vRealize Operations Tenant App for Metering and Chargeback

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Tenant App 101

VMWare supports thousands of partners to host and sell clouds built on VMware technology using vCenter and vCloud Director (vCD). While vCenter provides the core of virtualization, vCloud director provides needed constructs for segmenting the virtual infrastructure appropriately and offering it as a service to tenants of these partners.

As can be imagined, there are several variants of infrastructure that can be sold by these partners such as “Pay as you go”, “Raw capacity” aka “Allocation based”, “Raw capacity with minimum guarantee” aka “Reservation based”. Potentially combination of these could be offered to same tenants. It becomes challenging to track usage over a period and charge appropriately due to this complexity. In addition, tenants demand for a transparency in this billing, and it is imperative that service providers offer it.

vRealize Operations Tenant App (TA) sets out to solve these problems by metering the infrastructure. Further, it provides options to configure different models for pricing this metered infrastructure. Finally, it closes the loop by providing tenant specific views that help tenants validate their charges by looking at usage.

Architecture of TA is based on

- Data collector that collects data from vCenter, vCD and NSX,
- Pricing engine, that applies the charging policies defined by provider on the collected data

The collector and the pricing engine reside inside vRealize Operations Manager (vROps). TA appliance acts as a simple interface for creating pricing policies and storing generated "Bill". TA appliance also provides a plugin to expose Tenant views inside vCD.

Because of these criterion, deployment of TA needs two Virtual Appliances namely the TA Virtual Appliance and the vROps Virtual Appliance. Partners who are already running vROps will be able to just connect TenantApp and begin, and those who do not can start with deploying the Chargeback Licensed edition of vROps.

Configuration of TA post deployment involves configuring vROPs, vCloud Director, vCenter, and NSX. vROPS connection is used for metering of collected data and bill generation. vCloud director connection is used for user management, providing Tenant view, and for collection of data from vCD using vROps VA. vCenter connection is used for collecting inventory changes and metering data about virtual machines using vROps. NSX connection is used for collecting usage information on network elements such as edges, load balancers, firewalls etc using vROps data collectors.

A functional flow of using TA involves

- Defining pricing policies
- Associating these pricing policies to Org VDCs coming from vCD
- Generating bills and reports using this combination
- exposing these bills and other usage data to Tenants

Pricing policies have several variants such as their infrastructure scope of application (eg: Allocation pool, PAYG, Reservation pool), charge rates for different resources (eg: 2$/vCPU/Day, 1$/GB RAM configuration/Day) and conditions for applying the rates (eg: Only when powered on, slabbed rate or overage). Associating pricing policies to org VDCs sets up a combination that can be used henceforth for all metering and billing. Bills are created on-demand based on provider's request and contain a detailed result of applying a pricing policy on and Org-VDC. Reports are customizable entities containing historical data about pricing and usage. They can be scheduled and exported to formats such as CSV and PDF. A plugin to vCD allows these bills and usage data to be exposed to tenants. In addition, Tenant App provides a set of dashboards that can be exposed to tenants.

Rest of this paper expands on the above notions and details out each of them.

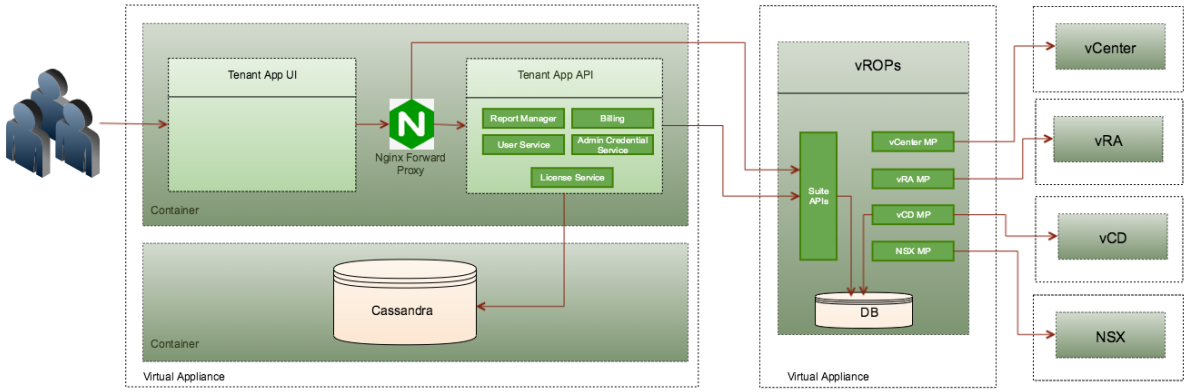
Licensing

TenantApp works in one of the two license modes.

1. Chargeback License : This license mode enables basic functionalities of TenantApp including metering for vCloud director, vCenter and NSX based infrastructure. The license key is applied from vROps UI, post which the UI of vROps is turned off and can be used only as a headless data collection and pricing engine.
2. vROPs entitled mode : If the partner is entitled to any variant of vROps already, he can continue to use the same vROps as a backend for TenantApp. In such cases, the partner gets

additional flexibility of using vROps UI and perform customizations such as custom reports and dashboards based on his entitlement.

Architecture and Dataflow



As can be seen in the diagram, combination of TenantApp appliance and vRops appliance together help service providers meter their infrastructure. vROps acts as the data collection engine talking to endpoints such as vCenter and vCloud director using its management packs. Installation and configuration of these management packs are covered in Administration Guide of Tenant App. Tenant App adds a pricing layer on top of these collected metrics by allowing configuration of the pricing engine. The pricing engine itself runs inside the vROps appliance and outputs the pricing metrics back into vROps. So in essence for a provider, Tenant App VA actsas the configuration interface for pricing policies, where as vROps acts as the single source of metrics for all collected and processed information. Full list of collected and processed metrics can be found in the addendum at the end of this white paper.

Tenant VA also acts as the User interface that can be configured and plugged into vCloud director to be accessed by Tenant Administrators. It provides summary information of usage and metered charges to Tenants of a provider.

Pricing Policies

This section provides details on various elements of pricing policy and how each of the components work in different scenarios, computation algorithm is described in detail.

Base Settings

Policy Name: Service provider admin will provide a relevant name to policy; one policy can be eventually assigned to multiple organization vDC. Each Organization in vCloud Director corresponds to one tenant, so pricing policy provides flexibility at much granular level (OrgVDC) so that differential charging can be done for different tenants (organizations) as well as multiple OrgVDCs within same tenant (organization).

Pricing Policy Type: This corresponds to types of allocation models (Allocation pool, Reservation pool and Pay-as-you-go) in vCD. This field is just used as an identifier only, so that when you create a policy you can assign a label to it so as to later associate it with appropriate organization vDC of same allocation model selected.

Note: This field currently does not drive intelligent filtering of pricing policy components (e.g. if you select Pricing policy type = allocation, there will be elements in pricing policy which are applicable only to PAYG model but still will be shown and does not impact the pricing as such). vCD 9.7 introduced new allocation model (Flex), which will be supported in future release of tenant app.

Currency: This is the currency in which pricing is setup and bills are generated, this currency is same as set in vROPS. In vROPS navigate to Administration > Management > Global Settings > Currency to set this value. Please note that this can be set only once per installation and cannot be modified once set.

Policy Description: Any additional details to be mentioned about pricing policy

CPU Rate

Charge CPU based on: This is applicable when admin selects policy type as PAYG, where pricing happens at virtual machine level, and admin can choose to charge CPU based on either gHZ or based on vCPU count.

Charge Period: A specific price can be applied with different periodicity such as Hourly, Daily and Monthly. The base rate and fixed cost mentioned will get applied based on this frequency.

Charge Based on: For each allocation model in vCD admin can define specific rules based on which chargeback can happen, it can be based on resource allocation, usage or reservation (guaranteed resource) or max of two entities (usage vs allocation, usage vs reservation). The details of which value will be considered in computation based on this set rule is described in the below table.

Table 1. 1

Pricing Policy Type / Allocation Model	Charge Based on	Power State	CPU	Memory	Storage
Allocation Pool	Charged on		Org-VDC	Org-VDC	Storage Policy under Org-VDC
	Allocation	Not Applicable / No Impact	CPU allocation (GHZ)	Memory allocation (GB)	Storage allocated (GB)
	Reservation		CPU resources guaranteed (GHZ)	Memory resources guaranteed (GB)	Not Applicable
	Usage		CPU Allocation Used (GHZ)	Memory Allocation Used (GHZ)	Storage used on allocated (GB)
	Max (Allocation, Usage)		Usage can go beyond what is allocated, so take whichever is higher	Usage can go beyond what is allocated, so take whichever is higher	Usage can go beyond what is allocated, so take whichever is higher
	Max (Reservation, Usage)		Usage can go beyond guaranteed, so take whichever is higher	Usage can go beyond guaranteed, so take whichever is higher	Usage can go beyond guaranteed, so take whichever is higher
Reservation Pool	Charged on		Org-VDC	Org-VDC	Storage Policy under Org-VDC

	Reservation		Same as allocation, as 100% is guaranteed	Same as allocation, as 100% is guaranteed	Not Applicable
	Usage		CPU Reservation used (GHZ)	Memory Reservation used (GB)	Storage used on Reservation (GB)
	Max (Allocation, Usage)		Usage can go beyond what is allocated, so take whichever is higher	Usage can go beyond what is allocated, so take whichever is higher	Usage can go beyond what is allocated, so take whichever is higher
	Max (Reservation, Usage)		Usage can go beyond guaranteed, so take whichever is higher	Usage can go beyond guaranteed, so take whichever is higher	Usage can go beyond guaranteed, so take whichever is higher
Pay As You Go	Charged on		VM	VM	VM/Media Template
	Not Applicable / No impact	Always	allocation/usage	allocation/usage	allocation/usage
		Only when powered on	allocation/usage	allocation/usage	allocation/usage
		Powered on at least once	allocation/usage	allocation/usage	allocation/usage

Base rate: Specific the rate or price at which you would like to charge the resource under consideration, this value will be multiplied accordingly with resource metered value to arrive at final charge to tenant in the bill generate

Charge Based on Power State: This rule is applicable for PAYG type of polices, where charging is done at virtual machine level and chargeback can be done based on three available options: Always, only when powered-on, Powered-on at least once.

- Always: do not consider VM uptime, charge irrespective of that
- Only when powered-on: Charge will be prorated based on uptime, e.g if daily charge is 10$ per gHZ for CPU and specific VM was only 20 min a day, then charge will be prorated based on the fraction (20/1440), where 1440 is total minutes in day.
- Powered-on at least once: In this case full charge is applied even if VM is switched on at least once for minimum duration of minute.

Table 1.1 includes this parameter as well and is applicable only to pay-as-you-go allocation model.

Charge Overage: This rule is applicable only to allocation pool allocation model, where guaranteed resources are some % of total available resources. In this case till guaranteed %, normal base rate will be applied. If usage goes beyond guaranteed %, the rate mentioned in overage will be applied (for the delta usage which is higher than guaranteed).

E.g in allocation pool model for specific OrgVDC if allocated CPU is 10 gHZ and guaranteed is 50%, which is 5 gHZ, the normal base rate is 3$ per gHZ and overage base rate is 4$, then if usage is found to be 6.5 gHZ, then for 1.5 gHZ the overage rate of 4$ is applicable and below which normal base rate of 3$ will be applicable.

Fixed Cost: This price is applied to resource under consideration irrespective of resource metering. The difference between base rate and fixed cost is that base rate gets multiplied with resource metered quantity, if there is no resource consumption/allocation base rate will not be applied whereas fixed cost gets applied irrespective of metered resource. Fixed cost follows the charge period.

E.g. charge period = daily and If base rate for CPU set as 2$ per gHZ for allocation pool policy and allocated value is zero in vCD, and fixed cost is 10$, so no base rate will be applied as allocated resource value is zero but fixed cost of 10$ would still be applied.

Memory Rate

Please refer to the “CPU rate” section, as all the fields and rules are similar in nature except that resource under consideration will be memory metered in MBs.

Storage Rate

Charge Storage based on: Admin has two options here, Default rate and storage policies. When ‘Default rate’ is selected, for all the datastore same base rate mentioned will be applicable irrespective of storage tiers. When ‘storage polices’ option is selected, admin can do a ‘differential’ pricing based on storage tiers as set in vCD, for specific OrgVDC.

E.g. if the policies created are Gold, Silver and Bronze tiers a differential price of 4$, 3$ and 2$ can be applied based on storage tiers.

Note: Currently user need to manually mention the policy name in the “storage policy name” field, which should be exactly same as storage policy defined in vCD. In future we would make this field dropdown so that admin can easily select the storage policy from dropdown

Please refer to the “CPU rate” section for other configuration parameters and rules, as all the fields and rules are similar in nature except that resource under consideration will be storage metered in GBs.

Network Rate

External Network Transmit: Tenant app captures the egress data from edge gateway which in turn is associated with specific orgVDC. Admin can apply a specific base rate ‘per mb’ of data transfer. The data is measured per edge gateway.

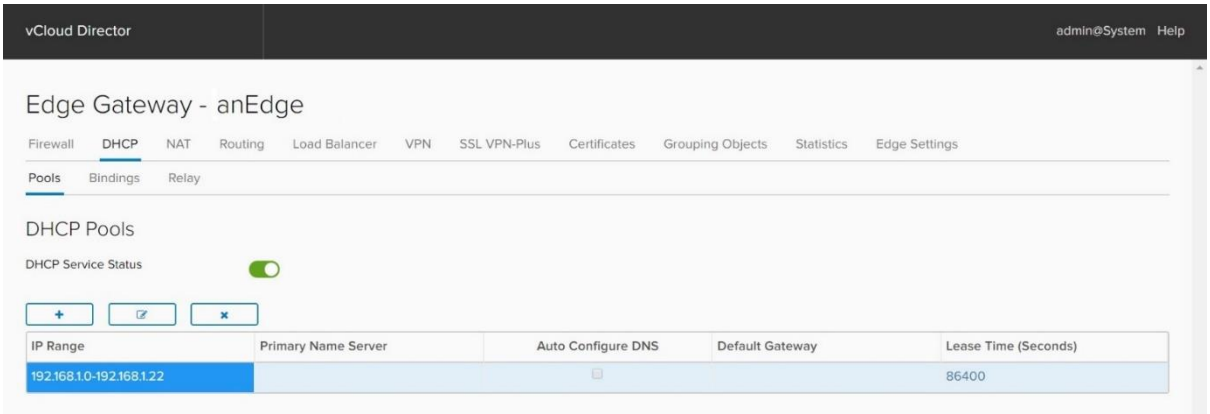
External Network Receive: Tenant app captures the ingress data from edge gateway which in turn is associated with specific orgVDC. Admin can apply a specific base rate ‘per mb’ of data transfer. The data is measured per edge gateway.

Network Transmit Rate (Bandwidth): Bandwidth/throughput is – actual throughput utilization on the edge and not network capacity provisioned. i.e. what is the actual packet transfer rate, over a period of time, say in a month - the rate at which the data being transferred will vary – it could be 60 MBps at some point 20 MBps at other, so tenant app collects sample points at intervals and then use the 95th percentile value for charging for the bandwidth

Network Receive Rate (Bandwidth): Similar to Network Transmit rate, 95th percentile of ingress data is considered to charge for network receive bandwidth. These stats are retrieved via NSX manager APIs

Advanced Network Rate

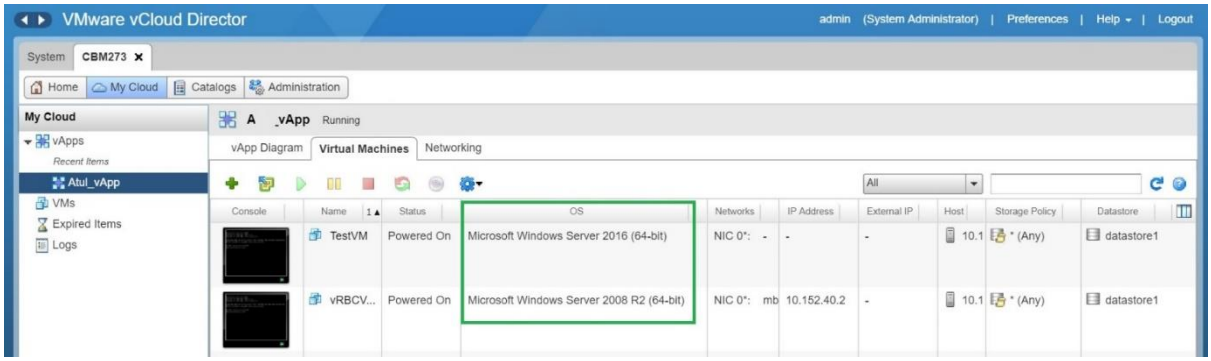
Edge Services: All the network services associated with specific edge such as HA, DHCP, IPV6, IP Sec, Load Balancer, NAT, SSL VPN, L2 VPN, Firewall, Static Routing, BGP Routing, OSPF Routing are considered for charging based on these services are 'Enabled' or not. If services are enabled for specific day and base rate is applied for that service, then that particular service gets charged for that specific day. If the service is disabled on any day then base rate will not get applied, but fixed cost will be charged if applied.



Edge Gateway Sizes: Tenant app understands the size of the edge gateway (Compact, Large, Extra Large and Quad Large) and differential price can be assigned based on the edge size.

Guest OS Rate

Guest OS for a specific VM can be charged to apply based on licensing costs, the Guest OS name should be mentioned as displayed in the vCD for specific VM, in future Guest OS name will be a dropdown in tenant app policy creation for the admin to select from the available list.

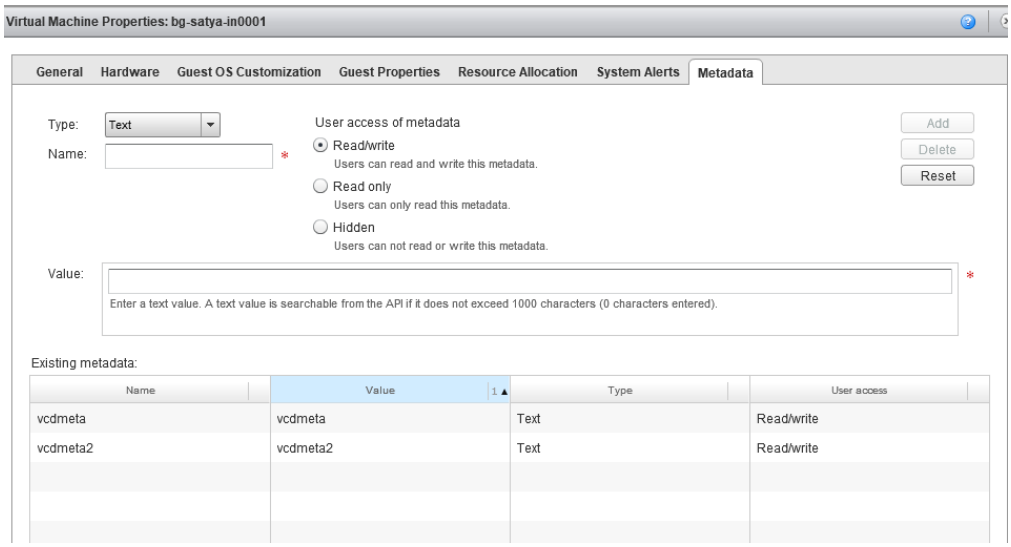


VM Tag Rate

If a VM is tagged with specific key (tag category) and value (tag value) in vCenter then this key-value can be specified to charge a VM or bunch of VMs differentially. Any VM having the specific tag will get this charge applied based on charge period.

vCD Metadata Rate

Very similar to VM Tags (as defined in the vCenter), admin can make use of vCD specific tags which are known as vCD Metadata. Objects with which specific metadata is associated will get the charge based on pricing attached to it in vCD metadata rate section of pricing policy.



Reports and Bills

Once these rates are set using the billing policy, they can be applied to organization VDCs in two different ways.

1. You can assign a pricing policy to an organization VDC once, and vROPs starts automatically calculating price metrics for the given Org-VDC and its resources using the assigned pricing policy. Subsequently, either customized reports can be created in vROPs containing usage and price metrics, or prebuilt reports can be accessed from TenantApp. The advantage of setting up reports is that they can be scheduled and exported to formats such as CSV.
2. You can generate an On-Demand Bill by selecting an organization VDC and a pricing policy. This recalculates the prices of Org-VDC and associated resources, and presents a Bill inside TenantApp. This bill can be shared with tenants.

Addendum : Metrics

vROps metrics for Metering the Infrastructure

Context

vROps and Tenant App Appliance together enable metering and charging of infrastructure offered by service providers to their consumers. vROps collects a series of metrics from vCenter with the help of vCenter adapter, and from vCLoud Director with the help of vCloud Director management pack. These metrics are typically used by service providers that want raw metering metrics to feed into their own billing systems.

TenantApp Appliance adds charging on top of these metrics wherein a rate card can be assigned against these collected metrics and Bills can be generated. These are used by service providers who want to perform billing in addition to metering the infrastructure using VMWare solutions.

The third category of service providers consume the data from billing metrics but as a summary instead of using raw metrics using what is called 1$ rate mechanism. For example, if a service provider wanted to know the number of vCPU hours used under an org-VDC within a month, only when VMs were powered on, first category of service providers would depend on the raw data of used vCPU metric and power state metric to create this number. However, using 1$ rate card mechanism, a service provider can configure 1$/hour as the vCPU charge based on power state, and simply use the output dollars to mean the number of vCPU hours.

Below we first describe general mechanisms to query a resource in vROps and obtain any metric on the resources. Next, the table describes typical metrics used by service providers for metering the infrastructure. These serve as definitive sources to the meaning of the metric and mechanism to obtain them for metering purposes.

Resoure Query API **- How to Query Objects in vROPs (eg: VMs, Org-VDCs, Orgs)**

Stats Query API - How to Query metrics on the Objects in vROps and Summarize them

Sl No	CBM METRICS	ENTITY	Based On	Description	vROps stats key	Metric or Property	Source VC or vCD or NSX	Stats Query API Response (timestamps & data)	Comments	Summary Parameter
1	CPU	Virtual Machine	Reservation	CPU|Effective limit (MHz)	cpu|effective_limit	Metric	VC	5 mins Interval	The response contains 5 mins sample measured by averaging 20 sec samples collected directly from ESXi box . This is the minimum of allocated MHz, Reserved MHz at VM level, Reserved MHz at resource pool of VM. This is the actual CPU limit for the VM. It's minimum of VM configured CPU capacity and CPU limit.	Average (AVG)
			Allocation	Total Capacity (MHz)	cpu|vm_capacity_provisioned	Metric	VC	5 mins Interval	This represents the allocate no of CPU MHz for the VM measured at 5 mins interval. CPU MHz is derived based on the no of vCPUs allocated to the VM & the CPU speed of ESXi hosting the VM. C onfigured capacity in MHz based on nominal (static) frequency of the CPU.	
			Usage	CPU|Demand (MHz)	cpu|demandmhz			5 mins Interval	The response contains 5 mins sample measured by averaging 20 sec samples collected directly from ESXi box . The amount of CPU resources descendant virtual machines would use if there were no CPU contention or CPU limit.	
2	vCPU	Virtual Machine	Usage	Configuration|Hardware|Number of CPUs (vCPUs)	config|hardware|num_Cpu	Metric	VC	5 mins Interval	This is configured the No of vCPU for the VM collected at 5 mins interval. It counts both the vSocket and vCore. A VM with 2 vSockets x 4 vCores each has 8 vCPU.	Average (AVG)
3	Memory	Virtual Machine	Reservation	Memory|Effective limit (KB)	mem|effective_limit	Metric	VC	5 mins Interval	The response contains 5 mins sample measured by averaging 20 sec samples collected directly from ESXi box. This is the minimum of allocated MB, Reserved MB at VM level, Reserved MB at resource pool of VM. This is the actual memory limit for the VM. It's minimum of VM configured memory capacity and memory limit.	Average (AVG)
			Allocation	Memory|Total Capacity (KB)	mem|guest_provisioned	Metric	VC	5 mins Interval	This represents the allocate amount of memory for the VM (in KB) measured at 5 mins interval.	

			Usage	Memory|Utilization (KB)	mem|vmMemoryDemand	Metric	VC	5 mins Interval	The response contains 5 mins sample measured by averaging 20 sec samples collected directly from ESXi box. Amount of memory utilized by the Virtual Machine. Reflects the guest OS memory required (for certain vSphere and VMTools versions) or Virtual Machine consumption.	
4	Storage	Virtual Machine	Usage	Disk Space|Virtual Machine used (GB)	diskspace|used	Metric	VC	5 mins Interval	Used disk space by the VM as measured by the hypervisor (Not Guest OS). Space used by virtual machine files.	
			Allocation	Configuration|Hardware|Disk Space (GB)	config|hardware|diskSpace	Metric	VC	5 mins Interval	Configured disk space for the VM.	
			Allocation Split by Storage Profile	Storage Profiles: <Storage Profile Name>|usage	Storage Profiles: <Storage Profile Name>|usage	Metric	VCD	10 mins Interval	Configured disk space per storage profile allocated to the VM.	Average (AVG)
5	CPU	Org VDC	Usage	CPU|Used (MHz)	cpu|used	Metric	VCD	5 mins Interval	This is the sum of no of vCPUs per VM in use with in this OVDC multiplied by 1000 MHz. For Example if an OVDC has 5 VMs of 2 vCPU each and only 3 of them are powered on at the point of collection, value of this metric at the OVDC level will be 3x2x1000 MHz.	Average (AVG)
			Allocation	CPU|Allocation (MHz)	cpu|allocation	Metric	VCD	5 mins Interval	Allocated CPU MHz to this OVDC in vCloud Director. For the PAYG OVDC is always 0.	Average (AVG)
			Reservation	CPU|Reserved (MHz)	cpu|reserved	Metric	VCD	5 mins Interval	Reserved CPU MHz to this OVDC in vCloud Director. For the PAYG OVDC is always 0.	Average (AVG)
6	vCPU	Org VDC	Usage	VCPU|Used	vcpu|used	Metric	VCD	5 mins Interval	This is the sum of no of vCPUs per VM in use with in this OVDC. For Example if an OVDC has 5 VMs of 2 vCPU each and only 3 of them are powered on at the point of collection, value of this metric at the OVDC level will be 3x2.	Average (AVG)
7	Memory	Org VDC	Usage	Memory|Used (MB)	memory|used	Metric	VCD	5 mins Interval	This is the sum of amount of memory MB configured per VM in use with in this OVDC. For Example if an OVDC has 5 VMs of 2GB Memory each and only 3 of them are powered on at the point of collection, value of this metric at the OVDC level will be 3x2x1024 MB.	Average (AVG)
			Allocation	Memory|Allocation (MB)	memory|allocation	Metric	VCD	5 mins Interval	Allocated memory MB to this OVDC in vCloud Director. For the PAYG OVDC is always 0.	Average (AVG)
			Reservation	Memory|Reserved (MB)	memory|reserved	Metric	VCD	5 mins Interval	Reserved memory MB to this OVDC in vCloud Director. For the PAYG OVDC is always 0.	Average (AVG)
8	Storage	Storage Profile	Usage	Storage|Used (MB)	storage|used	Metric	VCD	5 mins Interval	Under every ODVC one Storage profile object is created for every storage profile OVDC has access to. This metric represents storage used by the OVDC on this storage profile.	Average (AVG)
			Limit	Storage|Limit (MB)	storage|limit	Metric	VCD	5 mins Interval	It's just the storage Limit we collect, not at the profile level.	Average (AVG)
15	Count Of Networks	Org VDC	Usage	General|Number of Organization VDC Networks	others|Number of Organization VDC Networks	Metric	VCD	5 mins Interval	Total no of OVDC network configured on this OVDC.	
16	Media	Media	Storage	General|Storage (bytes)	General|storageB	Metric	VCD	5 mins Interval	Total Storage used by media file	Average (AVG)
17	vApp Template	vAPP Template	Storage	General|Storage (Kilo bytes)	General|storageKB	Metric	VCD	5 mins Interval	Total Storage used by vApp Template	Average (AVG)
18	Enabled IPSec VPN Tunnel Count	Edge Gateway	Usage	Services: ipsec|Enabled	services: ipsec|enabled	Metric	VCD	5 mins Interval	Count of VPN Tunnels on edge device	
19	NAT Service	Edge Gateway	Usage	Services: nat|Enabled	services: nat|enabled	Metric	VCD	5 mins Interval	Boolean stating NAT enabled on edge device	
20	DHCP Service	Edge Gateway	Usage	Services: dhcp|Enabled	services: dhcp|enabled	Metric	VCD	5 mins Interval	Boolean stating DHCP is enabled on edge device	
21	FIREWALL Service	Edge Gateway	Usage	Services: firewall|Enabled	services: firewall|enabled	Metric	VCD	5 mins Interval	Boolean stating Firewall Service is enabled on edge device	
22	Load Balancer Service	Edge Gateway	Usage	Services: loadbalancer|Enabled	services: loadbalancer|enabled	Metric	VCD	5 mins Interval	Boolean stating Load balancer is enabled on edge device	

23	Static Routing Service	Edge Gateway	Usage	Services: staticRouting|Enabled	services: staticRouting|enabled	Metric	VCD	5 mins Interval	Boolean stating Static routing is enabled on edge device	
24	Gateway HA Enabled	Edge Gateway	Usage	Services: highavailability|Enabled	services: highavailability|enabled	Metric	VCD	5 mins Interval	Boolean stating Gateway is enabled on edge device	
25	Full Gateway Configuration	Edge Gateway	Usage							
26	External Network Transmit	Edge Gateway	Usage	Statistics|Uplink|Data OUT (bytes)	statistics|uplink|out	Metric	VCD	5 mins Interval	This represents the amount of outward traffic as measured on this edge device at a 5 mins interval	Sum (SUM)
27	External Network Receive	Edge Gateway	Usage	Statistics|Uplink|Data IN (bytes)	statistics|uplink|in	Metric	VCD	5 mins Interval	This represents the amount of inward traffic as measured on this edge device at a 5 mins interval	Sum (SUM)
28	External Network Transmit Rate	Edge Gateway	Usage	Statistics|Uplink|Bandwidth OUT (MBps)	statistics|uplink|Bandwidth Out	Metric	VCD	5 mins Interval	This represents the speed of outward traffic as measured on this edge device at a 5 mins interval	Max /Percentile 95 /Average
29	External Network Receive Rate	Edge Gateway	Usage	Statistics|Uplink|Bandwidth IN (MBps)	statistics|uplink|Bandwidth In	Metric	VCD	5 mins Interval	This represents the speed of inward traffic as measured on this edge device at a 5 mins interval	Max /Percentile 95 /Average
30	Dynamic Routing OSPF	Edge Gateway	Usage	Services: ospfRouting|Enabled	services: ospfRouting|enabled	Metric	VCD	5 mins Interval	Boolean stating Dynamic routing OSPF is enabled on edge device	
31	Dynamic Routing BGP	Edge Gateway	Usage	Services: bgpRouting|Enabled	services: bgpRouting|enabled	Metric	VCD	5 mins Interval	Boolean stating Dynamic routing BGP is enabled on edge device	
32	L2 VPN	Edge Gateway	Usage	Services: l2vpn|Enabled	services: l2vpn|enabled	Metric	VCD	5 mins Interval	Boolean L2 VPN is enabled on edge device	
33	SSL VPN	Edge Gateway	Usage	Services: sslvpn|Enabled	services: sslvpn|enabled	Metric	VCD	5 mins Interval	Boolean stating SSL VPN is enabled on edge device	
34	Distributed Firewall	Edge Gateway	Usage						Boolean stating Distributed firewall is enabled on edge device	
35	Power Status	Virtual Machine		System|Powered ON	sys|poweredOn	Metric	VC	No of records based on Power State	Indicates 0 or 1 depending on power state of the VM	
36	Creation Date	Virtual Machine		Configuration|Creation Date	config|createDate	Property	VC	Creation Date	VM creation date.	
37	Uptime (Running)	Virtual Machine		Summary|Running	summary|running	Metric	VC	30 mins Interval	Indicates if the VM is powered on. The value is 1 if the VM is powered on and 0 otherwise.	
38	CPU	Organization	Usage	Aggregate|Organization VDC|CPU|Used (MHz)	Aggregate|VDC|cpu|used	Metric	VCD	5 mins Interval		
			Allocation	Aggregate|Organization VDC|CPU|Allocation (MHz)	Aggregate|VDC|cpu|allocation	Metric	VCD	5 mins Interval		
			Reservation	Aggregate|Organization VDC|CPU|Reserved (MHz)	Aggregate|VDC|cpu|reserved	Metric	VCD	5 mins Interval		
39	Memory	Organization	Usage	Aggregate|Organization VDC|Memory|Used (MB)	Aggregate|VDC|memory|used	Metric	VCD	5 mins Interval		
			Allocation	Aggregate|Organization VDC|Memory|Allocation (MB)	Aggregate|VDC|memory|allocation	Metric	VCD	5 mins Interval		
			Reservation	Aggregate|Organization VDC|Memory|Reserved (MB)	Aggregate|VDC|memory|reserved	Metric	VCD	5 mins Interval		
40	Storage	Organization	Usage	Aggregate|Organization VDC|Storage|Used (MB)	Aggregate|VDC|storage|used	Metric	VCD	5 mins Interval		
			Allocation	Aggregate|Organization VDC|Storage|Allocation (MB)	Aggregate|VDC|storage|allocation	Metric	VCD	5 mins Interval		
			Limit	Aggregate|Organization VDC|Storage|Limit (MB)	Aggregate|VDC|storage|limit	Metric	VCD	5 mins Interval		

			Metering Metrics (That can be used for Billing or 1$ rate mechanism)							
41	Organization	Metering		Summary|Metering|Total Cost	summary|metering|value	Metric	VCD	24 Hours Interval	Response contains the Total price of the resource (Sum of all price components) collected at 24 hours interval	
42	Org VDC	Metering		Summary|Metering|additional	summary|metering|additional	Metric	VCD	24 Hours Interval	Response contains the Additional price of the resource collected at 24 hours interval. Additional cost contains cost of TAGs, Custom properties, Guest OS, Network related items, metadatas, etc	
				Summary|Metering|cpu	summary|metering|cpu			24 Hours Interval	Response contains Price of CPU of the resource collected at 24 hours interval. This will be calculated based on the configurations(Charge period, Charge based on and power state) provided in the pricing policy. If vCPU is selected then base rate will be calculated based on the count of the vCPU or if CPU is selected then base rate will be calculated based on the GHz(used /allocated) for the CPU	
				Summary|Metering|memory	summary|metering|memory			24 Hours Interval	Response contains the Price of memory of the resource collected at 24 hours interval. This will be calculated based on the configurations(Charge period, Charge based on and power state) provided in the pricing policy	
				Summary|Metering|partialPrice	summary|metering|partialPrice			24 Hours Interval	Response shows whether the calculated price is partial for the resource (TRUE or FALSE), collected at 24 hours interval Partial price is always TRUE in scope of VCD	
				Summary|Metering|storage	summary|metering|storage			24 Hours Interval	Response contains the Price of storage of the resource collected at 24 hours interval. This will be calculated based on the configurations(Charge period, Charge based on and power state) provided in the pricing policy	
				Summary|Metering|Total Cost	summary|metering|value			24 Hours Interval	Response contains the Total price of the resource (Sum of all price components) collected at 24 hours interval	
43	vApp	Metering		Summary|Metering|additional	summary|metering|additional	Metric	VCD	24 Hours Interval	Response contains the Additional price of the resource collected at 24 hours interval. Additional cost contains cost of TAGs, Custom properties, Guest OS, Network related items, metadatas, etc This cost/price will propagate to OVDC cost	
				Summary|Metering|cpu	summary|metering|cpu			24 Hours Interval	Response contains Price of CPU of the resource collected at 24 hours interval. This will be calculated based on the configurations(Charge period, Charge based on and power state) provided in the pricing policy. If vCPU is selected then base rate will be calculated based on the count of the vCPU or if CPU is selected then base rate will be calculated based on the GHz(used /allocated) for the CPU This cost/price will propagate to OVDC cost	
				Summary|Metering|memory	summary|metering|memory			24 Hours Interval	Response contains the Price of memory of the resource collected at 24 hours interval. This will be calculated based on the configurations(Charge period, Charge based on and power state) provided in the pricing policy This cost/price will propagate to OVDC cost	
				Summary|Metering|partialPrice	summary|metering|partialPrice			24 Hours Interval	Response shows whether the calculated price is partial for the resource (TRUE or FALSE), collected at 24 hours interval Partial price is always TRUE in scope of VCD	

				Summary|Metering|storage	summary|metering|storage			24 Hours Interval	Response contains the Price of storage of the resource collected at 24 hours interval. This will be calculated based on the configurations(Charge period, Charge based on and power state) provided in the pricing policy This cost/price will propagate to OVDC cost only if "PROPAGATE_STORAGE_PROFILE_PRICE" is set to FALSE in vROPs or Tenant App	
				Summary|Metering|Total Cost	summary|metering|value			24 Hours Interval	Response contains the Total price of the resource (Sum of all price components) collected at 24 hours interval This cost/price will propagate to OVDC cost	
44	VM	Metering		Summary|Metering|additional	summary|metering|additional	Metric	VCD	24 Hours Interval	Response contains the Additional price of the resource collected at 24 hours interval. Additional cost contains cost of TAGs, Custom properties, Guest OS, Network related items, metadatas, etc This cost/price will propagate to VAPP cost	
				Summary|Metering|cpu	summary|metering|cpu			24 Hours Interval	Response contains Price of CPU of the resource collected at 24 hours interval. This will be calculated based on the configurations(Charge period, Charge based on and power state) provided in the pricing policy. If vCPU is selected then base rate will be calculated based on the count of the vCPU or if CPU is selected then base rate will be calculated based on the GHz(used /allocated) for the CPU This cost/price will propagate to VAPP cost	
				Summary|Metering|memory	summary|metering|memory			24 Hours Interval	Response contains the Price of memory of the resource collected at 24 hours interval. This will be calculated based on the configurations(Charge period, Charge based on and power state) provided in the pricing policy This cost/price will propagate to VAPP cost	
				Summary|Metering|partialPrice	summary|metering|partialPrice			24 Hours Interval	Response shows whether the calculated price is partial for the resource (TRUE or FALSE), collected at 24 hours interval Partial price is always TRUE in scope of VCD	
				Summary|Metering|storage	summary|metering|storage			24 Hours Interval	Response contains the Price of storage of the resource collected at 24 hours interval. This will be calculated based on the configurations(Charge period, Charge based on and power state) provided in the pricing policy This cost/price will propagate to VAPP cost only if "PROPAGATE_STORAGE_PROFILE_PRICE" is set to FALSE in vROPs or Tenant App	
				Summary|Metering|Total Cost	summary|metering|value			24 Hours Interval	Response contains the Total price of the resource (Sum of all price components) collected at 24 hours interval This cost/price will propagate to VAPP cost	
45	Edge Gateway	Metering		Summary|Metering|value	summary|metering|value	Metric	VCD	24 Hours Interval	Response contains the Total price of the resource (Sum of all price components) collected at 24 hours interval This cost is derived from additional cost - summary|metering|additional This cost/price will propagate to OVDC cost	

46	Storage Policy	Metering		Summary|Metering|value	summary|metering|value	Metric	VCD	24 Hours Interval	Response contains the Total price of the resource (Sum of all price components) collected at 24 hours interval This cost is derived from storage cost - summary|metering|storage This cost/price will propagate to OVDC cost only if "PROPAGATE_STORAGE_PROFILE_PRICE" is set to TRUE in vROPs or Tenant App	
47	vApp Template	Metering		Summary|Metering|value	summary|metering|value	Metric	VCD	24 Hours Interval	Response contains the Total price of the resource (Sum of all price components) collected at 24 hours interval This cost is derived from storage cost - summary|metering|storage This cost/price will propagate to VAPP cost	

Configurations

Charge Period - Charge period can be Hourly/Daily/Monthly. Specified base rate will be applied based on the selected option

Charge Based on - Charge based on can be Usage/Reservation/Max from Usage and Reservation. Specified base rate will be applied based on the selected option

Charge Based on Power State - Power state can be Always/Only when powered on/Powered on at least once. Specified base rate will be applied based on the selected option

Resources query API

GET Request : https://10.92.14.36/suite-api/api/resources

possible request parameters:

- **adapterKind** - vCloud, VMWARE
- **resourceKind** - none, ORG, ORG_VDC, VAPP, VirtualMachine, PRO_VDC
- **name** - "Name of the Entity" (like match)
- **adapterInstanceId** - "ID of Adapter Instances"
- **parentId** - "ID of direct parent"

Examples: To get VMs with name containing (vAPP_91_VM1)

https://10.92.14.36/suite-api/api/resources?adapterKind=VMWARE&resourceKind=VirtualMachine&parentId=1b71001a-a643-4a35-bb85-ade906891f72&name=vAPP_91_VM1

sample Response: (find the highlighted text for Resource ID)

Get Resource Response


```
{
    "pageInfo": {
        "totalCount": 1,
        "page": 0,
        "pageSize": 1000
    },
    "links": [
        {
            "href": "/suite-api/api/resources?adapterKind=VMWARE&amp;resourceKind=VirtualMachine&amp;
```

```
parentId=1b71001a-a643-4a35-bb85-ade906891f72&amp;name=vAPP_91_VM1&amp;page=0&amp;pageSize=1000",
            "rel": "SELF",
            "name": "current"
        },
        {
            "href": "/suite-api/api/resources?adapterKind=VMWARE&amp;resourceKind=VirtualMachine&amp;
parentId=1b71001a-a643-4a35-bb85-ade906891f72&amp;name=vAPP_91_VM1&amp;page=0&amp;pageSize=1000",
            "rel": "RELATED",
            "name": "first"
        },
        {
            "href": "/suite-api/api/resources?adapterKind=VMWARE&amp;resourceKind=VirtualMachine&amp;
parentId=1b71001a-a643-4a35-bb85-ade906891f72&amp;name=vAPP_91_VM1&amp;page=0&amp;pageSize=1000",
            "rel": "RELATED",
            "name": "last"
        }
    ],
    "resourceList": [
        {
            "creationTime": 1575881661389,
            "resourceKey": {
                "name": "vAPP_91_VM1",
                "adapterKindKey": "VMWARE",
                "resourceKindKey": "VirtualMachine",
                "resourceIdentifiers": [
                    {
                        "identifierType": {
                            "name": "VMEntityInstanceUUID",
                            "dataType": "STRING",
                            "isPartOfUniqueness": false
                        },
                        "value": ""
                    },
                    {
                        "identifierType": {
                            "name": "VMEntityName",
                            "dataType": "STRING",
                            "isPartOfUniqueness": false
                        },
                        "value": "vAPP_91_VM1"
                    },
                    {
                        "identifierType": {
                            "name": "VMEntityObjectID",
                            "dataType": "STRING",
                            "isPartOfUniqueness": true
                        },
                        "value": "vm-72"
                    },
                    {
                        "identifierType": {
                            "name": "VMEntityVCID",
                            "dataType": "STRING",
                            "isPartOfUniqueness": true
                        },
                        "value": "b92a41a0-ef91-4dd9-8420-ff96fa52db1d"
                    },
                    {
                        "identifierType": {
                            "name": "VMServiceMonitoringEnabled",
                            "dataType": "STRING",
                            "isPartOfUniqueness": false
                        },
                        "value": ""
                    }
                ]
            },
            "resourceStatusStates": [
                {
                    "adapterInstanceId": "b285d5d8-2747-44c6-957b-40be595a6e9f",
                    "resourceStatus": "DATA_RECEIVING",
```

```
            "resourceState": "STARTED",
            "statusMessage": ""
        },
        {
            "adapterInstanceId": "152b29ff-9e10-4447-b06c-781f47527f1e",
            "resourceStatus": "DATA_RECEIVING",
            "resourceState": "STARTED",
            "statusMessage": ""
        }
    ],
    "resourceHealth": "GREEN",
    "resourceHealthValue": 100.0,
    "dtEnabled": true,
    "badges": [
        {
            "type": "TIME_REMAINING",
            "color": "GREEN",
            "score": 366.0
        },
        {
            "type": "CAPACITY_REMAINING",
            "color": "GREEN",
            "score": 100.0
        },
        {
            "type": "EFFICIENCY",
            "color": "GREEN",
            "score": 100.0
        },
        {
            "type": "RISK",
            "color": "GREEN",
            "score": 0.0
        },
        {
            "type": "HEALTH",
            "color": "GREEN",
            "score": 100.0
        },
        {
            "type": "WORKLOAD",
            "color": "GREEN",
            "score": 0.0
        },
        {
            "type": "COMPLIANCE",
            "color": "GREY",
            "score": -1.0
        }
    ],
    "relatedResources": [],
    "links": [
        {
            "href": "/suite-api/api/resources/3b4c649a-5bed-42eb-8da3-931d5c9971f3",
            "rel": "SELF",
            "name": "linkToSelf"
        },
        {
            "href": "/suite-api/api/resources/3b4c649a-5bed-42eb-8da3-931d5c9971f3/relationships",
            "rel": "RELATED",
            "name": "relationsOfResource"
        },
        {
            "href": "/suite-api/api/resources/3b4c649a-5bed-42eb-8da3-931d5c9971f3/properties",
            "rel": "RELATED",
            "name": "propertiesOfResource"
        },
        {
            "href": "/suite-api/api/alerts?resourceId=3b4c649a-5bed-42eb-8da3-931d5c9971f3",
            "rel": "RELATED",
            "name": "alertsOfResource"
```

```
                },
                {
                    "href": "/suite-api/api/symptoms?resourceId=3b4c649a-5bed-42eb-8da3-931d5c9971f3",
                    "rel": "RELATED",
                    "name": "symptomsOfResource"
                },
                {
                    "href": "/suite-api/api/resources/3b4c649a-5bed-42eb-8da3-931d5c9971f3/statkeys",
                    "rel": "RELATED",
                    "name": "statKeysOfResource"
                },
                {
                    "href": "/suite-api/api/resources/3b4c649a-5bed-42eb-8da3-931d5c9971f3/stats/latest",
                    "rel": "RELATED",
                    "name": "latestStatsOfResource"
                },
                {
                    "href": "/suite-api/api/resources/3b4c649a-5bed-42eb-8da3-931d5c9971f3/properties",
                    "rel": "RELATED",
                    "name": "latestPropertiesOfResource"
                },
                {
                    "href": "/suite-api/api/credentials/",
                    "rel": "RELATED",
                    "name": "credentialsOfResource"
                }
            ],
            "identifier": "3b4c649a-5bed-42eb-8da3-931d5c9971f3"
        }
    ]
}
```


You can use this resource id (value of "**identifier**" from the above response) to get the metrics.

Stats Query API

Sample request to get CPU metrics

POST Request: https://10.92.230.157/suite-api/api/resources/stats/query

payload :

Payload


```
{
        "resourceId": ["3b4c649a-5bed-42eb-8da3-931d5c9971f3"],
        "statKey":["cpu|demandmhz"],
        "begin":1578227562000,
        "end":1578313962000,
        "metrics":true
}
```


To get the rolled up metric values "rollUpType" parameter has to be added in the payload

payload to get rolled up metric:

Payload with rollUpType

```
{
        "resourceId": ["3b4c649a-5bed-42eb-8da3-931d5c9971f3"],
        "statKey":["cpu|demandmhz"],
        "begin":1578227562000,
        "end":1578313962000,
        "metrics":true,
        "rollUpType": "SUM" //possible values - SUM,AVG, MIN, MAX, NONE, LATEST, COUNT
}
```

Suite-api Response


```
{
    "values": [
        {
            "resourceId": "3b4c649a-5bed-42eb-8da3-931d5c9971f3",
            "stat-list": {
                "stat": [
                    {
                        "timestamps": [
                            1578227790954,
                            1578228090954,
                            1578228390954,
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        "statKey": {
            "key": "cpu|demandmhz"
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        "intervalUnit": {
            "quantifier": 1
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        "data": [
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