.16.20.0/24 Tunnel ID 6**

**Stretched Network**
- **SSL Network**
- **Simple VM form factor**
- **VLANs/ VXLANs Trunk support**

**vCAN Service Provider**
- **L3 Network**
- **Provider vDC**
- **Provider Uplink NW**
- **Tenant External Network**
- **Tenant vCD Edge GW**
- **Trunk Interface**
- **Tenant Org vDC**
- **VXLAN 5000 172.16.10.0/24 Tunnel ID 5**
- **VXLAN 5001 172.16.20.0/24 Tunnel ID 6**

**SSL**
- **Simple VM form factor**
- **VLANs/ VXLANs Trunk support**
Automated and On-Demand Hybrid Connections
...via SSL VPN

ADVANTAGES
• Enables Hybrid connectivity between clients and workloads in cloud
• Can connect laptops/mobile devices to workloads in Cloud
• Opportunity for SP’s to Monetize

THINGS TO CONSIDER
• Supports client configuration for Windows, Mac and Linux
• Assigns Private IP to incoming client connections
• Local users need to be defined
The Tenant Admin view
The Virtual Machine view
Allocation Models

Deep Dive
Allocation Pool Model
(Virtual Data Center)
## Allocation Pool Model

**Virtual Data Center**

<table>
<thead>
<tr>
<th>Allocation Model</th>
<th>Key Characteristics</th>
</tr>
</thead>
</table>
| Allocation Pool (Virtual Data Center) | • Resource allocation  
  • Each Org vDC gets its own allocated pool of resources  
  • Only a % of resources allocated are committed / reserved to Org vDC  
  • Provider controlled SLA / overcommitment of resources  

| | • Advantages  
  • Ideal for stable workloads that need guaranteed resources (insulates one tenant from another assuming they are operating within the bounds of the guaranteed resource pool)  
  • Flexibility to burst capacity using non-guaranteed resource pools  
  • VM can take advantage of the resources of an idle VM on the same sub resource pool  
  • Predictable monthly fee for customers  
  • Lower risk for MSP  

| | • Disadvantages  
  • Possible contention within non-guaranteed resource pools across tenants |
Virtual Datacenter (Allocation Pool) – Service Design

Example: Silver Service Tier
VMs inherit resource reservation from Org VDC

Org VDC Tenant A

Resource Guarantee 20%

Org VDC Tenant B

Resource Guarantee 20%

Org VDC Tenant N

Resource Guarantee 20%

Over- Provisioned Resources
- Percentage of Non-Guaranteed Capacity
  Reflects SLA
- Determines infrastructure sizing
- Core to Business Model

Provider VDC (Default Elastic)

vSphere Cluster

Host

vSphere Cluster

Host

Result: Total Servers in Pool

Min. Required Non-Guaranteed Resources

Over-Provisioned Resources

- Percentage of Non-Guaranteed Capacity
  Reflects SLA
- Determines infrastructure sizing
- Core to Business Model

Sold e.g. 100 GB

Utilized e.g. 60 GB

Guarantee e.g. 20 GB

Sold

Guarantee

Sold

Over- Provisioned Resources

- Percentage of Non-Guaranteed Capacity
  Reflects SLA
- Determines infrastructure sizing
- Core to Business Model

Physical Infrastructure

Resource Allocation Utilization Rate

Allocated Capacity

Provider VDC (Default Elastic)

vSphere Cluster

Host

vSphere Cluster

Host

Sold

Guarantee

Sold

Min. Required Non-Guaranteed Resources

Over-Provisioned Resources

- Percentage of Non-Guaranteed Capacity
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Result: Total Servers in Pool

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Virtual Datacenter (Allocation Pool) – Example

VMs inherit resource reservation from Org VDC

Org VDC Tenant A  Org VDC Tenant B  Org VDC Tenant N

Provider VDC (Default Elastic)

vSphere Cluster  vSphere Cluster

Host  Host  Host  Host  Host

Resource Guarantee 20%

Resource Guarantee 20%

Sold  Utilized  Provisioned  Utilized

\[ \sum \text{Non-Guaranteed Capacity} \]

\[ \sum \text{Guaranteed Capacity} + \sum \text{Virt. Overhead} \]

Physical Infrastructure
Reservation Pool Model
(Dedicated Private Cloud)
## Reservation Pool Model

### Dedicated Cloud

<table>
<thead>
<tr>
<th>Allocation Model</th>
<th>Key Characteristics</th>
</tr>
</thead>
</table>
| Reservation Pool (Dedicated Cloud) | • Resource allocation  
  • Allocated pool of resources with 100% committed / reserved to the Org vDC  
  • No sharing of physical resources with other Org vDC  
  • Ensures resources are available when needed  
  • Tenant can adjust reservations and limits per VM  |
| Fully reserved pool of resources | • Advantages  
  • Ideal for critical apps with availability, performance, security compliance requirements  
  • Customization possible (e.g. supports dedicated, air-gapped infrastructure)  |
| | • Disadvantages  
  • Could lead to underutilized resources  
  • Potentially more expensive for customer – depending on scale |
Dedicated Server (Reservation Pool) – Service Design

Resource Reservation to VMs individually, Org VDC can be oversubscribed

Org VDC Tenant A

Pool Characteristics
- Pool Capacity 100% backed up by physical resources
- Physical resources 100% dedicated to pool
- Performance SLA defined per VM

Σ Non-Guaranteed Capacity

Σ Guaranteed Capacity + Σ Virt. Overhead

Max. VM Guaranteed Resources

Servers in Pool

Physical Infrastructure
Dedicated Server (Reservation Pool) – Example

Org VDC can be oversubscribed, resource reservation per VM

Org VDC Tenant A

Provider VDC

vSphere Cluster

Host
Host
Host
Host
Host

Physical Infrastructure
## vCloud Director Abstraction Constructs

<table>
<thead>
<tr>
<th>vCloud Director Component</th>
<th>Definition</th>
</tr>
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</table>
| Organization                           | • Logical group of all users (consumers) to which resources are presented  
• Security boundary  
• Each organization has its own cloud Web portal |
| Provider virtual datacenter            | • Logical group of vSphere compute resources (resource pools and datastores), to create a service offering  
• Multiple provider virtual datacenters can separate resources by  
  • Tier (server or storage performance, such as gold, silver, bronze)  
  • Group (location – availability zone, such as vSphere cluster 1, vSphere cluster 2) |
| Organization virtual datacenter        | • Resource allocation for a given organization, created as a subset of a provider virtual datacenter  
• Assigned a resource allocation model (compute resources, number of virtual machines limit)  
• Multiple organization virtual datacenters for an organization can  
  • Map to different provider virtual datacenters to provide different resource tiers, capacities, or groups  
  • Support different resource allocation models |
| vApp                                   | • Container of virtual machines and networks |
| External network                       | • Maps to a vSphere port group to provide external connectivity |
| Organization virtual datacenter network| • Network contained within an organization virtual datacenter  
• Remains internal to organization virtual datacenter and can connect to an external network |
| vApp network                           | • Network between virtual machines within a vApp  
• Provides direct or routed connection to an organization network (for cross-vApp communication) or can remain isolated |
| Edge Gateway                           | • Virtual router providing network edge security, connectivity and services between External and organization networks |
| Catalog                                | • Public or private repository of vApp templates and ISO images |
Thank You!
vCloud Director Appliance
vCloud Director innovation – delivered as an .ova Appliance

Simplify the vCD setup

In addition to the usual .bin binary file, vCD 9.7 is shipped as .ova appliance
Can be directly imported to vCenter

Prerequisites:

- An external DB exists and is ready for vCD to use it ….. for now
- An NFS server exists with an export setup to be used as the server group's transfer space.
- A load balancer that will stand in front of the cells
vCD Appliance Enhancements

Appliance includes PostgreSQL database
2 vNics for flexible network configuration
Possible to deploy in HA mode
Database access for troubleshooting and backup / restore

No Cassandra DB (for metrics)
No RabbitMQ (for extensions)