vRealize Operations Manager Reference Architecture

vRealize Operations Manager 6.2

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The VMware vRealize Operations Manager Reference Architecture Guide provides recommendations for deployment topology, hardware requirements, and interoperability, and scalability for VMware vRealize Operations Manager 6.2.

For information about software requirements, installation, and supported platforms see VMware vRealize Operations Manager 6.2 Documentation.

For detailed information about sizing, including CPU, memory, and IOPs requirements, see vRealize Operations Manager 6.2 Sizing Guidelines (2130551).
Implement all best practices when you deploy a production instance of vRealize Operations Manager.

**Analytics Nodes**

Analytics nodes consist of master nodes, replica nodes, and data nodes.

- Deploy analytics nodes in the same vSphere Cluster.
- Deploy analytics nodes on storage of the same type.
- Depending on the size and performance requirements for analytics nodes, apply Storage DRS Anti-Affinity rules to ensure that nodes are on separate datastores.
- Set Storage DRS to manual for all vRealize Operations Manager analytics nodes.
- If you deploy analytics nodes into a highly consolidated vSphere cluster, configure resource reservation to ensure optimal performance. Ensure that the virtual CPU to physical CPU ratio is not negatively impacting the performance of analytic nodes by validating CPU ready time and CPU co-stop.
- Analytics nodes have a high number of vCPUs to ensure performance of the analytics computation that occurs on each node. Monitor CPU Ready time and CPU Co-Stop to ensure that analytics nodes are not competing for CPU capacity.

**Management Packs and Adapters**

Various management packs and adapters have specific configuration requirements. Ensure that you are familiar with all prerequisites before you install a solution and configure the adapter instance.
For the production instance of vRealize Operations Manager to function optimally, your environment must conform to certain configurations. Review and familiarize yourself with these configurations before you deploy a production instance of vRealize Operations Manager.

**Sizing**

vRealize Operations Manager supports up to 120,000 monitored resources spread across 16 analytic nodes.

Size your vRealize Operations Manager instance to ensure performance and support. For more information about sizing see vRealize Operations Manager 6.2 Sizing Guidelines (2130551).

**Environment**

Deploy analytic nodes in the same vSphere cluster and use identical or similar hosts and storage. If you cannot deploy analytic nodes in the same vSphere cluster, you must deploy them in the same geographical location. vRealize Operations Manager does not support deploying analytics nodes in multiple geographical locations.

Analytics nodes must be able to communicate with one another at all times. The following vSphere events might disrupt connectivity.

- vMotion
- Storage vMotion
- HA
- DRS

Due to a high level of traffic between analytics nodes, all analytics nodes must be Layer 2 Adjacent. Layer 2 Adjacent means that each node is located on the same VLAN and IP subnet, and that VLAN is not stretched between data centers. Latency between analytics nodes cannot exceed 5 milliseconds, and the bandwidth must be equal to or higher than 1 GB per second. It is recommended that bandwidth be 10 GB per second.

If you deploy analytics nodes in to a highly consolidated vSphere cluster, configure resource reservations. A full analytics node, for example a large analytics node that monitors 10,000 resources, requires one virtual CPU to physical CPU. If you experience performance issues, review the CPU ready and co-stop to determine if the virtual to physical CPU ration the cause of the issues. For more information about how to troubleshoot VM performance and interpret CPU performance metrics, see Troubleshooting a virtual machine that has stopped responding: VMM and Guest CPU usage comparison (1017926).
You can deploy remote collectors behind a firewall. You cannot use NAT between remote collectors and analytics nodes.

**Multiple Data Centers**
If vRealize Operations Manager is monitoring resources in additional data centers, you must use remote collectors and deploy the remote collectors in the remote data center. You might need to modify the intervals at which the configured adapters on the remote collector collect information depending on latency.

It is recommended that latency between sites is less than 200ms. When latency exceeds 200ms, it is recommended that you monitor collections to validate that they are completing in less than five minutes. If collections are not completed in this time limit, increase the interval to 10 minutes.

**Certificates**
A valid certificate signed by a trusted Certificate Authority, private or public, is an important component when you configure a production instance of vRealize Operations Manager. Configure a Certificate Authority signed certificate against the system before you configure Endpoint Operations Management agents.

You must include all analytics, remote collectors, and load balancer DNS names in the Subject Alternative Names field of the certificate.

You can configure Endpoint Operations Management agents to trust the root or intermediate certificate to avoid having to reconfigure all agents if the certificate on the analytics nodes and remote collectors are modified. For more information about root and intermediate certificates, see Specify the End Point Operations Management Agent Setup Properties.

**Adapters**
It is recommended that you deploy adapters on remote controllers in the same data center as the analytics cluster for large and extra large deployment profiles. Deploying adapters on remote controllers improves performance by reducing load on the analytics node.

**Authentication**
You can use the Platform Services Controller for user authentication in vRealize Operations Manager. For more information about deploying a highly-available Platform Services Controller instance, see VMware vCenter Server 6.0 Deployment Guide.

**Load Balancer**
For more information about load balancer configuration, see the vRealize Operations Manager documentation.
Configure your initial deployment of vRealize Operations Manager based on anticipated usage.

**Analytics Nodes**

Analytics nodes consist of master nodes, master replica nodes, and data nodes.

For enterprise deployments of vRealize Operations Manager, deploy all nodes as medium or large deployments, depending on your available resources.

**Scaling Vertically by Adding Resources**

If you deploy analytics nodes in a configuration other than large, you can reconfigure the vCPU and memory. vRealize Operations Manager supports various node sizes.

**Table 4-1. Analytics Nodes Deployment Sizes**

<table>
<thead>
<tr>
<th>Node Size</th>
<th>vCPU</th>
<th>Memory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extra small</td>
<td>2</td>
<td>8 GB</td>
</tr>
<tr>
<td>Small</td>
<td>4</td>
<td>16 GB</td>
</tr>
<tr>
<td>Medium</td>
<td>8</td>
<td>32 GB</td>
</tr>
<tr>
<td>Large</td>
<td>16</td>
<td>48 GB</td>
</tr>
</tbody>
</table>

**Scaling Vertically -by Increasing Storage**

You can increase storage independently of vCPU and Memory.

To maintain a supported configuration, data nodes deployed in the cluster must be the same node size.

For more information about increasing storage, see Add Disk Space to a vApp Node or Add Disk Space to Linux or Windows Node. You cannot modify the disks of virtual machines that have a snapshot. You must remove all snapshots before you increase disk size.

**Scaling Horizontally (Adding nodes)**

vRealize Operations Manager 6.2 supports up to 16 analytic nodes in a cluster.

To maintain a supported configuration, analytics nodes deployed in the cluster must be the same node size.

**Remote Collectors**

vRealize Operations Manager supports two sizes for remote collectors, standard and large. The maximum number of resources is based on the aggregate resources that are collected for all adapters on the remote collector.
Table 4-2. Supported Remote Collector Sizes

<table>
<thead>
<tr>
<th>Collector Size</th>
<th>Resources</th>
<th>Endpoint Operations Management Agents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>1,500</td>
<td>250</td>
</tr>
<tr>
<td>Large</td>
<td>12,000</td>
<td>2,500</td>
</tr>
</tbody>
</table>
High Availability Considerations

HA creates a replica for the vRealize Operations Manager master node and protects the analytics cluster against the loss of a node.

**Cluster Management**

Clusters consist of master nodes and master replica nodes.

When you enable High Availability, information is stored on the master nodes and master replica nodes.

If the master nodes or master replica nodes are permanently lost, then you must disable and re-enable high availability to reassign the master roles or master replica roles. This process, which includes a hidden cluster rebalance, can take a long time.

**Analytics Nodes**

Analytics nodes consist of master nodes, master replica nodes, and data nodes.

Enabling High Availability within vRealize Operations Manager is not a disaster recovery solution. Enabling High Availability duplicates data in the system, and doubles the system’s compute and capacity requirements. When you enable high availability, you protect vRealize Operations Manager from data loss in the event that a single node is lost. If two or more nodes are lost, the data loss is permanent.

Deploy all analytics nodes to separate hosts to reduce the chance of data loss in the event that a host fails. You can use DRS anti-affinity rules to ensure that VMs remain on separate hosts.

**Adapters**

In vRealize Operations Manager 6.1 and later, you can create a collector group. A collector group is a collection of nodes (analytic nodes and remote collectors). You can assign adapters to the collector group, rather than assigning an adapter to a single node.

If the node running the adapter fails, the adapter is automatically moved to another node in the collector group.

Assign all normal adapters to collector groups, and not to individual nodes. Do not deploy hybrid adapters in collector groups. For more information about adapters, see the documentation for the specific adapters.
Adapters and management packs have specific configuration considerations.

**Normal Adapters**

Normal adapters require one-way communication to the monitored endpoint. Deploy normal adapters into collector groups, which are sized to handle failover.

Several normal adapters are available for vRealize Operations Manager.

- vSphere adapter
- Management Pack for NSX for vSphere
- Management Pack for OpenStack
- Management Pack for Storage Devices
- vRealize Automation Management Pack
- Management Pack for Log Insight

**Hybrid Adapters**

Hybrid adapters require two-way communication between the adapter and the monitored endpoint.

You must deploy hybrid adapters to a dedicated remote controller. You should configure only one hybrid adapter type for each remote controller. You cannot configure hybrid adapters as part of a collector group. For example, two vRealize Operations for Published Applications adapters can exist on the same node, and two vRealize Operations for Horizon adapters can exist on the same node, but a vRealize Operations for Published Applications adapter and a vRealize Operations for Horizon adapter cannot exist on the same node.

Several hybrid adapters are available for vRealize Operations Manager.

- vRealize Operations for Horizon adapter
- vRealize Operations for Published Applications adapter
- Management Pack for vRealize Hyperic

**Endpoint Operations Management Adapter**

By default, Endpoint Operations Management adapters are installed on all data nodes. Large analytic nodes can support 2,500 agents and large remote collectors can support 2,000 to 10,000 agents for a single cluster. To reduce ingestion load on the cluster, you can point Endpoint Operations Management adapters at remote collectors. You should
assign the dedicated remote collectors to their own collector group, which helps the Endpoint Operations Management adapter maintain the state of Endpoint Operations Management resources if a node in the collector group fails.

To reduce the cost of reconfiguring the system, it is recommended that you install Endpoint Operations Management agents against a DNS entry specific to Endpoint Operations Management agents if you plan to scale the system beyond a single node.

Remote Collectors Behind a Load Balancer for Endpoint Operations Management Agents
Hardware Requirements for Analytic Nodes and Remote Collectors

Analytics nodes and remote collectors have various hardware requirements for virtual machines and physical machines.

The following table specifies the components to install on each server profile in your deployment, and the required hardware specifications.

<table>
<thead>
<tr>
<th>Server Roles</th>
<th>Virtual CPU</th>
<th>Memory</th>
<th>CPU Requirements</th>
<th>Storage Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medium analytic node</td>
<td>8 vCPU</td>
<td>32 GB</td>
<td>2.0 Ghz minimum, 2.4 Ghz recommended</td>
<td>1875 IOPS</td>
</tr>
<tr>
<td>Large analytic node</td>
<td>16 vCPU</td>
<td>48 GB</td>
<td>2.0 Ghz minimum, 2.4 Ghz recommended</td>
<td>3750 IOPS</td>
</tr>
<tr>
<td>Standard remote collector</td>
<td>2 vCPU</td>
<td>4 GB</td>
<td>2.0 Ghz minimum, 2.4 Ghz recommended</td>
<td>N/A</td>
</tr>
<tr>
<td>Large remote collector</td>
<td>4 vCPU</td>
<td>16 GB</td>
<td>2.0 Ghz minimum, 2.4 Ghz recommended</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Storage requirements are based on the maximum supported resources for each node.

vRealize Operations Manager has a high CPU requirement. In general, the more physical CPU that you assign to the analytics cluster, the better the performance. You must use a minimum of eight physical CPU dual socket hosts, but it is recommended that you use 12 or more physical CPU dual socket hosts.
Port Requirements for vRealize Operations Manager

vRealize Operations Manager has certain port requirements for its components. All ports specified are default ports.

Internal Communications

The following components require internal communication.

**Table 8-1. Communication Between Master Node and Replica Node**

<table>
<thead>
<tr>
<th>Component</th>
<th>Protocol</th>
<th>Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>XDB</td>
<td>TCP</td>
<td>1235</td>
</tr>
<tr>
<td>Postgres Replica Database</td>
<td>TCP</td>
<td>5433</td>
</tr>
</tbody>
</table>

The XDB ports are required only when you upgrade to vRealize Operations Manager 6.1 or later and are not required for after the upgrade.

**Table 8-2. Communication Between Analytics Nodes**

<table>
<thead>
<tr>
<th>Component</th>
<th>Protocol</th>
<th>Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>HTTPS</td>
<td>TCP</td>
<td>443</td>
</tr>
<tr>
<td>Gemfire Locator</td>
<td>UDP</td>
<td>6061</td>
</tr>
<tr>
<td>Gemfire</td>
<td>TCP</td>
<td>10000:10010</td>
</tr>
<tr>
<td>Gemfire</td>
<td>TCP</td>
<td>20000:20010</td>
</tr>
<tr>
<td>Cassandra (inter-node)</td>
<td>TCP</td>
<td>7001</td>
</tr>
<tr>
<td>Cassandra client</td>
<td>TCP</td>
<td>9042</td>
</tr>
</tbody>
</table>

**Table 8-3. Communication From Remote Collector to Analytics Node**

<table>
<thead>
<tr>
<th>Component</th>
<th>Protocol</th>
<th>Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>HTTPS</td>
<td>TCP</td>
<td>443</td>
</tr>
<tr>
<td>Gemfire Locator</td>
<td>UDP</td>
<td>6061,</td>
</tr>
<tr>
<td>Gemfire</td>
<td>TCP</td>
<td>10000:10010</td>
</tr>
</tbody>
</table>

**Table 8-4. Communication Between Remote Collector and Analytics Node**

<table>
<thead>
<tr>
<th>Component</th>
<th>Protocol</th>
<th>Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>HTTPS (Casa)</td>
<td>TCP</td>
<td>443</td>
</tr>
</tbody>
</table>
Table 8-5. Communication Between Remote Collector and Master and Data Nodes

<table>
<thead>
<tr>
<th>Component</th>
<th>Protocol</th>
<th>Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>HTTP</td>
<td>TCP</td>
<td>80</td>
</tr>
<tr>
<td>HTTPS</td>
<td>TCP</td>
<td>443</td>
</tr>
<tr>
<td>Gemfire Locator</td>
<td>TCP</td>
<td>6061</td>
</tr>
<tr>
<td>Gemfire</td>
<td>TCP and UDP</td>
<td>10000:10010</td>
</tr>
<tr>
<td>Gemfire</td>
<td>TCP and UDP</td>
<td>20000:20010</td>
</tr>
<tr>
<td>NTP</td>
<td>UDP</td>
<td>123</td>
</tr>
</tbody>
</table>

Table 8-6. Communication From Endpoint Operations Management Agent to Analytics Node

<table>
<thead>
<tr>
<th>Component</th>
<th>Protocol</th>
<th>Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>HTTPS</td>
<td>TCP</td>
<td>443</td>
</tr>
</tbody>
</table>

Table 8-7. Communication From Endpoint Operations Management Agent to Remote Collector

<table>
<thead>
<tr>
<th>Component</th>
<th>Protocol</th>
<th>Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>HTTPS</td>
<td>TCP</td>
<td>443</td>
</tr>
</tbody>
</table>

External Communications

The following components require external communications.

Table 8-8. Communication from Analytics Nodes and Remote Collectors to External Resources

<table>
<thead>
<tr>
<th>Component</th>
<th>Protocol</th>
<th>Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>Platform Services Controller</td>
<td>TCP</td>
<td>443</td>
</tr>
<tr>
<td>DNS</td>
<td>TCP, UDP</td>
<td>53</td>
</tr>
<tr>
<td>LDAP</td>
<td>TCP</td>
<td>389</td>
</tr>
<tr>
<td>LDAPS</td>
<td>TCP</td>
<td>636</td>
</tr>
<tr>
<td>GC TCP</td>
<td>TCP</td>
<td>3268, 3269</td>
</tr>
<tr>
<td>NTP</td>
<td>UDP</td>
<td>123</td>
</tr>
<tr>
<td>SNMP</td>
<td>TCP</td>
<td>25</td>
</tr>
<tr>
<td>SNMP</td>
<td>UDP</td>
<td>161</td>
</tr>
<tr>
<td>Adapters</td>
<td>TCP</td>
<td>N/A</td>
</tr>
<tr>
<td>Web Client</td>
<td>TCP</td>
<td>443</td>
</tr>
<tr>
<td>User Web Browser</td>
<td>TCP</td>
<td>443</td>
</tr>
</tbody>
</table>
Port Requirements for vRealize Operations Manager

Protocols are not in the diagram.

* Required for upgrading from vRealize Operations Manager 6.0 to 6.1. The ports are closed after the upgrade.

** Required only for High Availability.
Small Deployment Profile for vRealize Operations Manager

The small deployment profile is intended for systems that manage up to 12,000 resources.

Virtual Appliance Name

The small deployment profile contains a single large analytics node, analytic-1.ra.local.

Deployment Profile Support

The small deployment profile supports the following configuration.

- 12,000 resources
- 1,000 Endpoint Operations Management agents
- Data retention for six months

Additional DNS Entries

You can add additional DNS entries for your organization's future requirements. If you do not expect your planned deployment to exceed a single node, you can configure Endpoint Operations Management agents against the analytics nodes.

epops.ra.local -> analytic-1.ra.local

Certificate

The certificate must be signed by a Certificate Authority. The Subject Alternative Name contains the following information.

- DNS Name = epops.refarch.local
- DNS Name = analytic-1.ra.local

This is an example of a small deployment profile.

Table 9-1. Adapter Properties

<table>
<thead>
<tr>
<th>Collector Group</th>
<th>Collector</th>
<th>Adaptor</th>
<th>Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEFAULT</td>
<td>analytic-1</td>
<td>A</td>
<td>2,000</td>
</tr>
<tr>
<td>DEFAULT</td>
<td>analytic-1</td>
<td>B</td>
<td>4,000</td>
</tr>
<tr>
<td>DEFAULT</td>
<td>analytic-1</td>
<td>C</td>
<td>2,000</td>
</tr>
<tr>
<td>DEFAULT</td>
<td>analytic-1</td>
<td>D</td>
<td>3,000</td>
</tr>
</tbody>
</table>
vRealize Operations Manager Small Deployment Profile Architecture

User → EP Ops Agents → DNS epops → Analytic Node analytic-1 A,B,C,D → Resources
Medium Deployment Profile for vRealize Operations Manager

The medium deployment profile is intended for systems that manage 40,000 resources, 20,000 of which are enabled for High Availability. In the medium deployment profile, adapters are deployed on the analytics nodes by default. If you experience problems with data ingestion, move these adapters to remote controllers.

Virtual Appliance Names

The medium deployment profile contains eight medium analytics nodes.
- analytic-1.ra.local
- analytic-2.ra.local
- analytic-3.ra.local
- analytic-4.ra.local
- analytic-5.ra.local
- analytic-6.ra.local
- analytic-7.ra.local
- analytic-8.ra.local

Deployment Profile Support

The medium deployment profile supports the following configuration.
- 40,000 total resources, 20,000 enabled for HA
- 6,000 Endpoint Operations Management agents
- Data retention for six months

Load Balanced Addresses

- analytics.ra.local
- epops.ra.local

Certificate

The certificate must be signed by a Certificate Authority. The Subject Alternative Name contains the following information.
- DNS Name = epops.refarch.local
- DNS Name = analytic-1.ra.local

This is an example of a medium deployment profile.

**Table 10-1. Adapter Properties**

<table>
<thead>
<tr>
<th>Collector Group</th>
<th>Collector</th>
<th>Adaptor</th>
<th>Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEFAULT</td>
<td>analytic-1</td>
<td>A</td>
<td>2,000</td>
</tr>
<tr>
<td>DEFAULT</td>
<td>analytic-2</td>
<td>B</td>
<td>4,000</td>
</tr>
<tr>
<td>DEFAULT</td>
<td>analytic-3</td>
<td>C</td>
<td>2,000</td>
</tr>
<tr>
<td>DEFAULT</td>
<td>analytic-4</td>
<td>D</td>
<td>3,000</td>
</tr>
<tr>
<td>DEFAULT</td>
<td>analytic-5</td>
<td>E</td>
<td>1,000</td>
</tr>
<tr>
<td>DEFAULT</td>
<td>analytic-6</td>
<td>F</td>
<td>2,000</td>
</tr>
<tr>
<td>DEFAULT</td>
<td>analytic-7</td>
<td>G</td>
<td>1,500</td>
</tr>
<tr>
<td>DEFAULT</td>
<td>analytic-8</td>
<td>H</td>
<td>4,500</td>
</tr>
</tbody>
</table>

**vRealize Operations Manager Medium Deployment Profile Architecture**
Large Deployment Profile for vRealize Operations Manager

The large deployment profile is intended for systems that manage 80,000 resources, 40,000 of which are enabled with High Availability. All adapters are deployed to remote controllers in large deployment profiles to offload CPU usage from the analytics cluster.

Virtual Appliance Names

The large deployment profile contains eight large analytics nodes, large remote collectors for adapters, and large remote collectors for Endpoint Operations Management agents.

- analytic-1.ra.local
- analytic-2.ra.local
- analytic-3.ra.local
- analytic-4.ra.local
- analytic-5.ra.local
- analytic-6.ra.local
- analytic-7.ra.local
- analytic-8.ra.local

Deployment Profile Support

The large deployment profile supports the following configuration.

- 80,000 total resources, 40,000 enabled for HA
- 10,000 Endpoint Operations Management agents
- Data retention for six months

Load Balanced Addresses

- analytics.ra.local
- epops.ra.local

Certificate

The certificate must be signed by a Certificate Authority. The Subject Alternative Name contains the following information.

- DNS Name = analytic.refarch.local
This is an example of a large deployment profile.

**Table 11-1. Adapter Properties**

<table>
<thead>
<tr>
<th>Collector Group</th>
<th>Remote Collector</th>
<th>Adapter</th>
<th>Resources</th>
<th>Endpoint Operations Management Agents</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>remote-1</td>
<td>A</td>
<td>5,000</td>
<td>N/A</td>
</tr>
<tr>
<td>1</td>
<td>remote-2</td>
<td>B</td>
<td>5,000</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td>10,000</td>
<td>N/A</td>
</tr>
<tr>
<td>2</td>
<td>remote-3</td>
<td>C</td>
<td>10,000</td>
<td>N/A</td>
</tr>
<tr>
<td>2</td>
<td>remote-4</td>
<td>D</td>
<td>5,000</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td>20,000</td>
<td>N/A</td>
</tr>
<tr>
<td>AIM</td>
<td>epops-1</td>
<td>epops</td>
<td>4,800</td>
<td>800</td>
</tr>
<tr>
<td></td>
<td>epops-2</td>
<td>epops</td>
<td>4,800</td>
<td>800</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td>9,600</td>
<td>1,600</td>
</tr>
</tbody>
</table>

If a remote collector is lost from these collector groups, you might have to manually rebalance the adapters to comply with the limit of 10,000 resource for each remote collector.

The estimate of 9,600 resources uses six resources for each Endpoint Operations Management agent.
The extra large deployment profile is intended for systems that manage 120,000 resources, 60,000 of which are enabled for High Availability. This deployment is divided into two data centers and is the maximum supported analytics cluster deployment.

**Virtual Appliance Names**

The extra large deployment profile contains 16 large analytics nodes, $X$ large remote collectors for adapters, and $Y$ large remote collectors for Endpoint Operations Management agents.

- analytic-1.ra.local
- analytic-2.ra.local
- analytic-3.ra.local
- analytic-4.ra.local
- analytic-5.ra.local
- analytic-6.ra.local
- analytic-7.ra.local
- analytic-8.ra.local
- analytic-9.ra.local
- analytic-10.ra.local
- analytic-11.ra.local
- analytic-12.ra.local
- analytic-13.ra.local
- analytic-14.ra.local
- analytic-15.ra.local
- analytic-16.ra.local

**Deployment Profile Support**

- 120,000 total resources, 60,000 enabled for HA
- 10,000 Endpoint Operations Management agents
- Data retention for six months
Load Balanced Addresses

- analytics.ra.local
- epops-a.ra.local
- epops-b.ra.local

Certificate

The certificate must be signed by a Certificate Authority. The Subject Alternative Name contains the following information.

- DNS Name = analytic.refarch.local
- DNS Name = epops-a.refarch.local
- DNS Name = epops-b.refarch.local
- DNS Name = analytic-1.ra.local to analytic-16.ra.local
- DNS Name = remote-1.ra.local to remote-N.ra.local
- DNS Name = epops-1.ra.local to epops-N.ra.local

This is an example of an extra large deployment profile. The adapter in the example provides N-1 redundancy, meaning, if two adapters support 20,000 resources, then a third adapter is added to attain a supported configuration that allows for a single failure.

Table 12-1. Adapter Properties

<table>
<thead>
<tr>
<th>Collector Group</th>
<th>Data Center</th>
<th>Remote Collector</th>
<th>Adapter</th>
<th>Resources</th>
<th>Endpoint Operations Management agents</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A</td>
<td>remote-1</td>
<td>A</td>
<td>5,000</td>
<td>N/A</td>
</tr>
<tr>
<td>1</td>
<td>A</td>
<td>remote-2</td>
<td>B</td>
<td>5,000</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>10,000</td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>remote-3</td>
<td>C</td>
<td>2,000</td>
<td>N/A</td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>remote-3</td>
<td>D</td>
<td>2,000</td>
<td>N/A</td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>remote-3</td>
<td>E</td>
<td>1,000</td>
<td>N/A</td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>remote-4</td>
<td>F</td>
<td>7,000</td>
<td>N/A</td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>remote-5</td>
<td>G</td>
<td>8,000</td>
<td>N/A</td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>remote-6</td>
<td>H</td>
<td>5,000</td>
<td>N/A</td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>remote-7</td>
<td>I</td>
<td>6,000</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>31,000</td>
</tr>
<tr>
<td>3</td>
<td>B</td>
<td>remote-8</td>
<td>J</td>
<td>10,000</td>
<td>N/A</td>
</tr>
<tr>
<td>3</td>
<td>B</td>
<td>remote-9</td>
<td>K</td>
<td>5,000</td>
<td>N/A</td>
</tr>
<tr>
<td>3</td>
<td>B</td>
<td>remote-10</td>
<td>L</td>
<td>5,000</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>20,000</td>
</tr>
<tr>
<td>AIM-1</td>
<td>A</td>
<td>epops-1</td>
<td>epops</td>
<td>8,004</td>
<td>1,334</td>
</tr>
<tr>
<td>AIM-1</td>
<td>A</td>
<td>epops-2</td>
<td>epops</td>
<td>7,998</td>
<td>1,333</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>epops-3</td>
<td>epops</td>
<td>7,998</td>
<td>1,333</td>
</tr>
</tbody>
</table>
### Table 12-1. Adapter Properties (Continued)

<table>
<thead>
<tr>
<th>Collector Group</th>
<th>Data Center</th>
<th>Remote Collector</th>
<th>Adapter</th>
<th>Resources</th>
<th>Endpoint Operations Management agents</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIM-2</td>
<td>B</td>
<td>epops-4</td>
<td>epops</td>
<td>8,004</td>
<td>1,334</td>
</tr>
<tr>
<td>AIM-2</td>
<td>B</td>
<td>epops-5</td>
<td>epops</td>
<td>7,998</td>
<td>1,333</td>
</tr>
<tr>
<td>AIM-2</td>
<td>B</td>
<td>epops-6</td>
<td>epops</td>
<td>7,998</td>
<td>1,333</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>24,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4,000</td>
</tr>
</tbody>
</table>

If a remote collector is lost from these collector groups, you might have to manually rebalance the adapters to comply with the limit of 10,000 resource for each remote collector.

The estimate of 24,000 resources for AIM-1 and AIM-2 collector groups uses six resources for each Endpoint Operations Management agent.
vRealize Operations Manager Extra Large Deployment Profile
Architecture - Data Center B

Data Center B
EP Ops Agents

LB epops-b

AIM-2 Collectors Group
Remote Collector epops-4
Remote Collector epops-5
Remote Collector epops-6

Collectors Group 3
Remote Collector remote-8
Remote Collector remote-10
Remote Collector remote-9

Data Center A
Analytics Cluster

200 ms latency

200 ms latency
When planning your environment, consider these recommendations for deployment topology, hardware requirements, and interoperability, and scalability.

This chapter includes the following topics:

- “Best Practices for Deploying vRealize Operations Manager,” on page 37
- “Initial Considerations for Deploying vRealize Operations Manager,” on page 38
- “Scalability Considerations,” on page 39
- “High Availability Considerations,” on page 40
- “Adapter and Management Packs Considerations,” on page 41
- “Hardware Requirements for Analytic Nodes and Remote Collectors,” on page 42
- “Port Requirements for vRealize Operations Manager,” on page 43
- “Small Deployment Profile for vRealize Operations Manager,” on page 45
- “Medium Deployment Profile for vRealize Operations Manager,” on page 46
- “Large Deployment Profile for vRealize Operations Manager,” on page 48
- “Extra Large Deployment Profile for vRealize Operations Manager,” on page 50

**Best Practices for Deploying vRealize Operations Manager**

Implement all best practices when you deploy a production instance of vRealize Operations Manager.

**Analytics Nodes**

Analytics nodes consist of master nodes, replica nodes, and data nodes.

- Deploy analytics nodes in the same vSphere Cluster.
- Deploy analytics nodes on storage of the same type.
- Depending on the size and performance requirements for analytics nodes, apply Storage DRS Anti-Affinity rules to ensure that nodes are on separate datastores.
- Set Storage DRS to manual for all vRealize Operations Manager analytics nodes.
- If you deploy analytics nodes into a highly consolidated vSphere cluster, configure resource reservation to ensure optimal performance. Ensure that the virtual CPU to physical CPU ratio is not negatively impacting the performance of analytic nodes by validating CPU ready time and CPU co-stop.
Analytics nodes have a high number of vCPUs to ensure performance of the analytics computation that occurs on each node. Monitor CPU Ready time and CPU Co-Stop to ensure that analytics nodes are not competing for CPU capacity.

**Management Packs and Adapters**

Various management packs and adapters have specific configuration requirements. Ensure that you are familiar with all prerequisites before you install a solution and configure the adapter instance.

**Initial Considerations for Deploying vRealize Operations Manager**

For the production instance of vRealize Operations Manager to function optimally, your environment must conform to certain configurations. Review and familiarize yourself with these configurations before you deploy a production instance of vRealize Operations Manager.

**Sizing**

vRealize Operations Manager supports up to 120,000 monitored resources spread across 16 analytic nodes. Size your vRealize Operations Manager instance to ensure performance and support. For more information about sizing see vRealize Operations Manager 6.2 Sizing Guidelines (2130551).

**Environment**

Deploy analytic nodes in the same vSphere cluster and use identical or similar hosts and storage. If you cannot deploy analytic nodes in the same vSphere cluster, you must deploy them in the same geographical location. vRealize Operations Manager does not support deploying analytics nodes in multiple geographical locations.

Analytics nodes must be able to communicate with one another at all times. The following vSphere events might disrupt connectivity.

- vMotion
- Storage vMotion
- HA
- DRS

Due to a high level of traffic between analytics nodes, all analytics nodes must be Layer 2 Adjacent. Layer 2 Adjacent means that each node is located on the same VLAN and IP subnet, and that VLAN is not stretched between data centers. Latency between analytics nodes cannot exceed 5 milliseconds, and the bandwidth must be equal to or higher than 1 GB per second. It is recommended that bandwidth be 10 GB per second.

If you deploy analytics nodes in to a highly consolidated vSphere cluster, configure resource reservations. A full analytics node, for example a large analytics node that monitors 10,000 resources, requires one virtual CPU to physical CPU. If you experience performance issues, review the CPU ready and co-stop to determine if the virtual to physical CPU ration the cause of the issues. For more information about how to troubleshoot VM performance and interpret CPU performance metrics, see Troubleshooting a virtual machine that has stopped responding: VMM and Guest CPU usage comparison (1017926).

You can deploy remote collectors behind a firewall. You cannot use NAT between remote collectors and analytics nodes.
Multiple Data Centers
If vRealize Operations Manager is monitoring resources in additional data centers, you must use remote collectors and deploy the remote collectors in the remote data center. You might need to modify the intervals at which the configured adapters on the remote collector collect information depending on latency.

It is recommended that latency between sites is less than 200ms. When latency exceeds 200ms, it is recommended that you monitor collections to validate that they are completing in less than five minutes. If collections are not completed in this time limit, increase the interval to 10 minutes.

Certificates
A valid certificate signed by a trusted Certificate Authority, private or public, is an important component when you configure a production instance of vRealize Operations Manager. Configure a Certificate Authority signed certificate against the system before you configure Endpoint Operations Management agents.

You must include all analytics, remote collectors, and load balancer DNS names in the Subject Alternative Names field of the certificate.

You can configure Endpoint Operations Management agents to trust the root or intermediate certificate to avoid having to reconfigure all agents if the certificate on the analytics nodes and remote collectors are modified. For more information about root and intermediate certificates, see Specify the End Point Operations Management Agent Setup Properties.

Adapters
It is recommended that you deploy adapters on remote controllers in the same data center as the analytics cluster for large and extra large deployment profiles. Deploying adapters on remote controllers improves performance by reducing load on the analytics node.

Authentication
You can use the Platform Services Controller for user authentication in vRealize Operations Manager. For more information about deploying a highly-available Platform Services Controller instance, see VMware vCenter Server 6.0 Deployment Guide.

Load Balancer
For more information about load balancer configuration, see the vRealize Operations Manager documentation.

Scalability Considerations
Configure your initial deployment of vRealize Operations Manager based on anticipated usage.

Analytics Nodes
Analytics nodes consist of master nodes, master replica nodes, and data nodes.

For enterprise deployments of vRealize Operations Manager, deploy all nodes as medium or large deployments, depending on your available resources.

Scaling Vertically by Adding Resources
If you deploy analytics nodes in a configuration other than large, you can reconfigure the vCPU and memory. vRealize Operations Manager supports various node sizes.

Table 13-1. Analytics Nodes Deployment Sizes

<table>
<thead>
<tr>
<th>Node Size</th>
<th>vCPU</th>
<th>Memory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extra small</td>
<td>2</td>
<td>8 GB</td>
</tr>
<tr>
<td>Small</td>
<td>4</td>
<td>16 GB</td>
</tr>
</tbody>
</table>
### Table 13-1. Analytics Nodes Deployment Sizes (Continued)

<table>
<thead>
<tr>
<th>Node Size</th>
<th>vCPU</th>
<th>Memory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medium</td>
<td>8</td>
<td>32 GB</td>
</tr>
<tr>
<td>Large</td>
<td>16</td>
<td>48 GB</td>
</tr>
</tbody>
</table>

**Scaling Vertically - by Increasing Storage**

You can increase storage independently of vCPU and Memory.

To maintain a supported configuration, data nodes deployed in the cluster must be the same node size.

For more information about increasing storage, see Add Disk Space to a vApp Node or Add Disk Space to Linux or Windows Node. You cannot modify the disks of virtual machines that have a snapshot. You must remove all snapshots before you increase disk size.

**Scaling Horizontally (Adding nodes)**

vRealize Operations Manager 6.2 supports up to 16 analytic nodes in a cluster.

To maintain a supported configuration, analytics nodes deployed in the cluster must be the same node size.

**Remote Collectors**

vRealize Operations Manager supports two sizes for remote collectors, standard and large. The maximum number of resources is based on the aggregate resources that are collected for all adapters on the remote collector.

<table>
<thead>
<tr>
<th>Collector Size</th>
<th>Resources</th>
<th>Endpoint Operations Management Agents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>1,500</td>
<td>250</td>
</tr>
<tr>
<td>Large</td>
<td>12,000</td>
<td>2,500</td>
</tr>
</tbody>
</table>

### High Availability Considerations

HA creates a replica for the vRealize Operations Manager master node and protects the analytics cluster against the loss of a node.

**Cluster Management**

Clusters consist of master nodes and master replica nodes.

When you enable High Availability, information is stored on the master nodes and master replica nodes.

If the master nodes or master replica nodes are permanently lost, then you must disable and re-enable high availability to reassign the master roles or master replica roles. This process, which includes a hidden cluster rebalance, can take a long time.

**Analytics Nodes**

Analytics nodes consist of master nodes, master replica nodes, and data nodes.

Enabling High Availability within vRealize Operations Manager is not a disaster recovery solution. Enabling High Availability duplicates data in the system, and doubles the system’s compute and capacity requirements. When you enable high availability, you protect vRealize Operations Manager from data loss in the event that a single node is lost. If two or more nodes are lost, the data loss is permanent.
Deploy all analytics nodes to separate hosts to reduce the chance of data loss in the event that a host fails. You can use DRS anti-affinity rules to ensure that VMs remain on separate hosts.

Adapters

In vRealize Operations Manager 6.1 and later, you can create a collector group. A collector group is a collection of nodes (analytic nodes and remote collectors). You can assign adapters to the collector group, rather than assigning an adapter to a single node.

If the node running the adapter fails, the adapter is automatically moved to another node in the collector group.

Assign all normal adapters to collector groups, and not to individual nodes. Do not deploy hybrid adapters in collector groups. For more information about adapters, see the documentation for the specific adapters.

Adapter and Management Packs Considerations

Adapters and management packs have specific configuration considerations.

Normal Adapters

Normal adapters require one-way communication to the monitored endpoint. Deploy normal adapters into collector groups, which are sized to handle failover.

Several normal adapters are available for vRealize Operations Manager.

- vSphere adapter
- Management Pack for NSX for vSphere
- Management Pack for OpenStack
- Management Pack for Storage Devices
- vRealize Automation Management Pack
- Management Pack for Log Insight

Hybrid Adapters

Hybrid adapters require two-way communication between the adapter and the monitored endpoint.

You must deploy hybrid adapters to a dedicated remote controller. You should configure only one hybrid adapter type for each remote controller. You cannot configure hybrid adapters as part of a collector group. For example, two vRealize Operations for Published Applications adapters can exist on the same node, and two vRealize Operations for Horizon adapters can exist on the same node, but a vRealize Operations for Published Applications adapter and a vRealize Operations for Horizon adapter cannot exist on the same node.

Several hybrid adapters are available for vRealize Operations Manager.

- vRealize Operations for Horizon adapter
- vRealize Operations for Published Applications adapter
- Management Pack for vRealize Hyperic

Endpoint Operations Management Adapter

By default, Endpoint Operations Management adapters are installed on all data nodes. Large analytic nodes can support 2,500 agents and large remote collectors can support 2,000 to 10,000 agents for a single cluster. To reduce ingestion load on the cluster, you can point Endpoint Operations Management adapters at remote collectors. You should
assign the dedicated remote collectors to their own collector group, which helps the Endpoint Operations Management adapter maintain the state of Endpoint Operations Management resources if a node in the collector group fails.

To reduce the cost of reconfiguring the system, it is recommended that you install Endpoint Operations Management agents against a DNS entry specific to Endpoint Operations Management agents if you plan to scale the system beyond a single node.

Remote Collectors Behind a Load Balancer for Endpoint Operations Management Agents

Hardware Requirements for Analytic Nodes and Remote Collectors

Analytics nodes and remote collectors have various hardware requirements for virtual machines and physical machines.

The following table specifies the components to install on each server profile in your deployment, and the required hardware specifications.

Table 13-3. Hardware Requirements for System Components

<table>
<thead>
<tr>
<th>Server Roles</th>
<th>Virtual CPU</th>
<th>Memory</th>
<th>CPU Requirements</th>
<th>Storage Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medium analytic node</td>
<td>8 vCPU</td>
<td>32 GB</td>
<td>2.0 Ghz minimum, 2.4 Ghz recommended</td>
<td>1875 IOPS</td>
</tr>
<tr>
<td>Large analytic node</td>
<td>16 vCPU</td>
<td>48 GB</td>
<td>2.0 Ghz minimum, 2.4 Ghz recommended</td>
<td>3750 IOPS</td>
</tr>
<tr>
<td>Standard remote collector</td>
<td>2 vCPU</td>
<td>4 GB</td>
<td>2.0 Ghz minimum, 2.4 Ghz recommended</td>
<td>N/A</td>
</tr>
<tr>
<td>Large remote collector</td>
<td>4 vCPU</td>
<td>16 GB</td>
<td>2.0 Ghz minimum, 2.4 Ghz recommended</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Storage requirements are based on the maximum supported resources for each node.

vRealize Operations Manager has a high CPU requirement. In general, the more physical CPU that you assign to the analytics cluster, the better the performance. You must use a minimum of eight physical CPU dual socket hosts, but it is recommended that you use 12 or more physical CPU dual socket hosts.
Port Requirements for vRealize Operations Manager

vRealize Operations Manager has certain port requirements for its components. All ports specified are default ports.

Internal Communications

The following components require internal communication.

Table 13-4. Communication Between Master Node and Replica Node

<table>
<thead>
<tr>
<th>Component</th>
<th>Protocol</th>
<th>Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>XDB</td>
<td>TCP</td>
<td>1235</td>
</tr>
<tr>
<td>Postgres Replica Database</td>
<td>TCP</td>
<td>5433</td>
</tr>
</tbody>
</table>

The XDB ports are required only when you upgrade to vRealize Operations Manager 6.1 or later and are not required for after the upgrade.

Table 13-5. Communication Between Analytics Nodes

<table>
<thead>
<tr>
<th>Component</th>
<th>Protocol</th>
<th>Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>HTTPS</td>
<td>TCP</td>
<td>443</td>
</tr>
<tr>
<td>Gemfire Locator</td>
<td>UDP</td>
<td>6061</td>
</tr>
<tr>
<td>Gemfire</td>
<td>TCP</td>
<td>10000:10010</td>
</tr>
<tr>
<td>Gemfire</td>
<td>TCP</td>
<td>20000:20010</td>
</tr>
<tr>
<td>Cassandra (inter-node)</td>
<td>TCP</td>
<td>7001</td>
</tr>
<tr>
<td>Cassandra client</td>
<td>TCP</td>
<td>9042</td>
</tr>
</tbody>
</table>

Table 13-6. Communication From Remote Collector to Analytics Node

<table>
<thead>
<tr>
<th>Component</th>
<th>Protocol</th>
<th>Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>HTTPS</td>
<td>TCP</td>
<td>443</td>
</tr>
<tr>
<td>Gemfire Locator</td>
<td>UDP</td>
<td>6061,</td>
</tr>
<tr>
<td>Gemfire</td>
<td>TCP</td>
<td>10000:10010</td>
</tr>
</tbody>
</table>

Table 13-7. Communication Between Remote Collector and Analytics Node

<table>
<thead>
<tr>
<th>Component</th>
<th>Protocol</th>
<th>Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>HTTPS (Casa)</td>
<td>TCP</td>
<td>443</td>
</tr>
</tbody>
</table>

Table 13-8. Communication Between Remote Collector and Master and Data Nodes

<table>
<thead>
<tr>
<th>Component</th>
<th>Protocol</th>
<th>Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>HTTP</td>
<td>TCP</td>
<td>80</td>
</tr>
<tr>
<td>HTTPS</td>
<td>TCP</td>
<td>443</td>
</tr>
<tr>
<td>Gemfire Locator</td>
<td>TCP</td>
<td>6061</td>
</tr>
<tr>
<td>Gemfire</td>
<td>TCP and UDP</td>
<td>10000:10010</td>
</tr>
<tr>
<td>Gemfire</td>
<td>TCP and UDP</td>
<td>20000:20010</td>
</tr>
<tr>
<td>NTP</td>
<td>UDP</td>
<td>123</td>
</tr>
</tbody>
</table>
Table 13-9. Communication From Endpoint Operations Management Agent to Analytics Node

<table>
<thead>
<tr>
<th>Component</th>
<th>Protocol</th>
<th>Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>HTTPS</td>
<td>TCP</td>
<td>443</td>
</tr>
</tbody>
</table>

Table 13-10. Communication From Endpoint Operations Management Agent to Remote Collector

<table>
<thead>
<tr>
<th>Component</th>
<th>Protocol</th>
<th>Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>HTTPS</td>
<td>TCP</td>
<td>443</td>
</tr>
</tbody>
</table>

External Communications

The following components require external communications.

Table 13-11. Communication from Analytics Nodes and Remote Collectors to External Resources

<table>
<thead>
<tr>
<th>Component</th>
<th>Protocol</th>
<th>Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>Platform Services Controller</td>
<td>TCP</td>
<td>443</td>
</tr>
<tr>
<td>DNS</td>
<td>TCP, UDP</td>
<td>53</td>
</tr>
<tr>
<td>LDAP</td>
<td>TCP</td>
<td>389</td>
</tr>
<tr>
<td>LDAPS</td>
<td>TCP</td>
<td>636</td>
</tr>
<tr>
<td>GC TCP</td>
<td>TCP</td>
<td>3268, 3269</td>
</tr>
<tr>
<td>NTP</td>
<td>UDP</td>
<td>123</td>
</tr>
<tr>
<td>SNMP</td>
<td>TCP</td>
<td>25</td>
</tr>
<tr>
<td>SNMP</td>
<td>UDP</td>
<td>161</td>
</tr>
<tr>
<td>Adapters</td>
<td>TCP</td>
<td>N/A</td>
</tr>
<tr>
<td>Web Client</td>
<td>TCP</td>
<td>443</td>
</tr>
<tr>
<td>User Web Browser</td>
<td>TCP</td>
<td>443</td>
</tr>
</tbody>
</table>
Port Requirements for vRealize Operations Manager

User
- HTTPS: 443

Web Client
- HTTPS: 443

EP Ops Agents
- HTTPS: 443

Analytics Cluster
- Load Balancer: 443
- HTTPS: 443

EP Ops
- Load Balancer: 443
- HTTPS: 443

EP Ops Agents
- Load Balancer: 443
- HTTPS: 443

Remote Collector
- HTTPS: 443

Protocols are not in the diagram.
* Required for upgrading from vRealize Operations Manager 6.0 to 6.1. The ports are closed after the upgrade.
** Required only for High Availability.

Small Deployment Profile for vRealize Operations Manager

The small deployment profile is intended for systems that manage up to 12,000 resources.

Virtual Appliance Name

The small deployment profile contains a single large analytics node, analytic-1.ra.local.

Deployment Profile Support

The small deployment profile supports the following configuration.

- 12,000 resources
- 1,000 Endpoint Operations Management agents
- Data retention for six months
Additional DNS Entries

You can add additional DNS entries for your organization's future requirements. If you do not expect your planned deployment to exceed a single node, you can configure Endpoint Operations Management agents against the analytics nodes.

epops.ra.local -> analytic-1.ra.local

Certificate

The certificate must be signed by a Certificate Authority. The Subject Alternative Name contains the following information.

- DNS Name = epops.refarch.local
- DNS Name = analytic-1.ra.local

This is an example of a small deployment profile.

Table 13-12. Adapter Properties

<table>
<thead>
<tr>
<th>Collector Group</th>
<th>Collector</th>
<th>Adaptor</th>
<th>Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEFAULT</td>
<td>analytic-1</td>
<td>A</td>
<td>2,000</td>
</tr>
<tr>
<td>DEFAULT</td>
<td>analytic-1</td>
<td>B</td>
<td>4,000</td>
</tr>
<tr>
<td>DEFAULT</td>
<td>analytic-1</td>
<td>C</td>
<td>2,000</td>
</tr>
<tr>
<td>DEFAULT</td>
<td>analytic-1</td>
<td>D</td>
<td>3,000</td>
</tr>
</tbody>
</table>

vRealize Operations Manager Small Deployment Profile Architecture

Medium Deployment Profile for vRealize Operations Manager

The medium deployment profile is intended for systems that manage 40,000 resources, 20,000 of which are enabled for High Availability. In the medium deployment profile, adapters are deployed on the analytics nodes by default. If you experience problems with data ingestion, move these adapters to remote controllers.

Virtual Appliance Names

The medium deployment profile contains eight medium analytics nodes.

- analytic-1.ra.local
Deployment Profile Support

The medium deployment profile supports the following configuration.

- 40,000 total resources, 20,000 enabled for HA
- 6,000 Endpoint Operations Management agents
- Data retention for six months

Load Balanced Addresses

- analytics.ra.local
- epops.ra.local

Certificate

The certificate must be signed by a Certificate Authority. The Subject Alternative Name contains the following information.

- DNS Name = epops.refarch.local
- DNS Name = analytic-1.ra.local

This is an example of a medium deployment profile.

<table>
<thead>
<tr>
<th>Table 13-13. Adapter Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collector Group</td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td>DEFAULT</td>
</tr>
<tr>
<td>DEFAULT</td>
</tr>
<tr>
<td>DEFAULT</td>
</tr>
<tr>
<td>DEFAULT</td>
</tr>
<tr>
<td>DEFAULT</td>
</tr>
<tr>
<td>DEFAULT</td>
</tr>
<tr>
<td>DEFAULT</td>
</tr>
<tr>
<td>DEFAULT</td>
</tr>
</tbody>
</table>
Large Deployment Profile for vRealize Operations Manager

The large deployment profile is intended for systems that manage 80,000 resources, 40,000 of which are enabled with High Availability. All adapters are deployed to remote controllers in large deployment profiles to offload CPU usage from the analytics cluster.

Virtual Appliance Names

The large deployment profile contains eight large analytics nodes, large remote collectors for adapters, and large remote collectors for Endpoint Operations Management agents.

- analytic-1.ra.lcoal
- analytic-2.ra.lcoal
- analytic-3.ra.lcoal
- analytic-4.ra.lcoal
- analytic-5.ra.lcoal
- analytic-6.ra.lcoal
- analytic-7.ra.lcoal
- analytic-8.ra.lcoal

Deployment Profile Support

The large deployment profile supports the following configuration.

- 80,000 total resources, 40,000 enabled for HA
- 10,000 Endpoint Operations Management agents
- Data retention for six months
Load Balanced Addresses

- `analytics.ra.local`
- `epops.ra.local`

Certificate

The certificate must be signed by a Certificate Authority. The Subject Alternative Name contains the following information.

- DNS Name = `analytic.refarch.local`
- DNS Name = `epops.refarch.local`
- DNS Name = `analytic-1.ra.local` to DNS Name = `analytic-8.ra.local`
- DNS Name = `remote-1.ra.local` to DNS Name = `remote-N.ra.local`
- DNS Name = `epops-1.ra.local` to DNS Name = `epops-N.ra.local`

This is an example of a large deployment profile.

Table 13-14. Adapter Properties

<table>
<thead>
<tr>
<th>Collector Group</th>
<th>Remote Collector</th>
<th>Adapter</th>
<th>Resources</th>
<th>Endpoint Operations Management Agents</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>remote-1</td>
<td>A</td>
<td>5,000</td>
<td>N/A</td>
</tr>
<tr>
<td>1</td>
<td>remote-2</td>
<td>B</td>
<td>5,000</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td>10,000</td>
<td>N/A</td>
</tr>
<tr>
<td>2</td>
<td>remote-3</td>
<td>C</td>
<td>10,000</td>
<td>N/A</td>
</tr>
<tr>
<td>2</td>
<td>remote-4</td>
<td>D</td>
<td>5,000</td>
<td>N/A</td>
</tr>
<tr>
<td>2</td>
<td>remote-5</td>
<td>E</td>
<td>5,000</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td>20,000</td>
<td>N/A</td>
</tr>
<tr>
<td>AIM</td>
<td>epops-1</td>
<td>epops</td>
<td>4,800</td>
<td>800</td>
</tr>
<tr>
<td></td>
<td>epops-2</td>
<td>epops</td>
<td>4,800</td>
<td>800</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td>9,600</td>
<td>1,600</td>
</tr>
</tbody>
</table>

If a remote collector is lost from these collector groups, you might have to manually rebalance the adapters to comply with the limit of 10,000 resource for each remote collector.

The estimate of 9,600 resources uses six resources for each Endpoint Operations Management agent.
vRealize Operations Manager Large Deployment Profile Architecture

Extra Large Deployment Profile for vRealize Operations Manager

The extra large deployment profile is intended for systems that manage 120,000 resources, 60,000 of which are enabled for High Availability. This deployment is divided into two data centers and is the maximum supported analytics cluster deployment.

Virtual Appliance Names

The extra large deployment profile contains 16 large analytics nodes, X large remote collectors for adapters, and Y large remote collectors for Endpoint Operations Management agents.

- analytic-1.ra.local
- analytic-2.ra.local
- analytic-3.ra.local
- analytic-4.ra.local
- analytic-5.ra.local
Deployment Profile Support
- 120,000 total resources, 60,000 enabled for HA
- 10,000 Endpoint Operations Management agents
- Data retention for six months

Load Balanced Addresses
- analytics.ra.local
- epops-a.ra.local
- epops-b.ra.local

Certificate
The certificate must be signed by a Certificate Authority. The Subject Alternative Name contains the following information.
- DNS Name = analytic.refarch.local
- DNS Name = epops-a.refarch.local
- DNS Name = epops-b.refarch.local
- DNS Name = analytic-1.ra.local to analytic-16.ra.local
- DNS Name = remote-1.ra.local to remote-N.ra.local
- DNS Name = epops-1.ra.local to epops-N.ra.local

This is an example of an extra large deployment profile. The adapter in the example provides N-1 redundancy, meaning, if two adapters support 20,000 resources, then a third adapter is added to attain a supported configuration that allows for a single failure.

Table 13-15. Adapter Properties

<table>
<thead>
<tr>
<th>Collector Group</th>
<th>Data Center</th>
<th>Remote Collector</th>
<th>Adapter</th>
<th>Resources</th>
<th>Endpoint Operations Management agents</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A</td>
<td>remote-1</td>
<td>A</td>
<td>5,000</td>
<td>N/A</td>
</tr>
<tr>
<td>1</td>
<td>A</td>
<td>remote-2</td>
<td>B</td>
<td>5,000</td>
<td>N/A</td>
</tr>
<tr>
<td>Collector Group</td>
<td>Data Center</td>
<td>Remote Collector</td>
<td>Adapter</td>
<td>Resources</td>
<td>Endpoint Operations Management agents</td>
</tr>
<tr>
<td>----------------</td>
<td>-------------</td>
<td>------------------</td>
<td>---------</td>
<td>-----------</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>remote-3</td>
<td>C</td>
<td>2,000</td>
<td>N/A</td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>remote-3</td>
<td>D</td>
<td>2,000</td>
<td>N/A</td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>remote-3</td>
<td>E</td>
<td>1,000</td>
<td>N/A</td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>remote-4</td>
<td>F</td>
<td>7,000</td>
<td>N/A</td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>remote-5</td>
<td>G</td>
<td>8,000</td>
<td>N/A</td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>remote-6</td>
<td>H</td>
<td>5,000</td>
<td>N/A</td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>remote-7</td>
<td>I</td>
<td>6,000</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>31,000</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>B</td>
<td>remote-8</td>
<td>J</td>
<td>10,000</td>
<td>N/A</td>
</tr>
<tr>
<td>3</td>
<td>B</td>
<td>remote-9</td>
<td>K</td>
<td>5,000</td>
<td>N/A</td>
</tr>
<tr>
<td>3</td>
<td>B</td>
<td>remote-10</td>
<td>L</td>
<td>5,000</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20,000</td>
<td></td>
</tr>
<tr>
<td>AIM-1</td>
<td>A</td>
<td>epops-1</td>
<td>epops</td>
<td>8,004</td>
<td>1,334</td>
</tr>
<tr>
<td>AIM-1</td>
<td>A</td>
<td>epops-2</td>
<td>epops</td>
<td>7,998</td>
<td>1,333</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>epops-3</td>
<td>epops</td>
<td>7,998</td>
<td>1,333</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>24,000</td>
<td>4,000</td>
</tr>
<tr>
<td>AIM-2</td>
<td>B</td>
<td>epops-4</td>
<td>epops</td>
<td>8,004</td>
<td>1,334</td>
</tr>
<tr>
<td>AIM-2</td>
<td>B</td>
<td>epops-5</td>
<td>epops</td>
<td>7,998</td>
<td>1,333</td>
</tr>
<tr>
<td>AIM-2</td>
<td>B</td>
<td>epops-6</td>
<td>epops</td>
<td>7,998</td>
<td>1,333</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>24,000</td>
<td>4,000</td>
</tr>
</tbody>
</table>

If a remote collector is lost from these collector groups, you might have to manually rebalance the adapters to comply with the limit of 10,000 resource for each remote collector.

The estimate of 24,000 resources for AIM-1 and AIM-2 collector groups uses six resources for each Endpoint Operations Management agent.
vRealize Operations Manager Extra Large Deployment Profile Architecture - Data Center A

User → LB analytics → Data Center A EP Ops Agents → LB epops-a → AIM-1 Collectors Group

- Remote Collector epops-1
- Remote Collector epops-2
- Remote Collector epops-3

Analytics Cluster

- Analytic Node analytic-1
- Analytic Node analytic-2
- Analytic Node analytic-3
- Analytic Node analytic-4
- Analytic Node analytic-5
- Analytic Node analytic-6
- Analytic Node analytic-7
- Analytic Node analytic-8
- Analytic Node analytic-9
- Analytic Node analytic-10
- Analytic Node analytic-11
- Analytic Node analytic-12
- Analytic Node analytic-13
- Analytic Node analytic-14
- Analytic Node analytic-15
- Analytic Node analytic-16

Collectors Group 1

- Remote Collector remote-1 A
- Remote Collector remote-2 B

Collector Group 1 Endpoint

Collectors Group 2

- Remote Collector remote-3 C,D,E
- Remote Collector remote-4 F
- Remote Collector remote-5 G
- Remote Collector remote-6 H
- Remote Collector remote-7 I

Collector Group 2 Endpoint
vRealize Operations Manager Extra Large Deployment Profile Architecture - Data Center B

Data Center B
EP Ops Agents

LB epops-b

AIM-2 Collectors Group
- Remote Collector epops-4
- Remote Collector epops-5
- Remote Collector epops-6

200 ms latency

Data Center A
Analytics Cluster

Collector Group 3
Endpoint

Collectors Group 3
- Remote Collector remote-8 J
- Remote Collector remote-9 K
- Remote Collector remote-10 L

200 ms latency
Index

A
adapters
  best practices 7, 37
  considerations 9, 15, 38, 41
analytics nodes
  best practices 7, 37
  hardware requirements 17, 42
  scalability considerations 11, 39
authentication, considerations 9, 38

B
best practices
  adapters 7, 37
  analytics nodes 7, 37
  management packs 7, 37

C
certificates, considerations 9, 38
considerations
  adapters 15, 41
  High Availability 13, 40
  management packs 15, 41

D
data centers, considerations 9, 38
  deployment 37
  deployment profiles
    extra large 31, 50
    large 27, 48
    medium 25, 46
    small 23, 45

E
environment, considerations 9, 38
  extra large deployment profile 31, 50

H
hardware requirements
  analytic nodes 17, 42
  remote collectors 17, 42
  High Availability, considerations 13, 40

L
large deployment profile 27, 48
load balancers, considerations 9, 38

M
management packs
  best practices 7, 37
  considerations 15, 41
  medium deployment profile 25, 46

O
overview
  architecture 5
  deployment 5
  scalability 5

P
ports, requirements 19, 43

R
reference architecture 37
remote collectors
  hardware requirements 17, 42
  scalability considerations 11, 39

S
scalability considerations
  analytics nodes 11, 39
  remote collectors 11, 39
  storage 11, 39
  sizing, considerations 9, 38
  small deployment profile 23, 45
  storage, scalability considerations 11, 39