VMware vCloud® Architecture Toolkit™
for Service Providers

Scalable Licensing with Selective Monitoring in VMware vRealize® Operations™

Version 2.9

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Brandon Gordon

VMware, Inc.
3401 Hillview Ave
Palo Alto, CA 94304
www.vmware.com

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Introduction

Overview

VMware vRealize® Operations Manager™ delivers intelligent operations management across the physical, virtual, and cloud infrastructure, enabling a VMware Cloud Provider™ to efficiently operate a cloud platform and meet required customer service level agreements (SLAs).

vRealize Operations Manager correlates data from applications to storage in a unified easy-to-use management tool that provides control over performance, capacity, and configuration, with predictive analytics driving proactive action policy-based automation.

Many service providers see the value of vRealize Operations and want to use it to monitor their environment. Some situations can make it difficult to justify licensing an entire infrastructure, when only a subset of the environment is critical for monitoring.

Document Purpose

This paper demonstrates several use cases where a subset of VMs can be monitored, which results in more optimal usage of licenses. When configured correctly, service providers can use vRealize Operations internally for capacity planning independent of whether tenant VMs are monitored or providing tenants with access.

Note This document is not a replacement for product documentation. Use it as a supplementary resource when planning a VMware Cloud Provider Program implementation.

Management and Infrastructure Monitoring

Overview

This use case is primarily intended to give a Service Provider the ability to leverage features of vRealize Operations for monitoring infrastructure components such as VMware ESXi™, datastores, port groups, and so on. Monitoring of VMs is limited to the management environment only. Tenants do not have access because all Tenant VMs are excluded from monitoring.

First and third-party Management Packs can be used, within the limits of the licensed vRealize Operations edition, to monitor components within the management environment. This allows the Service Provider to perform essential day 2 activities, such as monitoring for failures, performing capacity planning, and leveraging predictive analytics provided by vRealize Operations.

Before committing to this use case, VMware recommends that the Service Provider perform an analysis of licensing to determine the optimal license model and features provided by this use case. Metering for this use case, where all VMs are excluded from monitoring, is not currently metered correctly by VMware vCloud® Usage Meter. That essentially leaves vRealize Operations standalone as the only option because vCloud Usage Meter is needed to handle metering for bundles. In addition to a vRealize Operations license, a vCloud SP bundle that does not have monitoring is required to license the remainder of the infrastructure.

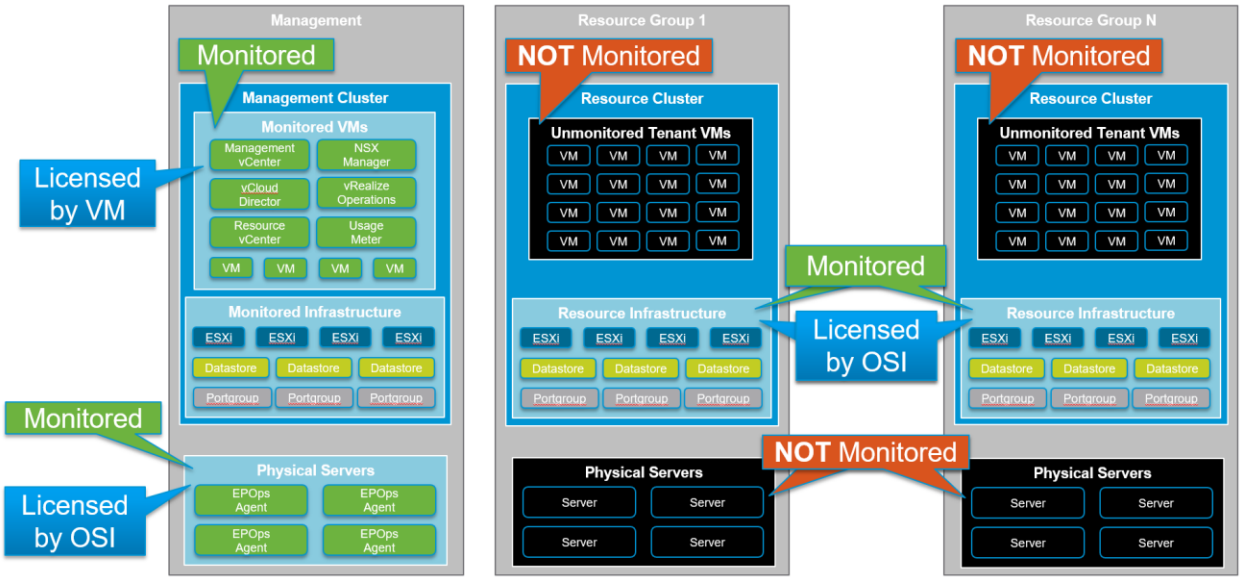
The management infrastructure has these features:

- Monitor ESXi, datastores, port groups, and so on
- Includes all VMs in management clusters
- Guest level monitoring for VMs and physical servers
- Capacity calculations based on VM demand
- Licensed based on monitored VMs
- Physical servers licensed based on OSI

Tenant infrastructure has these features:

- Monitor ESXi, datastores, port groups, and so on
- All Tenant VMs in resource clusters and physical servers are excluded from monitoring
- Capacity calculations based on ESXi host demand
- Licensed based on physical OSI

Figure 1. Management and Infrastructure Monitoring



Note This figure depicts vRealize Operations Standlone licenses only. An appropriate vCloud bundle is still required to license the remaining infrastructure components.

Licenses, Metering, and Reporting

Metering for this use case is not covered out of the box with vCloud Usage Meter as of 3.6.*x* and therefore must be reported manually. See Section 0, Manual Metering with vRealize Operations Reports for metering configuration.

Configuration

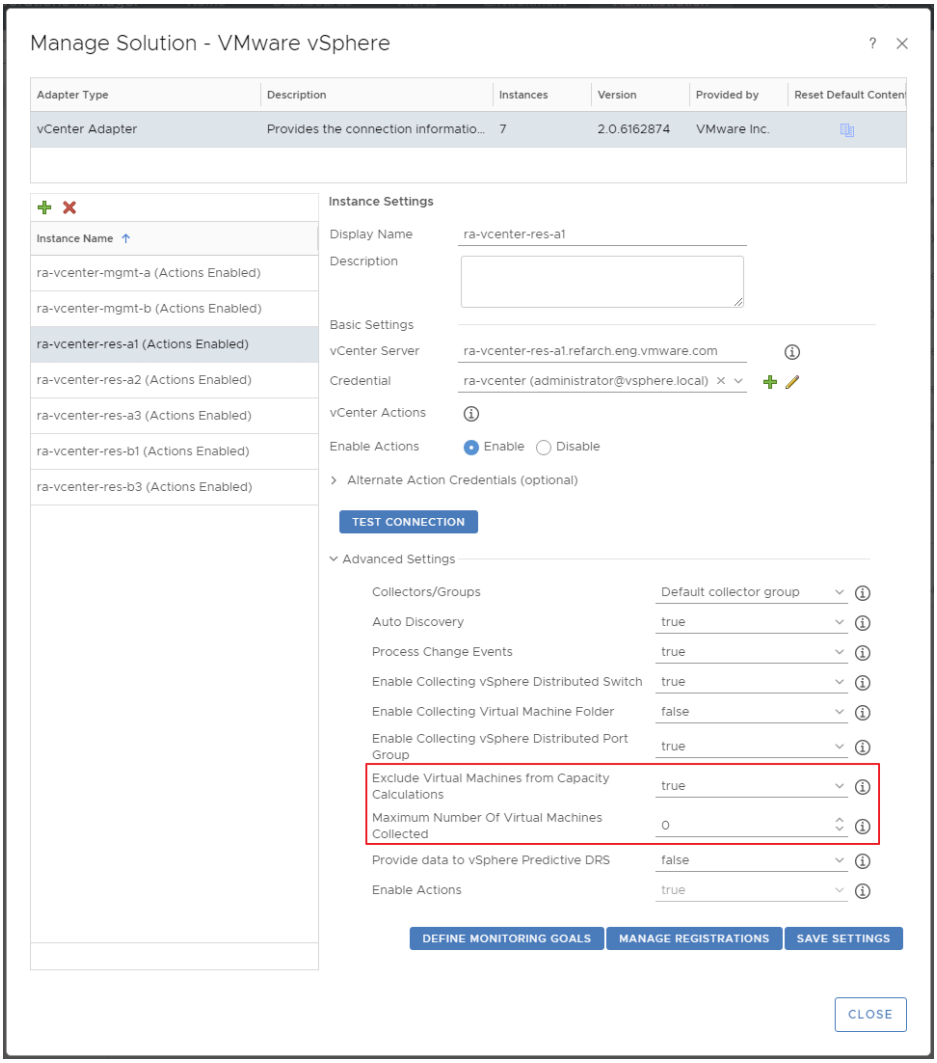
2.1.1 Adapter Instance Configuration

- Add adapter instances for Management VMware vCenter Server® nodes with default settings.
- Adapter instances for Resource vCenter Server nodes must be configured with advanced settings according to the following table.

Table 1. Management and Infrastructure Monitoring Adapter Instance Configuration

Setting	Value
Exclude Virtual Machines from Capacity Calculations	true
Maximum Number Of Virtual Machines Collected	0

Figure 2. Management and Infrastructure Monitoring Adapter Instance Configuration



Tenant Monitoring with a Single vRealize Operations Instance

Overview

This use case provides the same capabilities as the Management and Infrastructure use case previously described, but it adds Tenant VM monitoring within a single multitenant vRealize Operations instance. However, instead of a typical multitenant vRealize Operations deployment, this use case shows how to monitor a subset of Tenant VMs. VMs that are monitored can be restricted to specific tiers of service as defined by the Service Provider. For example, VMs in a Gold tier can include monitoring with vRealize Operations while VMs in a Bronze tier are not monitored.

Note Creating a vRealize Operations service is out of scope for this document because it is covered by the Multitenant Use of VMware vRealize Operations as a Service vCAT-SP paper.

First and third-party Management Packs can be used, within the limits of the licensed vRealize Operations edition. This allows the Service Provider to perform essential day 2 activities, such as monitoring for failures, performing capacity planning, and leveraging predictive analytics that are provided by vRealize Operations. It also allows Tenants to have access to vRealize Operations as a service to monitor their critical VMs.

Before committing to this use case, VMware recommends that the Service Provider perform an analysis of licensing to determine the optimal license model and features provided by this use case. Either a vCloud bundle that includes Management or Standalone vRealize Operations can be used.

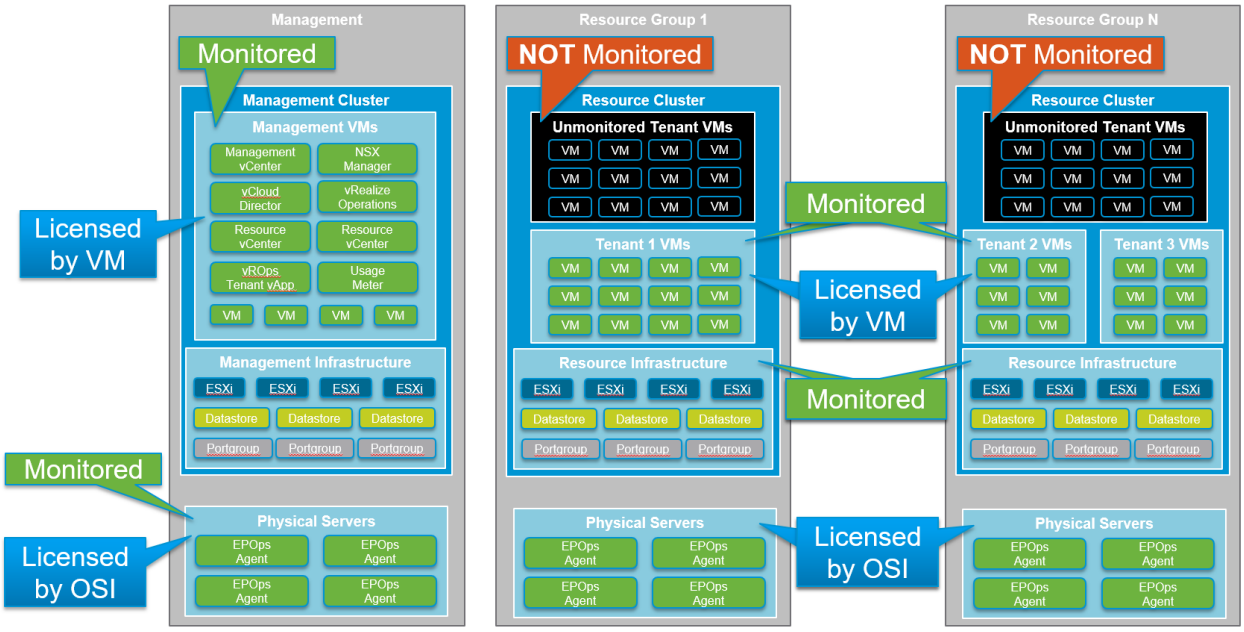
The management infrastructure has these features:

- Monitor ESXi, datastores, port groups, and so on.
- Includes all VMs in management clusters
- Guest level monitoring for VMs and physical servers
- Capacity calculations based on VM demand
- Licensed based on monitored VMs
- Physical servers licensed based on OSI

Tenant infrastructure has these features:

- Monitor ESXi, datastores, port groups, and so on
- Subset of VMs in resource clusters are monitored using vCenter Server permissions
- Guest level monitoring for VMs and physical servers
- Capacity calculations based on ESXi demand
- Licensed based on monitored VMs
- Physical servers licensed based on OSI

Figure 3. Tenant Workload Monitoring with a Single vRealize Operations Instance



Note This figure depicts vRealize Operations Standlone licenses only. An appropriate vCloud bundle is still required to license the remaining infrastructure components.

Licenses, Metering and Reporting

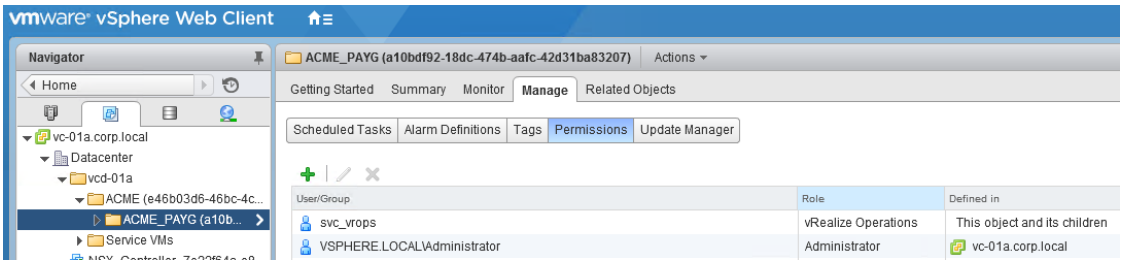
Metering for this use case depends on which vRealize Operations is used. For vRealize Operations Enterprise licenses included in a vCloud SP Bundle with Management, see Section 0, Metering with vCloud Usage Meter for metering configuration. For vRealize Operations Manager licensed as standalone, see Section 0, Manual Metering with vRealize Operations Reports for metering configuration.

Configuration

3.1.1 Service Account Configuration

Monitoring a subset of VMs is accomplished using permissions assigned to the vRealize Operations service account at key locations in vCenter Server. For example, the VM folder that corresponds to an Organization VDC in VMware vCloud Director® automatically monitors all VMs provisioned within that Organization VDC.

Figure 4. Example Showing Permissions Assigned to Monitor All VMs in an Organization VDC



Follow these steps to set up permissions and see https://kb.vmware.com/kb/1036195 for additional details:

1. Create a service account for vRealize Operations to collect data from vCenter Server.
2. Clone the "Read-only" role in vCenter Server.
3. Add privileges to the new role:
   - Global / Health
   - Profile-driven storage / Profile-driven storage view
   - Storage views / View
4. Assign permissions in vCenter Server to the appropriate vCenter Server objects using the new role. Table 2 offers some suggested locations to assign permissions.
5. Log in to vCenter Server using the service account to verify that the desired objects are visible.

Note Visibility of some objects require that permissions are assigned to the object's parent. If an object is not visible in the VMware vSphere® Client™, assign permissions to the parent of the object with propagation disabled.

Table 2. Example Service Account Permission Locations

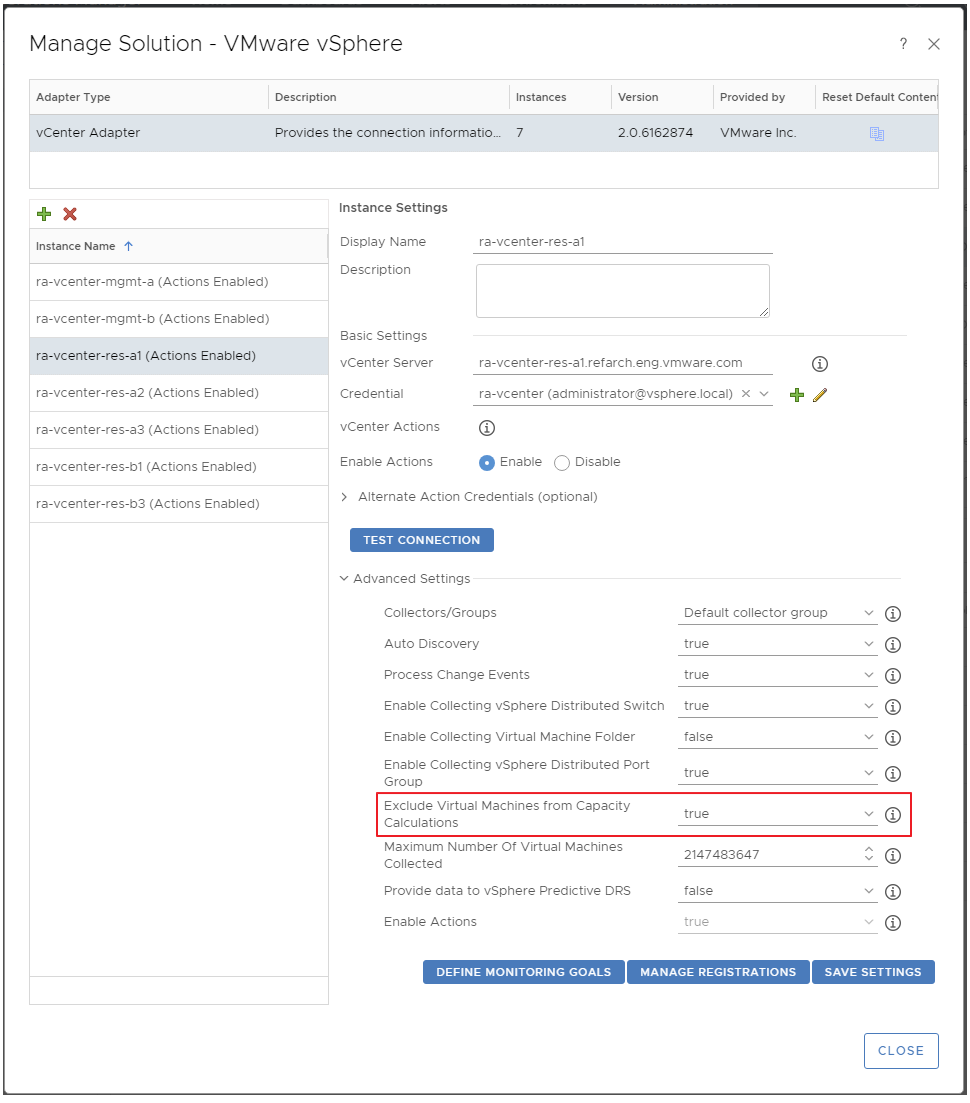
Location	Propagation?	Description
ESXi hosts	No	Allow monitoring of ESXi Host without monitoring all VMs
Resource pool for vCloud Director	Yes	Allow monitoring of all VMs in an Org VDC
VM folder for Org VDC	Yes	Allow monitoring of all VMs in an Org VDC
VM folder for vApp	Yes	Allow monitoring of all VMs in a vApp
VMware vSphere Distributed Resource Scheduler™ cluster	Yes	Allow monitoring of all ESXi hosts and VMs in a DRS cluster
Individual datastore	No	Allow monitoring of a specific datastore
Datastore folder	Yes	Allow monitoring of group of datastores
Network folder	Yes	Allow monitoring of VMware vSphere Distributed Switch™ instances and all port groups

3.1.2 Adapter Instance Configuration

If all VMs within a vCenter Server will be monitored, add the adapter instance using the default settings. Otherwise, do the following to create the adapter instance:

- For vCenter Server nodes where all ESXi hosts and VMs are visible, add adapter instances with default settings.
- For adapter instances for vCenter Server nodes where a subset of VMs are visible, set **Exclude Virtual Machines from Capacity Calculations** to **true**.

Figure 5. Tenant Workload Monitoring with a Single vRealize Operations Instance Adapter Instance Configuration



Tenant Monitoring with Multiple vRealize Operations Instances

Overview

This use case provides the same capabilities as the Management and Infrastructure use case, but adds Tenant VM monitoring with separate vRealize Operations instances per Tenant. However, instead of a typical vRealize Operations deployment, this use case shows how to monitor a subset of Tenant VMs within the dedicated instance. VMs that are monitored can be restricted to specific tiers of service as defined by the Service Provider. For example, VMs in a Gold tier can include monitoring with vRealize Operations while VMs in a Bronze tier are not monitored.

Note Creating a vRealize Operations service is out of scope for this document because it is covered by the Multitenant Use of VMware vRealize Operations as a Service vCAT-SP paper.

First and third-party Management Packs can be used, within the limits of the licensed vRealize Operations edition. This allows the Service Provider to perform essential day 2 activities, such as monitoring for failures, performing capacity planning, and leveraging predictive analytics that are provided by vRealize Operations. It also allows Tenants to have access to a dedicated vRealize Operations instance as a service to monitor their critical VMs.

Before committing to this use case, VMware recommends that the Service Provider perform an analysis of licensing to determine the optimal license model and features provided by this use case. Either a vCloud bundle that includes Management or Standalone vRealize Operations can be used.

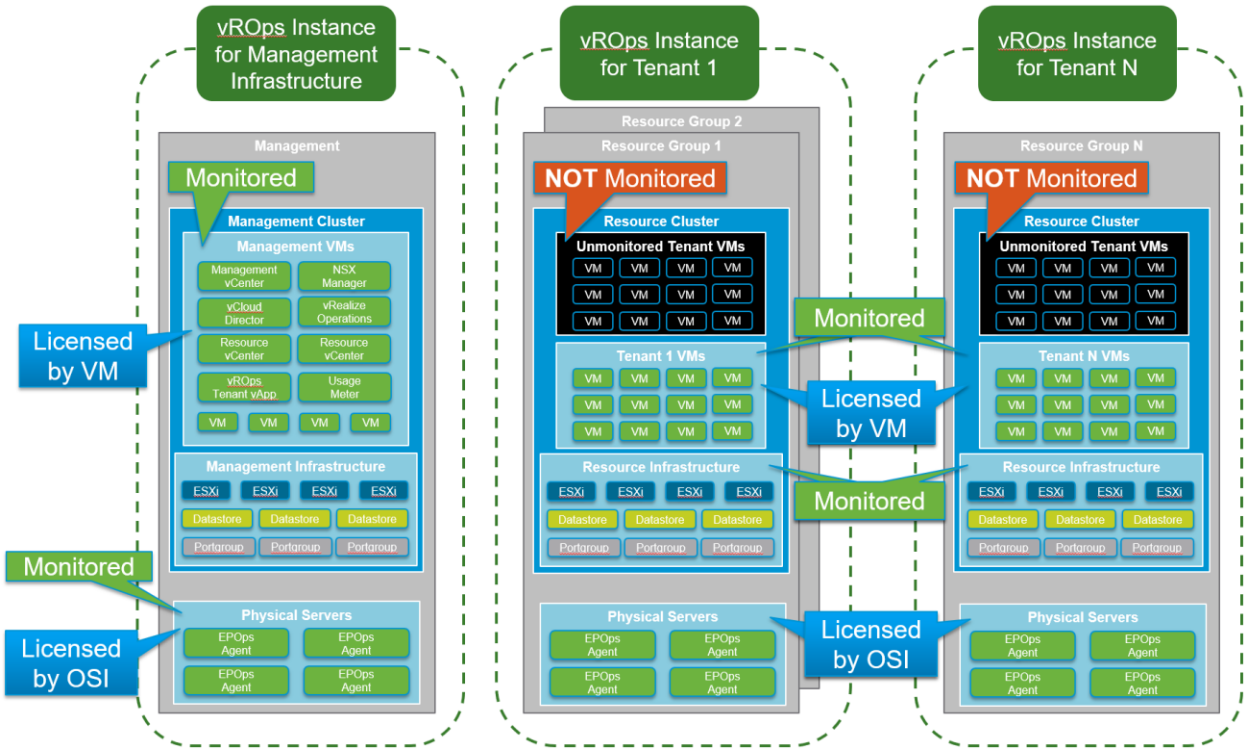
The management infrastructure has these features:

- Monitor ESXi, datastores, port groups, and so on
- Includes all VMs in management clusters
- Guest level monitoring for VMs and physical servers
- Capacity calculations based on VM demand
- Licensed based on monitored VMs
- Physical servers licensed based on OSI

Tenant infrastructure has these features:

- Monitor ESXi, datastores, port groups, and so on
- Dedicated vRealize Operations instance per Tenant
- Licensed based on monitored VMs
- Physical servers licensed based on OSI

Figure 6. Tenant Workload Monitoring with Multiple vRealize Operations Instances



Note This figure depicts vRealize Operations Standlone licenses only. An appropriate vCloud bundle is still required to license the remaining infrastructure components.

Licenses, Metering, and Reporting

Metering for this use case depends on which vRealize Operations is used. For vRealize Operations Enterprise licenses included in a vCloud SP Bundle with Management, see Section 0, Metering with vCloud Usage Meter for metering configuration. For vRealize Operations Manager Standard, Advanced, or Enterprise licensed as standalone, see Section 0, Manual Metering with vRealize Operations Reports for metering configuration.

Configuration

4.1.1 vRealize Operations for Management and Infrastructure Monitoring

Monitoring the management and tenant infrastructure is accomplished using the same procedure described previously in Section 0, Configuration.

4.1.2 vRealize Operations for Tenant Monitoring

vRealize Operations instance for each tenant can be configured to monitor all VMs or a subset. To monitor as subset of VMs, use the procedure described in Section 0, Configuration.

Note vCloud Usage Meter uses the vCenter Server web client registration to identify vCenter Server to vRealize Operations relationships. The tenant vRealize Operations instances must be registered with vCenter Server to be metered correctly.

Caution Multiple vRealize Operations instances collecting from a single vCenter Server puts additional stress on the vCenter Server. Proceed with caution and monitor vCenter Server performance.

Licenses, Metering, and Reporting

The metering solution required for vRealize Operations instances varies depending on whether vRealize Operations is licensed as part of a bundle or standalone. If vRealize Operations is licensed as standalone, the underlying infrastructure must be metered with vCloud Usage Meter even if vRealize Operations is not metered with vCloud Usage Meter.

Table 3. Licenses, Metering, and Reporting

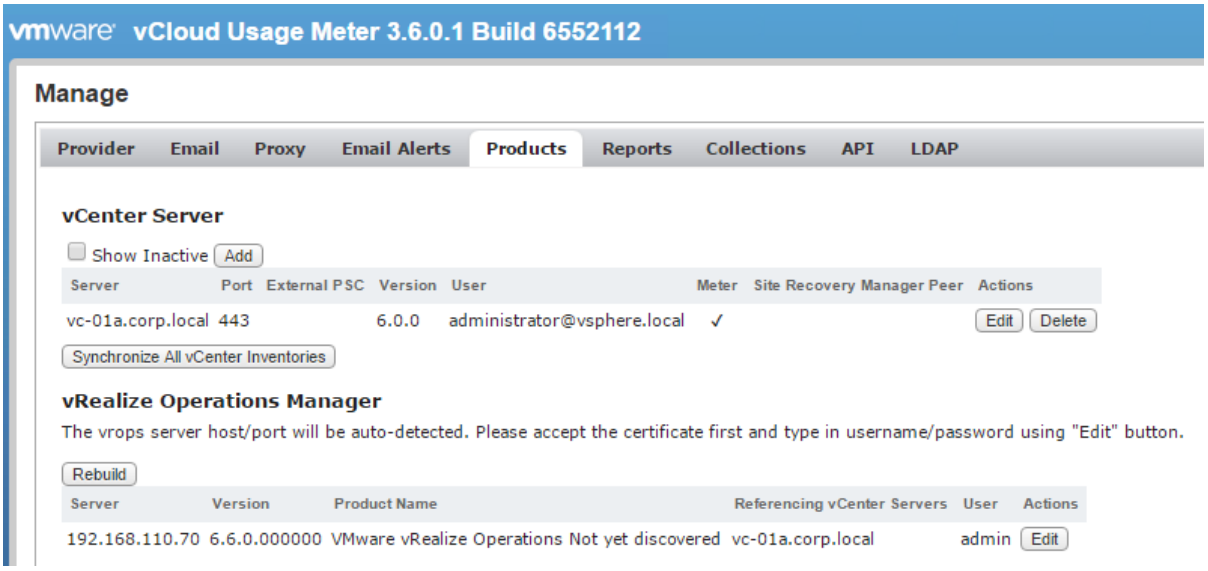
vCloud Provider Product	vRealize Operations Edition	Monitor All VMs in vCenter Server	Monitor Subset of VMs in vCenter Server	Monitor No VMs in vCenter Server
vCloud SP Bundle with Management	Enterprise	vCloud Usage Meter	vCloud Usage Meter	N/A
vRealize Operations Standalone	Standard	vCloud Usage Meter	vCloud Usage Meter	N/A
vRealize Operations Standalone	Advanced	vCloud Usage Meter	vCloud Usage Meter	vRealize Operations Report
vRealize Operations Standalone	Enterprise	vCloud Usage Meter	vCloud Usage Meter	vRealize Operations Report

Metering with vCloud Usage Meter

Metering with vCloud Usage Meter works natively when a vRealize Operations instance monitors all VMs in a vCenter Server and when using a vCloud SP bundle with a subset of VMs excluded from monitoring. After the vCenter Server is added in vCloud Usage Meter 3.6.0 or later, the vRealize Operations instance is automatically discovered. Credentials for vRealize Operations must be configured to enable metering.

Note If any vCenter Server instances monitored with vRealize Operations have all VMs excluded from monitoring, skip ahead to Section 0, Manual Metering with vRealize Operations Reports.

Figure 7. vRealize Operations Manager Configuration in vCloud Usage Meter



For additional details on vRealize Operations metering with vCloud Usage Meter, see the vCloud Usage Meter User's Guide.

Figure 8. Example Multitenant vCloud Usage Meter Report using vCloud Bundles

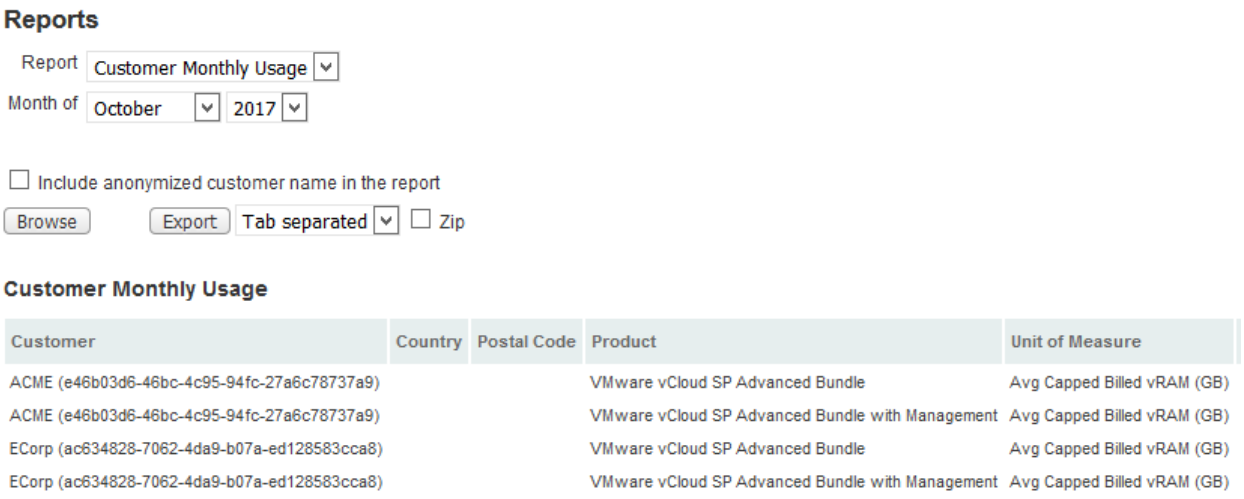
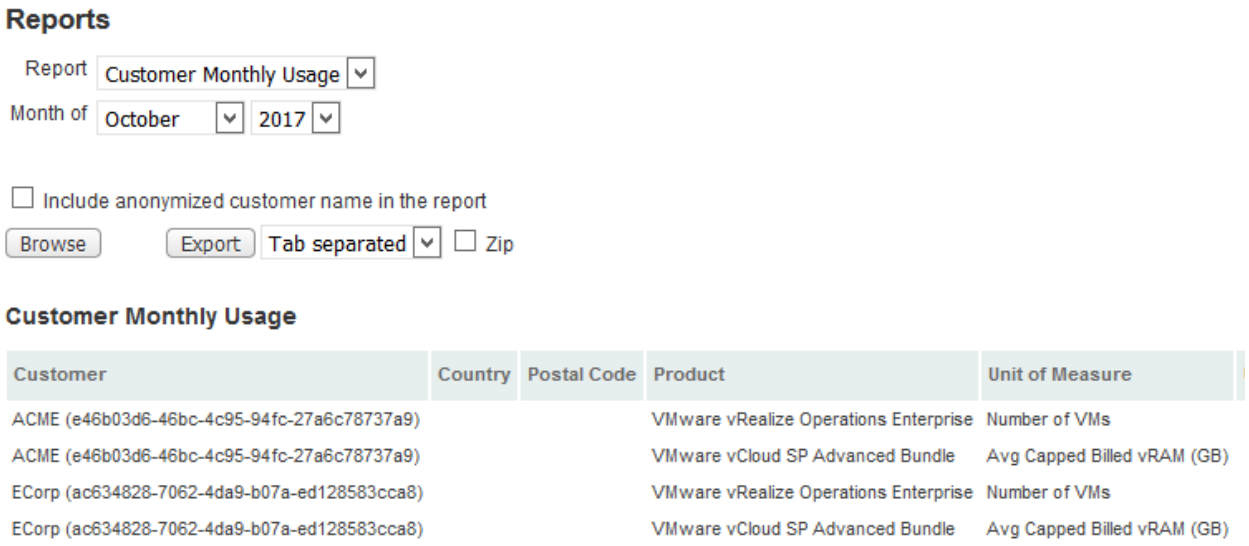


Figure 9. Example Multitenant vCloud Usage Meter Report using vRealize Operations Standalone

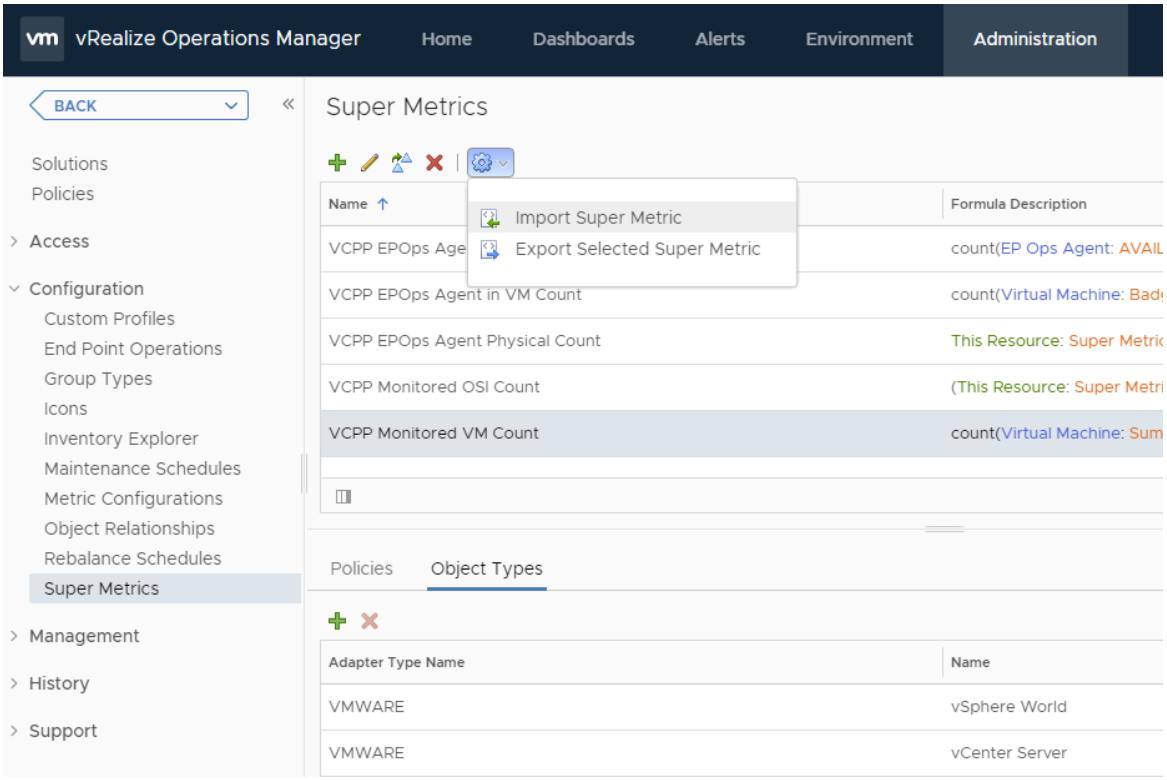


Manual Metering with vRealize Operations Reports

5.1.1 Metering Configuration

Metering requires the use of super metrics and a report to perform the necessary calculations. The steps in this section show how to import preconfigured super metrics and reports to automate metering and reporting.

Figure 10. Super Metric Import and Object Type Association



1. Import all super metric configuration files defined in Appendix A: Super Metric Definitions.
2. Set the Object Type for each super metric as shown in the following table.

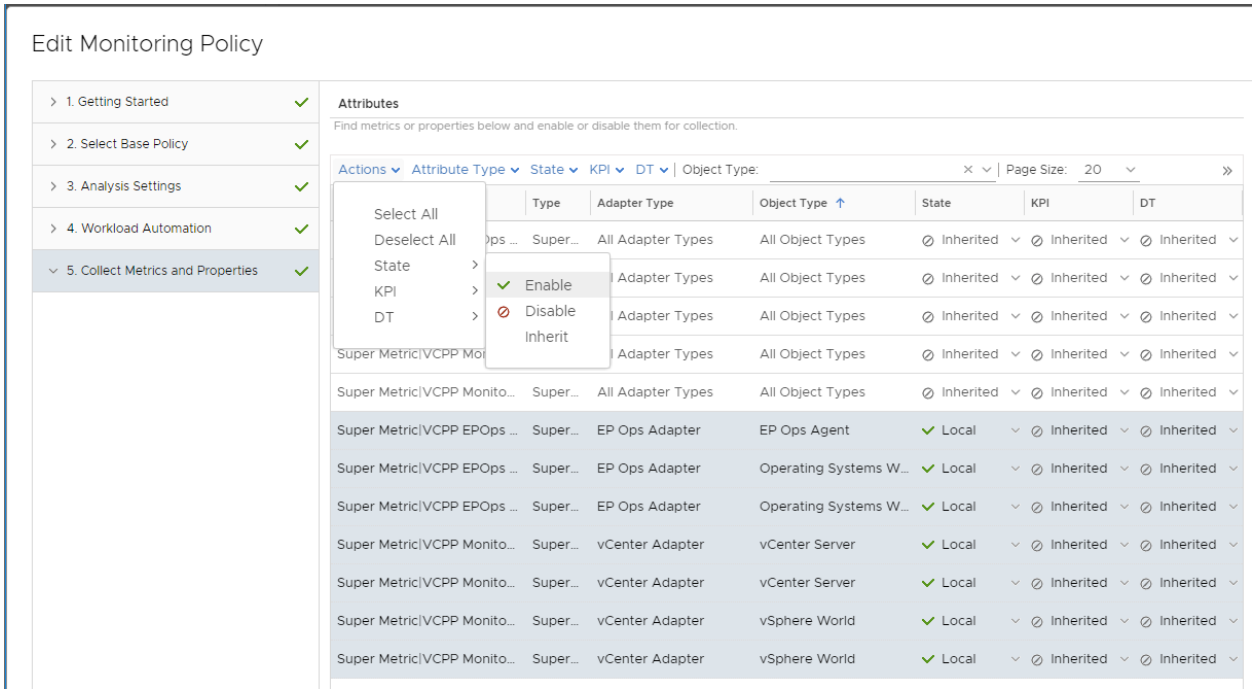
Table 4. Super Metric Object Type Associations

Super Metric	Adapter Type	Object Type
VCPP EPOps Agent in VM Count	EP Ops Adapter	EP Ops Agent
VCPP EPOps Agent Count	EP Ops Adapter	Operating Systems World
VCPP EPOps Agent Physical Count	EP Ops Adapter	Operating Systems World
VCPP Monitored OSI Count	VMWARE	vCenter Server
VCPP Monitored OSI Count	VMWARE	vSphere World

VCPP Monitored VM Count	VMWARE	vCenter Server
VCPP Monitored VM Count	VMWARE	vSphere World

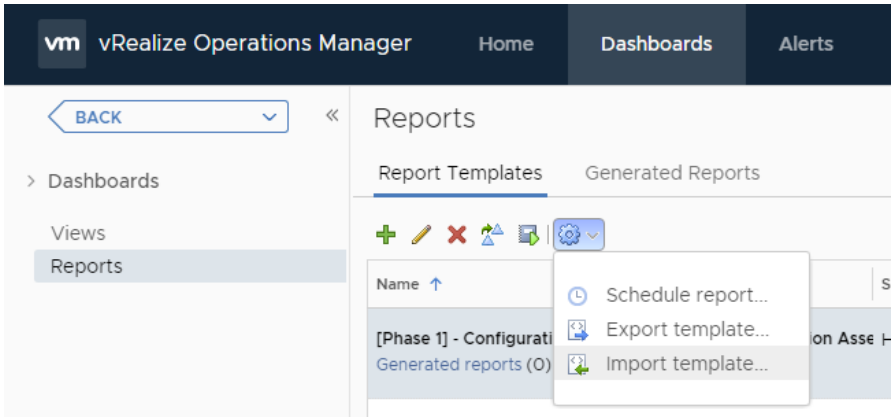
3. Enable super metrics in the policy editor for highlighted object types as shown in the following figure.

Figure 11. Enable Super Metrics in Policy Editor



4. Navigate to Dashboards / Reports.
5. Import the report template defined in Appendix B: Report Template.

Figure 12. Import Reports



5.1.2 Reporting Configuration

Reports can be scheduled within vRealize Operations to automate the reporting process. The following steps show how to send the reports through email on a scheduled basis:

1. Navigate to vSphere World Object.
2. Select the **Reports** tab.
3. Select the **VCPP Virtual License Count** report.
4. Click **Schedule report**.
5. Configure the schedule to send email monthly.

Note While this illustrates sending a global report, the same process applies to reporting for Tenant usage. Instead of selecting vSphere World Object, select the object that represents a Tenant when scheduling the report.

Figure 13. Schedule Report

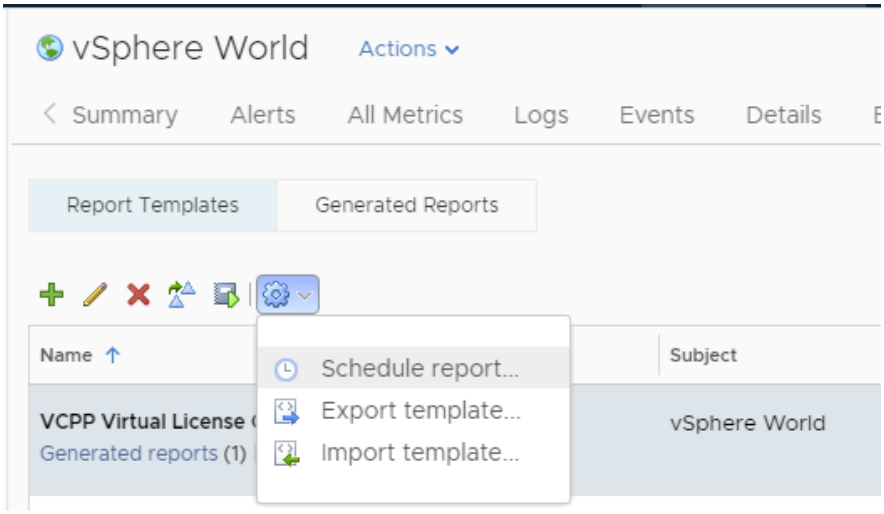


Figure 14. Define Report Schedule

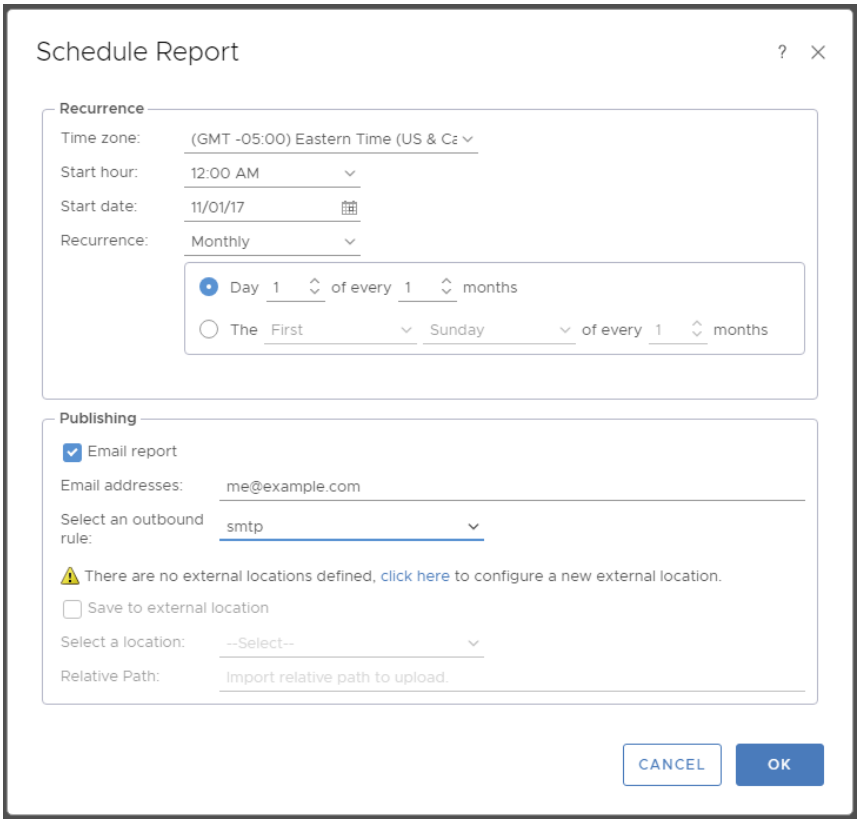


Figure 15. Example Metering Report from vRealize Operations

1. VCPP Virtual License Counts

Oct 12, 2016 02:25 - Oct 12, 2017 02:25 (GMT-04:00)

Name	Month	Average OSI
vSphere World	June 2017	116.27
vSphere World	July 2017	116.51
vSphere World	August 2017	113

References

The following table provides additional information pertinent to this document and its topics.

Table 5. References

Document Title	Link or URL
VMware vCloud Architecture Toolkit for Service Providers	https://www.vmware.com/solutions/cloud-computing/vcat-sp.html
vCloud Architecture Toolkit (vCAT) Blog	https://blogs.vmware.com/vcat/
Multitenant Use of VMware vRealize Operations as a Service	https://www.vmware.com/content/dam/digitalmarketing/vmware/en/pdf/vcat/vmware-multitenant-vrealize-operations-as-a-service.pdf
vRealize Operations Manager Sizing Guidelines (2093783)	https://kb.vmware.com/kb/2093783

Appendix A: Super Metric Definitions

VCPP EPOps Agent in VM Count

Save this code as **sm_VCPP EPOps Agent in VM Count.json**.

```
{
  "390c24b2-154e-455e-be78-799bfb8607fa": {
    "resourceKinds": [
      {
        "resourceKindKey": "EP Ops Agent",
        "adapterKindKey": "EP Ops Adapter"
      }
    ],
    "name": "VCPP EPOps Agent in VM Count",
    "formula": "count(${adaptertype=VMWARE, objecttype=VirtualMachine,
metric=badge|health, depth=-2})",
    "description": ""
  }
}
```

VCPP EPOps Agent Physical Count

Save this code as **sm_VCPP EPOps Agent Physical Count.json**.

```
{
  "d68f866b-804e-41de-8d61-b97fbc22c9ae": {
    "resourceKinds": [
      {
        "resourceKindKey": "Operating Systems World",
        "adapterKindKey": "EP Ops Adapter"
      }
    ],
    "name": "VCPP EPOps Agent Physical Count",
    "formula": "${this, metric=Super Metric|sm_70c1ae5d-1fdf-49d6-9e50-94878931ab57} -
sum(${adaptertype=EP Ops Adapter, objecttype=EP Ops Agent, metric=Super
Metric|sm_390c24b2-154e-455e-be78-799bfb8607fa, depth=100})",
    "description": ""
  }
}
```

VCPP EPOps Agent Count

Save this code as **sm_VCPP EPOps Agent Count.json**.

```
{
  "70c1ae5d-1fdf-49d6-9e50-94878931ab57": {
    "resourceKinds": [
      {
        "resourceKindKey": "Operating Systems World",
        "adapterKindKey": "EP Ops Adapter"
      }
    ],
    "name": "VCPP EPOps Agent Count",
    "formula": "count(${adaptertype=EP Ops Adapter, objecttype=EP Ops Agent,
metric=AVAILABILITY|ResourceAvailability, depth=100})",
    "description": ""
  }
}
```

VCPP Monitored OSI Count

Save this code as **sm_VCPP Monitored OSI Count.json**.

```
{
  "ea33ba48-3a9d-4be3-9c98-e227e102c4b2": {
    "resourceKinds": [
      {
        "resourceKindKey": "VMwareAdapter Instance",
        "adapterKindKey": "VMWARE"
      },
      {
        "resourceKindKey": "vSphere World",
        "adapterKindKey": "VMWARE"
      }
    ],
    "name": "VCPP Monitored OSI Count",
    "formula": "(${this, metric=Super Metric|sm_8a7bd06e-ae7a-4b8a-83d8-691be8976eb5}
> 0) ? (${this, metric=Super Metric|sm_8a7bd06e-ae7a-4b8a-83d8-691be8976eb5}) :
(${this, metric=summary|total_number_hosts})",
    "description": ""
  }
}
```

VCPP Monitored VM Count

Save this code as **`VCPP Virtual License Counts.xml`**.

```
{
  "8a7bd06e-ae7a-4b8a-83d8-691be8976eb5": {
    "resourceKinds": [
      {
        "resourceKindKey": "VMwareAdapter Instance",
        "adapterKindKey": "VMWARE"
      },
      {
        "resourceKindKey": "vSphere World",
        "adapterKindKey": "VMWARE"
      }
    ],
    "name": "VCPP Monitored VM Count",
    "formula": "count(${adaptertype=VMWARE, objecttype=VirtualMachine,
metric=sys|poweredOn, depth=100, where=\"==1\"})",
    "description": ""
  }
}
```

Appendix B: Report Template

VCPP Virtual License Counts

Save this code as **`VCPP Virtual License Counts.xml`**.

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<Content>
    <Views>
        <ViewDef id="0ae95462-fc46-4d04-b13a-a10b1fff21ef">
            <Title>VCPP Virtual License Counts</Title>
            <Description/>
            <SubjectType adapterKind="VMWARE" resourceKind="vSphere World"
type="descendant"/>
            <SubjectType adapterKind="VMWARE" resourceKind="vSphere World"
type="self"/>
            <Usage>dashboard</Usage>
            <Usage>report</Usage>
            <Usage>details</Usage>
            <Usage>content</Usage>
```

```
            <Controls>
                <Control id="time-interval-selector_id_26" type="time-interval-
selector" visible="false">
                    <Property name="advancedTimeMode" value="false"/>
                    <Property name="unit" value="YEARS"/>
                    <Property name="count" value="1"/>
                </Control>
                <Control id="attributes-selector_id_27" type="attributes-selector"
visible="false">
                    <Property name="attributeInfos">
                        <List>
                            <Item>
<Value>
    <Property name="objectType" value="RESOURCE"/>
    <Property name="attributeKey" value="Interval Breakdown"/>
    <Property name="id" value="extModel1219-1"/>
    <Property name="rollUpCount" value="0"/>
    <Property name="isTimeSegment" value="true"/>
    <Property name="breakdownBy" value="MONTHS"/>
    <Property name="startingOnUnit" value="WEEKS"/>
    <Property name="startingOnCount" value="1"/>
    <Property name="displayName" value="Month"/>
</Value>
                            </Item>
                            <Item>
<Value>
    <Property name="objectType" value="RESOURCE"/>
    <Property name="attributeKey" value="Super Metric|sm_ea33ba48-3a9d-4be3-9c98-
e227e102c4b2"/>
    <Property name="id" value="extModel1219-2"/>
    <Property name="isStringAttribute" value="false"/>
    <Property name="adapterKind" value="VMWARE"/>
    <Property name="resourceKind" value="vSphere World"/>
    <Property name="rollUpType" value="NONE"/>
    <Property name="rollUpCount" value="0"/>
    <Property name="transformations">
        <List>
            <Item value="AVG"/>
        </List>
    </Property>
    <Property name="isProperty" value="false"/>
```

```
    <Property name="displayName" value="Average OSI"/>
</Value>
                            </Item>
                        </List>
                    </Property>
                </Control>
                <Control id="pagination-control_id_28" type="pagination-control"
visible="true">
                    <Property name="start" value="0"/>
                    <Property name="size" value="50"/>
                </Control>
            </Controls>
            <DataProviders>
                <DataProvider dataType="list-view" id="list-view_id_25"/>
            </DataProviders>
            <Presentation type="list"/>
        </ViewDef>
    </Views>
    <Reports>
        <ReportDef id="49d16c84-d1bf-4057-b209-e2d4145b3a33">
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