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Summary
VMware vCloud Director (vCD) for Service Providers is the only Industry tested solution that helps Cloud service providers (CSP’s) deliver Multi-Tenant Infrastructure-as-a-service (IaaS). vCloud Director offers service providers turn key solutions to enabling Hybrid Cloud offerings on vSphere managed infrastructure. vCloud Director 9.0 extends the Tenant portal to add simplified Tenant Operations. Further, Tenants with multiple Organization Virtual Data Centers (Org vDC’s) spread across multiple sites can manage their Virtual Data Centers (vDC’s) from a single Pane of glass.

Features Update
Enhanced User Interface
The Tenant user interface has gone through some major updates that make day-to-day operations faster and easier to work around. One of the major changes end users will see when logging in to the newly updated vCD portal is the completely revamped user interface. The new Tenant UI is oriented towards making common Tenant workflows like instantiating a vApp, deploying new VM, Networking changes etc., simpler and more efficient.

The look and feel of the new Tenant facing UI is simplified as well, some of the enhancements Tenants will see in the new UI are but not limited to:

• Virtual Machines in ‘My Cloud’ will now appear in the ‘Compute’ section of the new UI
• Virtual Machines can now be viewed like cards. Each card has ability to click through actions like, Power, Properties, taking snapshots etc.
• Org vDC Networks can now be viewed under the ‘Network’ tab, this allows to create/edit org vDC Networks
• Standalone Virtual machines can be instantiated and viewed along with virtual machines that part of a vApp container. A filter button creates a list based on Virtual machines, virtual appliances or both.

The old flex based Web Console still stays, to access the new Tenant facing UI, users will have to logon with the URL:
https://{vCD _URP_IP}/Tenant/{organization_name}
vCD 9.0 relieves the requirement to have a Virtual Appliance (vApp) to build a single virtual machine, with this release of vCloud Director users can create virtual machines without having to necessarily create a vApp first. vApps can also be created however they are not required to operate individual virtual machines. vCD creates a vApp container automatically for virtual machines.

Figure 1 New Tenant UI

Figure 2 Create a VM using Template
Multisite Management
The Multisite feature lets service providers offer a single port of entry to Tenants having multiple Virtual Data Centers (Org vDC’s) in different instances of vCD. A Tenant can access and manage multiple Org vDC’s that are managed by different vCloud Director instances using the same pair of credentials in a single session. Service Providers managing two or more instances of vCD will have to associate/map one site to the other, this establishes a site-site association. A Site can have multiple association but an association between sites can only have two entities.

Once two sites that are managed by individual vCD instances are associated by a System Admin then Organization Admins can start establishing trust across Organizations from the two sites. Each Organization will generate a Public/Private Key Value Pair to establish trust amongst themselves.

Local and LDAP users across sites must have the same username and role associations across sites to manage Multisite.

Users created with SAML identification must use the same identification server across the associated sites.

After the Sites and Organizations have been associated, Tenants Users can log in via the Tenant Portal and access various Org vDC’s across sites via a dropdown menu as shown in Figure 3.

Figure 3 Multi Site view of Org vDC’s

To generate Site data, the below API will give attributes about the Site as shown in Figure 4.

GET: https://{{vcloud.example.com}}/api/site
The below API will generate local Site data that can be used to associate with a Remote Site as shown in Figure 5.

**GET:** https://(vcloud.example.com)/api/site/associations/localAssociationData

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Figure 4 REST API to get Site Data

The below API will generate local Site data that can be used to associate with a Remote Site as shown in Figure 5.

**GET:** https://(vcloud.example.com)/api/site/associations/localAssociationData

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Figure 5 Site Association Data
A System Admin will have to post this reference data to the site association data of Site B and vice versa.

Once the Sites have been associated, Organizations between two sites can be similarly associated by getting the Organization association reference of Site A and posting it to Organization association API of Site B.

GET: https://((vcloud.example.com))/api/admin/org/SiteA-OrgA/associations/localAssociationData

To authenticate via the REST API an additional attribute in the Login API header determines whether you are logging in to the local vCD instance or the federated site instance.

**Distributed Logical Router**

vCD 9.0 gives the ability to deploy distributed Logical Router to manage routing needs between two or more Org vDC Networks. The Distributed Logical Router (DLR) provides a faster method to resolving routing tables between org vDC networks. It allows for workloads to route traffic without needing to route traffic via the Edge Gateway. Up until vCD 9.0, a Tenant can have multiple org vDC networks, routing between these networks was always done by the Edge Gateway that sat in between these networks and the external service provider network. vCD works with NSX to deploy a DLR that will have its logic reside in kernel modules across the ESXi hosts that are part of the cluster backing the Provider vDC. The DLR will be hierarchal sitting in between the organization networks and the Edge Gateway. vCD will automatically create an uplink for the DLR that will connect to a network interface on the Edge Gateway.

Tenant Networks being backed by the DLR will be able to utilize DHCP and DNS functions of the Edge Gateway via a relay, this relay will be managed by vCD.

By default, when an Edge Gateway is created, the Tenant can choose to enable a DLR for that edge as show in Figure 5. This will enable the distributed Logical Router to be networked to the Edge Gateway in the backend for North South traffic flow from the org networks that will be connected to the DLR via the Edge Gateway.

After an upgrade to vCD 9.0, existing Edge Gateways will have an option to enable DLR by right clicking on the Edge Gateway.
**Support for Trunked vLAN backed Networks**

Service providers may have Tenants that want to bring in their own vLAN’s into Org vDC Networks. vCloud Director supported creation of External Networks that were backed by vLAN’s but not Trunked vLAN’s. Tenants may to run multiple vLAN’s in the Org Networks. With vCD 9.0, vCD now adds trunking support for External and Routed Org Networks. Virtual Machines that run on the trucked vLAN backed networks can create vLAN tags within the guest Operating System(OS).

To enable support for trunked vLAN backed Org Networks, create an External Network in vCD that has been configured with trunked vLANs. For Routed Org Network check the box, ‘Guest vLAN Allowed’ while creating the Network as shown below.
Flexibility to place Edge Gateways in separate Pool

vCloud Director created a System Resource pool within the compute cluster that would back a Provider Virtual Data Center. vCD used this ‘System’ resource pool to store management VM’s that it would deploy to operate Tenant function. When an organization would create an Edge Gateway, vCD would work with NSX Manager to deploy a new instance of Edge Virtual machine and would place the virtual machine under the ‘System’ resource pool.

Service Providers often architect separate resource pods to place management applications to better operate their Data Centers. With vCD 9.0 a Service Provider can define a resource pool/cluster that can be used to place the NSX Edge Gateway virtual machines. This is done by defining an attribute in the Provider vDC’s meta-data. The meta-data attribute called placement.resourcepool.edge = <resourcepool moref> can be defined on the Provider vDC. The <resourcepool moref> is the moRef ID of the resource pool/Edge cluster identified by vCD. Resource pools and their moRef are can be obtained by querying the vCD API. Please refer to Figure 5.
Right click a Provider vDC ➔ Click Properties ➔ Meta-Data tab

Note: The creation of a default Network pool when a Provider vDC is created is now an option. A user can choose to create a default network pool or choose from an existing custom VxLAN backed network pool as shown in the below.
VM Monitoring and Metrics

vCloud Director can collect and store various metrics around performance of workload in the cloud. These metrics collect data for virtual machine CPU/memory/storage utilization, the average latency of disk operations, etc. Previous releases of vCloud Director needed Kairos DB managed by Apache Cassandra to store data. With vCD 9.0, the need to have Kairos DB to store and collect metric data has been relieved. Metrics data can be stored in Cassandra database directly using the cell management tool.

Extensibility

vCD’s UI extensibility framework lets you extend the Tenant Portal User Interface to add more sections. Currently there are Compute, Network default sections in the Portal, with the Extensibility of the UI a new section can be added which can link to another solution portal or can be an embedded iFrame.

Architecture Changes

PostgreSQL Support

vCloud Director 9.0 supports PostgreSQL database as an External Database. PostgreSQL is supported as external database apart from Microsoft SQL and Oracle. This release support PostgreSQL version 9.5 and clustered database support. vCD also supports PostgreSQL database with SSL connectivity.

For customers having existing MSSQL or Oracle databases, the Cell Management Tool (CMT) will help migrate existing databases to a pre-installed PostgreSQL database instance. The 'dbmigrate' option in CMT will help migrate an existing database to a new PostgreSQL instance.

[bash]# cell-management-tool dbmigrate
Once the database has been migrated, use the 'reconfigure-database' option in CMT to ask vCD to start using the new PostgreSQL database.

![CMT Tool to migrate database](image)

vCenter Guest OS and Hardware Version Consistency
vCloud Director now works more efficiently with the vCenter Server to determine the hardware version supported for virtual machines. vCD now dynamically determines the highest hardware version supported by polling the backend vCenter and ESXi servers mapping to a compute cluster and determining the highest version supported by all hosts in the cluster.

When a service provider admin starts building a Provider vDC, the hardware version highlighted by vCD will be the highest the compute cluster can support. This allows vCD to expand the guest OS’s it can support. vCD will support all the guest OS’s that the underlying vSphere environment support.

vCD-vCenter Latency
vCloud Director can now support a latency of 100 Milli Seconds (ms) between itself and the vCenter Server/s. This helps service providers use a single instance of vCD to manage vCenter Servers that maybe located off-site/remote.

Networking Enhancements
Security Groups
vCloud Director 8.20 introduced Distributed Firewall (DFW) capabilities of NSX to be self-serviced by individual Tenants. Tenants could define DFW policies by creating individual rules per virtual machine or vApp. At the same time, they could also apply these policies in a blanket fashion to a set of IP addresses MAC address or Objects like Virtual Machines, Org vDC Networks, etc. However, to efficiently apply DFW policies Tenant admins would have to know exactly what IP/MAC sets/Objects to apply these policies to.

vCloud Director 9.0 introduces Security Groups that help define security policies dynamically. A Tenant Admin can define a criterion to match individual Virtual machines via Security Groups and DFW policies can be applied to these Security Groups.

To create Security groups, Right Click Edge Gateway → Edge Gateway Services → Grouping Objects → Security Groups
**Storage Enhancements**

**Migrate Tenants between Storage Arrays**

Service Providers may need to migrate/offload data from one datastore to other. They may need to migrate data to manage a storage subsystem maintenance or if they want to change the service level of Tenants from one storage tier to another.
With vCloud Director 9.0 Service Providers will be able to live migrate storage of individual Tenants from one datastore to another. All the objects that are specific to an Organization including Virtual Machines, Catalogs, Images etc. will be migrated to another datastore. This operation can only be done by a Service Provider Admin or a custom role that has access.

Figure 10 Migrate Storage for Organizations

To Migrate storage of Tenants, login to vCD → Mange & Monitor → Organizations → Right click Organization → Migrate Tenant Data

This will start a wizard that will help select source and destination datastores to migrate Tenant data. SP’s can migrate more than one Tenant’s data at a time.

Things to keep in mind are the destination datastore should be visible to all the hosts that are part of the cluster/Resource pool that is backing the Provider vDC. Also, Storage Profiles should map to the new destination datastores as well.
Support for Virtual Volumes (vVols)
vCloud Director 9.0 adds support to datastores that are created in vCenter using Virtual Volumes. While creating provider vDC, vCD lets you add datastores that are being backed by vVols.
Conclusion
vCloud Director 9.0 completely refreshes the way day-to-day operations are handled by both service providers and Tenants. This release focuses on making service provider operations simpler by adding support for multisite management, adding support for PostgreSQL, at the same time making Tenant operations simpler and efficient with the new Tenant User interface.

More Information
For more information about the VMware vCloud Director solution, visit the product pages at

https://www.vmware.com/products/vcloud-director.html

Access the documentation for vCloud Director software at

https://docs.vmware.com

Access reference design and architecture documentation at

https://www.vmware.com/cloud-computing/cloud-architecture/vcat-sp.html

To purchase the vCloud Director solution or to find out how you can join the VMware Cloud Provider Program visit,

http://www.vmware.com/go/partner-enrollment

About the Author
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