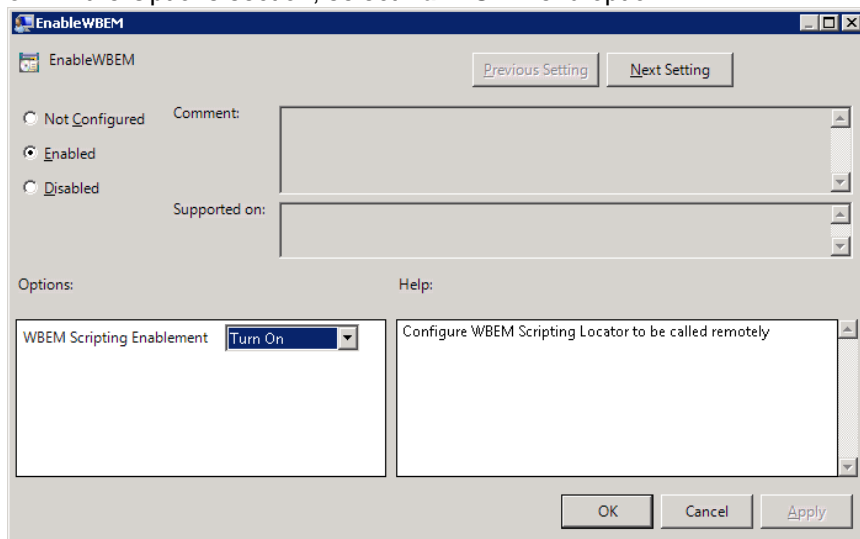


11. Enable the EnableWBEM and CreateDIISurrogate policies by following these steps:
 - a. Open each policy.
 - b. Select the **Enabled** option.
 - c. In the Options section, select **Turn On** menu option.



To manually edit your registry:

Note: Manually changing the registry requires the keys to change ownership from “Trusted Installer” to another account. This is not necessary if you deploy the Active Directory group policy.

1. Open the Registry Editor.
2. Search for the entry `HKEY_CLASSES_ROOT\CLSID\{76A64158-CB41-11D1-8B02-00600806D9B6}`.
3. Select the key and click **Edit > Permissions > Advanced**.
4. Select the **Owner** tab.
5. Modify the owner to include the account that is used to monitor the machine.
6. Select the **Permissions** tab.
7. Ensure the account has full control.

Note: You may need to add the account to the user list.

8. Click **OK**.
9. In `HKEY_CLASSES_ROOT\AppID` create a new key named `{76A64158-CB41-11D1-8B02-00600806D9B6}` by clicking **Edit > New > Key**.

10. In the new key, create a new string value key called *DllSurrogate*.
11. Select the key and **click Edit > Permissions > Advanced**.
12. Select the **Owner** tab.
13. Modify the owner to include the account that is used to monitor the machine.
14. Click **OK**.

Group Policy

The following is the contents of the group policy. You can copy the following information to create your own group policy file or you can use the group policy file included in your installation .zip file.

```
CLASS MACHINE

CATEGORY System

    POLICY EnableWBEM

        EXPLAIN !!WMIHelp

            KEYNAME SOFTWARE\Classes\CLSID\{76A64158-CB41-11D1-8B02-00600806D9B6}

                PART !!EnableConfig DROPDOWNLIST REQUIRED

                    VALUENAME "AppID"

                        ITEMLIST

                            NAME !!EnableYes VALUE "{76A64158-CB41-11D1-8B02-00600806D9B6}" DEFAULT

                                NAME !!EnableNo VALUE DELETE

                            END ITEMLIST

                        END PART

                    END POLICY

                POLICY CreateDllSurrogate

                    EXPLAIN !!DllHelp

                        KEYNAME SOFTWARE\Classes\AppID\{76A64158-CB41-11D1-8B02-00600806D9B6}

                            PART !!EnableConfig DROPDOWNLIST REQUIRED

                                VALUENAME "DllSurrogate"
```

```
ITEMLIST
```

```
    NAME !!EnableYes VALUE "" DEFAULT
```

```
    NAME !!EnableNo VALUE DELETE
```

```
END ITEMLIST
```

```
END PART
```

```
END POLICY
```

```
END CATEGORY
```

```
[strings]
```

```
EnableYes="Turn On"
```

```
EnableNo="Turn Off"
```

```
EnableConfig="WBEM Scripting Enablement"
```

```
;explains
```

```
WMIHelp="Configure WBEM Scripting Locator to be called remotely"
```

```
DllHelp="Configure appid key with dllsurrogate for WBEM Scripting  
Locator"
```

Advanced Setup

The yellow **Advanced Setup** link on the left menu of the Administration page opens the advanced setup menu.

The screenshot shows the SolarWinds Virtualization Manager interface. The left navigation menu includes: Configuration Summary, Configuration Wizard, License Information, Data Sources, Credentials, Collection Schedules, Discovery Jobs, Storage Manager, **Advanced Setup** (highlighted with a red box), Users, Inventory Filters, Labels, SMTP Configuration, SNMP Configuration, Authentication Server, System Properties, System Maintenance, and Server Logging. The main content area is divided into sections: License Status (Days Remaining: 8, Powered on VMs: 145), Setup (Data Sources: 6, Credentials: 5), Active Data Collection Jobs (No active jobs), and Recently Completed Collection Jobs. The 'Recently Completed Collection Jobs' section contains two tables: 'Configuration Data' and 'Performance Data', both listing targets, start times, and durations.

Typical elements that require advanced setup include:

- Administering users and access
- Adding or modifying user credentials as passwords are routinely updated or staffing changes occur
- Setting up default dashboards for users
- Configuring guest (WMI) inclusion masks to accommodate changes in WMI-accessible infrastructure
- Creating and managing searchable Labels
- Configuring a mail server to send email alerts
- Configuring SNMP traps to integrate with a 3rd party systems management tool
- Configuring low-level system properties
- Initiating tasks that perform maintenance

All of these tasks can be accomplished by selecting their corresponding menu item under Advanced Setup on the Configuration page

User Management

To control user access to SolarWinds Virtualization Manager, select the **Users** menu option. Here, you can add, edit, or delete users from the internal credential store.

To add a new user, click **Add** and then provide the following information:

- **Username** - The login name of the user
- **Role** - User or Admin roles are available to any user.
 - User Role: Has access only to the user side of the SolarWinds Virtualization Manager product.
 - Admin Role: Can access both the user and administrator sides of SolarWinds Virtualization Manager.
- **Local Auth** - Accounts with local authentication use SolarWinds Virtualization Manager's internal authentication. Otherwise, LDAP pass-through authentication is used to verify credentials using sources such as Active Directory.
- **Enabled** - Whether this account is currently enabled. Disabled accounts cannot log on
- **Password** - The password of the user with a second box to confirm
- **Full Name** - The full name of the user
- **Email** - The email address for the user
- **Description** - A brief description of the user

Click **Save** to finish the process.

Edit lets you edit the full name, email address, and description of the selected account.

Change Password lets you enter and verify a new password for the selected account.

Setting default dashboards for different users

New users get the standard default dashboards of SolarWinds Virtualization Manager. However, you may specify exact dashboards for the user by clicking Dashboard.

Select up to five available dashboards from the left column and click the right arrow to make those dashboards the default for a user. This feature is useful for making dashboards relevant to the user's position in the company. For example, you can give storage administrators storage dashboards by default while giving managers the manager dashboard.

Inventory Filters

This configuration page lets you limit the scope of data collection activities by restricting the virtual machines that SolarWinds Virtualization Manager interrogates for WMI information.

The default filter includes all guests for WMI. This was done by making a "filter" with Subnet address 0.0.0.0 and a subnet mask of 0.

To create additional filters:

1. Figure out the IP address or range that you wish to include. This process is described at <http://www.subnet-calculator.com/cidr.php>.
2. Click **Add**.
3. In the dialog box, enter the **Network** address and **Mask** for your new inclusion list.
4. Click **Save**.

You can add as many filters as you need to include multiple ranges of IP addresses.

Labels

The Labels configuration page provides you with a quick way of creating a series of custom labels that you can apply to VMs and hosts.

To create a label, click **Add Label**.

For more information, see "Custom Labels" on page 149.

SNMP Configuration

SolarWinds Virtualization Manager has the ability to send SNMP traps for events that occur in the system such as:

- New VMs are discovered
- Alerts are raised or lowered

To configure SNMP traps, click **SNMP Configuration**.

To specify a new host that will receive SNMP traps, click **Add Trap Host**. Enter the following information to configure a new SNMP integration.

- **Host Address** - The IP address or FQDN of the receiver of SNMP alerts
- **Community String** - The SNMP community string which is used for read-only access to SolarWinds Virtualization Manager alerts
- **UDP Port** - The port the SNMP receiver expects SNMP UDP traffic
- **Retries** - If no acknowledgment is received, the number of times to resend the SNMP trap
- **Timeout (ms)** - The amount of time to wait for acknowledgment before attempting a retry

After saving a new Trap Host, click **Send Test Trap** to test the integration.

SNMP trap receivers may need details of the Manager alert MIB (Management Information Base). Click **MIB** to view the entire SolarWinds Virtualization Manager MIB.

Authentication Server

The Authentication Server configuration page lets you specify the servers used to authenticate Active Directory (AD) and/or LDAP users.

To add an Active Directory authentication server:

1. Click **Add**.
2. In the **Authentication Type** field, select **Active Directory**.
3. If you want this to be the authentication server for users who specify a domain, click **Use for this domain only** and then enter the specific domain in the text field.
4. If you want this to be the authentication server for users who do not specify a domain, click **Use for all accounts where a domain is not specified**.
5. In the **Server** field, enter the IP address of the Active Directory server.
6. In the **Port** field, enter the port used for AD authentication (default is 389).
7. In the **Realm Name** field, enter the Kerberos realm in uppercase.
8. Click **Save**.

To add an LDAP authentication server:

1. Click **Add**.
2. In the **Authentication Type** field, select **LDAP**.

3. If you want this to be the authentication server for users who specify a domain, click **Use for this domain only** and then enter the specific domain in the text field.
4. If you want this to be the authentication server for users who do not specify a domain, click **Use for all accounts where a domain is not specified**.
5. In the **Server** field, enter the IP address of the LDAP server.
6. In the **Port** field, enter the port used for LDAP authentication (default is 3268).
7. In the **Search Filter** field, enter the LDAP query filter you want to use to map user accounts to the LDAP server entries. Example: `(cn=*)`
8. In the **Search Base** field, enter the portion of the directory tree you want to search for LDAP users. Example: `dc=example,dc=com`
9. In the **Bind User** field, enter a user with LDAP search permissions. Example: `user@example.com`
10. In the **Bind Password** field, enter the password of the bind user.
11. Click **Save**.

Synchronize the Time of the AD/LDAP Server and the SolarWinds Virtualization Manager Server

For security reasons, you must synchronize the system times of the SolarWinds Virtualization Manager server and the AD/LDAP server. Authentication will fail if the two clocks vary by more than five minutes.

If you deployed SolarWinds Virtualization Manager on Microsoft Windows, you can synchronize the system time from the Internet Time tab of the Date and Time dialog box.

If you deployed the virtual appliance, the built-in NTP server support will automatically maintain time synchronization.

To customize the NTP synchronization settings (optional):

1. Log on to the Management UI at `https://applianceHostName:5480`
2. Click the **SolarWinds Mgmt** tab.
3. *If you have recently upgraded and the NTP Status is empty*, click **Restart ntpd**.
4. Click **Edit Configuration**.
5. Select `ntp.conf` and then click **Edit**.
6. Customize the NTP settings and then click **Save**.

Adding AD/LDAP users to SolarWinds Virtualization Manager

If you want to automatically add the AD/LDAP users who log on to SolarWinds Virtualization Manager as authorized users, select the **Auto create New Users upon Authentication** check box.

If you do not select this check box, you must manually create user entries in SolarWinds Virtualization Manager for your AD and LDAP users before they will be able to log on. Create a user identically named as the AD/LDAP user with a blank password. For example, if Bob Smith's AD user name is **bsmith**, you must create a **bsmith** user in SolarWinds Virtualization Manager with no password. Make sure **Local Auth** is not enabled for that user.

System Properties

Most internal settings for the SolarWinds Virtualization Manager system are available for edit via the System Properties page. These properties will be discussed in two sections. The first section is for properties that should be edited to tune SolarWinds Virtualization Manager according to your needs. The other section is for properties that should NOT be modified unless you are instructed to by SolarWinds Technical Support.

Properties that may be edited

Each of these properties may be edited by clicking on the value of the property and entering a new value. New entries are automatically picked up by the system so there is no Save button. No restart is necessary to pick up these new values.

Aging Intervals

- Stale to Decommissioned Interval
- Active to Stale Interval

These properties define how entities (virtual machines, hosts, datastore, clusters, and applications) are treated when they are made unavailable in successive data collection jobs. For example, if a VM is collected in an initial job, and subsequently not available in a re-occurrence of that job, does that indicate that the VM was unregistered with vCenter or simply inaccessible to its host? So, the intervals such as Active to Stale and Stale to Decommissioned define the number of hours between those virtual machine life cycle changes. This life cycle process is described below.

Active VMs →

- Virtual machines which are accessible for data collection and registered with their hosts or Virtual Center
- This is the normal state for virtual machine records
- These machines are searchable in the current and historical timeframes

Stale VMs →

- Virtual machines which are either inaccessible for data collection or unregistered with their hosts or Virtual Center for the defined "Active to Stale" interval
- These virtual machines are searchable however they appear dimmed to indicate their stale status

Decommissioned VMs

- Virtual machines which have been "Stale" for the defined "Stale to Decommissioned" interval
- These virtual machines are no longer searchable in the current timeframe
- These virtual machines still exist in the data repository as historically searchable records.

Sample Data Retention Windows

- Days to Retain Raw Performance Data
- Days to Retain Performance Data Hourly Rollups

SolarWinds Virtualization Manager frequently collects a large amount of performance data. This data makes up the majority of information in the database. The Days to Retain Raw Performance Data property above define how long to keep the raw data in the system before purging it. Every hour, that raw data is consolidated into a hourly value that represents the average of all values in that hour. The Days to Retain Performance Data Hourly Rollups property defines how long to maintain those hourly values before purging them. Both of these properties are major inputs to the [disk sizing spreadsheet](#) and can be tuned according to the needs of your environment.

Trend Execution Interval

- Hourly Interval For Trend Execution

Trends run periodically to track historic changes in your environment. By default, they run every four hours, but you may increase or decrease this value to get more or less granularity in your historic trend data.

External Internet Access

- Allow Application To Contact SolarWinds

SolarWinds Virtualization Manager periodically pulls information from SolarWinds for RSS updates and to deliver non-identifiable usage data about installations. If your installation does not have external access to the Internet, this should be set to false.

Log File Retention Windows

- Days to Keep Logs Before Deletion

By default, log files are retained for five days before purging. These log files can grow large, so this window can be trimmed to delete log files more often. However, SolarWinds Technical Support will need these files to diagnose issues, so logs containing details of the problem should be preserved.

Properties that may not be edited

- Collect Performance Data From Virtual Center - changing this value will cause performance sample data to be collected directly from ESX hosts instead of Virtual Center, but additional system configuration will be required by SolarWinds Technical Support
- Resource Depletion Percent Threshold - Default setting for the resource depletion calculations. Changing this value will result in alerts on resource depletion to the specified percentage instead of the default 100%.
- depletion.warning.threshold - Default setting for the resource depletion calculations. Changing this value will result in warnings on resource depletion to the specified percentage instead of the default 90%.
- fitment.memory.waste - Default setting for capacity planning. This should not be changed because this field is editable in the capacity planning section of SolarWinds Virtualization Manager.
- How Many Days to Use for Resource Depletion - Default setting for capacity planning. This should not be changed because this field is editable in the capacity planning section of SolarWinds Virtualization Manager.
- fitment.memory.oversub - Default setting for capacity planning. This should not be changed because this field is editable in the capacity planning section of SolarWinds Virtualization Manager.
- fitment.sizing.target - Default setting for capacity planning. This should not be changed because this field is editable in the capacity planning section of SolarWinds Virtualization Manager.
- Calculate Configuration Differences on Collection - Performs a DNA configuration comparison every time a new configuration document is collected. This is a very expensive operation and should only be changed by SolarWinds Technical Support after ensuring the installed system can handle the load.
- Perform DNS Resolution to Validate VMs - Dictates whether a reverse DNS lookup occurs before collecting data from VM guests. This setting is deprecated.
- data.multiplication - Used for scalability testing and should NEVER be changed in a deployed system.

System Maintenance

This configuration page contains functions for enhancing, maintaining, or troubleshooting your SolarWinds Virtualization Manager server.

Run Trends

Recalculates trends now, ahead of the regular maintenance schedule.

Run Depletions

Recalculates resource depletion estimates now, ahead of the regular maintenance schedule.

Clear Job Trackers

Clears the tracking data from the collection summary page. Do this if you have reason to believe the jobs listed on the summary page are inaccurate. This does not cancel data collection jobs that are running.

Rebuild Indexes

Rebuilds the search indexes. This may take a long time. While rebuilding, you will not have access to historical data.

Enable Plugin / Disable Plugin

Enables and disables the vSphere 4.0 client plug-in. The vSphere 4.0 plug-in adds a SolarWinds menu to the vSphere client that can launch SolarWinds Virtualization Manager modules from vCenter inventory items.

The available modules are:

- Add to App
- View Notes
- Export
- Compare
- Add to Chart
- Map
- Label
- Plan
- View Collected Data

For example, if you right-click a virtual machine and then click **SolarWinds > Add to Chart**, vSphere opens a performance analyzer window for that virtual machine.

This plugin also adds a SolarWinds option to the Management panel. This option, available on the Home Page or in the View menu under **Management > SolarWinds**, opens Virtualization Manager inside your vSphere client.

Note: Only one SolarWinds Virtualization Manager may register this plug-in for each vCenter. If you have more than one SolarWinds Virtualization Manager collecting data, you must disable the plug-in on one before enabling it for the other.

Recalc License

Recalculates license status now, ahead of the regular maintenance schedule.

Server Logging

The Server Logging configuration page lets you enable debug-level verbose logging for several categories of loggable events. Debug logging should be reserved for troubleshooting only, as debug-level logging can fill up a disk very quickly.

To enable debug-level logging, click **Choose a Logging Category** and then select a category from the list.

To disable debug-level logging, select a category in the Enabled Debug Logging Categories section and then click **Clear**.

Viewing the Log Files

On Windows, the log file is **C:\Program files (x86)\Hyper9\Server\logs\hyper9**

On the appliance, the log file is accessible from the maintenance website.

1. Log on to the administration website of SolarWinds Virtualization Manager with your admin credentials.

Note: Typically, this is `https://hostname:5480` where *hostname* is the host name or IP address of your appliance. Acknowledge the security certificate warning and continue to the website.

2. Click the **SolarWinds Mgmt** tab.
3. Click **View Recent Log Activity**.

Chapter 3

Key Features

SolarWinds Virtualization Manager is a comprehensive virtual environment management solution that helps you combat VM sprawl, identify performance bottlenecks, plan for changing capacity requirements, and illustrate showback and chargeback. Virtualization Manager is pre-populated with industry best practice-based tools to enable you to more efficiently manage your virtual environment.

Dashboard

The Dashboard area uses widgets to bring you information at a glance regarding performance, capacity planning, VM sprawl, and more. You can customize both dashboards and dashboard widgets to display what is most important to your environment. The dashboard answers high-level questions such as:

- Which VMs are experiencing the most latency?
- Which clusters have memory ballooning issues?
- What is my average uptime?

Dashboard information is frequently used as a starting point in investigating environmental issues.

Explore

The Explore area allows you to quickly view items in your environment, including historical information collected by Virtualization Manager. You can view your environment in the Map, the content stored in Virtualization Manager, historical information for alerts and resources, and more. Information in the Explore tab helps answer questions such as:

- What did my environment look like in the past?
- What details are collected per resource?
- How similar are two resources?

Capacity Planning

The Capacity Planner tool assists you in creating capacity plans. You can create what-if scenarios, visualize how long you can continue with your current load, or plan when to requisition new resources. The Capacity Planner answers questions such as:

- When will I run out of resources?
- What are my resource constraints?
- How many more VMs can I add?

Search

The search engine is the underpinning of many of the tools and customizations that you can perform. Saved search queries can be used to create new reports, alerts, trends, and more.

Answering Management Questions

The following sections briefly demonstrate how to answer management questions with Virtualization Manager. Usually, several tools are used in conjunction to answer questions such as:

- How Do I Find Performance Bottlenecks?
- How Can I Diagnose Historic Performance Issues?
- How Do I Create a Virtualization Capacity Plan?
- How Can I Solve VM Sprawl, Reclaim Resources, and Rightsize My Virtual Environment?

How Do I Find Performance Bottlenecks?

Bottlenecked areas, where a single or limited number of items restrict the performance of a resource, can be identified using the administrator's dashboard, alerts, or the Capacity Planner. The administrator dashboard hosts widgets that monitor various performance contention metrics such as CPU, memory, disk, I/O, and storage metrics. Using the dashboard, you can quickly view which areas per resource may need to be addressed. Alerts can be created for other areas that you wish to monitor that are not included in the default alerts. The Capacity Planner allows you to proactively identify what will become a bottleneck in the future. For more information, see "Capacity Planning".

How Can I Diagnose Historic Performance Issues?

Virtualization Manager collects data and stores it to compile historical information about the resources, which is most effective when enough time has elapsed to create a large base of comparison. For example, I/O latency data is not available until data has been collected for some time, and the accuracy of the information increases as more data is gathered. The dashboard can be used to look at current trend information, while the historical performance analyzer charts allow more in-depth views to issues and trends in your resources. For more information, see "Historical Performance Analyzer Charts".

How Do I Create a Virtualization Capacity Plan?

Use the Capacity Planner to view potential bottlenecks, plan additions to your current infrastructure, or determine when you need to expand your capacity. Information is drawn from your current environment and data sources to compile your current capacity and to predict the potential capacity. Additionally, use the dashboards and alerts to monitor your current capacity for spikes that indicate changing needs. For more information, see “Capacity Planning”.

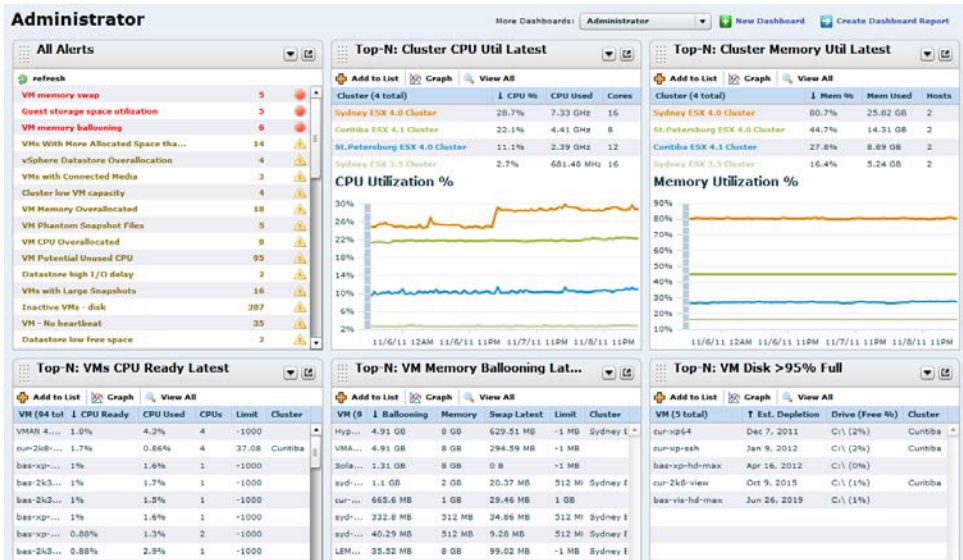
How Can I Solve VM Sprawl, Reclaim Resources, and Rightsize My Virtual Environment?

Virtualization Manager includes a VM sprawl dashboard that displays the number of unused, oversized, and undersized VMs over time along with other metrics useful in effectively utilizing your virtual environment. Use business views to further your understanding of which resources are overallocated and underallocated, which VMs are sized incorrectly, and which VMs are stale. For more information, see “Business Views”.

Chapter 4

Dashboards

Dashboards form a "single pane of glass" to highlight important information about your virtual environment. They are completely customizable, so no two dashboards look exactly the same.



SolarWinds Virtualization Manager ships with a number of default dashboards. Depending on your data sources, not all dashboards are available. To view a different dashboard, select it from the **More Dashboards** list:

- **Administrator** - Quick view of alerts, depleted resources, and virtual environment health for VMware, Hyper-V, or mixed environments
- **Capacity Planning** - Details about resources that are nearly depleted and overview of capacity in the virtual infrastructure
- **Cloud Cost (EC2)** - What would it cost to move my current virtual infrastructure to Amazon EC2?
- **Cluster Host Health** - Shows high level details health statistics for cluster hosts in VMware, Hyper-V, or mixed environments
- **Manager** - High level view of the size and scope of your virtual environment and its available capacity for VMware, Hyper-V or mixed environments

- **Reporting** - Trends how your virtual environment is changing over time
- **Showback** - Quick view of how your VMs are being used over time
- **Storage** - Insight into the virtual environment storage utilization, mostly from the datastore point of view
- **VM Sprawl** - Shows resources that are currently being wasted by inactive VMs and other virtual infrastructure

Dashboard Basics

You may always return to the Dashboards by clicking the logo at the top left of the SolarWinds Virtualization Manager application or by using the **Recent** tab to navigate to the Dashboard.

To view a different dashboard, select it from the **More Dashboards** list.

To create a new dashboard, click New Dashboard. New dashboards are empty. You will be prompted to name your new Dashboard and then it will appear as a clean (empty) Dashboard. All new Dashboards are empty except for the "Add new Widget" placeholder represented by the empty Widget with a blue plus sign (+). The process to add new Widgets is covered in the sections below.

To create a report based on the contents of the current dashboard, click **Create Dashboard Report**.

Dashboards are composed of one or more "Widgets." A Widget is just a small window in each Dashboard which presents information from the SolarWinds Virtualization Manager system. There is no limit to the number of Widgets that may be placed on a Dashboard. Widget types include the following:

- Alert Monitor Widget
- Consumption Widget
- Content / Alert List
- Facet View Widget
- Fitment Widget
- Map Widget
- Notes Widget
- Performance Chart Widget
- RSS Feed Widget
- Top N Widget




- Trend Widget

Each Dashboard will also have a final Widget with a blue plus sign (+) which you may click to add a new Widget to the dashboard. This will walk you through the configuration of the new Widget depending on its type. Configuration options for each type of Widget are covered in the sections below.


Dashboards are another type of Content in SolarWinds Virtualization Manager. You may view and manage all of your Dashboards in the Content Manager. Keep in mind that you may make a Dashboard private to have a very personalized view of your virtual environment.

Common Widget Controls

Regardless of the type of Widget, there are common controls at top of each Widget:





- Move - 
- Options - 
- Open Related - 


Move

To move a Widget to a different location on the Dashboard, drag the  to your desired location. All other Widgets will be reorganized according the Widget you just moved.

Options

The Options button contains several other commands:

-  Edit Widget—Lets you edit the options and properties of the widget. Most widgets allow you to configure the data columns displayed in the widget from the **Columns** tab. Other configurable options and properties are covered in the widget descriptions.
-  Export as PNG—Creates a graphics file of the current widget state.
-  Copy Widget Link—Creates a URL for the widget and copies the URL to the clipboard. You can paste the URL from the clipboard to share the widget with others in an e-mail message or web page
-  Make a copy of this widget—Creates a duplicate of this widget on the dashboard. You can edit the duplicate to make a new version of the widget.

-  Delete—Removes the widget from the dashboard.

Open Related

The Open Related button lets you explore the information in your widget on a grander scale.

For example, on the map widget, the Open Related button can take you to a full-sized map view. On a Trend widget, the button will plot the data on a full-sized business view.

Widget Types

Each widget has its own unique perspective, controls, and configuration options. This section discusses each of these in detail:

- Alert Monitor Widget
- Consumption Widget
- Content / Alert List
- Facet View Widget
- Fitment Widget
- Map Widget
- Notes Widget
- Performance Chart Widget
- RSS Feed Widget
- Top N Widget
- Trend Widget

Alert Monitor Widget

Alert Monitor Widgets allow you view some or all of the Alerts configured in your SolarWinds Virtualization Manager installation.

Alert Name	Count	Status
Guest storage space utilization	4	Critical
VM memory ballooning	7	Critical
VM CPU ready	2	Critical
VM memory swap	5	Critical
Datastore high I/O delay	1	Warning
VM Disk Latency	14	Warning
Stale VMs	1	Warning
Cluster low VM capacity	1	Warning
VM - No heartbeat	76	Warning
VMs with Large Snapshots	29	Warning
Inactive VMs - disk	378	Warning
Host memory utilization	11	Warning
VM Phantom Snapshot Files	7	Warning
Cluster memory utilization	2	Warning
VM CPU Underallocated	7	Warning

Alerts are just another form of content in the SolarWinds Virtualization Manager system. The bulk of the configuration for an Alert Monitor Widget is similar to picking Content for a Content Viewer Widget.

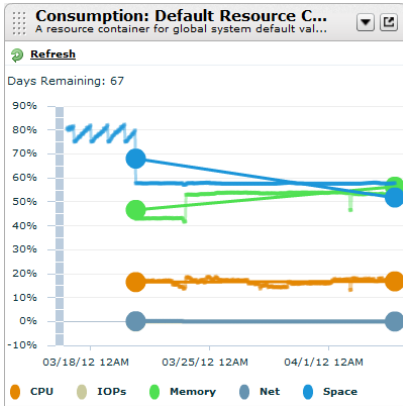
To add a new Alert Monitor Widget:

1. Click the **Add Widget...** placeholder.
2. Enter a title and subtitle for the alert widget.
3. Navigate to the Alert tab, and click **Select an Alert...**
4. Choose an alert. You can filter the number of alerts available for selection by using tags or by searching. You can also view only alerts that you own. To narrow down your view to a smaller set of Alerts, you should create a custom Tag in the Content Manager and select only that Tag.
5. Save the alert

The only custom control for an Alert Monitor Widget is the "Refresh" link at the top of the Widget. This will reload the alert with its current status.

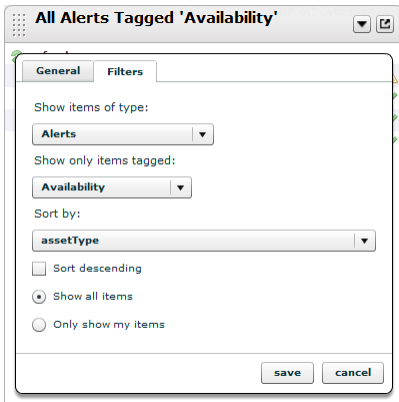
Consumption Widget

The Consumption Widgets shows graphs the remaining virtualization resources based on the default usage profile and default resource container. You can change both the resource container and the usage profile.



Content / Alert List

Content Alert / List Widgets allow you to have any Content in the SolarWinds Virtualization Manager system available to you right on your Dashboard.



All Content in SolarWinds Virtualization Manager has a Type, Tags, and an Owner. To add a new Content Viewer Widget, click the blue plus (+) Widget at the end of every Dashboard to add the Widget manually. You will be prompted to select the Type of Content and optionally select Content with a given Tag to display. Next, you must choose an attribute to "Sort by." Your options are:

- **assetType** - the type of Content

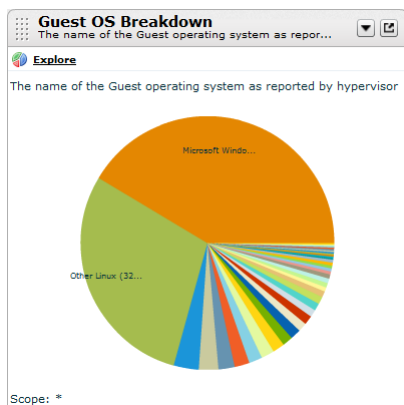
- **dateCreated** - the Content's creation date
- **dateModified** - the Content's last modified date
- **displayName** - the name of the Content

Finally, you may choose to see all Content visible to you or only Content that you own.

The only custom control for an Alert Monitor Widget is the "Refresh" link at the top of the Widget. This will reload the list of Content in the Widget in case more has been created since the Dashboard last refreshed. Keep in mind that every piece of Content that appears in the Widget is a hot link that will launch into a detailed view for that type of Content.

Facet View Widget

The easiest way to create a new Facet Visualization Widget is to enter the Data Center Visualizer section of Business Views and configure the pie chart to your liking. You may then click the "Add Widget" button in the top right of the screen to save the view as a Widget. You will be prompted to pick the Dashboard in which that Widget will reside and click Save.



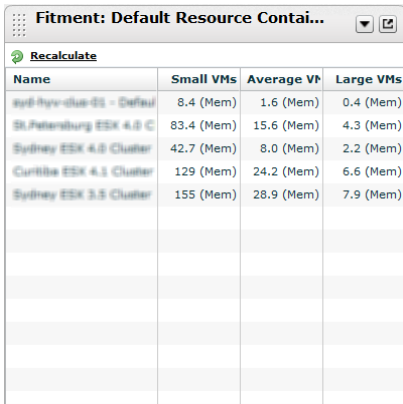
You may also click the blue plus (+) Widget at the end of every Dashboard to add the Widget manually. In this process, you will be prompted for the Search Query from which you will facet and the type of entity (VM, Host, Datastore, Cluster, or Application) to search. You can enter the search query manually or load a saved query using the "Load query..." link. Next, select the facet property that will break down the search results into pie pieces. You may enter the facet property manually or click the "Select facet..." link to choose from a list of all facets. Click the Save button to view your new Widget or the Cancel button to not add the Widget.

The process to configure a Facet Visualization Widget is identical to the process to create a new one except that its current Search Query and facet will be pre-populated.

The final control on the Facet Visualization Widget is the "Explore" link at the top of the widget. Pressing this link will launch you into a full screen view of that Facet Visualization in the Data Center Visualization section of Business Views.

Fitment Widget

Fitment Widgets allow you to see the number of VMs that you may add to your various Clusters given the current load on the virtual infrastructure.



Name	Small VMs	Average VP	Large VMs
syd-phys-clus-ES - Default	8.4 (Mem)	1.6 (Mem)	0.4 (Mem)
St.Petersburg ESX 4.0 C	83.4 (Mem)	15.6 (Mem)	4.3 (Mem)
Sydney ESX 4.0 Cluster	42.7 (Mem)	8.0 (Mem)	2.2 (Mem)
Curitiba ESX 4.1 Cluster	129 (Mem)	24.2 (Mem)	6.6 (Mem)
Sydney ESX 3.5 Cluster	155 (Mem)	28.9 (Mem)	7.9 (Mem)

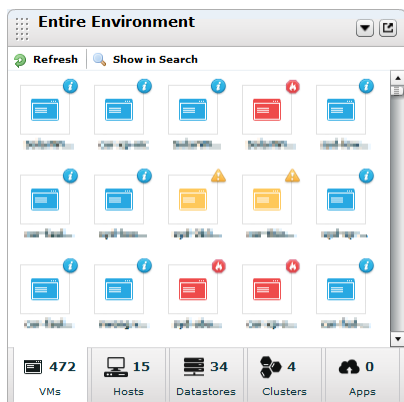
Fitment widgets are driven by a supply side and a demand side. The supply side is a Resource Container and defines the compute resources available in one or more hosts or all the hosts in one or more clusters. The demand side is called a Resource Profile and it defines the set of VMs that utilize the compute resources. These concepts are discussed in greater detail in the Capacity Planning section of this user guide.

To configure a Fitment Widget, click the blue plus (+) Widget at the end of every Dashboard to add the Widget manually. The default view uses the Default (All Clusters) as the resource and the Default (All VMs) as the consumption usage profile. Edit the widget to change the resource, usage profiles, and workload size.

Click **Recalculate** if you want to recompute the capacity plan in the widget.

Map Widget

The Map widget lets you add a smaller version of the Map view directly into your dashboard.



The default map widget view displays all available VMs, hosts, datastores, clusters, and apps. To switch object types, click the object counter at the bottom.

Widget Options

Click  > **Edit Widget** to change the context.

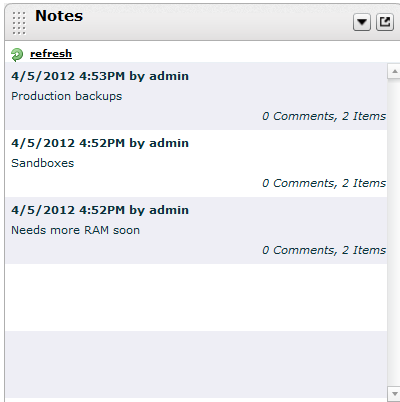
Open Related

Click  to open the large map view with the current context.

The "Refresh" link at the top of the Widget will reload the list of Content in the Widget in case more has been created since the Dashboard last refreshed. The "Show in Search" link at the top of the Widget opens the selected map view in the search results page.

Notes Widget

SolarWinds Virtualization Manager allows you to add notes to any item in inventory. This is a convenient way to share team information about past activity or planned future activity. All notes may be surfaced on a widget.



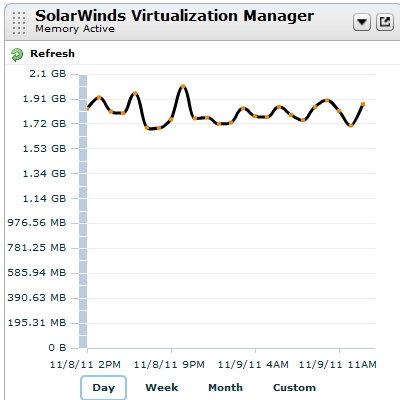
Like all content in SolarWinds Virtualization Manager, all notes may be tagged. When adding a Notes Widget, you may select to show all notes in the system or just notes with a certain tag.

Simply select the tag of the notes you wish to show when creating the Widget.

Performance Chart Widget

The Performance Chart widget lets you place metrics on your dashboard.

Note: New chart widgets are empty until you configure the chart details in the options.



Widget Options

Click  > **Edit Widget** > **Chart** to select:

- Asset Type
- Asset

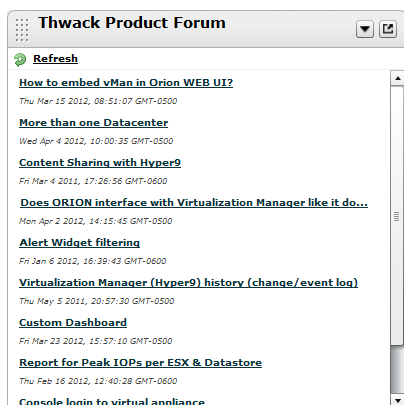
- Metric

Open Related

Click  to plot the current metric on the larger chart view.

RSS Feed Widget

The RSS Feed Widget allows you to view any RSS feed the Dashboard. SolarWinds Virtualization Manager includes this Widget by default on the Administrator Dashboard to inform customers about breaking company news and product updates.



To configure a RSS Feed Widget, click the blue plus (+) Widget at the end of every Dashboard. You will be prompted for the URL of any RSS feed you wish to view in the Widget. Click the Save button to view your new Widget or the Cancel button to not add the Widget.

The only custom control on the RSS Feed Widget is the "Refresh" link at the top. Pressing this link will grab a fresh version of the RSS feed and refresh the Widget with new content.

Top N Widget

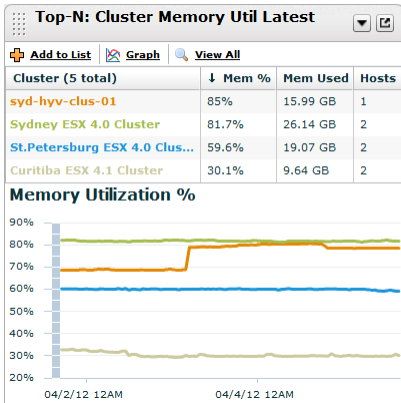
Top N Widgets are a very powerful way to see a short list of virtual entities (VMs, hosts, clusters, datastores, or applications) that are utilizing more resources than their counterparts. There are two types of Top N Widgets: those that contain a graph, and those that do not. Those without graphs look something like this and provide more real estate for more results.

Top-N: VMs CPU Ready Latest

[Add to List](#) [Graph](#) [View All](#)

VM (18)	↓ CPU Ready	CPU Used	CPU	Limit	Cluster
bas-2...	99.9%	0.14%	1	1000	
tok-2k...	8.4%	7.1%	1	-1000	
VMAN ...	4.2%	4.8%	4	-1000	
tok-xp...	3.1%	63.8%	1	45.35	
tok-2k...	2.2%	5%	2	-1000	
tok-xp...	1.9%	77%	1	-1000	
tok-xp...	1.5%	65.7%	1	-1000	
bas-x...	1.4%	1.6%	1	-1000	
bas-x...	1.4%	1.6%	1	-1000	
bas-2...	1.4%	4.2%	1	-1000	
tok-xp...	1.3%	65.8%	1	-1000	
simdk	1.3%	1.7%	1	-1000	
bas-vi...	1.2%	4.1%	2	-1000	
tok-xp...	1.2%	66.4%	1	-1000	

Those with graphs show you both the value of the resource consumed and a historical chart of that resource consumption over time.



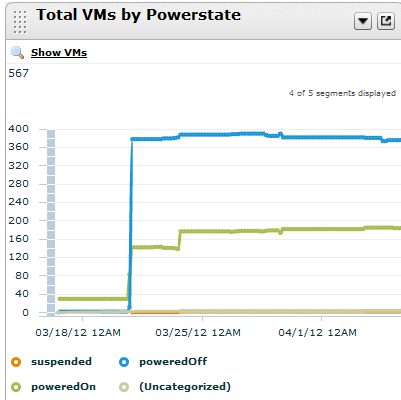
To configure a Top N Widget, click the blue plus (+) Widget at the end of every Dashboard to add the Widget manually. In this process, you will be prompted to select the Type of entity to display also for the Search Query used to get those items. This lets you see all or just a subsection of your virtual environment. You can enter the search query manually or load a saved query using the "Load query (optional)..." link. Next, select you may "Pick a sort field..." that will prompt you to pick a field that determines how the results are ordered in your Top N Widget (ascending or descending). Finally, you may optionally select to include a graph with the Top N results by pressing the "Overlay Graph (optional)..." link. This will show you all the graphs available to display in the Widget.

The custom controls for a Top N Widget are the ability to add the virtual entities to the active List, to view the items in the performance analyzer, and to run the search in the search results view. The "Graph" link will open the entities in the Performance Analyzer to give you a full screen view of the entities and their resource consumption over time.

Trend Widget

Trend Widgets allow you to embed a historical trend graphs or a multi-trend table into a Dashboard.

Historical trend graphs look like this:



Multi-trend tables provide a tabular view of trend data:

Segment	Average datastore	Average host mem
(All)	2.5	50.1%

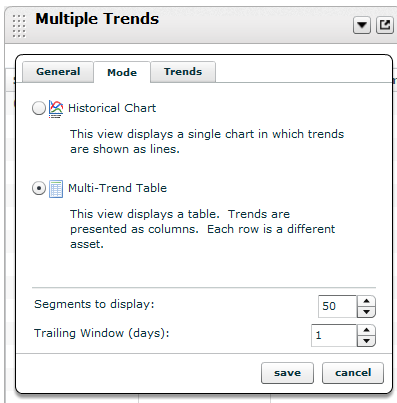
The easiest way to create a new Facet Historical Chart Widget is to find the Trend in the Business Views section of SolarWinds Virtualization Manager. Once are viewing the Trend, you may then click the "Add Widget" button in the top right of the screen to save the Trend as a Widget. You will be prompted to pick the Dashboard in which that Widget will reside and click Save.

You may also click the blue plus (+) Widget at the end of every Dashboard to add the Widget manually.

Under the “Mode” tab, select **Historical Chart** or **Multi-Trend Table** to determine the widget type.

- Segments to display – the maximum number of items to identify in the chart or table.
- Trailing Window (days) – the amount of history to show on the historical chart.

Under the “Trends” tab, click **Add Trend** to add one or more trends. You can filter the list of trends by tag, ownership, or by a search term.



For Historical Charts, you can choose to "View" the Trend in detail. This will launch into the Trends of Business Views and show you a full screen version of the Trend.

Custom Widgets

Widgets can be customized from existing widget types. Some widgets can be customized directly from the widget, such as the RSS Feed Widget, and some widgets need a custom search query, such as the Top N Widget.

For widgets that do not rely on a modifiable query, simply add the widget and use the Edit control to make any necessary changes.

For widgets that do rely on a selectable query, first create the query. You can save the query, create a trend from the query, or do both. When customizing the widget, you can then select the custom query or the custom trend.

Portal Integration

Widgets can be viewed outside of the SolarWinds Virtualization Manager application.

To obtain the URL to embed or link to a widget, right-click a widget and then click **Get Widget URL**.

Clicking this option provides a direct URL to a read-only view of the widget as well as HTML source code to embed the widget in another web page. Note that this URL is good for the specific widget spot, not necessarily that specific widget. For example, if you get the URL for the first widget, which could be a Top-N widget, and then you later put a Trend widget in the first spot, the URL will show the Trend widget.

When embedding widgets in other HTML pages, be sure to provide at least 354px width. Failure to do so may result in scrollbars placed over the widget



If you are working on localhost, the URL you receive will also be from localhost, which of course will not be accessible from the outside. You'll want to replace localhost with the real server hostname or IP address.

SolarWinds Orion

SolarWinds Virtualization Manager can easily integrate with SolarWinds Orion by embedding a widget on the Network Summary Home.

1. In Virtualization Manager, click the **Copy Widget Link** button above the widget.
2. Copy the HTML code.
3. Open Orion and navigate to **Settings > Manage Views**.
4. On the Network Summary Home, select **Edit**.
5. Under Miscellaneous select Custom HTML and click **Submit**.
6. Click **Edit** on the Custom HTML widget.
7. Paste the html code copied from Virtualization Manager.
8. Click **Submit**.

OpenSocial Portals

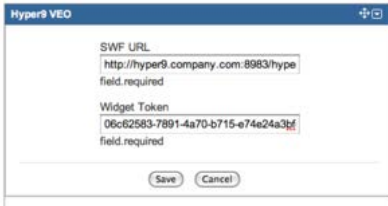
Google's OpenSocial dashboard standard is a common way to share gadgets. SolarWinds Virtualization Manager's widgets can be displayed inside of an OpenSocial Gadget. This example uses Atlassian's JIRA project.

1. You'll first need to add the gadget to your directory of gadgets.
2. In JIRA we click the **Add Gadget** button at the top of any Dashboard.
3. From there click the **Add Gadget to Directory**

It now asks for your gadget URL. The gadget is hosted on your SolarWinds Virtualization Manager server, so for the URL use `http://your-server:8983/hyper9/gadget.xml`

Now the SolarWinds Virtualization Manager gadget is ready to be used on your OpenSocial compliant dashboard. In JIRA you simply click the **Add it Now** button to place an empty gadget on your dashboard and follow the steps below to configure.

1. Click the edit button at the top of the widget
2. The configuration of this gadget requires two fields
 - **SWF URL** - This field is where the gadget should look for the flash movie. Use the Widget URL retrieved from the widget right-click action, but remove everything after the `AppContainer.swf`. For example, `http://hyper9.company.com:8983/hyper9/AppContainer.swf`
 - **Widget Token** - This field is for the unique token for the widget. This is the last section of the Widget URL after the `=` symbol



3. Click the save button to display the gadget

The result is a SolarWinds Virtualization Manager widget inside of an OpenSocial Portal.

Microsoft SharePoint

Microsoft SharePoint restricts flash content that can be placed into a generic HTML page editor. Follow these directions to add the widget flash movie to your SharePoint page as a Web Part. These directions were constructed using SharePoint 2010, but they also apply loosely to SharePoint 2007 in the sense that you'll want to edit the HTML source of a Content Editor Web Part.

1. Open the page in SharePoint that you will be editing.
2. Once open, go to **Site Actions > Edit Page**.
3. Under **Editing Tools** at the top of the screen click **Insert**
4. From the **Insert** menu select **Web Part**.
5. Select **Media and Content** and add a **Content Editor** type to your page.
6. Now that the **Content Editor** part is on your page, highlight it and then click **Format Text** under the **Editing Tools** header.
7. Select **HTML>Edit HTML Source**.
8. Then use the embeddable HTML source code from the **Get Widget URL** popup shown above to embed your widget in your SharePoint page as a Web Part.

Chapter 5

Business Views

Business Views provide graphical representations of virtual infrastructure trends, historical performance, and make-up. They are named Business Views because they give a high level overview of the current performance and composition of your data center such that you can make business decisions about capacity planning, chargeback, and system security. Business Views have two aspects which are discussed on their respective pages.

- Trends - 
- Data Center Visualizer - 

You can reach the Business Views by clicking the Reporting tab and then clicking Business Views at the top of the SolarWinds Virtualization Manager application.

Note: The Historical Performance Analyzer Charts are no longer a section of the Business Views. You can now see Performance charts from anywhere by clicking **Add to Chart** when you have one or more selected objects.

Trends

Data centers undergo constant change and SolarWinds Virtualization Manager constantly collects and monitors configuration and performance data over time. The Global Trends aspect lets you see high level changes of your environment over time. Upon installation the SolarWinds Virtualization Manager system begins tracking over 70 Trends that ship with the product. By default, each Trend runs a Search every four hours and records the result. The result may be a count of the number of results returned, or a value based on data within each search result.

You may get to the Global Trends aspect by clicking on the line chart icon in the top left corner of the Business Views.

You may change the default four hour interval to run more or less often, but usually this value should be the same as the configuration collection interval because most Trends are based on configuration data. This may be done in the Administration UI in the System Properties screen.

Trend Operations

In the top right corner of the Trend screen, there are links to perform other operations with the currently loaded Trend.

- **Add Widget** - Creates a Widget view of this trend (showing a maximum of four segment lines) on a Dashboard of your choice.
- **Save Report** - Generates an Excel spreadsheet that contains all data points for all segments in the current view of this Trend.
- **Search** - Executes the search that powers this Trend and shows the results on the Search page.
- **Configure** - Allows you to edit this Trend. Detailed configuration options are described in the "Creating a Trend" section.

In addition to the Trends that ship out of the box, customers may create their own Trends. To create a Trend, perform a Search of your choice. Once you have found the search that contains the data you wish to Trend, click the "Trend Results" button at the top of the Search. This will take you to the Trend creation screen.

Creating Trends

The query that you used is pre-populated along with the type of entity that your search targeted. Like Saved Searches and Reports, Trends are content that live in your Content Manager.

If you wish to simply trend the number of search results over time, you should select "Search result count" in the Base Trend On section.

If you wish to pull data out of each search result instead of just using the count of search results, you have two options. The first is to select the Attribute radio button in the "Base Trend On." This will give you a text box to type the name of the attribute you seek. The type-ahead function should present options based on what you have typed so far. You may also hit the Find button to see an entire list of properties to pull out of a search result and select one from there. To reset the Attribute, hit the Clear button.

Within the Attribute text box, you also have the option to use XPath. This requires familiarity with the SolarWinds Virtualization Manager configuration model, but provides a powerful way to do math operations on multiple values to return the attribute value. Whether you use XPath or just select an attribute, remember to select the Units for the values that you are pulling out.

Regardless of how you extract values from the search results, you must choose an aggregation function. This tells the system whether to count the number of values, total (sum) the values, or get an average of the values. More aggregation functions will be added over time into the SolarWinds Virtualization Manager system.

Finally, you may wish to have a Trend with multiple lines that are segmented by some attribute. For instance, you may wish to see the total disk space used for each operating system. To do so, you would create a segmentation for operating system so that you see one Trend line per segmenting value. Just like using Attribute radio button, you may type in the Segmentation text box to create the segmentation value. Each unique value in the Segmentation field will result in a different line in the Trend.

Click the Preview button at the bottom of the screen to get a set of values that would be saved as Trend values if you ran this Trend right now. This feature is a sanity check so that you can see what values would be saved to ensure they are correct before setting the Trend to run periodically in perpetuity. Once your Preview shows that the Trend is setup correctly, click the Save button to persist the Trend and begin tracking data center changes moving forward. The Save or Save As buttons will prompt you to supply a name and optional description for the Trend.

Data Center Visualizer

Some properties of the items in the virtual infrastructure have a finite number of available options for the values. SolarWinds Virtualization Manager calls these Facets. The Data Center Visualizer allows you to see pie chart breakdowns of your inventory according to these Facets. You may get to the Data Center Visualizer by clicking on the pie chart icon in the Reporting tab under Business Views.

The Data Center Visualizer comes up with a pie chart pre-selected for the `vm.host.hostname` property so you can see how the data center breaks down by hosts. At any point, you can select a different property to view as a facet. To do this, navigate the Facets list on the left to select a property. You may need to open the list by clicking on "Facets" under Configuration Explorer. You will immediately see a new pie chart that shows all the unique values for that property in the SolarWinds Virtualization Manager system. You can mouse over each pie piece to see the value for that pie piece and the count of entities that make up the pie piece. You may also check the "Search" button to bring these items up as search results. This lets you quickly get a breakdown of your data center and a quick glimpse into what entities make up each segment.

After clicking on a pie piece, new controls become available in the top left corner to "Sort Selected Facet By". These controls hold all Custom Labels that you have defined in the SolarWinds Virtualization Manager system. This will let you see how an individual pie piece breaks down according to a Custom Label. As an example, let's assume that you have a Custom Label for each department. You may click on a pie piece in the `vm.host.hostname` facet and then select the "Department" custom field in the top left controls and hit apply. You will see which departments have VMs on the host that you selected in the pie chart. You may slice any facet further by Custom Label. Once done with the custom label, click the "Clear" button in the top left to return to the pie chart for the facet alone.

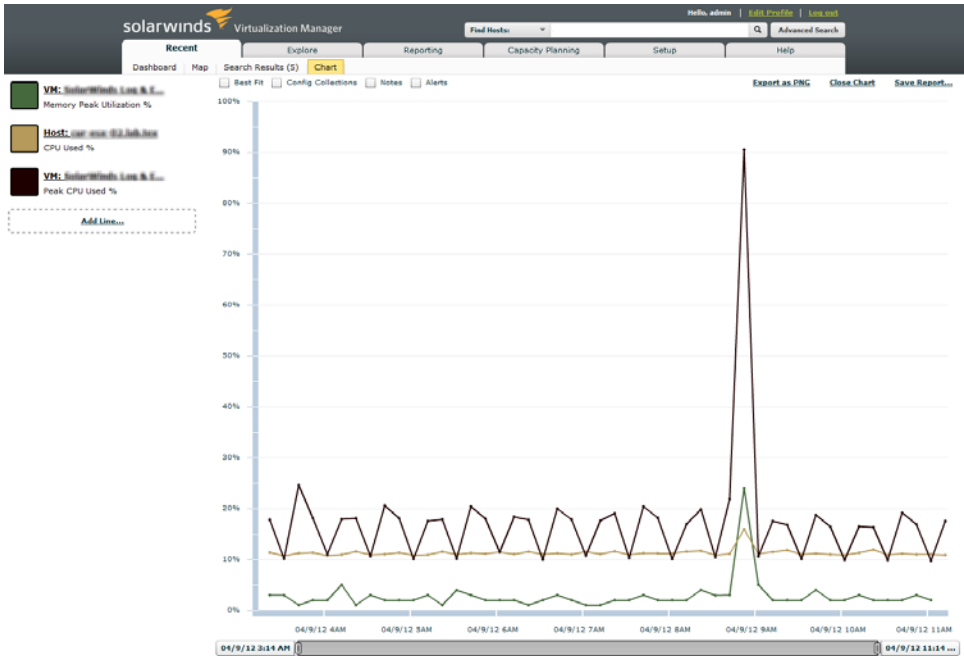
Once you have created a new visualization of your data center, you may click the "Add Widget" button in the top right to save it to one or more of your Dashboards.

Historical Performance Analyzer Charts

SolarWinds Virtualization Manager collects performance data frequently and stores that data over time. The result is that all performance data can be visualized over time. A subset of the data available to graph includes:

- CPU Ready
- CPU Utilization %
- CPU Wait
- IOPs (Input/Output per second)
- Memory Active
- Memory Ballooning
- Memory Consumed
- Memory Swap In
- Memory Swap Out
- Memory Swap Used
- Memory Utilization %
- Network Bandwidth
- Network Packets Rx
- Network Packets Tx



To view data for any object, select one or more objects and then click **Add to Chart**. This will take you directly to the performance chart.

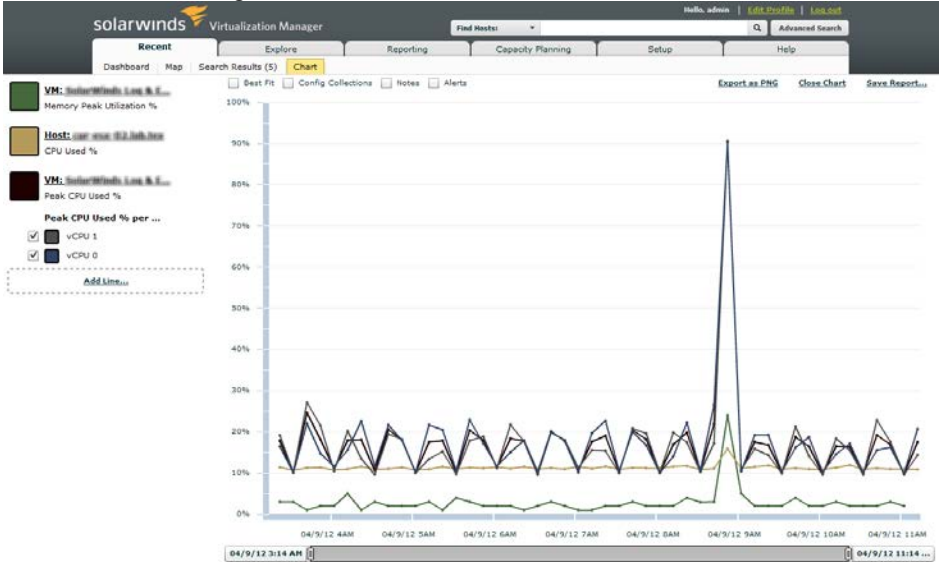



To add additional lines for comparison, click **Add Line** at the leftmost portion of the Performance Analyzer. This will give you a dialogue to add more lines.

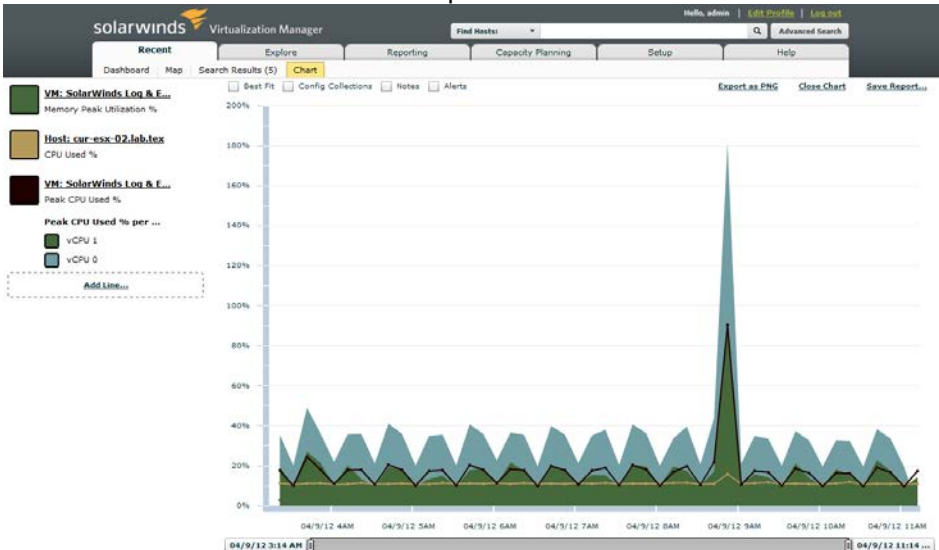
To change the time frame for this view of performance details, click the start and end dates at the bottom of the Performance Analyzer.

Graphed objects may have additional graph controls:

-  - Click this control to open a dialog box to add lines from this VM, its parent cluster, its parent host, or related datastores.
-  - Click this control to view the individual components values that determine the overall value of this line. For example, viewing the component values for CPU usage reveals the individual vCPU cores.



-  - Click this control to view the component values as a stacked chart.



Capacity Planning

All lines on the performance charts will include an optional "Best Fit" line that shows a flat line which best fits the points for that metric. To see the Best Fit line, select the **Best Fit** check box at the top of the chart.

The best fit line is based on a classic least squares linear regression calculation of the data points. It is only meaningful if there is an underlying long term trend in resource utilization. For some resources (disk space) this is almost inevitable. For others (CPU, for example) it only applies if the externally applied system load is driving a trend in the data set. The calculation is done on the data range selected in the graph. You may mouse over the line to see the following values:

- "gradient" is the slope of the line -> rate of growth of the performance metric / trend
- "r2" is the r-squared coefficient of determination
 - The range of possible values is 0.0 to 1.0. Higher values means the data better fits a straight line projection with growth over time.
 - Do not lend too much weight to it if there are only a handful of data points (e.g. with only 2 points, it's meaningless, and always comes out to a perfect 1.0)
 - A low value of r2 indicates either (i) a lot of variability in the data, or (ii) the data doesn't really change with time -> either of these cases means extrapolating a "drop dead" date on the resource is invalid

For capacity planning, any metric that is a percentage of total resources, this best fit line will also include an estimate for when that value will reach 100%. This gives you a predictive analysis of how your resources are trending over time and will give you a clue about when to insert more resources.

Overlays

At the top of the performance analyzer chart are other checkboxes that control data that can be overlaid on top of the time line in context of the lines being displayed.



- **Config Collections** – displays an overlay of the configuration collection times
- **Notes** – displays an overlay of notes
- **Alerts** – displays a historical overlay of alert notifications

Overloaded Hosts

In general, the best indicator of an overloaded datastore is the latency, or response time, of read/write requests to the datastore. Outside of the storage dashboard and alerts, you can determine when datastores will be overloaded based on your current performance. After adding your datastores to the chart, select a device latency graph or line to see which datastores are experiencing the highest response time. You can also plot IOPs for the datastore and the corresponding VMs to find the top culprit VMs generating the most IO.

Chapter 6

Search

SolarWinds Virtualization Manager is creating a new paradigm in virtual infrastructure management. A cornerstone of this paradigm is the Search Service that forms the foundation of the SolarWinds Virtualization Manager product line. This search engine has been specifically tailored to handle the challenges posed by searching large, in-depth, unstructured information sets such as the data created from an operational virtualized environment. Search capabilities within SolarWinds Virtualization Manager allow virtual infrastructure administrators to query for any item(s) of interest within the entire scope of the virtualized environment. This includes both performance and configuration details on the vCenters, clusters, datastores, hosts, Virtual Machines, and applications.

As you have seen in the Installation and the Configuration sections, the installation and configuration process has facilitated the establishment of a data collection process for the defined Virtual Center servers and unmanaged hosts. This process leverages the vendor supplied APIs to access all available data provided for these objects. In addition, a discovery process enumerates and explores the configurations for the Virtual Machines, Hosts, Datastores, and Clusters. Performing Windows Management Instrumentation (WMI) interrogation of the VMs and SSH interrogation of the VMware hosts augments this data set. This entire process of data collection is repeated at periodic intervals. The end result is a data repository that accurately represents the configuration, state, performance, and utilization of the virtual infrastructure. It is this data “richness” that is interrogated by the SolarWinds Virtualization Manager Search Service, and it is this breadth of data that is available for analysis by the Virtual Infrastructure Administrator.

Many of the items on your Dashboard will perform a search and show results on the search page. The query for the search is pre-populated in the search bar. Many times, you can edit this search to modify the results. However, you can also perform searches from scratch which will be addressed below.

Starting a Search

The search process begins with the Search link at the top of the SolarWinds Virtualization Manager user interface.

The screenshot shows a simple query, "*", executed within the SolarWinds Virtualization Manager user interface to search for all hosts. This is the primary interface for virtual infrastructure administration. This interface is divided into several sections. The top portion of the interface is dedicated to the search bar. The user must input the query into the search bar, select the appropriate class of objects to query upon, and press the Enter key or the Search button to execute the query. SolarWinds Virtualization Manager currently supports searching on VMs, Hosts, Datastores, Clusters, and Applications. The drop down selection next to the search bar dictates what type of objects will be returned by the search.

Any executed query can be saved as a Saved Search by selecting the Save Search button on the main interface page. After selecting this button, a dialog displays to allow the user to enter in the name, description, and permissions for the currently executed search. The name is a brief name to refer to the search, the description is a detailed description of the search, and permissions are a way to specify the sharing of the search query with other SolarWinds Virtualization Manager users.

Permissions include:

Private – Only the user saving the search query has access.

World Writable – All users can view and modify the query

World Readable – all users can view the query

To execute any saved search, click the Load button in the bottom right corner of the main interface page. Any saved queries in the user's private folders will be shown as the default. Specific tags can be used to trim down the list of saved queries. Select the tags via check boxes at the left of the dialog. Once the desired tag is selected, the search can be executed using the OK button.

Search Details

Any search result may be clicked to open the "Search Details" page. For each type of search result the details differ, but there are important details to help you understand this item's importance to the virtual environment.

The left column displays the item's vital performance metrics and alerts about its performance. You may click on alerts to see the details of the alert. The icon indicates its importance (red=bad, yellow=warning, green=good).

The right column displays the relationships of this item to the virtual infrastructure. Clicking on any of these items will open that item on the search details page.

Search Result Actions

The check boxes next to search results may be selected to show actions available to execute upon those search results.

The action buttons will launch into a new module of SolarWinds Virtualization Manager with the selected search results in context. The possible actions are:

- Add to List - Add the search results to the Active List.
- Add Note - Place a custom note on the selected search results.
- Add to App - Group the VM search results together into an application. (Available only to VM search results.)
- Plan - Create a capacity plan with using the selected search results.
- Add to Chart - Open the Performance Analyzer with the selected search results in context to view graphs of performance metrics over time.
- Label - Add or edit Labels on the selected search results.
- Map - View a dependency map of the virtual infrastructure with the selected search results in context.
- Export - Perform data export to create a spreadsheet containing details about properties on the selected search results.
- View Notes - View any custom notes on any of the selected search results.
- Compare - Perform a DNA comparison between one or two selected search results.

Note: These actions will only display when one or more search results have been selected.

Search Query Actions

From the Search screen, the search query may be used to power other areas of SolarWinds Virtualization Manager. Usually, the search query is entered in the search bar and run via the "Search" button. Once you have found a query that you want to use as the basis for other activities (trends, alerts, data export, performance charts), select an action.

Possible search queries actions include:

- Trend Results - Create a new Trend based on this search query.

- **Create Alert** - Create a new Alert based on this search query.
- **Export Results** - Create a spreadsheet of properties from these search results in the Data Export module.
- **Plan** - Create a capacity plan from the search results.
- **Explore Facets** - Open the Data Center Visualizer with the search results from this query in context.

Search Language

The SolarWinds Virtualization Manager search language is a powerful search syntax that allows the Virtual Infrastructure Administrator to create multi-clause, proper-name, instance-based search queries. Queries are composed of terms and operators. A term can be a single term or a phrase. A single term is a single word such as “windows” or “west”. A phrase is a group of words surrounded by quotes such as “windows west”. Multiple terms can be combined together with Boolean operators to form more complex queries. If there are multiple terms, they are implicitly joined together with AND clauses meaning that all clauses must be true for search results.

Other advanced search syntax includes:

- Wildcards (* or ?) can be associated to any term
- Fuzzy searches are supported as well by appending the tilde (~) onto any term
- Proximity searches
- Range queries
- Boosting Term Relevance

Examples

Currently, SolarWinds Virtualization Manager supports searching on virtual machines, hosts, datastores, clusters, and applications. This language is described below and query examples are given in the table below. The examples below are for virtual machines, but the language is the same for other types of entities.

Search Query	Result(s)
*	A listing of all virtual machines in the <i>SolarWinds Virtualization Manager</i> data repository
"vm.name:rcarecords-2-test"	Returns all VMs named <i>rcarecords-2-test</i>

Search Query	Result(s)
rca*	Returns all VMs with any data containing the a word starting with <i>rca</i>
rcarecords-?-test	Returns VMs named <i>rcarecords-X-test</i> where X can be any character
rcarecords~	Returns VMs with any data containing strings similar to <i>rcarecords</i> .
vm.environmentFor.diskVolume.freeSpace:[0 TO 10000000]	All VMs whose disk volumes have 0 to 1000000 bytes free space not including 0 or 1000000.
"Microsoft Windows"^4 "Server 2003"	All VMs with <i>Microsoft Windows</i> and <i>Server 2003</i> in the OS details where <i>Microsoft Windows</i> is 4 times as relevant as <i>Server 2003</i>
Server OR Workstation	Any VMs with any data containing string <i>Server</i> or <i>Workstation</i>
Server AND Mail	Any VMs with any data containing string <i>Server</i> and <i>Mail</i>
+Mail Server	Any VM with any data that must contain the string <i>Mail</i> but may also contain the string <i>Server</i>
Mail NOT Server	Any VM with any data that may contain the string <i>Mail</i> but may not contain the string <i>Server</i>
-Mail Server	Any VM with any data that must not contain the string <i>Mail</i> but may contain the string <i>Server</i>
(Mail OR Web) AND Server	Any VM with any data that may contain the string <i>Mail</i> or <i>Web</i> in combination with the string <i>Server</i>

Named Fields

Named fields provide a mechanism to search over the specific attributes associated with virtual machines, hosts, datastores, clusters and applications. As such, named fields operate as Facets do by adding attribute filters to the search language. Named fields are entered by specifying the exact property to target in the search. Searches for named fields use the following syntax:

```
CI_TYPE.PROPERTY.SUB_PROPERTY:VALUE
```

CI_TYPE may be one of the following:

- vm = Virtual Machine
- host = Host Server

- cluster = Cluster
- datastore = Datastore

Not all properties have a sub-property, so many named field searches will simply be `CI_TYPE.PROPERTY:VALUE`.

Below are a few examples of search syntax.

```
vm.cpuCount:2 AND vm.memory:1024
```

In the preceding example, the query shown searches for all virtual machines with two (2) CPUs and 1024 MBs of memory as configured. The usage of MBs as the unit of measure for the memory field is specific to the named field implementation. More complex named field structures are available and based on “dot” notation hierarchies as show in the following example:

```
vm.environmentFor.networkAdapters.defaultGateway.ipv4Address:172.16.115.1
```

The query above searches for virtual machines whose network adapter’s default gateway is set to 172.16.115.1. Furthermore, named fields can be composed of query sub-clauses and any other additional search language features as shown below:

```
vm.cpuCount:2 AND vm.memory:(1024 OR 2048)
```

In the preceding example, the query shown searches for all virtual machines with two (2) CPUs and 1024 or 2048 MBs of memory as configured. If a named field value has special characters, it must be enclosed in quotes. For example, a query such as

```
vm.environmentFor.diskVolume.label:Hard Disk 1
```

returns disk drives that are labeled “Hard” not “Hard Disk 1”. The correct version of the query above is

```
vm.environmentFor.diskVolume.label:"Hard Disk 1"
```

A table showing an abbreviated list of fields and their description, including associated unit of measure, is shown below.

Named Field (w/o “vm.” Qualifier)	Description
cpuCount	Number of vCPUs configured
diskDrives.capacity	Capacity of configured virtual disk in MBs
diskDrives.label	Name of configured virtual disk
environmentFor.cpus.description	Description of CPU

Every alert is analyzed as new data is collected and enters the SolarWinds Virtualization Manager system. If you define the scope of an alert to evaluate on performance data, the evaluations happen every time new performance data comes in (5 minutes by default). If you define the alert to evaluate on configuration data, the evaluation happens every time new configuration data enters the system (4 hours by default). While it may seem more granular to set all alerts to evaluate on performance data, many alerts only consider configuration data in their evaluations which will not change as frequently as performance data. Instead, set the "Evaluate on" scope of the alert to match the data (configuration or performance) that is being analyzed.

Criteria

Alerts use criteria to evaluate data in the results of a search query (defined in the scope). The criteria includes:

- Base Alert on - The basis of the alert (either Search Result Count or Attributes within the search results)
- Triggers on - Rules used to evaluate the basis of the alert

Search Result Count

Many alerts have most of the logic built into the query. This means that the alert only needs to evaluate the alert based on the set of results returned from the query. For these types of alerts, you should "Base Alert on" the "Search result count."

If the query is written such that any results should fire the result, the "Triggers on" section should be set to "Any."

If the purpose of the alert is to fire when the search results change from the last time the alert was evaluated, the "Triggers on" section should be set to "Changed."

If the purpose of the alert is to fire when the number of search results is outside of a specified range, the "Triggers on" sections should be set to "Range" and you can define the range in the "Less Than" and "Greater Than" fields.

Because virtual environments are dynamic, you may wish to only fire an alert if a condition has been met for a sustained period of time. For example, you may not want to immediately fire an alert the first time that a single search result is returned, but only fire it if the search result is returned over a 10 minute span. In this case, set the "Sustained Minutes" attribute in the "Triggers on" section to the number of minutes in the span. Because alerts are only evaluated when new data (configuration or performance) enter the system, the "Sustained Minutes" should be set to a period that coincides with the collection period for that type of data. (By default, performance data is collected every 5 minutes and configuration data is collected every 4 hours or 240 minutes.) You should refer to the settings for "Evaluate on" in the Scope of the alert to remember whether the alert is evaluated on a performance collection schedule or a configuration collection schedule.

Attributes

Some alerts are based on the attributes of the search results instead of the number of search results. This means that the alert must pluck properties from the search results and evaluate the value of that property. For these types of alerts, you should "Base Alert on" an "Attribute."

When the alert is based on an attribute, you first must select which attribute you wish to evaluate. You can use the "Find" button to see a full list of attributes available for evaluation. This list is based on the type of object your search returns (VMs are different than hosts, etc.).

Many times alerts must do some math on the properties. For such cases, the Attribute field can utilize XPATH. In most cases, this is used to create an average of multi-value properties. For example, if you wish to get the average hourly CPU utilization of all VMs in a cluster, you could enter this in the Attribute field:

```
avg(/cluster/virtualMachine/cpuMhzAvgUtilization/hour)
```

Or to get the cluster storage utilization, you could enter this in the Attribute field:

```
(sum(/cluster/datastore/freeSpace) div
sum(/cluster/datastore/capacity)) * 100
```

Once you define the Attribute to evaluate, you must select the unit of measure for that attribute. Because SolarWinds Virtualization Manager allows XPATH functions, it cannot automatically determine the correct unit.

The Aggregation Function allows you to perform operations across search results. The options for Aggregation Functions are:

- Average
- Sum
- Total

Having defined the attribute to evaluate, the final step in the Alert Criteria is to set the rules used in evaluation in the "Triggers on" section. There are three options

- Any - Alert should fire if any attribute is returned
- Changed - The alert should fire when the value of the attribute changes
- Range - The alert should fire when the value of the attribute is outside of a specified range

When the "Triggers on" section is set to "Range," there are a number of other options that appear. The first defines the range of values for which the alert should fire via the "Less Than" and "Greater Than" fields. (It is important to remember that the alert will fire when the value is IN the range, not OUTSIDE of the range.)

The second option defines whether to fire the alert based on the attribute value of each search result or the total value across search results as defined in the Aggregation Function.

Because virtual environments are dynamic, you may wish to only fire an alert if the criteria has been met for a sustained period of time. For example, you may not want to immediately fire an alert the first a VM is seen with CPU utilization over 90%, but only fire it if the high CPU utilization is sustained over 10 minute span. In this case, set the "Sustained Minutes" attribute in the "Triggers on" section to the number of minutes in the span. Because alerts are only evaluated when new data (configuration or performance) enter the system, the "Sustained Minutes" should be set to a period that coincides with the collection period for that type of data. (By default, performance data is collected every 5 minutes and configuration data is collected every 4 hours or 240 minutes.) You should refer to the settings for "Evaluate on" in the Scope of the alert to remember whether the alert is evaluated on a performance collection schedule or a configuration collection schedule.

Notifications

An alert should be configured to fire a notification when it is lowered or raised.

The first option on the Notifications tab dictates whether to send alerts if they fire repeatedly. Based on your company's policies, you may wish to receive notification of an alert every time it fires or just once until its status changes. If you wish to receive the notification every time the alert fires, select the "Notify on consecutive events" check box. Otherwise, select "Notify only when raised," and SolarWinds Virtualization Manager will only send one notification until the alert status changes.

Most users wish to receive an alert via email. The Notifications tab allows you to specify which email addresses should receive the alert. Simply enter the email addresses separated by a comma in the "Email To" text box.

Note: Your SolarWinds Virtualization Manager installation must be configured for SMTP before your alert can send email notifications when it is raised or lowered. Instructions to configure SMTP can be found in the Advanced Configuration Guide.

Actions

When an alert fires, it can invoke an external action that can automatically fix a situation or file a trouble ticket into a ticketing system. External actions are programs or command executions that are simply defined by an XML manifest file. In the Notifications tab of alert configuration, you may use the "Pick an Action" to select an action to invoke when the event fires. You can also use the "Remove the Action" button to remove actions currently associated with an alert.

Example Action

If you do not see any available actions, you can follow the sample action below to get started.

Below is an example manifest. To use this example, you'll want to save this manifest file to your server's `data/content/externalActions` folder and name it `logAlert.manifest`. After it is saved, click the 'Reload' button on the alert configuration popup for choosing an action.

```
<?xml version="1.0" encoding="UTF-8"?>
<manifest xmlns="http://www.hyper9.com/ws"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <enabled>true</enabled>
  <type>ALERT</type>
  <uniqueId>alert-test</uniqueId>
  <name>Log Alert Summary</name>
  <description>Logs a summary of this alert's firing details to
a file</description>
```

```

<command>perl</command>
<command>${MANIFEST_HOME}/logAlert.pl</command>
<argumentPrefix>-</argumentPrefix>
<successCode>0</successCode>
<!-- Optionally specify the directory to start from -->
<!--<workingDirectory></workingDirectory>-->
</manifest>

```

For this example, we have customized a script to run as the command, called `logAlert.pl`. Notice there are two command elements. Use a new element for every time you have whitespace in your arguments.

Save the following code in the same `data/content/externalActions` folder as `logAlert.pl`. Since it is saved in the same folder as the manifest, we use the `MANIFEST_HOME` variable in the manifest above to describe its path.

```

#!/usr/bin/perl
# Author: Ryan Kruse
#
# Description: Designed to be called through the Hyper9 external
actions framework,
# this script simply uses the SOAP API to retrieve an Alert and
log its values to a file
#
use strict;
use Hyper9::Client;
use Getopt::Long;

my $timestamp;
my $alertId;
my $loginToken;

get_args();

my $client = Hyper9::Client->new( host => 'localhost:8983', );
#$client->{services_path} = '/single-vm';
$client->loginWithToken( username => 'admin', token =>
$loginToken, ) || die "Login failed\n\n";
my $alert = $client->getWorkspaceAsset(assetId=>$alertId);
$client->logout();

my $status = ($alert->{raised} eq 'true') ? "RAISED" : "LOWERED";
open( LOG, ">>logAlert.log" );
print LOG $timestamp."\t".$alert->{name}."\t$status\t".$alert-
>{value}."\n";
close(LOG);

```

```

sub get_args
{
    my $help;
    GetOptions(
        "timestamp:i" => \$timestamp,
        "alertId:s"   => \$alertId,
        "loginToken:s" => \$loginToken,
        "help"        => \$help,
        "h"           => \$help,
    );

    usage() if ( $help || !($alertId) );
}

sub usage
{
    print STDERR << "EOF";

    usage: $0 -timestamp=1271186678 -alertId=404cb4f0-4732-11df-
9879-0800200c9a66 -loginToken=62b796e0-4732-11df-9879-0800200c9a66

        -timestamp : seconds since epoch
        -alertId    : hyper9 ID of the alert
        -loginToken : a token that can be used to login to the hyper9
web service

EOF
    exit;
}

```

All commands are passed these arguments

- **timestamp** - the timestamp of the alert firing instance. This can be used to retrieve more details of this alert firing.
- **alertId** - the ID of the alert. This can be used to retrieve more details of the alert.
- **loginToken** - a short lived one time use token that can be used to login to the Hyper9 web service (see script below)

The script above uses the Perl Client (Hyper9::Client) module, so you'll need to download that from the additional components page of your SolarWinds Customer Portal before you can run the action. Make sure it is installed somewhere in your Perl path. For more information, see "PERL SDK" on page 157.

Consult your system WSDL (<http://your-server:8983/swvm/hyper9.wsdl>) for information on all you can do through the SOAP web services.

SNMP Settings

Many customers use an external monitoring tool to view all system alerts. SolarWinds Virtualization Manager integrates with these systems by sending SNMP traps. SNMP traps will automatically be sent for every alert if your system is configured for at least one trap receiver. For more information, see "SNMP Configuration" on page 56.

If you do not want all alerts to utilize the same OIDs, then you can specify a different OID per alert on the "Advanced" tab of the Alert definition. Each SNMP alert will always be prefixed by the SolarWinds Virtualization Manager enterprise OID.

Accessing Historical Alert Information

You can access historical alert information in the Explore module by using the Map's Time Travel tool, viewing the resource details, or by viewing alert details.

If you wish to use the Time Travel tool, select a resource in the Map and place it in context. Time Travel information is only available when a single item is in context. Click the calendar controls to navigate. Items icons will change color based on whether an alert was raised and the severity of the alert is. You can mouse over items to view which alerts were raised during the selected time period.

If you wish to view alert information for a specific resource, search for the resource and open the detailed view by clicking the name of the resource. You can view the latest active alerts in the detailed view. If you click on an alert, you can view the history of the alert.

If you wish to view the alert's history, search for the alert in the Content area and open the alert. You can see which resources have the alert raised and which resources in the past have had the alert raised.

Chapter 8

Capacity Planning

SolarWinds Virtualization Manager includes a deep capacity planning module to allow administrators and managers see when their current virtual infrastructure will run out of resources, plan to add new VMs into their current infrastructure, and examine how new hardware will increase the capacity of their virtual infrastructure.

The sections in this topic discuss the following:

- Planning Basics
- When Will I Run Out?
- How Much More Can I Add?
- What If I Add More Resources?
- Advanced Options
- Showing the Calculations and Variables

Planning Basics

Capacity Planning is driven by a supply side and a demand side. The supply side is a Resource Container and defines the computing resources available in one or more hosts or all the hosts in one or more clusters. In the capacity planning module, the Resource Container is in the upper left quadrant. The demand side is called a Resource Profile and it defines the set of VMs that utilize the computing resources. It is in the upper right quadrant. The bottom portion is for results from the capacity planning analysis.

- Resource Containers
- Usage Profiles

Resource Containers

A Resource Container is simply a group of hosts that provide computing resources. The primary resources that are considered are CPU, memory, and disk space. You may define a Resource Container by searching for hosts, selecting one or more results, and clicking the Plan button in the top right corner of the search results page to enter the capacity planning module. The Resource Container will be in the top left quadrant of the capacity planning module.

At the bottom right of the screen to edit the Resource Container, four links allow you to get different views of the capacity plan. First, the "Summary" link will take you back to the summary page where an overview of the Resource Container, Usage Profile, and calculated capacity results are present. If you are missing calculated results, click the "Calculate" button in the top right corner of the Capacity Planning Module.

The "Capacity" link opens utilization graphs that show actual consumed capacity within the Resource Container.

The "Consumption" link answers the question "When will I run out?" by showing the dates when the resource will cross a configurable warning threshold and ultimately cross an outage threshold. These thresholds are configurable in the Advanced Options discussed below.

The "Scatterplot" link opens the scatterplot graphs of IOPS.

Usage Profiles

A Usage Profile is a group of Virtual Machines (VMs) that consume computing resources. The primary resources that are considered are CPU, memory, and disk space. You may define a Usage Profile by searching for VMs, selecting one or more results, and pressing the Plan button in the top right corner of the search results page to enter the capacity planning module.

Once in the capacity planning module, the Usage Profile will be in the top right quadrant of the capacity planning module. You may also enter the capacity planning module by clicking on the "Plan" button of a Capacity Planning Widget on the Capacity Planning Dashboard.

After entering the capacity planning module, you also have the ability to define a Usage Profile more generally by specifying all VMs in a cluster or all VMs in all clusters. These options are available via the "Cluster Average" or "All Cluster Average" buttons at the bottom of the Usage Profile quadrant. You also have the option to use a different Usage Profile by pressing the "Load" button. This will prompt you to pick a Usage Profile that you previously saved.

Your final option is the "Edit" button which will open an interface to modify and save the current Usage Profile.

When editing a Usage Profile, you will notice that there are two options to specify the members of the profile. One option is to create a static list of VMs in the Usage Profile. This is usually accomplished by searching for VMs or clusters, selecting a few search results, and clicking the "Plan" button in the top right corner of the search result page. When editing the Usage Profile in the capacity planning module, the initial view only shows you a summary of the Usage Profile. You may get more details about the members and resource utilization of a Usage Profile member by pressing the "Show Details" button in the Item Details section.

You can also create a dynamic set of VMs in the profile. This is accomplished with a search query for either VMs or clusters. It is important to keep in mind that if you choose to use a cluster, all VMs in that cluster are considered as members of the Usage Profile and will be used to calculate resource utilization. This query will be executed in real time for all capacity planning operations. The benefit of this approach is that you can constantly update your capacity plan based on a dynamic query. The downside is that the calculations only happen after the query executes, so you cannot get details of the average CPU, memory, and disk usage in the view to Usage Profile editing screen.

When editing a Usage Profile, you have the ability to Save or Save As to persist the Usage Profile. These buttons are available in the top right when editing a Usage Profile. Like editing a text document, Usage Profiles are NOT saved by default. So these operations should be performed once you have a Usage Profile configured to your liking.

Use the links at the bottom to the full view of a Capacity Plan and to answer questions like "how much more can I add?" or "what if I add more resources?".

When Will I Run Out?

One of the most common questions around capacity planning is "When will I run out of resources." While the answer is highly dependent on the deployment of new VMs and applications that consume resources, SolarWinds Virtualization Manager can predict when you will run out of resources based on how your environment has grown historically.

Once in the capacity planning module, begin by loading a Resource Container. It is the resources within this container that will be considered when asking "When will I run out?" The calculations examine the historic trending of the following:

- CPU utilization
- memory utilization
- disk space consumption and disk IOPs
- network consumption

The calculations also projects when one of those items will hit 100%.

Note: 100% is the default threshold, but you may customize this via the Settings as described in the Capacity Planning Options.

At the bottom right corner of the Capacity Planning Module, click the "Consumption" button to generate a graph of the historic performance of the CPU, memory, and disk utilization. The "Consumption" button opens a utilization graph that show actual consumed capacity within the Resource Container.

The large graphs show the historic values and a best fit line. Below the graph is a table with the calculated dates of when each resource will hit certain thresholds at current course and speed. The first date is a Warning Date which is the date when the metrics will hit the "Warn at" threshold. Likewise, the next columns show the Outage Date which is the date when the metrics will hit the "Out at" threshold. The "Warn at" and "Out at" thresholds are both configurable via the Capacity Planning Options.

To return to the Capacity Planning summary page, click the "Summary" button in the bottom right corner.

How Much More Can I Add?

Given your current host resources, another common capacity planning question is "How many more VMs can I add?" SolarWinds Virtualization Manager can do this analysis given a Resource Container of the hosts in consideration and a Usage Profile containing VMs that are representative of the new VMs to add.

Within the capacity planning module, begin by loading a Resource Container. It is the available resources within this container that will be considered when asking "How much more can I add?"

The calculations will examine availability of the following resources on hosts within the Resource Container.

- CPU
- memory
- disk space and IOPs
- network

Next, load a Usage Profile that contains VMs that are representative of the new VMs to add. SolarWinds Virtualization Manager will examine the CPU, memory, and disk space resources consumed by those VMs.

At the top right corner of the main capacity planning page, click the "Calculate" button to generate a table that shows the number of VMs that may be added to the hosts within the Resource Container. In parenthesis, each entry in the table also includes the bounding resource which restricts more VMs from being added.

Note: the time to calculate is directly proportional to the number of members in your Resource Container and your Usage Profile. If you have a large number of members, this operation may take a few minutes.

The table contains one row for every cluster with hosts included in your Resource Container. It has four columns for each cluster.

- **Workload** - If you used the Workload section of advanced options to specify a number of VMs to add and their specifications, the Workload column represents how many times can ALL of them be added.
- **Small** - If you only add the smallest VM (least resources consumed) within the Usage Profile, how many could be added?
- **Average** - Based on the average resources consumed by VMs within the Usage Profile, how many could be added?
- **Large** - If you only add the largest VM (most resources consumed) within the Usage Profile, how many could be added?

For a more visual representation of how much you can add, click the "Capacity" link in the bottom right corner of the capacity planning module.

This graphical representation shows you all the clusters or hosts in the left bar chart. If your Resource Container holds clusters, then its clusters are shown. Likewise, if the Resource Container holds hosts, then hosts are shown. Each of the consumed resources (CPU, Memory, and Disk) is represented per cluster/host. This gives you the latest resource utilization across your Resource Container.

In the right column of bar charts, the number of VMs that may be added is shown. The top chart represents VM capacity by CPU. The second shows capacity by memory. And the bottom chart shows VM capacity by Disk space. These charts take into account all advanced options and will refresh whenever the "update" button is pressed in the advanced options or the "Calculate" button is pressed at the top right of the capacity planning module.

Calculating VM Sizes

Virtualization Manager calculates the small, average, and large VM sizes based on the information from the Usage Profile.

If the Usage Profile does not include clusters, then the sizes are calculated based on all the averaged values per resource included in the Usage Profile. These values can be viewed in the detail view of the Usage Profile.

Small - The minimum value of all the averaged values of the resources

Average - The average of all the averaged values of the resources

Large - The maximum of the averaged values of the resources

If the Usage Profile does contain clusters, then the calculation uses minimum, maximum, and average values from cluster trends.

What If I Add More Resources?

For the use cases "When Will I Run Out?" and "How Much More Can I Add?", you may wish to plan while considering new host resources that are not currently part of your virtual environment. To accomplish this, open the Advanced options using the "Advanced options" link in the bottom left of the capacity planning module.

Other options from this section will be covered in the Advanced options section below, but for the "What if I add More Resources?" question, notice the bottom five text boxes on the Outage Threshold tab in advanced options. These allow you simulate adding more hosts.

When adding hosts, you must enter the following information:

- Number to add - Number of hosts to add
- CPU (count) - Number of CPUs per host
- x Speed (MHz) - Speed of each CPU (in MHz, NOT GHz)
- Memory (GB) - Memory per host (in GB)
- Shared Disk (GB) - Shared disk space per host (in GB)

When complete, click the "Calculate" button to see how these new resources affect how many VMs may be added. The total extra resources that will be added to this Resource Profile are the resources per host multiplied by the number of hosts. Any calculations, "When Will I Run Out?" and "How Much More Can I Add?", will consider these new resources as available when using this Resource Container. These options are saved with the Resource Container, so be sure to save the Resource Container to persist these options.

Advanced Options

On all screens within the Capacity Planning Module, the bottom left of the screen hold the "Advanced options" link which will give you the ability to customize how the capacity plan is calculated.

The advanced options column appears on the left of any capacity planning screen. The options are broken into four sections in an accordion control:

- Sample Period
- Calculation Settings
- Resource Types
- Workload

Sample Period

The Sample Period section allows you to specify the performance data used to calculate load on a Resource Container. The default is to use performance data all day over the last 30 days.

You may also choose to use only data during certain time of the day or certain days of the week. Most commonly, SolarWinds Virtualization Manager users change this to use data only during business hours (8am-5pm, Monday through Friday) or only during daylight hours (7am-7pm, every day). To do this, click the radio button next to the "Start" and "End" fields to specify the time frame for data used to calculate load on a Resource Container. These options are saved with the Resource Container. Be sure to save it to persist your selected options.

Calculation Settings

Any time you click the "Calculate" button, SolarWinds Virtualization Manager analyzes the load on the Resource Container, calculates the remaining capacity, and then determines how the Usage Profile would fit into the remaining capacity. The Calculation Settings allow you to tweak the way the capacity is calculated.

Below is a description of each field and its purpose.

- Mem Wastage - Spare memory due to non-uniform VM resource requirements.
- Mem Oversub - Amount of memory over-subscription as configured in VMWare Virtual Center.
- Sizing Target - Defines how the CPU, memory, and disk space utilization values are used in calculations.
- Peak - Default setting which looks at the peak resource utilization.
- 95th Percentile - Ignore the peak, but calculate based on the 95th percentile of resource utilization.
- 75th Percentile - Ignore the peaks and high spots, but calculate based on the 75th percentile of resource utilization.
- Failover capacity - Calculate assuming that the resources of one or more hosts are in reserve to accommodate hardware failures.
- Add Hosts - Perform calculations assuming more host resources than currently in the virtual environment. This is described in greater detail in "What If I Add More Resources?".

To make the new settings take effect immediately, click the "update" button at the bottom of the custom Calculation Settings.

Resource Types

When viewing the resource consumption chart as described in the "When Will I Run Out?" use case, the thresholds for a warning and an outage are configurable in the Resource Types section of the Advanced options.

To make the new settings take effect immediately, click the "Update" button at the bottom of the custom Calculation Settings.

Workload

This section allows you to define a theoretical set of new VMs to deploy in your environment to see if your current resources can support it. This is part of the "How Much More Can I Add?" use case.

Showing the Calculations and Variables

From the Summary page of Capacity Planning (the main page), you may choose to see all the calculations that went into the capacity plan. To do this, click the "Details" link in the bottom right. This will open a page that shows the calculations done in the order they were done. The first calculation is at the top and then goes in order down the page.

The "copy" button in the top left of the Details page allows you to copy all data in the table and paste it into a spreadsheet or text document for easier consumption.

Chapter 9

Configuration Comparison

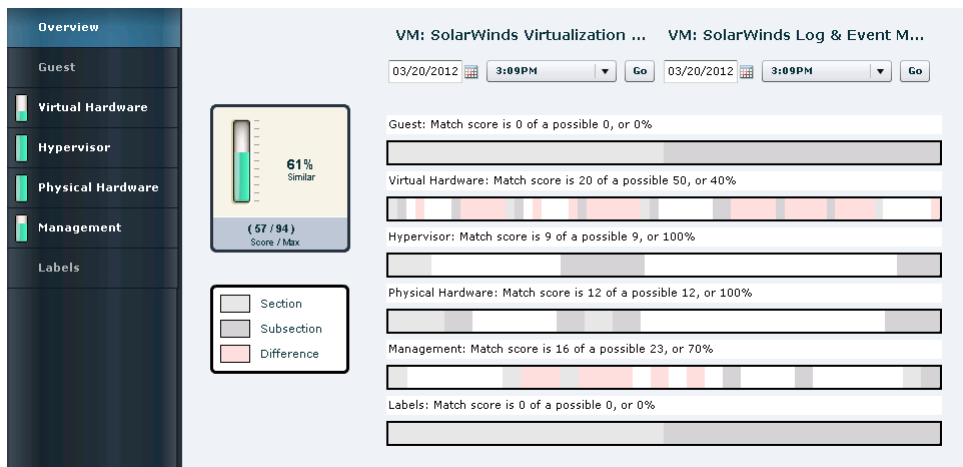
The ability to retain historical data for not just performance data, but also for state, event, and configuration data make SolarWinds Virtualization Manager a unique solution in the virtual infrastructure management marketplace. One of the most compelling product features about SolarWinds Virtualization Manager is the ability to visualize this data in an intelligent, intuitive manner to understand the lifecycle of virtual machines and hosts. The Compare button on the search result page allows a user to select one or two virtual machines or hosts from a search query result list for further historical analysis. This is accomplished by leveraging what we call DNA™ Comparison.

DNA Comparison

DNA™ Comparison consists of two parts that together comprise the unique attributes of a virtual machine or host throughout its lifecycle. The first part is the identity attributes. These attributes make up the unique combination of immutable attributes that define, with a high degree of accuracy, what uniquely identifies a virtual machine / host through typical life cycle transitions. The second component of DNA™ Comparison comprises all the remaining attributes of virtual machines or hosts that are subject to change and that uniquely identify it at a particular point in its lifecycle. This second class of attributes is available for historical analysis by the Compare feature.

The first step to performing comparisons is to find the VMs or hosts. Select the checkbox next to the object(s) of interest and then select the Compare button above.

Once one or two virtual machines or hosts have been selected and the comparison button is selected, the following screen is displayed to compare the two objects. This is an overview of the comparison of every attribute collected for the objects at the time of the most recent data collection interval.



This page is comprised of several key details. The left column displays a list of categories of attributes that can be examined for comparison on a category-by-category basis. The degree of differences for each category is also displayed in gauge to the left of the category name. The green represents similarities and the white space represents differences. The overall matching percentage based score is computed and presented by the gauge on the results pane with a comparison of the direct attribute counts below. The meaning of the colors is similar to the attribute categories.

The majority of the results page is dedicated to the comparison of the objects selected.

Comparing an Object to Itself

If one object (virtual machine or host) is selected, then the comparison is against itself at the same point in time by default. To compare an object to itself over time, change the time selectors to the times needed and click the "Go" button. This allows the user to compare a virtual machine or host to itself over time to understand configuration drift of the object and to pinpoint configuration changes across a specific data collection interval and therefore a specific time frame.

Note: This will always result in 100% similarity because the object is being compared to itself at the same point in time.

Comparing Two Objects

If two objects are selected from the search results, then the comparison is between the two objects occurs at the last point data was collected for each one individually. Multiple virtual machine / host comparisons allow the user to understand changes that should have some degree of logical similarity such as parent-child relationships in cases of VM cloning or similarly configured VMs such as cluster members.

The Comparison overview screen also presents a graph of the degree of difference between each of the different categories of attributes to quickly identify attribute categories of interest. Each color on the bars for each category represents a different comparison state. White represents attributes that are identical between objects selected and pink represents attributes that have different values. Each bar also has metrics for percentage of similar attributes and raw attribute similarity comparisons. The gray areas are section headers.

Detailed Comparison by Category

When a particular attribute category warrants further investigation, the category can be selected for a detailed analysis of every attribute in the category. The resulting display lists the attribute name in the left column and the resulting values for each object in the remaining columns. Once again, the color-coding represents a different comparison state. White represents attributes that are identical between objects selected and pink represents attributes that have different values. The scroll bar to the right of the table gives an at a glance view of the differences so that particular areas can be immediately scrolled to. The radio buttons to "Show all fields" or "Only show differences refresh the table to show all attributes or just the attributes that are different in value or their presence.

Chapter 10

Dependency Maps

Dependency Maps provide a way to see one item in your virtual infrastructure and its relationship to the rest of the infrastructure. They are a great way to see how problems in your environment may affect applications, services, or other areas of your virtual infrastructure.

Dependency Maps start with one or more items in context. Initially, the items in context appear in the top box. All items that depend on (or are depended on) by the items in context will then appear in the other four boxes. There are generally a total of five boxes in a Dependency Map.

- Virtual Machines
- Hosts
- Clusters
- Datastores
- Applications

Remember, the items displayed in their boxes are **ONLY** the items that are related to whatever is in context. Changing the context will change the dependencies.

Initial Context

You may enter in one of two ways. First, click the Explore tab at the top of SolarWinds Virtualization Manager and then click "Map". This will open a Dependency Map with all Clusters in context. By definition, this means that the Dependency Map is showing your entire environment.

The second way to enter Dependency Maps is to select one or more items from search results or the active list with a check box and click the "Map" button in the action bar. This will place the selected items in context. Only other virtual infrastructure items that are related to what is in context will be displayed in the Dependency Map.

Setting Context

To reset the context, click the button in the left corner that says "Show Entire Environment". This will put all clusters in your virtual environment in context. By definition, this means that each box will contain all entities: VMs, Hosts, Datastore, and Applications.

To set the context to just a few items currently in the map, click on small box in the upper left corner of those items and a checkmark will appear. Click the “Context” button in the main box to put the selected items in context.

Alerts

In all boxes, any entity that has an alert firing will display a colored icon. You may mouse over the item to get details of the alert(s) that are currently firing.

The colors and their meanings are:

- No alert - No colored background
- Informational - Blue
- Warning - Yellow
- Critical - Red

This legend is displayed in the top right of the Dependency Map. You may unselect checkboxes to fade alerts into the background if you do not wish to see them.

Add to Chart

To add specific items to a chart, click in the upper left corner of those items and a checkmark will appear. Click the "More" button and select "Add to Chart." When prompted select the chart to which you want to add the item.

Export

To export data about selected items, click in the upper left corner of those items and a checkmark will appear. Click the "More" button and select "Export" to open the Data Export screen. Add any attributes you want to include in the data export or load a predefined template. Then, click the “Run Export” link to finalize the data export.

Add to List

To add specific items to the Active List, click in the upper left corner of those items and a checkmark will appear. Click the "More" button and select “Add to List” to put the selected items in the Active List.

Time Travel

To view the dependencies of a specific time and date, ensure that a single item is in context. The Time Travel control will switch to “ON” when a single item is in context. Click the calendar in the top left of the map and browse to the desired date. The map will change accordingly, affording you a historical view of the configuration and dependencies of your virtual infrastructure.

Any Comparison or Add to Chart commands you run on objects while in Time Travel mode will be run in the context of the select time period.

Note: The Time Travel control is only available if there is a single object in the Context box. If more than one object is in Context, Time Travel is not available.

Chapter 11

Content

The Content module of SolarWinds Virtualization Manager has two main sections. The left side is a content filter that lets you drill down to exactly the type of content you seek based on its attributes. This is helpful since SolarWinds Virtualization Manager ships with hundreds of pieces of content to allow greater customization and flexibility. You may filter the content in the viewer by Tags, Type, or User (Owner) and Permissions.

The right side of the Content viewer shows you the content itself based on the filters that you have applied. In addition, it also gives you a search bar to type in the name of the content you seek and returns only matching results. Any list of content may be sorted using the Sort by drop down on the top right of the content viewer. You may sort content by name, type, date created, or date modified.

Editing Content

Once you have found the content you seek, clicking on it gives you details and actions you can take with that piece of content.

The actions available at the bottom of the screen are

- Edit attributes (pencil icon) - Allows you to change the name, description, or permissions of the content
- Configure the content - Launches the editor to change the content based on its type
- View - Launches the viewer to see the content's output based on its type

Note: Not all types of Content have the same operations available to them.

Adding and Removing Content

Content is not static in the SolarWinds Virtualization Manager system. It may be added and removed. To remove content, simply select it and click the Delete button.

Any time you create and save content of any type in SolarWinds Virtualization Manager, it appears in the Content manager with you as its owner. That is the most common way that content is created.

SolarWinds may release periodic content updates and these new pieces of content may be imported into your system. To import content, click on the Import Content button in the lower right corner of the Content viewer. A dialog opens asking you to select the file to import. After selecting the file, select the privileges (visibility) that you wish to assign the new content. SolarWinds Virtualization Manager content is in XML and you may browse to open any XML file that SolarWinds delivered to you to import it into the system. After import, the new content is available in the content browser and may be edited, executed, deleted, or tagged.

You may also wish to Export content to share with another SolarWinds Virtualization Manager user to request assistance from SolarWinds Technical Support. To export content, select the content in the content viewer and click the Export button in the upper right. A dialogue appears to tell you that SolarWinds Virtualization Manager is ready to export the content. Click the Save button to name the exported file and select its location.

Content Types

Content comes in a variety of types. Below is a list of content types with a brief description.

- Alerts - Monitors incoming data and triggers notifications based on rules
- Dashboards - Collection of widgets available on the user's home page
- Lists - Collection of CIs (Configuration Items like VMs, hosts, datastores, clusters, and applications)
- Queries - Search terms to find CIs
- Reports - MS Excel or PDF output from Canned Reports or Data Export
- Resource Containers - Used by capacity planning module to define supply of resources
- Resource Profiles - Used by capacity planning module to define usage of resources
- Templates - Used by data export to define what properties of a CI to export
- Trends - Periodic searches and functions to track changes in a virtual environment over time

Each piece of content has a number of attributes:

- Tags - Grouping mechanism for content
- Type - Described above

- Owner - The user that created the content
- Permissions - Visibility of the content that the owner gives to other users (Private, World Readable, World Writable)

Tags

In the Tags accordion content filter section on the left, you can filter content by Tags. By default, this view has no Tags checked and so it shows all content regardless of Tags. But you may select one or more Tags and the content viewer on the right will filter the view to only show content with that Tag. This is a simple way to filter content to only see pieces that may help with a problem at hand. For instance, if you are having storage issues, select the Storage Tag on the left to see all content that will let you search, trend, or alert on storage related issues.

To modify the Tags on a piece of content, select the content and click the Tags drop down button. With the Assign button selected, click each Tag that you wish to add to this content. Conversely, you may remove one or more Tags from a piece of content by clicking the Remove button and selecting the Tag names.

You may always create your own Tags.

To create a custom Tag:

1. Select the Tags drop-down in the top right of the content viewer.
2. Click the Assign button.
3. In the text box next to the Plus (+) button, enter the name of the new tag.
4. Click the Plus (+) button.

After hitting the Plus (+) button, the new Tag is available to be applied to all content.

Owner and Permissions

For administrators, all content is accessible on the Content management page. Regular users only have access to their content and other user's publicly readable or writable content.

You may change the permissions on any content that you own or that is World Writable. To modify permissions, select the content and click the Pencil button in the bottom left of the content viewer. You may choose to make the content Private, World Readable, or World Writable.

To change the owner of a piece of content, you must own the content or it must be World Writable. Select the content and hit the Set Owner drop down button. Next, select the SolarWinds Virtualization Manager user that you wish to make the owner.

Chapter 12

Lists

Lists, and more specifically, the Active List, provide a mechanism to group related objects into permanent collections to be reused at any time. Lists may contain VMs, Hosts, Clusters, Datastores, and Applications.

For example, if you are searching for a specific set of VMs requiring a patch, you can add the results of the search to the Active List and save that List for future reference. This allows you to use the List as a holding pen of VMs requiring the patch update. As VMs get patched, they may be removed from the List. Another example would be grouping a collection of like hosts based on ownership, role, geography, or any combination of attributes for the purpose of sharing these Lists with other SolarWinds Virtualization Manager users. You could make the Lists private, publicly readable, or publicly writable so others could gain the benefit of your efforts.

Lists are different from search queries in that they are static by nature. If a VM changes characteristics that are criteria for a search query, that VM will not show up the result set anymore. If a VM changes characteristics in a List, that VM will remain in that List.

Note: The only exceptions are cases where the VM is unregistered with a vCenter server or otherwise made unavailable for data collection.

Nearly every screen and module in SolarWinds Virtualization Manager has buttons or links to add items to the Active List. These are usually an orange "+" icon or button next to virtual objects (VMs, Hosts, etc.). Pressing the orange "+" adds a single object to the Active List. When there are multiple objects on a page like on search results or dependency maps, multiple items may be selected. Click the "Add to List" button to add all these items to the active list. Likewise, some types of dashboard widgets have an "Add to List" button, usually located at the top of the screen or control, to add their contents to the Active List.

Note: There can only be one active list at any given time. It shows up in the Explore tab under "List."

Keep in mind that you may continuously add items to the Active List from multiple pages in SolarWinds Virtualization Manager. Once you have completed finding and adding VM objects to the Active List, you can review the items in the Active List by at any time by selecting the Explore module tab and clicking List. This brings up the current contents of the Active List.

Here, you can see the contents of the Active List. This page works much like the search page in that each item and each group of items has check boxes next to it. Selecting one or more items brings up a row of action buttons to do things like comparisons, data exports, adding notes, etc.

You now have several options for managing your Active List. You can remove any number of elements from the Active List by selecting the desired elements and clicking the “Remove from List” button in the row of action buttons. You can select one or two VMs for comparison operations. You can also clear the contents of the entire Active List via the “clear” link at the bottom right of the Active List module. You can also load another saved list as the Active List via the “load...” link as well as save the contents of the current list via the “save as” link. Like all content in SolarWinds Virtualization Manager, you must specify the permissions, name, description, and one or more Tags when saving a new List.

Chapter 13

Reporting

Reports come in two flavors in SolarWinds Virtualization Manager, On-Demand Reporting and Data Exports.

Reports can be configured to run on a periodic basis according to a schedule and are known as Scheduled Report Jobs.

Data Exports

Data exports allow any user to export the results of any search query or list to a Microsoft Excel spreadsheet in an XLS format. Once exported, the results can be downloaded immediately or saved as a report for sharing with other SolarWinds Virtualization Manager users. This is particularly useful when you need to share the results of a query, condition, or state of your virtual infrastructure with others. You can both provide the export results in a Microsoft Excel (XLS) format for emailing to others who don't have access to SolarWinds Virtualization Manager such as managers, suppliers, vendors, network operations, etc., or place the report in a shared folder within SolarWinds Virtualization Manager for other users to see.

Exports can be generated from search results or the Active List by selecting one or more items and clicking the Export button. Exports can be generated from a search query as well. To do this, enter the search query in the search field, select the appropriate results, and click the "Export" button.

Once a target collection of items have been selected for an Export, you must then complete the Data Export Tool. First verify that you have selected the appropriate object to export data from in the left hand column. If you have not selected the proper objects of interest, you can reset the "Export These Items" list via the "load list" or "load search" links at the bottom of the left hand column.

Once you have the appropriate objects or query in place in the left hand column, select the attributes from those objects to export by selecting Add Attribute in the right column. This brings up the "Attribute Picker" where you can select properties to export individually. You may type the partial name of any property into the "Filter" box at the top of the "Attribute Picker" to narrow down the properties available to you. Once you have found the property of interest you can click OK button to add it to the property list and close the Attribute Picker Tool. Repeat this step for all properties to be exported.

You can save the attributes you've selected as a standard named set by picking the "save as" hyperlink at the bottom of the right column of the Data Export Tool.

You can also load a saved set of properties via the "load" link at the bottom of the Data Export Tool. SolarWinds Virtualization Manager ships with many templates for all types of objects. This list is available via the "Load Template" button in the right column of a fresh Data Export page or the "load" link at the bottom of the right column.

Once you have selected the objects to be exported and their corresponding attributes to be available within the resulting report template, you can execute the report by clicking the Run Export button on the bottom of the screen.

As the report runs, it shows up in the report schedules page. Upon completion, the resulting report can be downloaded immediately or referred to at any point as a piece of content.

On-Demand Reporting

On-Demand Reports provide one mechanism for exporting data from SolarWinds Virtualization Manager. Scripted Reports differ from Data Exports by adding additional data or doing additional processing. Data Exports only allow you to create a spreadsheet of data that has already been collected. A Scripted Report can grab additional data from external sources and process it to present new insight.

The reporting interface can be accessed via the Reporting tab at the top of the main interface page and then the "On-Demand Reporting" sub-link. Currently, there are nine scripted reports that ship with SolarWinds Virtualization Manager. Each release SolarWinds Virtualization Manager creates many more canned reports and has an interface to create ad-hoc reports in the field.

Any report can be selected for execution from this interface directly by either selecting the report in the reports list or by navigating to any report from the reporting categories listed on the right hand column. Reports are generated from direct connections with live data sources and therefore, a Virtual Center or Hyper-V server instance must be specified in the selection drop down. The current format for the report data is a Microsoft Excel 2007 spreadsheet (XLS) file.

Custom Reports

The easiest way to create a custom report is to base it on a saved query. For example, if you want to report the number of VMs with more than four snapshots, you can enter `vm.snapshotSummaryCount:[4 TO *]` in the search bar or you can use the Advanced Search feature. After the query runs, save the query and navigate to **Reporting > All Reports > Queries**. Use the search bar on the upper left to more easily find your saved query. Once found, click **Create Excel Report**. Enter the name, description, and any tags you want to associate with the new report and click **Save**. You can schedule when the report runs and who is notified when the report has run in the Report Schedules page.

Another method to create custom reports is to create a custom dashboard and create a dashboard report. Some widgets on the dashboard will not be printed in the report, such as Maps or RSS Feeds. After you have created a custom dashboard, click the **Create Dashboard Report** link at the top right of the dashboard. The report will run, and you can configure it further in the Report Schedules page. Dashboard reports are published as PDFs.

Scheduled Report Jobs

After executing a report, you will be dropped at the Report Schedules page. A "job" is a generic word for any scheduled task. Scheduled reports are the most common type of scheduled job. This page shows you the status of the job(s) in progress and gives you the opportunity to run them on a periodic basis.

The Report Schedules page has three columns: Scheduled, Running, and Completed. When a job is executed, it appears in the Running column. In the screen shot above, the "Connected Media" report is currently running. Usually, a report run just one time will only stay in the Running column for a few seconds or minutes. Upon completion, it will move to the Completed column. In the Completed column, items in green ran successfully while items in red failed during execution.

Downloading Reports

Upon completion, a job will move from the "Running" column to the "Completed" column. A scheduled job that executed a report will appear in the "Completed" column with a "Download" button. Click this button to access the resulting report.

When prompted, click the "Save" button to save the report on your local machine to view in the application of your choice.

Configuring Schedules

In all columns, every job has a "Configure" button. This will open a dialogue with three tabs: Information, Schedule, and Notifications.

Information

The information tab contains the name and description of the job. For reports, this is the name and description of the resulting report when it completes and is present in your content.

Click the "Save" button to make these changes.

Schedule

Jobs may run once or run on a schedule. Once a job has been run once, enter the Schedule tab to configure a repeating schedule for that job. In practice, this is most commonly used to generate a report daily, weekly, or monthly.

Select the Start Time and recurring interval (Once, Daily, Weekly, Monthly, or Cron). If you selected Cron, you must fill in the Cron expression (in GMT) to describe the recurring interval. Finally, you may choose an end date after which no more jobs will be run on this schedule. Click the "Save" button to persist these changes.

Notifications

Upon completion of a job, you may wish to notify one or more users. If the job was a report, those on the notification list will receive an email stating the report completed and the actual report will be attached to the email.

Enter email addresses for notifications about this job. You may enter multiple email address separated by a comma (","). Click the "Save" button to store the list of email addresses to notify upon job completion.

Note: You must enable an SMTP server in the Administration section to send email.

Removing Jobs

To remove a scheduled job and prevent it from ever executing again, find the job in the "Scheduled" column on the left and click the "Remove" button for that job.

Note: You will be not asked for confirmation before the job is deleted.

Pause and Resume Jobs

Pausing a scheduled job will prevent it from executing while it is in a paused state. To do so, find the job in the "Scheduled" column on the left and click the "Pause" button for that job.

To make the job active again, click the "Resume" button. "Resume" and "Pause" work like a toggle to change the state of the job from paused to resumed.

Chapter 14

Custom Labels

Labels provide a mechanism to insert business information into the SolarWinds Virtualization Manager system so that business data can be searched, exported, compared, etc. Labels are similar to custom fields in Virtual Center. You can define both the name of the label and assign a different value to one or more hosts and/or VMs. The new label becomes a part of the host or VM data so that it can be used throughout SolarWinds Virtualization Manager.

The most common uses for Labels are to assign VMs and Hosts to departments, lines of business, applications, or resource pools. You can then create searches based on those values. Once you can search on the data, you can also use those searches as the basis for Trends. This is an excellent mechanism for charge-back or "shame-back." In addition, all custom fields are available as Facets that can be viewed in the Facet Explorer or in Search Results.

To create a Label, select one or more results from the Search page by clicking the checkbox next to them. Then click the Label button. You will be presented with a screen that shows all of the currently defined Labels and the values for those Labels on the selected search results. To modify the values for Labels that currently exist, type the value into the text box next to the appropriate Label and click the Save Changes button.

To create a new Label, click the Add New Field button and name the Label. The new Label will appear, but have no values for any Hosts or VMs. You can now add values for the selected search results.

Labels may be removed by pressing the Delete Field button. Once removed, no history of the Labels or their values will remain.

To search for a Label, simply type the value of the Label into the Search Query. Alternatively, you can also type the Label name and value separated by a colon. For instance, if you created a Label named "Department" and you wanted to find entities in the "Finance" department, you would do a search for either:

```
Finance
```

or

```
Department:Finance
```

Chapter 15

Notes

Notes are a mechanism to document details of VMs, Hosts, Clusters, Datastores, and Applications that cannot adequately be documented via other means. By adding the ability to annotate virtual object, the user can create a journal of running commentary on the lifecycle of items in the virtual infrastructure. This is useful as it can be made to capture the “why something changed” as opposed to the what’s, when’s, and how’s of changes. This sort of information is typically not provided in event logs or other sources of management data.

Notes can be added to any entity by selecting objects and clicking the Add Note button on the search page, active list, or CI view.

Also on the search page and active list, you may select one or more objects and click the "View Notes" button on the action bar to see a log of all notes on those objects.

This view details each note, when it was created, who created it, and for which entity it applies. In addition, the user can get a link to any of these notes as well as provide any additional commentary on the existing notes.

Appendix A

PowerCLI

SolarWinds Virtualization Manager Power CLI lets administrators leverage the power of SolarWinds Virtualization Manager using Microsoft PowerShell. This section discusses:

- Getting Started
- Cmdlets and Scripts

Getting Started

Installation

Download the PowerShell Client installer from the Additional Components page of your SolarWinds Customer Portal.

Install PowerCLI by double-clicking on the installer file.

Install the VMware vSphere PowerCLI for additional functionality.

(http://communities.vmware.com/community/vmtn/vsphere/automationtools/windows_toolkit?rls=en&q=vmware%20vsphere4%20powercli&ie=UTF-8&oe=UTF-8)

Once the SolarWinds Virtualization Manager PowerCLI is installed (as well as the VMware vSphere PowerCLI if you wish to take advantage of seamless SolarWinds Virtualization Manager-VMware integration), find the SolarWinds Virtualization Manager PowerCLI in the start menu (or on your desktop or QuickLaunch bar if you selected either of those options during installation), and double-click on it.

Congratulations! You've successfully installed and launched the SolarWinds Virtualization Manager PowerCLI. Now let's take a look at some of the tasks you can accomplish by leveraging Microsoft PowerShell and SolarWinds Virtualization Manager.

Connecting

Now that you've installed the SolarWinds Virtualization Manager PowerCLI, you're probably wondering how to connect to your SolarWinds Virtualization Manager server. Good question. Here is the answer! Simply use the Connect-H9Server cmdlet to establish a connection. For example:

```
Connect-H9Server akutz-hyper9 admin admin
```

The preceding cmdlet will create a connection to the SolarWinds Virtualization Manager server `akutz-hyper9` using the credentials `admin/admin`.

Searching

While you're connected to a SolarWinds Virtualization Manager instance, you always have an active query. At first, the query is empty, and returns no results. Thus, you'll typically want to immediately run `Set-H9Query`:

```
Set-H9Query * VirtualMachine
```

The command line above will set your active query to all known virtual machines, and return the number of results found. The first parameter is a query, just like you would type into the search bar. The (optional) second parameter is the object type. In addition to virtual machines, you can search for any managed object that SolarWinds Virtualization Manager knows about. Once you're happy with the query, you can view the results with:

```
Show-H9Results 1 20
```

This will print a list of items 1 through 20 in the current search result set. The parameters are optional; there's no reason you couldn't show all the items in your result set. However, very large result sets can take a long time to display. All SolarWinds Virtualization Manager cmdlets are pipeline-aware, so it would be just as efficient to write:

```
Show-H9Results | Select-Object -first 20
```

About Configuration Item References

If you've run the above command lines, you've probably noticed that the items returned by `show-h9result` are very sparse. Many of the operations you'll be performing with SolarWinds Virtualization Manager could involve hundreds or even thousands of virtual machines, host computers, and so forth. Thus most SolarWinds Virtualization Manager cmdlets accept and return "configuration item references." These are just pointers to the actual data stored by SolarWinds Virtualization Manager.

Occasionally, you will need to perform some deep inspection of the actual data. To do this, use the `Get-H9Doc` cmdlet:

```
$xml = Get-H9Result 1 1 | Get-H9Doc
```

This will return an [xml] object, which can then be traversed/inspected:

```
PS C:\> $xml.virtualMachine.cpuAllocation
```

limit	reservation	shares	sharesLevel
----	-----	-----	-----
45351	0	500	low

Working with the vSphere PowerCLI

Frequently, you'll be working with both the vSphere and the SolarWinds Virtualization Manager PowerShell snapins. For managed objects that SolarWinds Virtualization Manager understands (virtual machines, host servers, clusters, datastores, and vApps), you can use the `ConvertTo-H9Ref` command to retrieve a configuration item reference for a VMware object:

```
Get-Vm | ConvertTo-H9Ref | Add-H9List
```

The above command line would retrieve all known virtual machines via the vSphere PowerCLI, convert each to a SolarWinds Virtualization Manager reference, and then add them to the active list.

Cmdlets and Scripts

Cmdlets

The SolarWinds Virtualization Manager PowerCLI ships with several cmdlets that allow you to access a SolarWinds Virtualization Manager server.

Use the `Get-Command` built-in cmdlet to retrieve SolarWinds Virtualization Manager commands. You can use the more precise `"Get-Command -pssnapin Hyper9.Powershell.Core"` or the shortcut `"Get-Command *h9*"` For more information about a command, use the `Get-Help` built-in.

The following product features are accessible via cmdlets:

- Basic session management (`Connect-H9Server`, `Disconnect-H9Server`)
- Search and facet browsing (`Set-H9Query`, `Get-H9Result`, `Get-H9Facet`)
- Dependency graph browsing (`Get-H9Related`)
- Retrieving and managing user content (`Get-H9Content`, `Set-H9Content`, `Remove-H9Content`, `Get-H9Report`, `Get-H9AlertRefs`)
- Simple document management (`Get-H9Doc`, `Get-H9History`, `Set-H9Doc`)
- Active list integration (`Add-H9List`, `Set-H9List`, `Show-H9List`, `Clear-H9List`)
- Basic collection setup (`Add-H9Credential`, `Add-H9Datasource`, `Get-H9Collector`)
- Label management (`Get-H9Label`, `Clear-H9Label`, `Set-H9Label`)
- Notes (`Get-H9Note`, `New-H9Note`)
- vSphere PowerCLI integration (`ConvertTo-H9Ref`)
- Document DNA (`Export-H9DNA`)

Scripts

The SolarWinds Virtualization Manager PowerCLI ships with PowerShell scripts that can help administrators tame their virtual environment. Scripts are located in the Scripts directory inside the SolarWinds Virtualization Manager PowerCLI directory (by default this is `C:\Program Files\Hyper9 VEO PowerCLI`).

vi2h9.ps1 - This script synchronizes the folder and resource pool hierarchy of a VM along with the custom fields of both VMs and hosts to SolarWinds Virtualization Manager labels.

Appendix B

PERL SDK

Installing Perl

If you do not already have Perl, you will need to download and install it. For Windows machines we recommend using [http://www.activestate.com/activeperl/ ActiveState's ActivePerl 5.10.

Module Installations

The Perl Client ::Client module requires SOAP::Lite.

To install SOAP::Lite on Linux or Mac versions of Perl, simply type:

```
sudo cpan install SOAP::Lite
```

To install SOAP::Lite on Windows using ActivePerl 5.10 run the following command

```
ppm install http://cpan.uwinnipeg.ca/PPMPackages/10xx/SOAP-Lite.ppd
```

Download the Perl Client

Now you are ready to begin using the Perl Client module. Download the Perl client module from the Additional Components page of your [SolarWinds Customer Portal](#). This .zip file includes the Perl Client module (Hyper9::Client) as well as a few example scripts. Extract the archive in a place where you will be running your scripts from.

Using the Perl Client

The Perl Client module (Hyper9::Client) contains some inline POD (plain old documentation). To view the POD you can navigate to the place where you extracted the Perl SDK archive and type the command

```
perlpod Hyper9/Client.pm
```

Perlpod will generate a manual page of sorts that should be familiar to most Perl developers. This alone will provide significant direction in using the client module.

Writing Your First Script

This example walks you through writing a script that executes a search for VMs that are configured for less than 1GB RAM; pulls out the configuration model for each of those VMs and prints out the memory size and name of the VM.

Create a new file called `searchMemory.pl` and open the file for editing. You first need to setup the proper imports.

```
use strict;
use Hyper9::Client;
use XML::Simple;
```

Next, setup your script with a `Hyper9::Client` reference and use it to login. You'll need to substitute the host address and credentials in the setup of the client. Below it is configured to login to a SolarWinds Virtualization Manager server found at `localhost` using the `admin/admin` credentials.

```
my $client = Hyper9::Client->new(
    username => 'admin',
    password => 'admin',
    host      => 'localhost:8983',
);
$client->login() || die "Login failed\n\n";
```

Now that we have a `$client` variable, we can use it to run any of the web service operations. For a complete list of operations along with their inputs and outputs, visit <http://your-server:8983/swvm/hyper9.wsdl>. We are going to execute the search operation. Insert the code below into your script.

```
my @results = $client->search(
    ciType    => 'VirtualMachine',
    query     => 'virtualMachine.memory:[0 TO 1023]',
    pageData => {
        pageSize    => 100,
        pageNumber => 1,
    },
);
```

As you can see, the result of the search call is placed into an array called `@results`. Next we will iterate the results items that are VMs and print out how much memory they actually have.

```
foreach my $vm (@results) {
    if (defined $vm->{ciRef}) {
        my $document = XMLin($vm->{document});
        print $document->{memory}."MB\t";
        print $vm->{ciRef}->{displayName}."\n";
    }
}
```

Lastly, don't forget to logout!

```
$client->logout();
```

Now you can save your searchMemory.pl file and run it using perl searchMemory.pl. The result should look something like this...

```
ryankruse$ ./searchExample.pl
512MB      Sarasota
768MB      Jacksonville
256MB      Natchitoches Parish
768MB      Apalachicola
256MB      Inx Lake
512MB      Reunion Arena
512MB      Ubuntu 64 bit
256MB      Johnson Space Center
256MB      Insta-Gator Ranch
768MB      Clearwater
512MB      Dixie Landing
512MB      Lafayette
512MB      Odessa
512MB      River Ranch
```

Scripting Tips

Whenever you receive a response from a Hyper9::Client call, you can place it directly into an array or a simple scalar, depending on what the web service call sends in its response.

Accepting a response into a scalar

```
my $response = $client->methodThatReturnsSingleThing();
```

Accepting into an array

```
my @response = $client->methodThatReturnsMultipleThings();
```

If you are not sure of the structure of the response variable, use the Data::Dumper module in Perl for an exhaustive printout of the data structure. The Data::Dumper is one of the most valuable modules when using the Hyper9::Client so use it often while developing your scripts.

```
use Data::Dumper;
print Dumper(@response);
```

Using the Provided Examples

searchExample.pl

The search example used above is also provided in the Perl SDK .zip file, where it is called searchExample.pl.

h9Console.pl

The most complete example provided in the PerlSDK .zip is the h9console.pl script. Simply run it with `perl h9console.pl -help` to see how to use it. Most administrative and search functions can be run through the h9console.pl program. It is only meant to be an interactive program though, so do not write scripts against it. Additionally, you may have to install the Term::ShellUI module using cpan or ppm to use this example.