

HP Server Automation

Ultimate Edition

Software Version: 10.23

User Guide: Service Automation Visualizer

Document Release Date: June 2016

Software Release Date: June 2016



Legal Notices

Warranty

The only warranties for HP products and services are set forth in the express warranty statements accompanying such products and services. Nothing herein should be construed as constituting an additional warranty. HP shall not be liable for technical or editorial errors or omissions contained herein.

The information contained herein is subject to change without notice.

Restricted Rights Legend

Confidential computer software. Valid license from HP required for possession, use or copying. Consistent with FAR 12.211 and 12.212, Commercial Computer Software, Computer Software Documentation, and Technical Data for Commercial Items are licensed to the U.S. Government under vendor's standard commercial license.

Copyright Notices

© Copyright 2001-2016 Hewlett Packard Enterprise Development LP.

Trademark Notices

Adobe® is a trademark of Adobe Systems Incorporated.

Intel® and Itanium® are trademarks of Intel Corporation in the U.S. and other countries.

Microsoft®, Windows®, Windows® XP are U.S. registered trademarks of Microsoft Corporation.

Oracle and Java are registered trademarks of Oracle and/or its affiliates.

UNIX® is a registered trademark of The Open Group.

This product includes software developed by the Apache Software Foundation (<http://www.apache.org/>).

Support

Visit the HP Software Support Online website at:

<https://softwaresupport.hp.com/>

This website provides contact information and details about the products, services, and support that HP Software offers.

HP Software online support provides customer self-solve capabilities. It provides a fast and efficient way to access interactive technical support tools needed to manage your business. As a valued support customer, you can benefit by using the support website to:

- Search for knowledge documents of interest
- Submit and track support cases and enhancement requests
- Download software patches
- Manage support contracts
- Look up HP support contacts
- Review information about available services
- Enter into discussions with other software customers
- Research and register for software training

Most of the support areas require that you register as an HP Passport user and sign in. Many also require a support contract. To register for an HP Passport ID, go to:

<https://hpp12.passport.hp.com/hppcf/createuser.do>

To find more information about access levels, go to:

<https://softwaresupport.hp.com/web/softwaresupport/access-levels>

Support Matrices

For complete support and compatibility information, see the support matrix for the relevant product release. All support matrices and product manuals are available here on the HP Software Support Online website:

<https://softwaresupport.hp.com/group/softwaresupport/support-matrices>

You can also download the *HP Server Automation Support and Compatibility Matrix* for this release from the HP Software Support Online Product Manuals website:

<https://softwaresupport.hp.com/>

This site requires that you register for an HP Passport and sign in. After signing in, click the **Search** button and begin filtering documentation and knowledge documents using the filter panel.

Documentation Updates

All the latest Server Automation product documentation for this release is available from the SA Documentation Library:

<https://softwaresupport.hp.com/group/softwaresupport/search-result/-/facetsearch/document/KM00417675>

Use the SA Documentation Library to access any of the guides, release notes, support matrices, and white papers relevant to this release or to download the full documentation set as a bundle. The SA Documentation Library is updated in each release and whenever the release notes are updated or a new white paper is introduced.

How to Find Information Resources

You can access the information resources for Server Automation using any of the following methods:

Method 1: Access the latest individual documents by title and version with the new SA Documentation Library

Method 2: Use the complete documentation set in a local directory with All Manuals Downloads

Method 3: Search for any HP product document in any supported release on the HP Software Documentation Portal

To access individual documents:

1 Go to the SA 10.x Documentation Library:

<https://softwaresupport.hp.com/group/softwaresupport/search-result/-/facetsearch/document/KM00417675>

2 Log in using your HP Passport credentials.

3 Locate the document title and version that you want, and then click **go**.

To use the complete documentation set in a local directory:

- 1 To download the complete documentation set to a local directory:
 - a Go to the SA Documentation Library:
<https://softwaresupport.hp.com/group/softwaresupport/search-result/-/facetsearch/document/KM00417675>
 - b Log in using your HP Passport credentials.
 - c Locate the All Manuals Download title for the SA 10.1 version.
 - d Click the **go** link to download the ZIP file to a local directory.
 - e Unzip the file.
- 2 To locate a document in the local directory, use the Documentation Catalog (docCatalog.html), which provides an indexed portal to the downloaded documents in your local directory.
- 3 To search for a keyword across all documents in the documentation set:
 - a Open any PDF document in the local directory.
 - b Select **Edit > Advanced Search** (or Shift+Ctrl_F).
 - c Select the All PDF Documents option and browse for the local directory.
 - d Enter your keyword and click Search.

To find additional documents on the HP Software Documentation Search Portal:

Go to the HP Software Documentation Search Portal:

<https://softwaresupport.hp.com/>

This site requires that you register for an HP Passport and sign in. After signing in, click the **Search** button and begin filtering documentation and knowledge documents using the filter panel.

To register for an HP Passport ID, click the **Register** link on the HP Software Support Online login page.

You can also receive updated or new editions if you subscribe to the appropriate product support service. Contact your HP sales representative for details. See Documentation Change Notes for a list of any revisions.

Product Editions

There are two editions of Server Automation:

- Server Automation (SA) is the Ultimate Edition of Server Automation. For information about Server Automation, see the SA Release Notes and the SA User Guide: Server Automation.
- Server Automation Virtual Appliance (SAVA) is the Premium Edition of Server Automation. For more information about what SAVA includes, see the SAVA Release Notes and the SAVA at a Glance Guide.

Contents

- 1 Service Automation Visualizer 9
 - Overview of HP Server Automation Visualizer 9
 - The SAV and SA Clients 9
 - SAV Platform Support 10
 - Overview of SAV Features 10
 - SAV Usage Examples 11
 - Launch SAV 11
 - Discover and Map Business Applications on Servers 11
 - View Related Networking and Storage Information 12
 - Define Business Application Definition 12
 - Troubleshoot Problems and Take Action 13
 - How SAV Works 13
 - Data Collection and Display 13
 - SAV Business Application 14
 - Launching SAV 19
 - Launching SAV from Servers, Devices, or Device Groups 20
 - Launching Business Applications from the SA Client Library 21
 - Launching SAV from Search Results — SA Client or SAR Client 22
 - Launching SAV from Generated Reports — SA Client or SAR Client 22
 - Launching Storage Essentials from SAV 23
 - SAV User Interface 23
 - SAV Toolbars 24
 - Menus and Menu Options 28
 - Adding and Removing Devices in SAV 28
 - SAV Maps 30
 - Tiers Map 30
 - Server Map 31
 - Network Map 34
 - Storage Map 36
 - Viewing Storage and SA Permissions 38
 - SAN Map 39
 - SAV Infrastructure Pane 40
 - Symbols Used in Maps 41
 - SAV Properties 44
 - Exporting Properties Information to .csv 45
 - Tiers Tree: Tiers, Process Family, Signature Properties 45
 - Devices Tree: Server and Network Device Properties 49
 - Storage and SAN Properties 56
 - SAN Link Properties 61

SAV Options.....	61
Virtualization Settings.....	61
Scan Time-Out Preference.....	62
Discovery Settings.....	62
Reset All Settings.....	63
Accessing Servers and Devices From SAV.....	63
Opening the Device Explorer.....	63
Opening a Remote Terminal.....	63
Opening a Global Shell.....	64
Running Scripts on Devices.....	64
Creating Business Application Definitions.....	65
Business Application Templates.....	66
Creating Business Application Contacts.....	66
Sending Email to Business Application Contacts.....	67
Business Application Tiers.....	67
Cutting and Copying a Tier.....	68
Pasting a Tier.....	68
Application and Storage Signatures.....	68
Signature Evaluation Order.....	69
Creating an Application or Storage Signature.....	71
Editing Signatures.....	72
Deleting Signatures.....	72
Cutting and Copying Signatures.....	72
Pasting a Signature.....	72
SAV Business Application Management.....	73
Opening a Business Application.....	73
Saving a Business Application.....	73
Saving a Business Application as an Application Template.....	74
ACLs and Server Pool Configurations.....	74
Viewing ACLs.....	74
Comparing ACLs — Two Devices In Same Snapshot.....	75
Comparing ACLs — Same Device Between Two Snapshots.....	75
Comparing Server Pool Configuration.....	76
Viewing Server Pool Configuration.....	76
Comparing Snapshots.....	77
Creating a Snapshot.....	77
Opening a Snapshot.....	77
Scheduling a Snapshot.....	78
“Source” and “Comparison” Snapshot.....	78
Comparison Types.....	78
Comparing Snapshots.....	81
Significant Scan Result Difference Heuristics.....	81
Filtering SAV Data.....	82
Creating a Data Filter in SAV.....	84
Filter Criteria.....	84
SAV Scan Error Messages.....	85
SAV Platform Support.....	87

1 Service Automation Visualizer

Overview of HP Server Automation Visualizer

HP Server Automation Visualizer (SAV) allows you to manage the operational architecture and behavior of distributed business applications in your IT environment by displaying detailed application information in physical and logical drawings.

SAV enables you to scan selected servers or devices in your data center so you can visualize all aspects of your business applications and how it interacts with other components on your network. SAV gives you the ability to create signature-based definitions of your Business Applications and storage components, and models them in Tiers. This provides a detailed and comprehensive picture of how all a business application's components interact.

SAV's detailed picture of your business application includes all related physical and virtual servers, network and storage devices, and physical and logical connections between any of them. When you better understand a business application's processes and interrelationships, you can understand how the business applications are distributed and you are likely to be more effective in troubleshooting errors when they occur.

SAV enables you to take snapshots of a business application (on a one time or recurring basis) and compare the results, so you can view and compare differences in your business application at a specific point in time. You can compare two snapshot results to see changes that have occurred and remediate any differences in the results.

You can also view compliance information in SAV, so you can monitor server and device compliance levels and troubleshoot those that are out of compliance.

SAV is tightly integrated with features in HP Server Automation(SA), as well as the Network Automation (NA) and Storage Essentials (SE). The kinds of data you can visualize and tasks you can perform in SAV, however, depends upon the SA products you are licensed to run or have configured to work with SA and SAV.

The SAV and SA Clients

The Service Automation Visualizer (SAV) Client is a separately licensed product that requires SA in order to run.

In order to visualize networking information with Network Automation (NA) inside of SAV, you must have both a licensed version of NA integrated with your SA core, plus an additional license to run SAV showing NA data.

In order to visualize SAN objects, such as arrays, switches, volumes in SAV, Storage Essentials (SE) version 6.1.1 or later is required and the Server Automation SE Connector component must be installed and configured on your SA core.

You can also visualize servers and devices in search and report results from inside the Service Automation Reporter (SAR), which is also a separately licensed product.

If you have not purchased SAV, NA, SE or SAR, but would like to, contact your sales representative.

SAV Platform Support

For the current list of support OS platforms and hardware architecture supported by SAV, see [SAV Platform Support](#) on page 87.

Overview of SAV Features

SAV enables you to perform the following tasks:

- Discover, map, and visualize the process families, connections, dependencies, and storage of multi-tiered business applications
- Visualize business applications that run on virtual servers, showing virtual servers in relationship to their hypervisors, as well as virtual switches and port groups (VMware ESX only)
- Visualize business application information in multiple physical and logical layouts, such as an application view, a server view, a network view (including virtual network devices), a storage and SAN view that displays logical and physical storage connections, and an infrastructure view that provides detailed inventory and infrastructure information related to objects scanned.
- Visualize Oracle database instances, including their tablespaces and connection to database files (including redo logs).
- Organize recognized application and storage signatures into multi-tier applications to create a logical view that can be analyzed to verify correct operation
- Map business application process families to application and storage signatures and highlight them with custom color schemes
- Create, schedule and compare snapshots of your Business Applications and all the data captured in them
- Filter business application snapshots to find exactly the data you are looking for
- Create and share business application templates that represent an ideal application definition
- Run scripts on devices or the Global File System (OGFS) on a one-time or scheduled basis
- Troubleshoot and resolve problems by launching the Device Explorer, Network Device Explorer, Global Shell, Remote Terminal, and NAS interface to perform in-depth analysis or to perform actions on the systems under investigation
- Export maps to .gif, .jpg, and .svg files
- Export tables (Properties and Infrastructure tabs) to .csv

SAV Prerequisites

In order to scan and visualize devices and relationships in SAV, the following requirements must be met:

- Server Agent version 7.0 or greater to scan and visualize managed servers from a SA core. The exceptions to this requirement is VMware ESXi Server, which does not require an SA agent for scanning and visualizing those servers in SAV
- SA core that is configured to connect to Storage Essentials (SE). For information, see the Storage Visibility and Automation documentation.
- NA 7.0 or greater server in order to scan network devices and connections

Supported Operating Systems

SAV collects and displays data about managed servers that are running AIX, Linux, HP-UX, Solaris, VMware ESX, and Windows operating systems. If you are running non-standard kernels on a Linux operating system, SAV might depend on the kernel version, in addition to the operating system version.

For more detailed information on SAV platform support, see the *SA Support and Compatibility Matrix*.

SAV Usage Examples

Understanding how SAV functions within the context of a real datacenter is best illustrated with some general usage examples:

- [Launch SAV](#)
- [Discover and Map Business Applications on Servers](#)
- [View Related Networking and Storage Information](#)
- [Define Business Application Definition](#)
- [Troubleshoot Problems and Take Action](#)

Launch SAV

An application administrator starts a new job at a company and one of his first tasks is to add a new feature to a business application, that was maintained by a prior employee, but the former employee left very little documentation. The administrator was provided with the application's source code but does not understand how all pieces of the application work together from an operational standpoint.


To gain a better picture of the application, he opens the SA Client, selects a group of servers (some of which use remote storage) that the application runs on, and launches SAV.

For information on how to launch SAV, see [Launching SAV](#) on page 19.

Discover and Map Business Applications on Servers

SAV scans the selected servers and discovers all applications, signatures, processes and process families, files systems, local and remote storage, database connections, and any other connections related to all the applications running on the selected servers. SAV displays detailed “maps” of the applications (processes and process families) and servers and connections associated with them, as well as any related network relationships and remote storage and SAN connections.

The application administrator examines this information and sees a short list of items that contains two servers, one of which is his server, and two network devices. Looking at the Server Map, he selects the box that represents his server, and a properties pane opens to display more detailed information about the server. He notices that the server has virtual machine-related information, so he concludes that his business application may be running on a virtual machine instance.

He then clicks **Show Virtual/Physical Containment Relationships**  on the SAV toolbar, and now the map shows that his server is a virtual machine running on a hypervisor. He double-clicks the hypervisor server and once it expands, he sees his server within it. He now understands that his business application

runs on a VMware virtual machine (VM), and has visibility into the physical host (hypervisor) on which the VM runs. He also notices that the hypervisor server is connected to a SAN disk array, and he can see the connection between the file system on the server and the storage device.

For more information on the SAV maps, see [SAV Maps](#) on page 30.

View Related Networking and Storage Information

The administrator then selects the Network Map and sees his server again, but notices that it has a green line connecting it to another box. By clicking on that box and examining the properties, he determines that the other box is a VMware vSwitch, which in turn is connected to a Cisco switch. He can see precisely which VLAN, port group, switch port, and network interfaces are involved when his business application communicates over the network. He now understands how his business application fits into the network, both physical and virtual.

He takes a closer look at the lines emanating from his server, and notices a prominent, thick black line pointing at some IP address, so he clicks on it. He sees that the line represents 64 connections to another host on port 1433. It looks like the database that he knows his business application uses. He right-clicks the box that his server is pointing at and selects **Add Devices**. A window opens that shows the discovered database selected. He clicks the Add button and his Snapshot refreshes, this time including the new server.

Now he sees that the thick black line is pointing at the new server, and after drilling down, he discovers it pointing specifically at an SQL server process. He continues this until he finds his business application running across and depending on 10 separate servers. He also sees that the SQL server process family runs on two different file systems on the server, which are being stored on a SAN disk array. The connection to the disk array is brown, so he knows this is not a problem with the remote storage device.

Define Business Application Definition

The application administrator naturally does not want to have to perform all of this manual mapping and discovery each time he wants to view and manage his business application. He knows that the vendor's documentation contains a logical architectural diagram of the business application, so to make his job easier, he uses SAV to create an business application diagram.

His first step is to create the logical tiers of the business application. He selects the Tiers tree and creates four main tiers for the business application: Web, Application, Database, and Storage. He creates sub-tiers for authentication services and integration services. He then defines application signatures to add to each tier, specifying which tier a recognized signature should fall in. For the Storage tier, he creates storage signatures to capture any related storage on any NAS filers or disk arrays.

In order to create reusable application and storage signatures for each tier, he specifies the criteria used to recognize it, including process names, open files, listener ports, command line, environment variables, and so on.


He continues to do this for each tier in the business application, and then color codes the signatures in each tier. When the business application is visualized in the Tiers or Server or Storage maps, he will be able to see each tier of the business application in different colors. Next time he launches SAV, the business application will map and display according to his definition.

Finally, he saves his business application definition so it can be reused by others who want to work with the same business application.

For more information on creating a business application, see [Creating Business Application Definitions](#) on page 65.

Troubleshoot Problems and Take Action

To help keep track of the state of a business application at any given time, the application administrator

continually clicks **Refresh Snapshot**  on the SAV toolbar in order to create new snapshots. Each snapshot can be saved to the SA Client Library or to a local system, which can be used later to compare previous snapshots of the business application with a current state to find any important differences and troubleshoot errors.


For example, if at some point his business application malfunctions and stops working, the administrator can open his saved the business application, select the Compare feature, and visualize the differences between snapshots that compare the current state of the business application with the last known good state. Comparing snapshots can show numerous thing, such as if specific devices are not communicating with other devices. For example, he can drill into the network map and see that an interface is missing from his VMware ESX hypervisor from the same diagram and select Open Remote Terminal to remedy to problem.

For more information on snapshots, see [Comparing Snapshots](#) on page 77.

How SAV Works

SAV's main function is to visualize business applications in great detail, and to display the relationships among all their parts and processes and the servers and devices they depend on to function.

SAV scans a server (or multiple servers) and network and storage devices to gather this information and displays it in the maps and tiers, visualizing all processes and process families, connections, and devices related to the business application. Each SAV session, which can be saved as a Business Application to the SA Client Library (or to a local system), allows you to create, visualize, analyze, define, share, and troubleshoot your business applications.

Clicking **Refresh Snapshot**  allows you to scan the current state of the SAV business application and save it. These scan results (called a "Snapshot") can be compared on a one to one basis using the compare feature (activated by the Compare toolbar button).

Data Collection and Display

SAV scans devices (servers and network and storage devices) and draws maps based on data that is collected in real-time results of a SAV snapshot. Device data is captured directly from servers and then recorded in snapshots. Network device data is scanned and then recorded in scan results by NAS — where it is retrieved by the SAV from the Network Automation data model. Storage data that relates to the selected device is scanned from the SE data model.

When you launch SAV, a set of programs runs on the selected managed devices and captures data. This scanning process collects data about processes running on those devices and the connections between them. It also collects detailed configuration information and current run-time state information about connections and processes. SAV then merges the server data, network, and storage device data to show how servers, interfaces, switches and switch ports, file systems and local and remote storage are connected together.

When you click **Refresh Snapshot**  on the SAV toolbar, SAV creates a new snapshot that captures all the information gathered when you scan a business application (and the servers and devices it runs on) as well as your business application definitions.

SAV uses information gathered from SA, NA, and SE, leveraging the architecture to collect more data on-demand (such as processes that are running, open ports, and the number of users logged in). It also maps business application data to visualize and analyze your operational environment.

SAV collects and displays the following information about managed servers, network, and storage devices:

- Processes and process families (potentially matching application signatures) that are running on managed servers
- TCP and UDP connections between these processes
- Detailed configuration information
- Current runtime information about servers, connections, and processes
- File systems on servers and how they are used by process families, are mapped to fibre channel ports, and are reliant on local and remote storage
- Servers, interfaces, adapters, switches and vSwitches, and switch port connections
- Local and remote storage devices and how they connect to servers, SAN switches, and other storage devices

See [Processes, Process Families, and Extended Process Families](#) on page 16 for an explanation of how SAV interprets this data. See [Filtering SAV Data](#) on page 82 for instructions on how to search the data that was collected by object type, such as by process family, network interface, and so on.

SAV Business Application

A business application is a complex collection of services that typically run across multiple servers, networking (LAN and SAN), and storage devices. A business application in SAV consists of business application definitions (tiers, application and storage signatures, and properties definitions) visible in the Tiers tree, and a collection of maps that visualizes relationships between a business application's signatures, processes (and process families), file systems, storage devices, and external clients and dependencies.

A SAV business application maps to actual instances of business applications that are running on servers that SAV has scanned and displayed. A business application, as seen in the Tiers Map, is a collection of processes running on a managed server that maps to a SAV Application definition, as specified in the Tiers tree. A business application can also include storage devices and how they relate to and connect with process families running on servers.

The SAV business application is further explained in the following sections:

- [Tiers Tree](#)
- [Creating Tiers to Model Business Applications](#)
- [Application Signatures](#)
- [Processes, Process Families, and Extended Process Families](#)
- [Storage Signatures](#)

For information on how to create a SAV application, see [Running Scripts on Devices](#) on page 64.

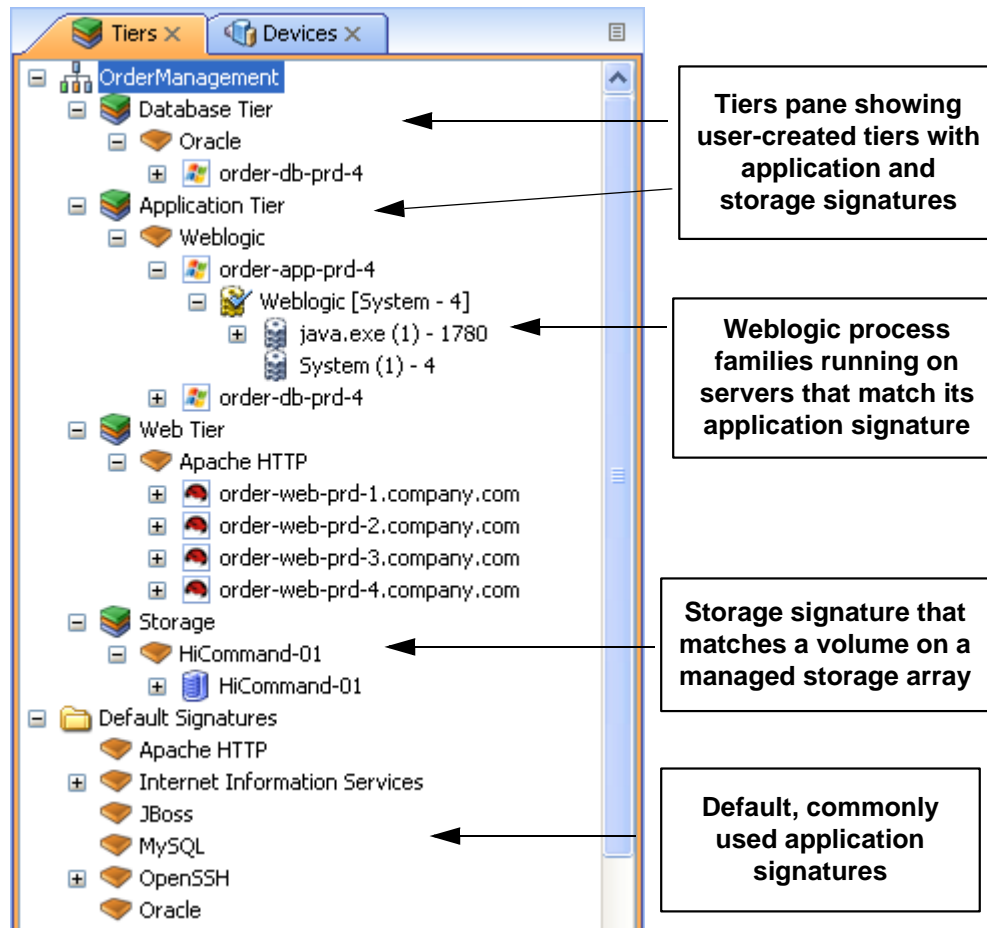
Tiers Tree

The Tiers tree is a logical view of a business application that provides a hierarchical representation of a business application's infrastructure. The Tiers tree provides a different way of looking at what is visually displayed in the Tiers map. The Tiers tree contains tiers and subtiers, which in turn can contain application and storage signatures.

Inside of each application signature is the server or device that the process families run on, and inside of the server or device is the process family itself. A storage signature is similar to an application signature except that its signature matches storage volumes rather than process families (as in an application signature). This allows you to quickly identify and categorize storage dependencies.

See [Figure 1](#) for a picture of the Tiers tree.

figure 1 Tiers Tree



▶ Default signatures at the bottom of the Tiers tree do not appear in the Tiers map — instead, they are highlighted in the Network Map, Server Map, and Storage and SAN Maps.


If there are no matching process families for a signature, a warning icon  appears next to it, and the tiers that contain it, in the Tiers tree.

Creating Tiers to Model Business Applications

Creating tiers enables you to model the logical structure of a business application, representing all of its processes and process families as a diagram of elements that run across multiple servers, displaying the connections among them, clients connecting to them, and dependencies to which they connect. Tier

definitions can contain a device filter, which restricts the servers whose process families will match the tier's application signatures; or, can contain storage devices whose volumes or filesystems will match the tier's storage signature.


Each application consists of a set of tiers and sub-tiers, such as a Web tier running Apache on Linux, an application tier running WebLogic on Windows, a database tier running Oracle on Solaris, and a storage tier to represent disk arrays and NAS filers.

A tier is represented in the Tiers tree by the  icon, which can contain application signatures, storage signatures, and optional sub-tiers.

For information on how to create business application tiers, see [Business Application Tiers](#) on page 67.

Application Signatures

An application signature is an object that represents a process or process family that comprise an application, such as Apache, Oracle, BEA WebLogic, Microsoft® SQL Server, and so on.

An application signature is represented in the Tiers tree by the  icon. An application signature object consists of a signature and visual display preferences.

A signature is a set of rules that you provide and that SAV uses to identify a process family. This set of rules uses data such as process name, open files, command line, environment variables, connected to port, modules, executable path, and listener port. If SAV discovers the process or process family during a scan according to the signature rule definition, then the process or process family is added to the signature and highlighted in the maps.


Preferences specify the alias of the application component. These are displayed in the specified background and foreground text color of the different maps.

For more information on creating application signatures, see [See Creating an Application or Storage Signature](#) on page 71.

Processes, Process Families, and Extended Process Families


In SAV, a process is a running instance of a program in a UNIX or Windows environment. A process is discovered and aggregated into process families and extended process families.

A *process family* is a collection of processes that are part of the same UNIX session (same name and GID) or a collection of processes that are part of the same Windows session (same name and login session ID).

A process family is represented in the Application (or Device) Tree by this  icon. (Single processes are always grouped visually into process families, and so are also represented by the process family icon.) If the process family is connected to something else (another process family, for example), it is represented

in the Application (or Device) Tree by the  icon.

An *extended process family* is a set of processes that the SAV has heuristically computed to be related, but are not necessarily members of the same process hierarchy.


An extended process family is represented by the  icon.


Storage Signatures

If your scanned managed servers are configured with a storage inventory snapshot and the SE Scanner is configured to integrate with your SA core, then you can also model logical storage hierarchies to help visualize and understand how your storage devices and SAN relate to the processes used by your business application.

A storage signature is similar to an application signature except that its signature matches storage volumes rather than process families (as in an application signature). This allows you to quickly identify and categorize storage dependencies.

Storage signatures are created in the Tiers tree. The Tiers Map displays them according to modifiable settings of color and name in the signature's properties.

A storage signature is represented in the Tiers tree by the  icon. A storage signature object consists of the name of the storage volume, LUN name and ID, exported path, and any relevant manufacturer information, such as manufacturer name and model number of the related device.

Storage signatures that do not match any actual volumes in the current scan are flagged with a  warning icon.

For more information on creating storage signatures, see [See Creating an Application or Storage Signature](#) on page 71 and [Examples of Regular Expressions](#) on page 85.

Devices Tree

The Devices tree is a logical, tree-based view of top-level information about managed servers, process families, and network and storage devices. This tree hierarchically displays the same top level information that is shown in the Network Map, Server Map, Storage Map and SAN Map.

The Devices tree contains servers, network and storage devices (physical and virtual) as its top nodes. Below the servers are process families and extended process families. Network devices contain VLANs, ports, and port groups (for VMware virtual switches).

▶ VMware ESXi hypervisor servers cannot be expanded to view process information in the Devices Tree.

Storage devices in the Devices Tree display the following elements:

- NAS filers and their exported file systems and mapped LUNs used by servers
- SAN arrays and their volumes LUN mapped to servers:
- SAN switches and their fibre channel ports.

The Devices tree also shows virtual devices that were scanned when you launched SAV. These virtual devices can be shown grouped beneath their hypervisor when the Virtualization button is selected. This tree includes the following:

- Virtual servers.
- VMware virtual switches (vSwitches). vSwitches can be expanded to view their port groups.
- Solaris Global zones can be expanded to list all running processes, but this list of processes includes processes on non-global zones not included in the current scan.

Attributes in the Properties pane for Device Tree objects contain the following:

Oracle

- Oracle executable
- Oracle database instance

- Tablespaces inside the database

WebLogic

- Applications
- Web Applications
- EJBs
- JDBC Connection Pools

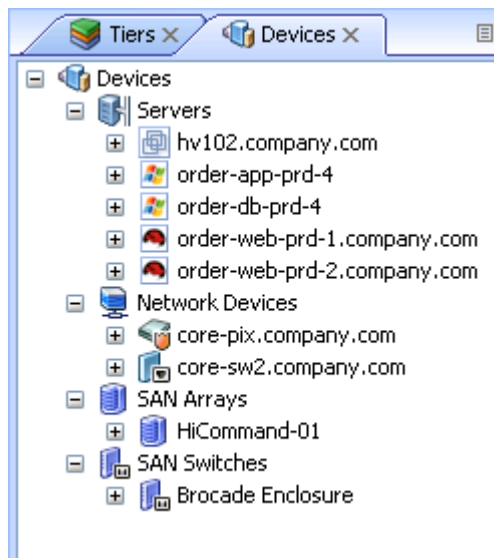
Microsoft IIS

- Web Sites
- FTP Sites
- Bindings

To view online help for these objects, select the object in the Device Tree, then select the Properties tab in the lower left of the SAV window. Then, press F1 on your keyboard.

Figure 2 illustrates the Devices tree, showing servers, network devices, storage and SAN devices.

figure 2 **Devices Tree**




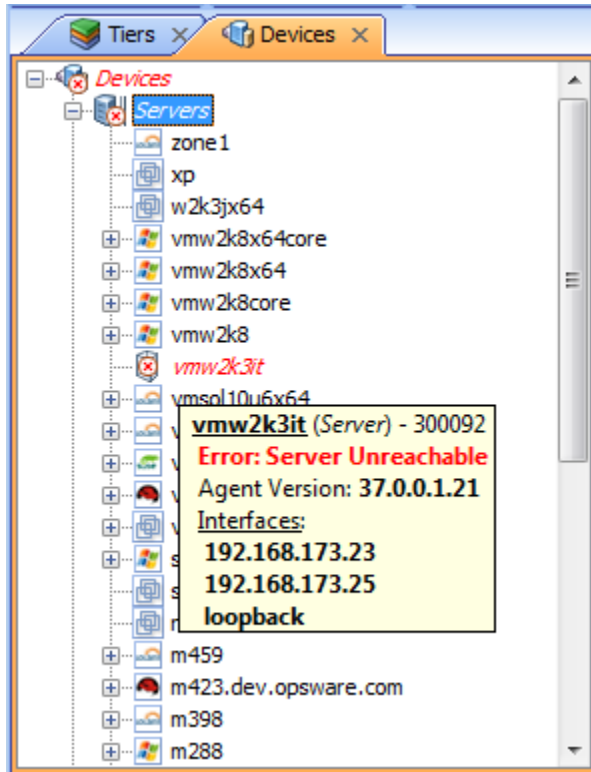
If a server device has an error associated with it, then it appears in the Devices tree with an error icon on it , for example if the server is unreachable by SA. When you move your mouse pointer over the device node in the tree, a tooltip message indicates the nature of the error, as shown in [Figure 3](#).

figure 3 Devices Tree Server Node with Tooltip Indicating Device Scan Error



For more information on possible device errors, see [SAV Scan Error Messages](#) on page 85.

Launching SAV

You can launch SAV in several different ways:

- From a server or group of servers (using drag and drop or menus)
- From the SA Client Library
- From search or report results
- From a storage or network device (or group of devices)
- From a report or search result inside of the SAR Client

When you launch SAV, it performs an extensive scan of the servers or devices you selected — including all virtual servers and their hypervisors.

For more information about how SAV scans a server or device, see [Data Collection and Display](#) on page 13.

For more information on launching SAV from the SAR Client, see the *SAR User's Guide*.



The Allow Analyze permission is required to use SAV. You also need read access to each managed server that you plan to scan. Write access to each managed server is not required to run the SAV; however, write access is required to perform any actions on the servers, such as opening a remote terminal or running a script.

To visualize virtualization dates inside of SAV, the View Virtual Server permission must be set to Yes for the user group that your user belongs to. (Without this permission, virtual servers will be displayed just like regular physical servers.) To obtain these permissions, contact your SA administrator. For more information on permissions, see the *SA Administration Guide*.

You can launch SAV from inside the SA Client from the following different locations:

- [Launching SAV from Servers, Devices, or Device Groups](#)
- [Launching Business Applications from the SA Client Library](#)
- [Launching SAV from Search Results — SA Client or SAR Client](#)
- [Launching SAV from Generated Reports — SA Client or SAR Client](#)

Launching SAV from Servers, Devices, or Device Groups

To launch SAV servers (virtual servers, or hypervisors), devices (servers, storage devices, or network devices), or groups of devices, perform the following steps:

- 1 Launch the SA Client from one of the following locations:
 - Double-click the SA Client icon on your desktop (if you installed it on your desktop when you installed the SA Client).
 - Select **Start** menu > **All Programs** > **HP Server Automation Client**.
 - 2 From the Navigation pane, select the Devices tree.
 - 3 From the Device Groups, Servers list, or Storage list, select a device and perform one of the following actions:
 - From the **Actions** menu, select **Open with** > **HP Service Automation Visualizer**.
- Or
- Right-click, and from the menu, **Open with** > **HP Service Automation Visualizer**.
- Or
- From the **Tools** menu, select **HP Service Automation Visualizer** > **Open Selection**.
- Or
- Select the servers and drag them into an open SAV window. After doing this, click **Refresh**

Snapshot  on the main toolbar so SAV can scan and display the new device.

After scanning is completed, the SAV application window appears containing the selected device or devices in the Devices tree, Tiers tree, Properties Panes, Server Map, Network Map, Storage Map, Tiers Map, and the Infrastructure pane.

If a SAV scanning process is taking too long, you can cancel. For more information on how to set the scan timeout value, see [Scan Time-Out Preference](#) on page 62.

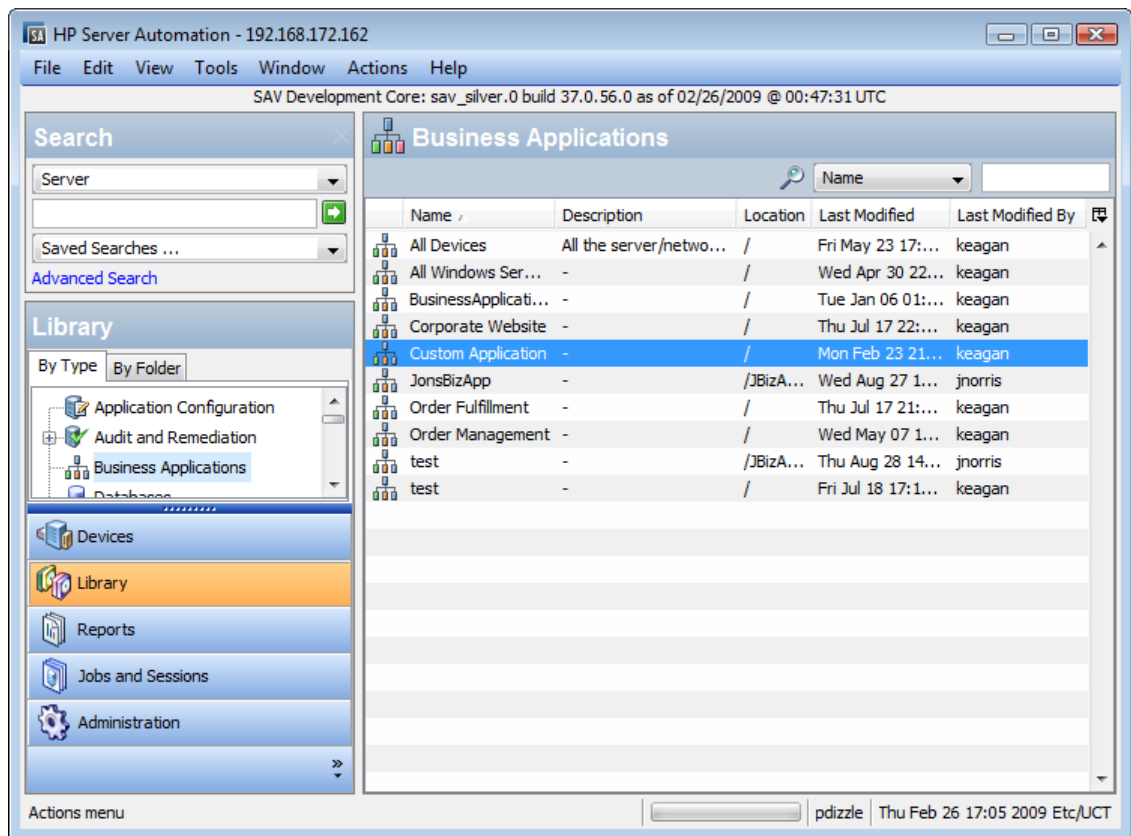


If you have selected virtual servers or a virtual server's hypervisor to open with SAV, you will initially be asked if you want to scan virtualization relationships — in other words, whether or not to scan any virtual and host servers related to the servers that you selected. This could increase the time it takes to complete the scan, depending on how many virtual servers or hypervisors are related to your selected servers. To control virtual server scan settings, see See “Virtualization Settings” on page 61.

Launching Business Applications from the SA Client Library

You can launch Business Applications from the Library. A business application is a complex collection of services that typically run across multiple servers, networking (LAN and SAN), and storage devices. A business application in the SAV consists of business application definitions (tiers, application and storage signatures, and properties definitions) visible in the Tiers tree, and a collection of maps that visualizes relationships between a business application's signatures, processes (and process families), file systems, storage devices, and external clients and dependencies.

figure 4 Business Applications in the SA Client Library




For more information about creating and saving SAV business applications, see [Creating Business Application Definitions](#) on page 65 and [Saving a Business Application](#) on page 73.

To launch SAV from the SA Client Library, perform the following steps:

- 1 From the Navigation pane, select **Library** > **By Type**.
- 2 Select the Business Applications object. The Contents pane on the right side shows all SAV business applications you have permissions to see.
- 3 To open a business application and launch SAV, select a business application, right-click, and select **Open**.

Launching SAV from Search Results — SA Client or SAR Client

To launch SAV from search results in either the SA Client or SAR Client, perform the following steps:

- 1 Launch the SA Client from one of the following locations:
 - Double-click the SA Client icon on your desktop (if you installed it on your desktop when you installed the SA Client).
 - Select **Start** menu > **All Programs** > **HP Server Automation Client**.Or, to launch the SAR Client:
 - Select **Start** menu > **All Programs** > **HP Server Automation Client**.
- 2 From the Search panel, perform a search for servers. For example, from the top drop-down list, select Servers, or Business Application, or SAN Switch, or Storage System, and then click the green search button .
- 3 In the search results, select one or more servers and then perform one of the following actions:
 - From the **Actions** menu, select **Service Automation Visualizer**.Or
 - From the **Tools** menu, select **Service Automation Visualizer** > **Open Selection**.


After scanning is completed, the SAV application window appears containing the selected device or devices in the Devices tree, Tiers tree, Properties pane, Server Map, Network Map, Storage Map, Tiers Map, and the Infrastructure pane.

Launching SAV from Generated Reports — SA Client or SAR Client

To launch SAV from report results from either the SA Client or the SAR Client, perform the following steps:

- 1 From the **Start** menu, select > **All Programs** > **HP Business Service Automation** > **HP Server Automation**.
Or, to launch the SAR Client:
From the **Start** menu, select > **All Programs** > **HP Business Service Automation** > **HP Server Automation Reporter**.
- 2 From the Navigation pane, select Reports.
- 3 Expand the Reports, and select a report that will display servers in its results.
- 4 From the report results, drill down and select an individual server or multiple servers, right-click, and select **Service Automation Visualizer**.

After scanning is completed, the SAV application window appears containing the selected device or devices in the Devices tree, Tiers tree, Properties panes, Server Map, Network Map, Storage Map, Tiers Map, and the Infrastructure pane.

-  When launching SAV on device groups or when refreshing a previous scan, the servers involved in that scan will consist of the members of those device groups at the time of the scan. Membership may change over time, so two scans of the same selection may produce a different set of scanned servers.

Launching Storage Essentials from SAV

If your SA core has been configured with Storage Essentials, you can launch Storage Essentials from a SAN array inside of SAV.

To launch Storage Essentials from inside of SAV, perform the following steps:

- 1 From inside the SAV application window, select the SAN map.
- 2 Select a storage array, right-click, and select **Open HP Storage Essentials**.

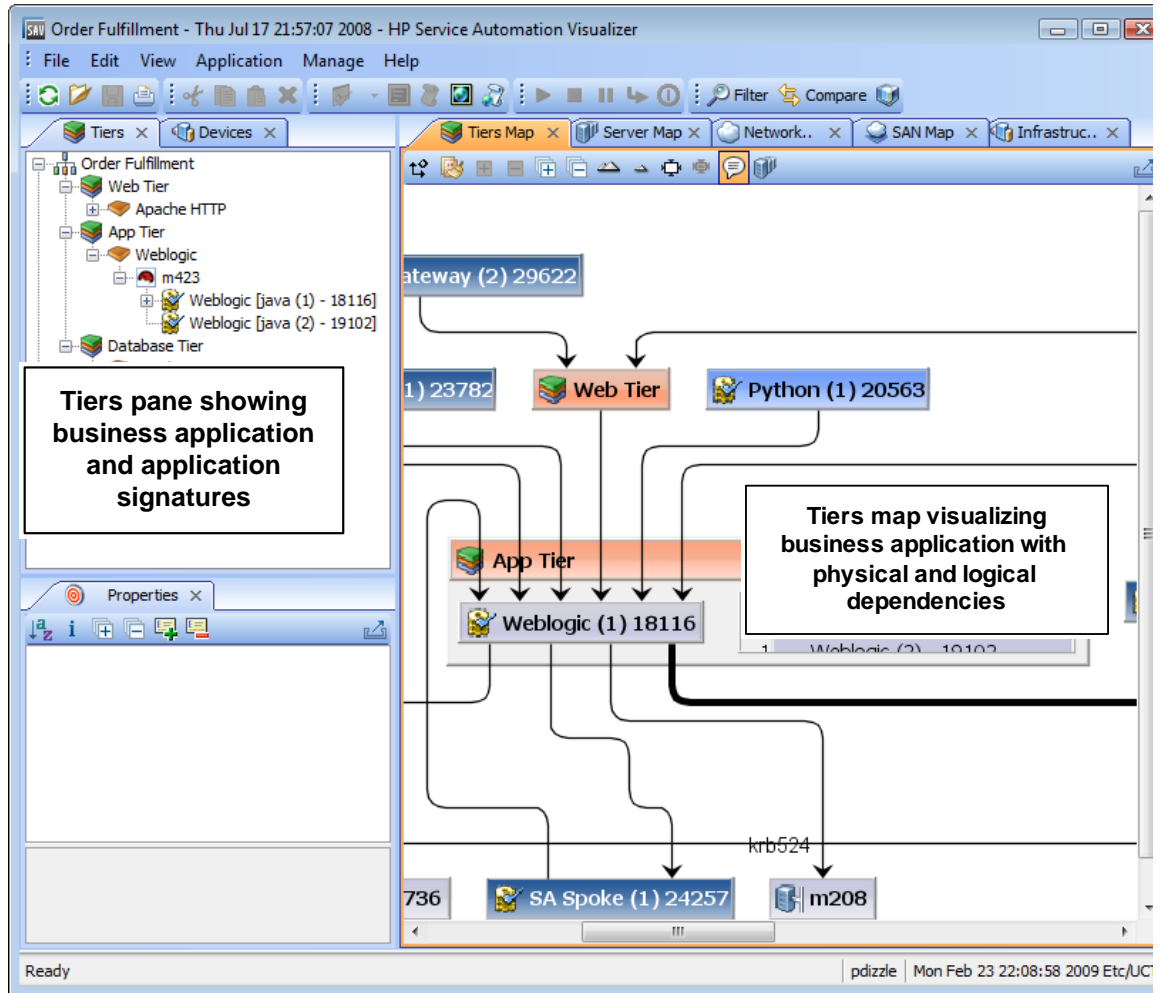
SAV User Interface

The SAV user interface shows a business application and all its related processes, connections, and devices. It does so by providing the following user interface elements:

- Maps that display the physical and logical and virtual layouts of applications — see [SAV Maps](#) on page 30.
- Trees that display the physical and logical layouts of applications — see [Tiers Tree](#) on page 15 and [Devices Tree](#) on page 17.
- Properties panes that provide granular information about a selected object, signature, process, or connection — see [SAV Properties](#) on page 44.
- Detailed tables for comparison of objects — see [Comparing Snapshots](#) on page 77.
- Dynamic tool bars and detailed tooltips to provide more information about tree and map objects.

Figure 5 shows the types of information that the SAV displays.

figure 5 Service Automation Visualizer User Interface



SAV Toolbars

The SAV toolbars allow you to open, close, resize, and organize different layout views and trees, as well as execute scripts, launch the Global Shell, create a SAV Snapshot, compare Snapshots, and more.

Depending on the tree and view selected, certain tool bar icons will be unavailable. See [Table 1](#) for a description of SAV's tool bar icons.

table 1 **Tool Bar Icons in SAV**












Toolbar Icon	Description
Main Toolbar	
	Refreshes the scan results by collecting and displaying new information. Each time you click this button, SAV creates a new SAV snapshot that gets saved as part of the Business Application, and can be used in a snapshot comparison.
	Opens a previously saved .vam or .vat file, or Business Application from the SA Library.
	Saves the current business application (including maps) as a .vam or .vat file in your local file system, in the SA Client Library, or in the Global File System (OGFS). If the business application has not been previously saved, the Save As window displays.
	Prints the selected map. Displays the Print window where you specify page setup (including printing across multiple pages), a title for the printed map, and so on.
	Cuts a selected business application or storage signature or a selected tier in the Tiers tree and saves it to the clipboard.
	Copies a business application component or storage signature in the Tiers tree and saves it to the clipboard.
	Deletes a selected application tier or signature in the Tiers tree or Tiers Map.
	Opens the Device Explorer for the selected device — server, storage device, network device.
	Opens the compliance view of the server (in SA Client) or network device (in NA Client).
	Opens NA for the selected network device (if your core is NA-enabled).
	Opens the Open Remote Terminal window where you select a login ID for a Remote Terminal.

table 1 Tool Bar Icons in SAV (cont'd)

Toolbar Icon	Description
	Launches the Run Script window in the SA Client (for servers) or the NA Client New Task - Run Command Script page (for network devices).
	Opens a Global Shell session.
	Launches the Run OGFS Script window.
	Starts the selected virtual server (VM or Solaris local zone).
	Stops the selected virtual server (VM or Solaris local zone).
	Pauses the selected virtual server (VM only).
	Restarts the selected virtual server (VM or Solaris local zone).
	Allows you to filter the currently loaded scan results to find relevant data. For more information, see Filtering SAV Data on page 82.
	Allows you to compare to SAV snapshots. Clicking once will display the Compare pane at the bottom of SAV window. Click again to hide the Compare pane. For more information on comparing scan results, see Comparing Snapshots on page 77.
	Displays virtualization relationships between virtual server or virtual switches inside of their hosts in the Server map, Storage Map, and Devices Tree.
Properties Pane Toolbar	
	Alphabetize properties of the selected object in the Properties pane.
	Displays additional information about the selected Properties attribute.
	Expands all Properties categories.
	Collapses all Properties categories.

table 1 Tool Bar Icons in SAV (cont'd)
















Toolbar Icon	Description
	Adds a contact to your Business Application. (Available only when you select the top-level node of a Business Application in the Tiers tree.)
	Deletes a contact to your Business Application. (Available only when you select the top-level node of a Business Application in the Tiers tree.)
	Exports Properties pane or table contents (such as Infrastructure or differences) to .csv.
Maps Toolbar	
	Rotates the selected view, toggling it between a vertical and a horizontal orientation.
	Redraws all components in the selected view. Components that have been manually revised will retain their sizing.
	Expands selected tiers in the Tiers tree or closed folders in the selected map. Tiers are expanded recursively down to the business application component that they contain. Managed servers underneath the business application components are not expanded.
	Collapses all tiers in the Tiers tree or closed components in the selected view.
	Opens all tiers in the Tiers tree or signature in the selected map.
	Closes selected tiers in the Tiers tree or folders in the selected map.
	Zooms into the selected view (enlarges display size).
	Zooms out of the selected view (reduces display size).
	Resizes the selected components in a currently active view to fit within the screen size.

table 1 Tool Bar Icons in SAV (cont'd)

Toolbar Icon	Description
	Resizes all components in the currently active map to fit within the screen size.
	Labels all IPC lines with their associated protocol, such as SSH, HTTP, and so on. Protocols will display in the Server, Network and Tiers Maps. The Show Protocols mode is applied on a per-map basis
	Toggles the Tiers map to display the host server names in the title bar for process families.

Menus and Menu Options

This section discusses the menus and menu options that might not be self-explanatory.

File Menu

If you have made changes to the business application definition and want to set this as the default, select **Set as Default Template** from the **File** menu.

If you have made changes to the business application definition and want to restore the previously saved default business application, select **Reset Default Template** from the **File** menu.

If you want to import a business application template that has already been saved, from the **File** menu, select **Import Template** and import the selected template.

For more information on business application templates, see [Business Application Templates](#) on page 66.


View Menu

By default, the **Animate Layout** option is ON (preceded by a check mark). This causes the map to be animated (objects are displayed in motion) each time it is drawn, including a refresh. If the **Animate Layout** option is OFF (no check mark), the map will not be animated (objects are not displayed in motion) each time it is drawn.

Adding and Removing Devices in SAV

After you have opened and visualized devices in SAV and created your business application definition, you can add more devices to the initial snapshot in order to see how other devices — servers, network devices, storage devices, and so on — relate to the current state of your business application.

For example, you might have created a business application but you are still not sure about all the storage devices it might be using, or, you might see that there are a few managed servers that are connected to your business application, but that were not initially scanned. You can easily add these to the SAV application window.

Depending on your settings in the Add Devices window that you see when you add a device, SAV will automatically refresh the SAV snapshot and scan the selected devices. If you would rather not have SAV automatically scan any newly added devices, then you can add the devices, uncheck the check boxes in the window, and scan them later by clicking **Refresh Snapshot**  on the SAV toolbar.

In some cases, you might find that some of the devices you have scanned are not necessary to your snapshot, and so you want to remove them. You can easily do so by selecting the device and selecting to remove it.

There are several potential errors that can occur when a Refresh or a device scan in SAV does not work. For a list of potential errors, see [SAV Scan Error Messages](#) on page 85.


Adding Devices to SAV

To add devices to SAV, perform the following steps:

- 1 From anywhere inside of SAV, either right-click or from the **Application** menu, select **Add Devices**.
- 2 In the Add Devices window, in the left pane you can choose a device category, and the corresponding devices appear in the right pane. You can add servers, device groups, network devices, storage devices, and so on.

The Discovered Dependencies category shows any devices that SAV has discovered to be related to or connected to some of the devices in the existing SAV snapshot.


The Refresh Scan Results option instructs SAV to automatically refresh the SAV snapshot when you click **Add**.

- 3 When you have selected the devices to add, click **Add**. Be sure to save the results or these newly added devices will not be saved in the Business Application.
- 4 If the Refresh Snapshot Results option was not selected, click **Refresh Snapshot**  on the SAV toolbar so SAV will scan the newly added devices. Any devices that have been added to SAV without being refreshed appear as a translucent box in the maps and will not display any properties information.


▶ If you attempt to save or export the Business Application without refreshing the snapshot, a dialog appears asking if you want to save the Business Application. If you want the new information to be included in the Business Application, be sure to refresh the snapshot before saving or exporting.

Removing Devices From SAV

To remove devices from SAV, perform the following steps:

- 1 From inside of SAV, from one of the maps or the Devices pane, select a device, right click or from the Application menu, select Remove Devices.
- 2 You are asked to confirm that you want to remove the selected device. Click **Yes** to remove the device.
- 3 To make sure your SAV snapshot is up to date, click **Refresh Snapshot**  on the SAV toolbar so SAV can update the snapshot and scan the newly added devices, and then save the Business Application.

When a device is removed from a scan, the device and all connections to and from it and all external client IP addresses are removed in the maps, trees and tables, including links to other managed servers in the scan.

When you click **Refresh Snapshot** , these lines to the other managed servers may display as a Client IP or other dependencies.

- ▶ If you attempt to save or export the Business Application without refreshing the snapshot, a dialog appears asking if you want to save the Business Application. If you want the new information to be included in the Business Application, be sure to refresh the snapshot before saving or exporting.

SAV Maps

SAV provides five visual maps that display physical and logical drawings of managed servers, network and storage devices, and connections in your environment: the Tiers Map, Server Map, Network Map, Storage Map, and SAN Map.

To enable you to see and understand how your application functions, SAV provides the following maps:

- [Tiers Map](#)
- [Server Map](#)
- [Network Map](#)
- [Storage Map](#)
- [SAN Map](#)

In addition to viewing the SAV maps, you can also:


- Show any virtualization relationships in the maps (such as virtual servers or devices, hypervisors, switches, and more). See [Showing Virtual Server Relationships in the Server Map](#) on page 32.
- Export a map to a .gif, .jpg, or an .svg file. See [Printing a Map](#) on page 43.
- Print a map on single and multiple sheets of paper. See [Printing a Map](#) on page 43.
- View IPC service names — such as HTTP or SMTP — in the Server or Network Maps. See [Showing IPC Service Names in Maps](#) on page 43.

Tiers Map

The Tiers Map displays the logical structure of a business application, including a business application's tiers and the connections between its application and storage signatures, external clients, and other dependencies. By default, this map is initially empty until you create the tiers and define signatures that comprise an application. See [Creating a Tier](#) on page 68.

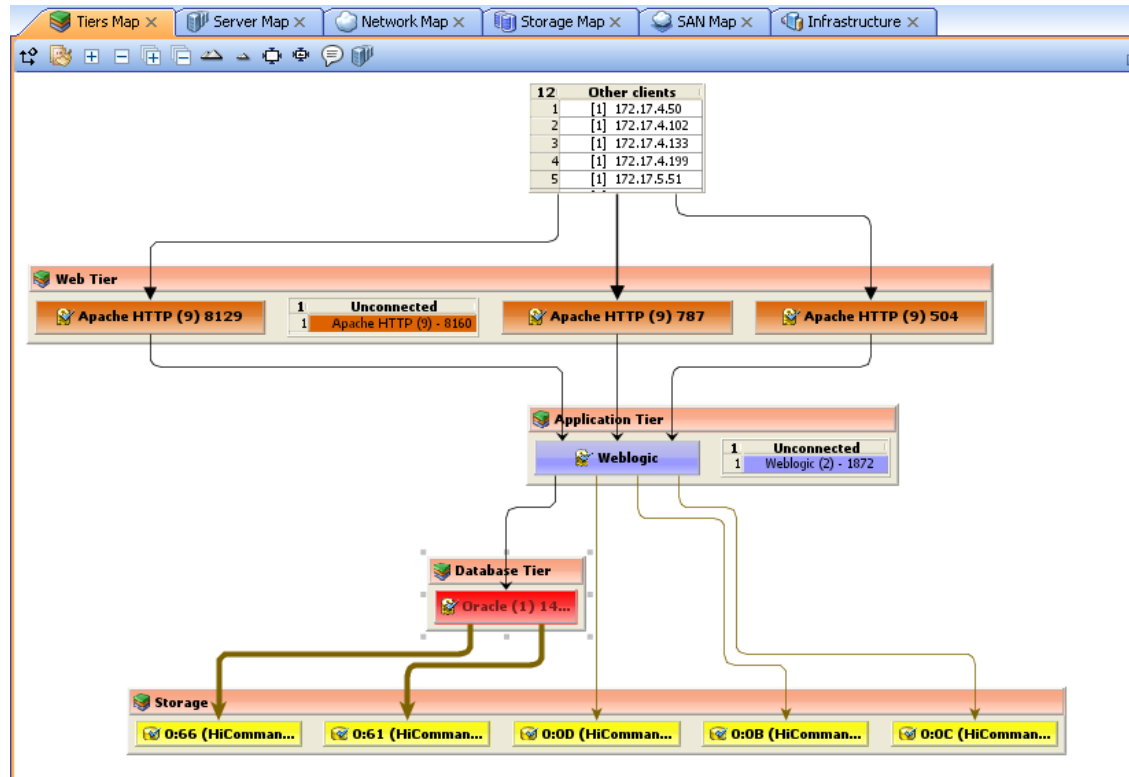
In addition, the Tiers Map shows the external IP addresses (Client IPs) that are connected to the application and the external IP addresses (external dependencies) that the application connects to and depends on.



A storage signature is similar to an application signature except that its signature matches storage volumes rather than process families (as in an application signature). This allows you to quickly identify and categorize storage dependencies. The Tiers Map displays storage signatures according to modifiable settings of color and name in the signature's Properties.

Storage signatures that do not match any actual volumes in the current scan are flagged just like a application signature, with a warning  icon.

Signatures can be categorized within a tier and used to recognize process families as named elements of an application. Tiers that do not have process families are shown in the Tiers Map. You can group them within a tier and make them visually distinct by modifying their color and name. See [Figure 6](#).

figure 6 Tiers Map




If an application (or storage) signature does not have any process families (or storage devices) associated with it, then the tier object title bar will display a warning icon ; for example, .

- ▶ VMware ESXi hypervisor servers will not appear in the Tiers Tier map, but any VMs hosted on the servers can be displayed.


Server Map

The Server Map displays the physical layout of how elements of a Tiers Map connect to a set of servers (virtual or physical), including the process families that are running on servers and how those processes families are connected to one another.

The Server Map shows the external IP addresses (client IPs) that are connected to the application and the external IP addresses (external dependencies) that the application connects to and depends on. If one of these external connections is an SA managed server, then SAV displays the connection as a server.

If you want to include these servers to the scan, right-click the server and select **Add. Devices**. After the device is added, click **Refresh Snapshot**  on the SAV toolbar.


In addition, in both the Server Map and Network Map, a DNS Servers element displays DNS servers in use by all the servers in the scan. If managed server information is known about any of these servers, then you can right-click to Add Devices. No connections will be shown to this DNS servers node.

If you want to see the type of service being used for connections between processes (and the devices they run on) in the Server Map, such as http, ssh, click the Show IPC Service Names in Maps  button.

▶ VMware ESXi hypervisor servers will not expand to show process information in the Server Map.

Showing Virtual Server Relationships in the Server Map

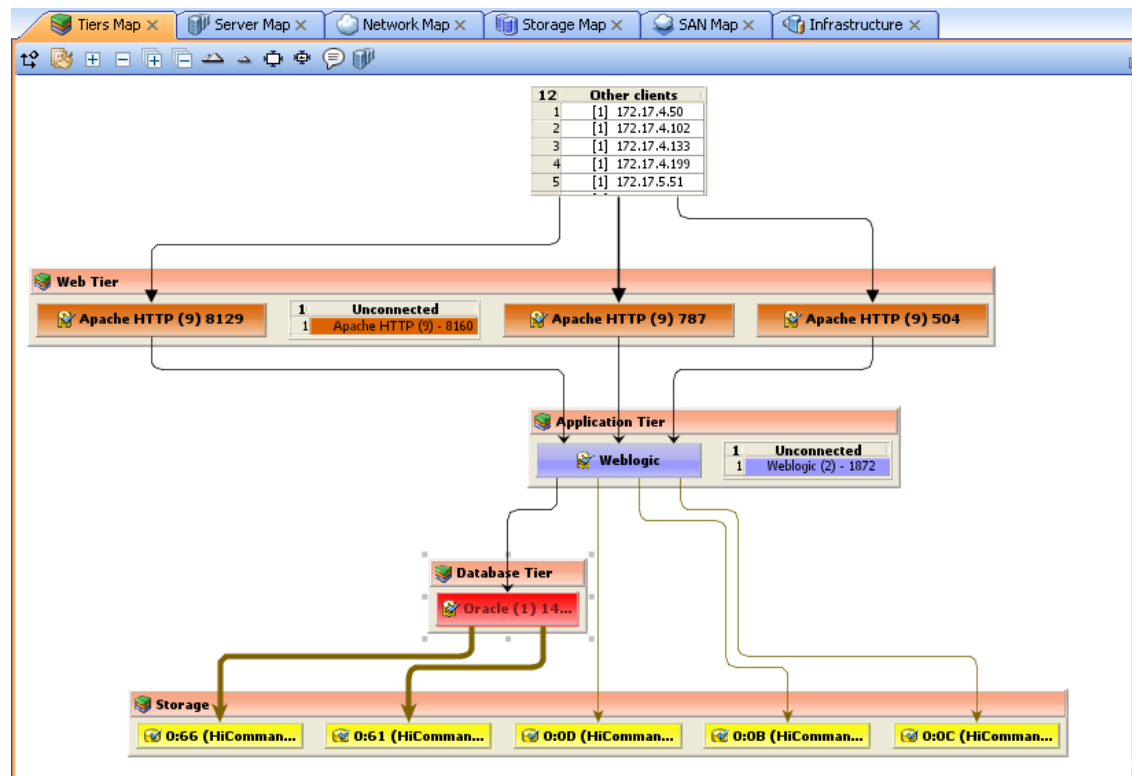
If you scanned virtual servers or devices in SAV, or any devices that contain or are connected to other

virtual devices, then clicking **Show Virtual/Physical Containment Relationships**  will display the relationships between virtual servers and the physical devices that host them in the Server Map (and any other map that shows virtual devices).

Clicking this button shows virtual servers inside of the hypervisor that is hosting them, so you can see which servers are virtual, and which are physical, and how they relate to one another.

Figure 7 shows the Server Map displaying a physical (non-virtual) server (top) and a virtual server (bottom) with the hypervisor name showing in the title bar.

figure 7 Server Map



For virtual server technologies, if you choose to scan only the hypervisor but not its guests, then you only see limited information about the virtual servers and will not be able to open them and view their contents.

For all Solaris global zones that are scanned, the Virtual Map displays a list named Other Zones. It contains all processes visible in the global zone that are actually running in a non-global zone, but that were not included in the scan.

For VMware ESX hypervisors, vSwitches are shown alongside virtual machines, in addition to the connections between the virtual machines and the vSwitches' port groups, which always appear as a green matching-duplex ethernet connection.



VMware ESXi hypervisor servers will not display process family and runtime information.


The information that SAV is able to display is also dependent upon whether or not the hypervisor or virtual server has an agent installed on it.

For example:

- It is possible that a virtual server has an agent installed on it, but not its hypervisor. In this case, SAV only displays the scanned virtual server but not its hypervisor.
- It is possible to have a hypervisor that has an agent installed on it, but some or all of its guest virtual servers do not. In this case, SAV shows all guest virtual servers but only with limited virtual server information. In other words, you won't be able to open it (drill down into it).







If you open a virtual server and the arrangement of server boxes is difficult to view inside the map, click

the Rotate Layout icon  on the toolbar and SAV will rotate the layout for a different unique maps of the servers.

Starting, Stopping, Suspending, Resetting Virtual Servers

In addition to viewing virtual servers and their relationships, you can also stop, pause, start, and reset virtual servers inside of SAV (but not physical hypervisor servers). Using either the SAV toolbar, or by right-clicking a virtual server, you can perform the following functions on a virtual server (VMware VM or a Solaris zone):

- **Start Virtual Servers:**  If the virtual server is currently paused, it is resumed. This is enabled if the selected virtual servers are stopped or paused.
- **Stop Virtual Servers:**  Stops selected virtual servers that are running.
- **Suspend Virtual Servers:**  Pauses selected virtual servers that are running. Only available for VMware's VMs, not Solaris local zones.
- **Restart Virtual Servers**  : Restarts if any selected objects are virtual servers that are running.

To start, stop, suspend, or reset a virtual server, perform the following steps:

- 1 From one of the SAV maps that display virtual servers (Servers, Network, Storage, SAN), select a virtual server.
- 2 From either the right-click or from the **Manage** menu select **Start**, **Stop**, **Suspend**, or **Restart Selected Virtual Server**.
- 3 If you want to see virtual servers and their relationships to their hypervisors, click **Show Virtual/**

Physical Containment Relationships  on the SAV toolbar.

Microsoft IIS, Oracle Database, and WebLogic in the Maps

In the maps, you can drill into a Microsoft IIS, Oracle Database, or WebLogic and expand the following objects:

WebLogic process family:

- Web Applications
- EJBs

- JDBC Connection Pools

Oracle Database process family:

- Oracle database instance
- Oracle tablespace
- Oracle data files
- Microsoft IIS process family:
- Web Site
- FTP Sites

Network Map

The Network Map displays a physical (and virtual) layout of how the elements of an application connect to each other within the network, including the network interfaces on a server and the devices (switches and vSwitches) to which the server is connected. SAV also displays any firewalls and load balancers in your network environment.


In this map, you can see process families that are connected over network interfaces on a server, the ports and port groups, VLANs, and listeners to which a server's network interfaces are connected. All network elements are displayed in green.

The Network Map also shows external IP addresses (client IPs) that are connected to an application and the external IP addresses (external dependencies) that an application connects to and depends on. If one of these external connections is an SA managed server, then SAV displays the connection as a server.

If you want to include these servers to the scan, right-click inside the Network map and select **Add**

Devices, then click **Refresh Snapshot**  on the SAV toolbar.

Finally, the Network Map displays DNS servers in use by all the servers in the snapshot. If managed server information is known about any of these servers, then you can right-click to Add Devices.

If you want to see the type of service being used for connections between processes (and the devices they run on) in the Network Map, such as http, ssh, click the Show IPC Service Names in Maps  button.



Network interfaces for VMware ESXi hypervisor servers cannot be expanded to show process information in the Network Map.

Enhanced Layer 1 (L1) Network Graph

The Network Map displays not just the devices that are directly connected to a scanned server, but also the devices that are connected to the devices that are connected to scanned servers. Specifically, the Network Map will display the following physical L1 network information:

- All switches that SAV can detect that are directly connected to scanned servers are shown
- All network devices along the shortest path (based on number of hops) between any 2 servers in the snapshot are shown
- All additional network devices, including:
 - Network devices that were manually added to a business application snapshot
 - Network devices that were shown in a previous snapshot of the business application, but which were not yet manually removed from the Business Application

- All physical (L1) connections between any two devices that are plugged into each other

Network Speed and Duplex Matching

The Network Map also highlights layer 1 connections that have speed or duplex mismatches between interfaces and network devices, using the following color scheme:

- Green lines and arrows indicate duplex and speed matches.
- Red lines and arrows indicates either a duplex or speed mismatch.
- Gray lines and arrows indicate that not enough information was gathered to determine the duplex or speed matches.

ACL and Server Pool Configurations

For network devices (such as firewalls, load balancers, routers, switches), you can view ACL and server pool configuration (load balancers only) information.

For more information on viewing and comparing ACL and server pool configurations, see [ACLs and Server Pool Configurations](#) on page 74.






Virtual Network Devices

If you want to see how virtual network devices are related to the physical devices they run on and are

connected to, click **Show Virtual/Physical Containment Relationships**  on the SAV toolbar.

VMware vSwitches are shown alongside virtual machines or other network devices. Connections between them appears as a green matching-duplex ethernet connection.

Network interfaces and devices use the following symbols:

-  **Network Device:** (As shown in the Devices tree) A switch or a vSwitch.
-  **Network Interface Card (NIC):** When available, a NIC is shown with its IP address and any processes connected to it.
-  **Listeners:** Process families that are listening on or connected to more than one network interface appear multiple times in the Network Map.
-  **Network Device Port:**
-  **Virtual LAN:**


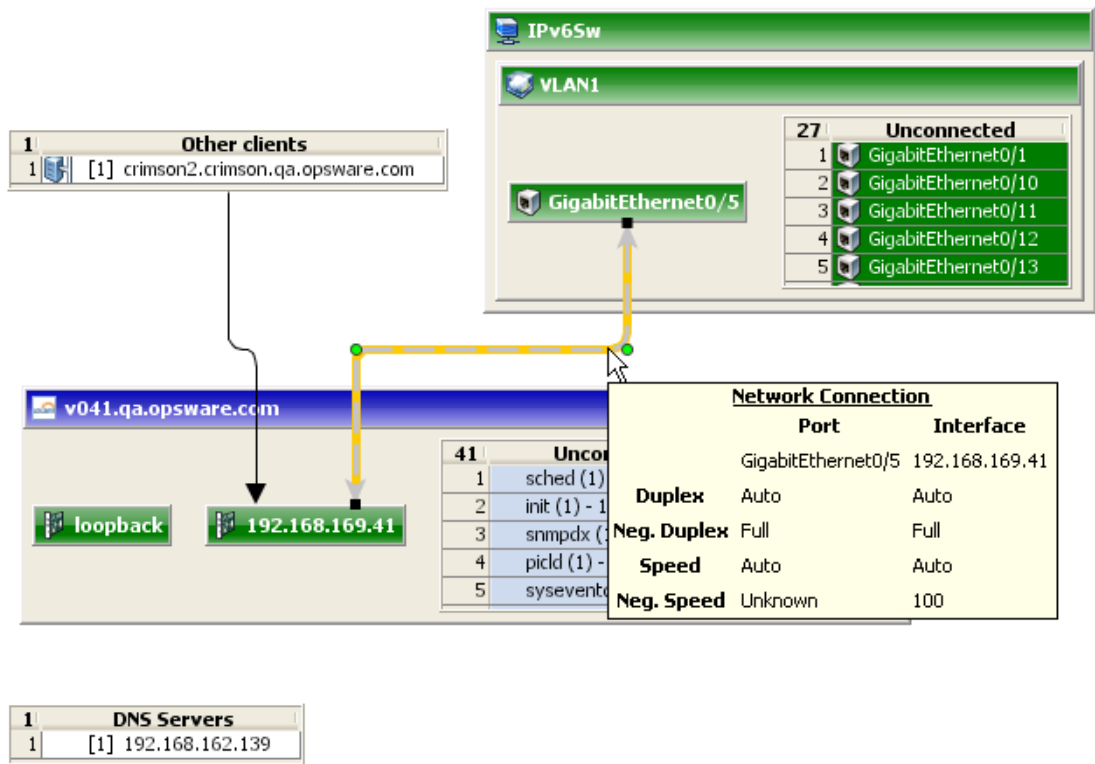
Network devices without connections are also shown. If it is unknown whether the network device is connected to a server or another network device, a warning icon  appears next to it in the Devices tree. See [SAV Scan Error Messages](#) on page 85.

Figure 8 illustrates network devices (green) as shown in the Network Map, with a switches connected to a network interface on a server, port and MAC address for the switch, and moving the mouse over the connection line displays connection speed and duplex information.

figure 8 Network Map



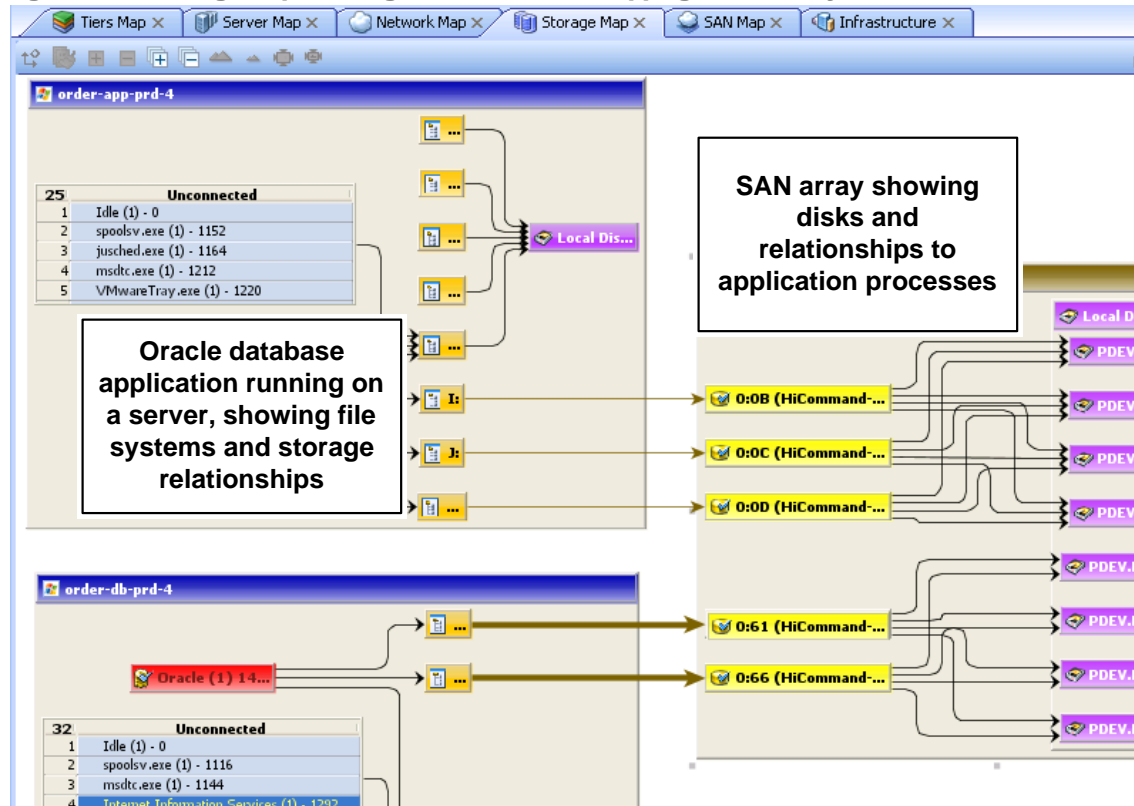
Storage Map

The Storage Map displays storage dependencies for all of the logical storage elements used by servers you have scanned with SAV.

This map provides a graphical view that displays servers, the process families running on them, including the file systems and local or remote storage devices these files are stored on and served from, either through local disks, NAS filers, or fibre channel disk arrays. The map shows connections between process

families and their open files and where they files are stored. It also shows on which local (disks) or remote (SAN or NFS) storage those file systems reside. Even multipath SAN connections are displayed, and broken connections shows in red.

figure 9 Storage Map Showing Oracle Database Mapping to SAN Array



In this map you will see the following data:

- **Servers:** Shows all process families and their relationship to file systems (through all open files) on each server. These file systems are served from NAS filers, local discs, and/or remote volumes from storage arrays. In the Storage Map you can see how specific applications running on servers interact with files systems and where data involved with these process families are stored — locally or remotely.
- **Databases (Oracle):** Shows Oracle database instances, tablespaces, and database files connected to each tablespace. The database files are displayed on the physical file system on which they are stored.
- **File Systems:** Shows file system pathname in the title bar and displays a single list of all open files that live on it. Each file system also shows a connection line between the itself and either local or remote storage.
- **Dependencies:** Shows lines that display how process families use the open files list on each file system on which they have open files. Connection lines also tie NFS-mounted file systems to the exported volumes on their hosting NAS filers, as well as the remote storage array volumes or local disks that they are hosted on.
- **LUN Mapping:** Displays mapping from a server to a disk array. Multipath link (shown in brown) will have thicker lines based on the number of paths to the storage device (thicker lines mean more paths). For links that are multipath, where at least one of the paths is down, the line is colored red.
- **Local Disks:** Groups all local disks into a Disk element, which can be expanded to show other disks.

- **SAN Arrays:** Shows storage disk arrays that are mapped and in use by the servers in the snapshot. Storage arrays that are scanned but are not in use by any of the applications show a special icon to distinguish them from those arrays in use. If you expand the SAN Array, you only see volumes in the array that are LUN mapped to the server. SAN Array backups are also displayed.
- **NAS Filers:** Displays all exported file systems stored on NAS Filers (which appear in a brown box) that are in use by servers included in the snapshot. Those files that are scanned but are not in use by any of the applications have a special icon to distinguish them from those files that are in use. Other servers and devices that use disk on a filer are displayed by way of an exported file system, and a scroll list of other consumers is shown which points to that disk.

Viewing Storage and SA Permissions

Your user may be able to view some types of storage information in a SAV snapshot even if your user belongs to any groups that do not have permission to see storage devices such as SAN fabrics, arrays, and so on.

Specifically, if your user belongs to one or more groups that have the permission “Manage Business Applications: Read & Write,” then your user will be able to view such devices in a SAV snapshot and objects as fabrics (switches), storage arrays, network devices, and VM info in the SAV snapshot, even if the group does not have individual permissions granted to see those devices and objects.

If your user belongs to one or more groups that do not have “Manage Business Applications: Read & Write,” your user will be able to view SAN fabrics (switches), storage arrays, network devices, and VM info in a SAV snapshot only if the group has those individual permissions granted.

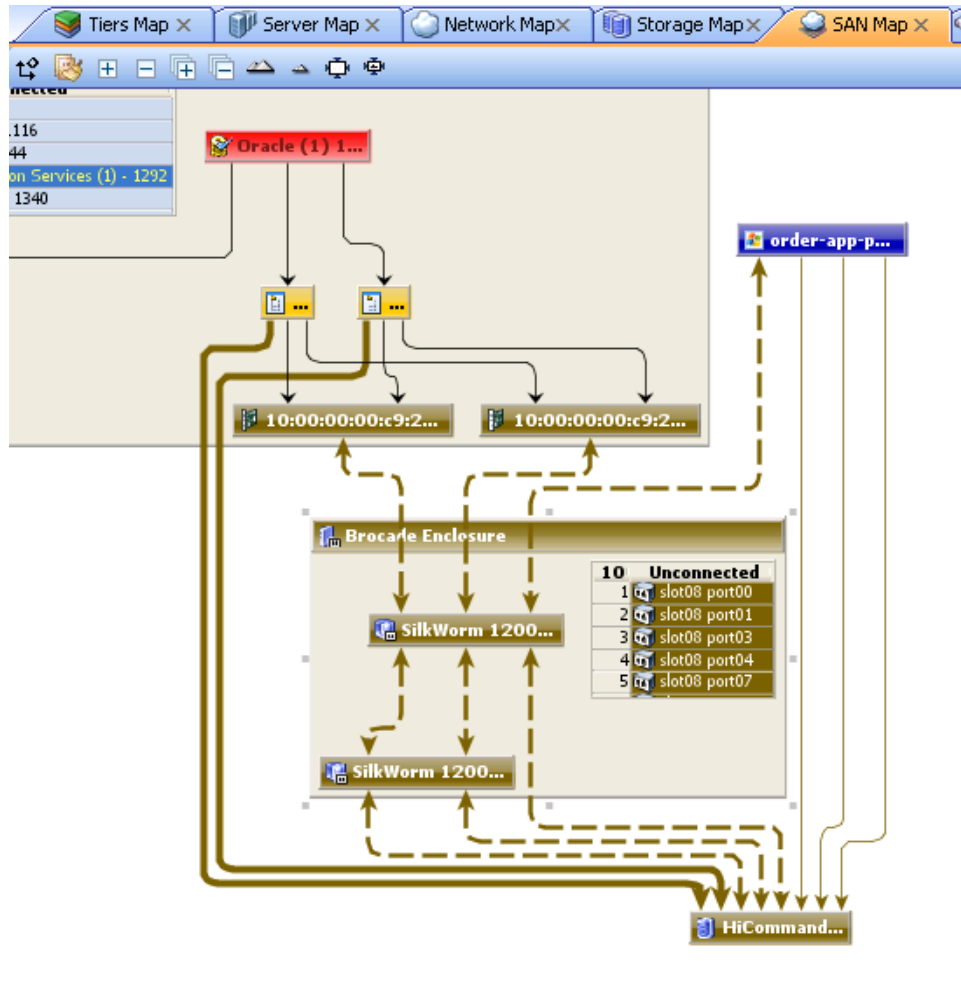
For example, if your user belonged to one or more groups that have the following permission: “Manage Business Applications: Read & Write” but had Manage Fabrics: None, your user would still be able to see fabrics (and SAN switches) in the SAV snapshot.

For more information on setting user group permissions, see the *SA Administration Guide*.


SAN Map

The SAN Map shows a superset of the Storage Map, including a graphical view of the fibre channel storage area network involved in a SAV snapshot, including all servers and their Fibre Channel Adapter (including fibre channel ports), and each adapter's connections to switches in the SAN.

figure 10 SAN Map with Fibre Channel Switches Routing Storage Traffic from Server to SAN Array



The SAN Map displays the following data:

- Servers and their Fibre Channel Adapters (including fibre channel ports), and each adapter's connections to switches in the SAN.
- All SAN arrays and NAS files included in the snapshot, with physical connections shown between servers, switches, and storage devices.
- File systems (and all open files) and how they rely on remote or local storage.
- LUN mapping between file systems and storage devices (shown in brown solid lines)
- SAN Switches. Each switch, when expanded, shows all ports being used. Any ports not in use in this snapshot are collected in a scrollable list of Extraneous ports.
- Virtual SAN Switches and Ports. Click **Show Virtual/Physical Containment Relationships**  on the SAV toolbar to show virtual switches inside of their physical switch parent.

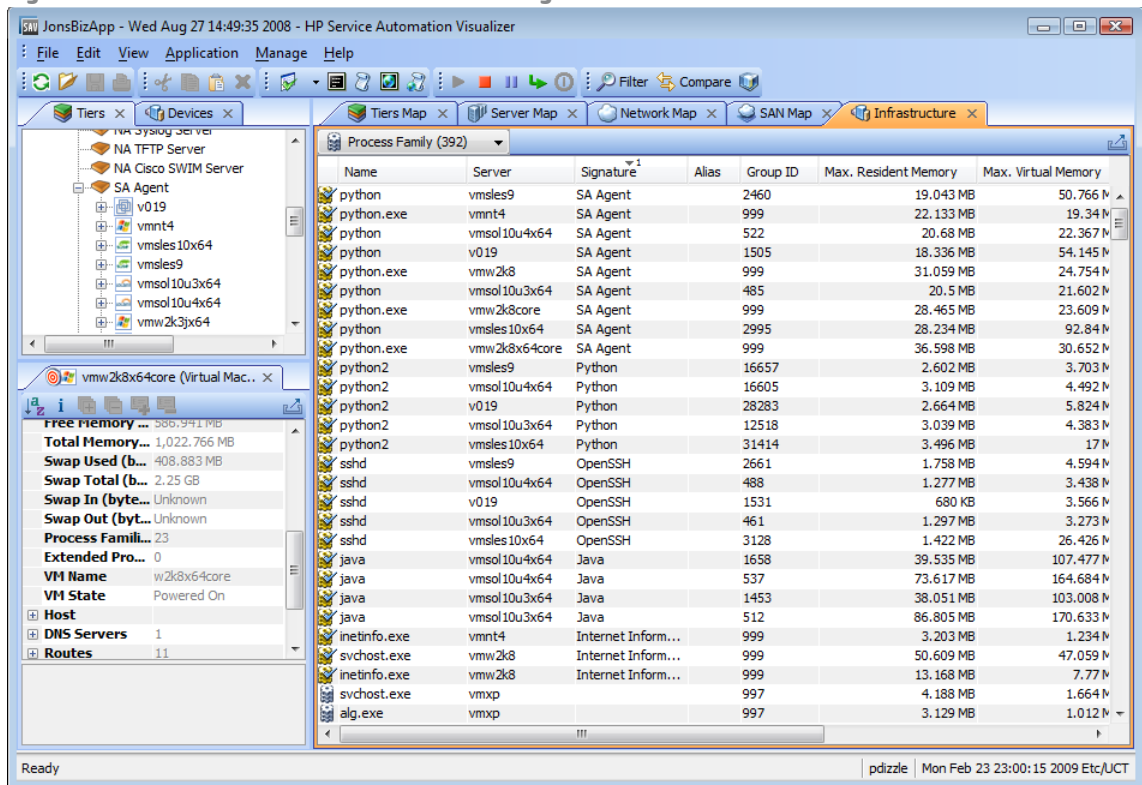
- Logical connections between devices are represented by solid lines. If a connection is down or has a mismatch, the line is red. If the connection is working and has no mismatch, the line is black. Thickness of line indicates the number of connections.
- Actual physical SAN connections (Fibre Channel cables) are shown in brown dashed lines, while LUN mapping connections between a server and a disk array is shown with solid brown lines.

SAV Infrastructure Pane

The Infrastructure pane provides detailed inventory and infrastructure information related to devices you have scanned in SAV. This pane provides a flat list of various objects found in the SAV snapshot and lists detailed properties for each.

Using the drop-down list the Infrastructure pane to filter categories of objects and their properties, to view and sort objects such as, all servers in the snapshot, all SAN arrays in the snapshot, and so on. You can then sort the columns to compare attributes of each item in the list. For example, you can select Servers and look at the load average for all servers discovered in the snapshot, or sort load average between servers. Or, you can view compliance policies are in use by all the servers or network devices in your business application.

figure 11 Infrastructure Pane in SAV Showing Process Families



Depending upon what you have scanned in SAV, the Infrastructure pane displays the following types of object categories:

- Bindings (IIS)
- Compliance Policy
- Database

- Database File
- Disks
- Fibre Channel Adapters
- Fibre Channel Ports
- File Systems
- NAS Filers
- LUN Volumes
- NFS Exported File Systems
- Network Devices
- Network Interfaces
- Network Port
- Process Family
- SAN Arrays
- SAN Switches
- SAN Zone
- Servers
- Tablespace
- VLAN



VMware ESXi hypervisor servers will not display runtime state information in the Infrastructure Pane.

Symbols Used in Maps


SAV uses a variety of symbols in the Network Map, Server Map, and Tiers Map, such as lines, arrows, diamonds, and so on. This section explains SAV map symbols in the following topics:

- [Process and Links Connection Symbols](#)
- [Map Process and Network Connection Symbols](#)
- [Exporting a View to .gif, .jpg, or .svg](#)
- [Printing a Map](#)
- [“Source” and “Comparison” Snapshot](#)

Process and Links Connection Symbols

In the SAV maps, lines and arrows represent connections between process families. In some cases, SAV knows both the source of the connection and the destination. In other cases, SAV may only know either the source or the destination of the connection.

To represent these process connection relationships, SAV uses the following lines and arrows:

- **Source Unknown — Diamond:**  An arrow with a diamond at its source indicates that SAV does not know the source of the connection. If there is a solid line from a process connection source (in other words, it doesn't show a diamond) then SAV knows the connection source.

- **Destination Unknown — Hollow Arrow:** → A hollow arrow represents an inbound connection to a process family destination that is unknown.
- **From Remote IP — Solid Arrow:** → A solid arrow represents an inbound client connection from a remote IP, such as TCP or UDP, where the destination process family is known.
- **From Process — Lined Arrow:** → A lined arrow represents a connection from a process family where the destination process family is known.


Map Process and Network Connection Symbols

In the SAV maps, lines represent the following connections between devices:


- **Client link:** An internal connection that is labeled by the client IP address.
- **Process link:** A collection of TCP or UDP connections between process families. This link displays processes that provide a network service, such as listening for network connections, and processes that have a connection to another process or server.
- **Layer 1 connection:** A physical link between a server's network or storage interfaces and switch ports/switches. Layer 1 connections are indicated by colored, dashed lines in the map: These connection symbols are also used for virtual server and device connections as well.

 A green dashed line indicates that there is no duplex mismatch.

 A red dashed line indicates that there is a duplex mismatch.






 A gray dashed line indicates that there may or may not be a duplex mismatch because at least one value is unknown.

 A brown solid line shows LUN mapping connections from a server to a disk array (in the Storage Map)

 A brown dashed line shows physical fibre channel cable connections (SAN and Storage Maps only).

- **Line Thickness:** The thinness or thickness of the line represents the number of connections associated with the link. A smaller number is indicated by a thinner line and a larger number is indicated by a thicker line, as illustrated in [Figure 12](#)


figure 12 Line Thickness and Process Connection Relationship

	1-4
	5-16
	17-64
	65-256
	257+

Exporting a View to .gif, .jpg, or .svg

You can export a view to a .gif, .jpg, or .svg file for use in other applications where you can annotate the drawing or map the exported file in a web browser.

To export a map to an image file, perform the following steps:

- 1 From the **View** menu, select **Export View**. (Or, click the Export View  button at the upper right corner of the map.)
- 2 Select a directory where you want the file to be located.
- 3 Enter a file name that includes either .gif, .jpg, or .svg as the file name extension.
- 4 Click **Export View**.



► For information about exporting Properties to a .csv file, see [Exporting Properties Information to .csv](#) on page 45.

Printing a Map


You can print a map on single and multiple sheets of paper, and you can also title the map for better presentation.

If the map you want to print is very dense and complex, you can make adjustments by zooming in and zooming out, and by creating rows and columns that will break the map up over several pages. Doing this enables you to print the map on multiple sheets of paper, thus increasing the map's readability.


To adjust the map before you print:

- Click Zoom In  or Zoom Out  to increase or decrease the size of the map before you print.
- Enter a title for the map


To print a map, perform the following steps:

- 1 From the **File** menu, select **Print** or select the  toolbar icon.
- 2 (Optional) In the Print window, specify page setup and printer options, including a title that you want to appear on the printed map.
- 3 Click **Print**.

Showing IPC Service Names in Maps

If you want to see the type of service being used for connections between processes (and the devices they run on) in the Network or Server map, such as http, ssh, click the Show IPC Service Names in Maps  on the SAV toolbar. The service name will appear on each connection line.

To show IPC service names in the Server or Network map, perform the following steps:

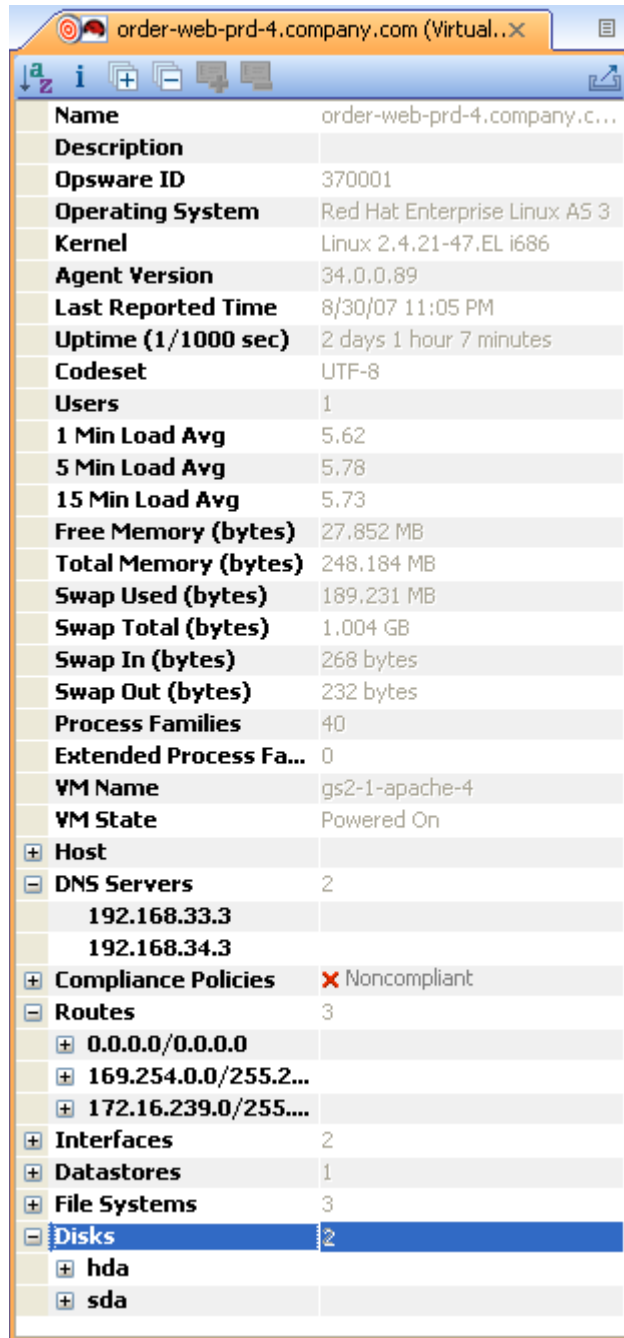
- 1 Inside of SAV, select either the Server or Network map.
- 2 From the **View** menu, select **Show IPC Service Names in Maps**.
Or
- 3 Click Show IPC Service Names in Maps  on the SAV toolbar

SAV Properties

SAV displays detailed properties for components selected in the Devices tree, Tiers tree, the Infrastructure pane, and any of the maps.

The information displayed in the Properties pane varies depending on the component type, such as a server, network device, storage device, process family, tier, application or storage signature, and links. Depending on the type of object you select, this page includes the number of users logged in, load average, swap usage, memory usage, application components, network devices, network ports, VLANs, tiers, links, and so on. It shows the MAC addresses for each network interface, as shown in [Figure 13](#).

figure 13 Properties Pane for a Server




Name	order-web-prd-4.company.c...
Description	
Opware ID	370001
Operating System	Red Hat Enterprise Linux AS 3
Kernel	Linux 2.4.21-47.EL i686
Agent Version	34.0.0.89
Last Reported Time	8/30/07 11:05 PM
Uptime (1/1000 sec)	2 days 1 hour 7 minutes
Codeset	UTF-8
Users	1
1 Min Load Avg	5.62
5 Min Load Avg	5.78
15 Min Load Avg	5.73
Free Memory (bytes)	27,852 MB
Total Memory (bytes)	248,184 MB
Swap Used (bytes)	189,231 MB
Swap Total (bytes)	1.004 GB
Swap In (bytes)	268 bytes
Swap Out (bytes)	232 bytes
Process Families	40
Extended Process Fa...	0
VM Name	gs2-1-apache-4
VM State	Powered On
Host	
DNS Servers	2
192.168.33.3	
192.168.34.3	
Compliance Policies	✘ Noncompliant
Routes	3
+ 0.0.0.0/0.0.0.0	
+ 169.254.0.0/255.2...	
+ 172.16.239.0/255....	
Interfaces	2
Datastores	1
File Systems	3
Disks	2
+ hda	
+ sda	

Exporting Properties Information to .csv

You can export the information contained in any Properties pane to the .csv format, which enables you to view SAV object properties inside spreadsheet applications.

To export a Properties pane to .csv, perform the following steps:

- 1 From inside of a SAV map or tier, select an object.
- 2 From inside the Properties pane for the selected object, click the Export View  button.
- 3 In the Export to CSV window, choose a location and enter a file name (with the .csv extension), and then click **Save**.

Tiers Tree: Tiers, Process Family, Signature Properties

SAV displays property information about the following SAV elements in the Tiers Tree and maps:

- [Business Application Properties](#) on page 45
- [Process Family Properties](#)
- [Extended Process Family Properties](#)
- [Tier Properties](#)
- [Application Signature Properties](#)
- [Storage Signature Properties](#)



VMware ESXi hypervisor servers will not display in the Tiers Tree, although any VMs hosted on the servers will be displayed here.

Business Application Properties

A business application allows you create application tiers and application and storage signatures, so SAV can recognize application processes and storage devices in your data center and display them in the Tiers Map.

The business application Properties pane displays the following information (properties with a * indicate editable fields):

- **Name (*)**: Name of the Business Application
- **Description (*)**: Description of the business application.
- **Tiers**: The number of tiers contained in the business application.
- **Contacts (*)**: User created contacts (Application menu)
- **Custom Fields (*)**: Any Custom field you create is editable.

Process Family Properties

A process family is a collection of processes. The Properties Pane for a process family displays the following information:

- **Name**: The name of the controlling process of the family.
- **Family ID**: The unique ID given to the process family.

- **Extended Family:** The name of the extended process family, if the selected process family belongs to an extended process family.
- **Max. Resident Memory:** The maximum permanent memory used by the process family, in bytes.
- **Max. Virtual Memory:** The maximum permanent memory used by the process family, in bytes.
- **Max. Run Time:** The length of time the process has been running.
- **Total CPU Time:** The total length of time the process used CPU resources.
- **Max CPU Utilization:** The total amount of CPU resources used by the process.
- **Group ID:** The group ID of the process family on UNIX and the session ID on Windows.
- **Listeners:** The interface and port for each listener.
- **Incoming connections:** The connections incoming to the process family, grouped by process family (if known, the IP address otherwise) and interface.
- **Outgoing connections:** The connections outgoing from the process family, grouped by process family (if known, IP address otherwise) and interface.
- **Modules:** The shared libraries associated with the process family. These include DLLs on Windows and shared object files on UNIX.
- **Open files:** The files that the process family currently has open.
- **Software Packages:** The packages associated with the files that the process family has open.
- **Processes:** The number of individual processes in the process family. For each process, the following information is displayed:
 - **PID:** The process ID.
 - **User:** The user ID the process is running as.
 - **Command line:** The command line used to start the process.
 - **Path:** The path to the process binary.
 - **Memory statistics:** The percentage of physical memory consumed by the process, the resident size (in bytes) of the process and the virtual size (in bytes) of the process.
 - **Run time:** The time (in milliseconds) that the process has been running.
 - **CPU Statistics:** The CPU time accumulated by the process and the percentage of CPU consumed by the process since it began.
 - **Environment:** The name and value of each environment variable in the process environment.

Extended Process Family Properties

An extended process family is a collection of process families. If one process family has a listener and another has a connection into that same port, then SAV joins them into an extended family. The Properties Pane for extended process families contains the following information:

- **Name:** Name of the extended process family.
- **Process Families:** A list of all process families
- **Incoming connections:** The connections incoming to the process family, grouped by process family (if known, the IP address otherwise) and interface.
- **Outgoing connections:** The connections outgoing from the process family, grouped by process family (if known, IP address otherwise) and interface.

Tier Properties

The Properties Pane for a tier displays the following information (properties with a * indicate editable fields):

- **Name (*)**: The name of the application tier as displayed in the Tiers tree.
- **Subtiers**: The number of subtiers that are currently recognized in the tier.
- **Application signatures**: The number of application signatures currently recognized in the tier.
- **Storage Signatures**: The number of storage signatures currently recognized in the tier.
- **Device Filter (*)**: The devices that are associated with this tier. Only matching devices are filtered for matching application or storage signatures.

Tier Folder Properties

The Properties Pane for a tier displays the following information:

- **Name:** The name of the folder as displayed in the Tiers tree.
- **Application Tiers:** The number of subtiers that are currently recognized in the folder.
- **Application or signatures:** The number of application signatures currently recognized in the folder.
- **Storage Signatures:** The number of storage signatures currently recognized in the folder.
- **Device Filter:** The devices that are associated with the signatures in this folder. Only matching devices are filtered for matching application or storage signatures.

Application Signature Properties

The Properties Pane for an application displays the following information (properties with a * indicate editable fields):

- **Name (*):** The name of the application component as displayed in the Tiers tree.
- **Alias (*):** The name of the application component as displayed in the different views. The name will be shown as an alias.
- **Families:** The number of process families recognized as this application component.
- **Process Name (*):** The process name filter used to recognize this application component.
- **Command Line:** The command line filter used to recognize this application component.
- **Executable Path (*):** The executable path filter used to recognize this application component.
- **Open Files (*):** The open file filter used to recognize this application component.
- **Modules (*):** Shared libraries that are associated with the process family, DLL files on Windows operating systems and shared object files on UNIX operating systems.
- **Environment Variable (*):** The name and/or value of an environment variable that matches a process family associated with an application signature, where NAME is the name of the environment variable, and VALUE is its value. If you want to find an exact match, use both NAME=VALUE.
- **Ports Connected To (*):** The port that the server is connected to.
- **Listener Port (*):** The listen port used to recognize this application component.
- **Background Color (*):** The background color displayed in the different maps.
- **Foreground Color (*):** The foreground text color displayed in the different maps.

Storage Signature Properties

The Properties Pane for a storage signature displays the following information:

- **Name (*):** The name of the storage component as displayed in the Tiers tree.
- **Alias (*):** The name of the storage component as displayed in the different views. The name is shown as an alias if it is not defined.
- **Remote Volumes:** The number of storage volumes that are defined in this signature
- **LUN ID (*):** The LUN can be defined with a regular expression to indicate the storage volume the server is connected to.
- **LUN Name (*):** Name given to the LUN.
- **Exported Path (*):** Exported path to the LUN.

- **Manufacturer (*)**: Company that manufactured the LUN.
- **Model (*)**: Model name or number of the LUN.
- **Background Color (*)**: The background color displayed in the different maps.
- **Foreground Color (*)**: The foreground text color displayed in the different maps.

Devices Tree: Server and Network Device Properties

SAV displays property information about servers, network devices, and the connections between them:

- [Server Properties](#)
- [DNS Servers Properties](#)
- [Properties for Servers and Devices with Compliance Policies](#)
- [Virtual Server Properties](#)
- [Link Properties for Servers and Network Devices](#)
- [Network Devices Properties](#)
- [Virtual Switch Properties](#)
- [Port Group Properties](#)
- [Network Interface Properties Pane](#)



If your managed server is configured with a storage inventory snapshot and the SE Scanner is configured to integrate with an appropriate SE server, then a server's properties will also include related storage and more detailed file system information..

Server Properties

The Properties Pane for a server displays the following information:

- **Name**: The host name of the server.
- **Server ID**: The SA unique identifier for the server.
- **Operating System**: The operating system of the server.
- **Kernel**: The kernel version of the operating system (when applicable).
- **Agent Version**: The version of the Server Agent that enables the server to be managed and scanned.
- **Last Reported Time**: The most recent time that the Server Agent communicated with the SA core.
- **Uptime**: The length of time the server has been powered on.
- **Codeset**: The character encoding for the server's locale.
- **Users**: The number of users that are currently logged in.
- **Load averages**: 1-minute, 5-minute, and 15-minute load averages. The load average for servers running a Windows operating system displays unknown because it is not supported by Microsoft.
- **Memory usage**: The total free memory.
- **Swap usage**: The total used swap and swap in/out activity.
- **DNS Servers**: All configured DNS servers for the selected server.

- **Virtual Machines/Zones:** If the selected server is a hypervisor (Solaris Global Zone or VMware ESX server), you can expand the list and view all zones (Solaris) virtual machines (VMware ESX). Each virtual machine or zone will display its own server properties. For more information, see [Virtual Server Properties](#) on page 52.
- **Routes:** All configured static routes on the selected server.
- **Interfaces:** The number of network interfaces. For each interface on a server, the following information is displayed:
 - MAC address
 - Broadcast address
 - Subnet mask
 - Device
- **FCAs:** All Fibre Channel Adapters (HBAs) installed on the selected server.
- **File systems:** All files systems in use on the selected server. For each file system, properties include: drive letter, mount point, mount options, type of file system, logical block device used by the file system, amount of free space, percent used, and associated device for each file system.
- **Disks:** All physical disks installed on the selected server.



If you have added a server to SAV but have not yet refreshed the Snapshot, the server will appear grayed out in the maps and in the Devices tab. The properties information will be blank until you initiate a refresh.

DNS Servers Properties





DNS Server properties contain the following information:



- **Name:** Name of the DNS Server.
- **IP Address:** IP address of the DNS Server.
- **Servers:** Provides server properties for each server using this DNS server. For information on individual server properties, see [Server Properties](#) on page 49.

Properties for Servers and Devices with Compliance Policies

For servers or network devices that have compliance policies associated with them (Software, AppConfig, Patch, Audit, Duplex), the server's properties shows a rollup compliance status for all attached policies. You can expand the compliance list to view each individual compliance policy attached to the server.

Each compliance category displays one of the following compliance statuses:

- **Compliant**  : The compliance scan ran successfully and the actual server or device configuration matches the criteria defined in the policy.
- **Partial**  : The compliance scan ran successfully, but the server or device configuration did not fully pass the compliance criteria defined in the policy.
- **Noncompliant**  : The compliance scan ran and the actual server or device configuration did not match the criteria defined in the policy.
- **Scan Failure**  : The compliance scan was unable to run.

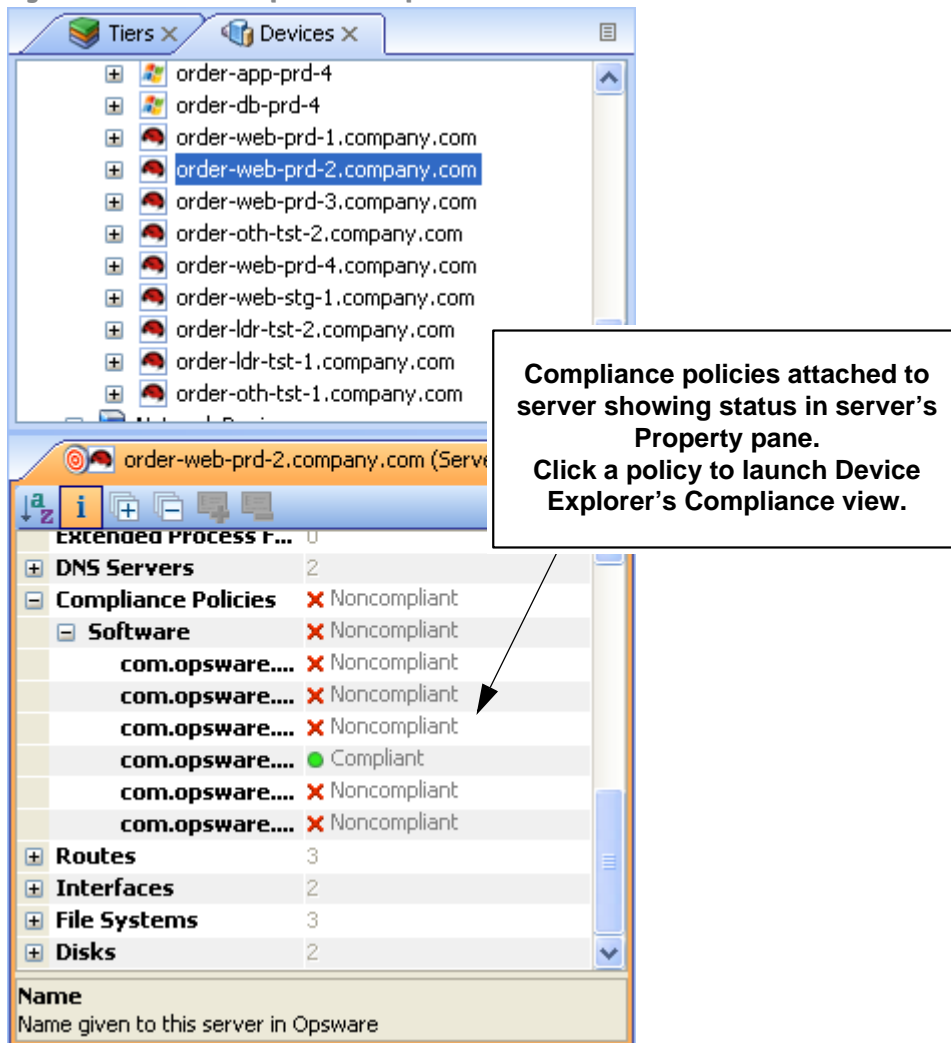
- **Scan Needed** : The results are unavailable, perhaps because a compliance scan was never run (for example, on a new installation), or the configuration on the server changed since the last time information was reported to the Compliance Dashboard.
- **Scanning** : The compliance scan currently being run.

You can launch the Device Explorer or remote terminal in the SA Client to view and remediate any compliance discrepancies by clicking on a compliance status link in the properties window. For NA-enabled cores, clicking a compliance status link launches the NA Web interface.


For information on launching a Device Explorer, remote terminal, or global shell, see [Adding and Removing Devices in SAV](#) on page 28.

Figure 14 shows a server's properties and lists compliance information about the server. Note that when any compliance policy on the server is non-compliant, then the main compliance policies row shows a non-compliant status, as seen in Figure 14.

figure 14 Server Properties Compliance Information



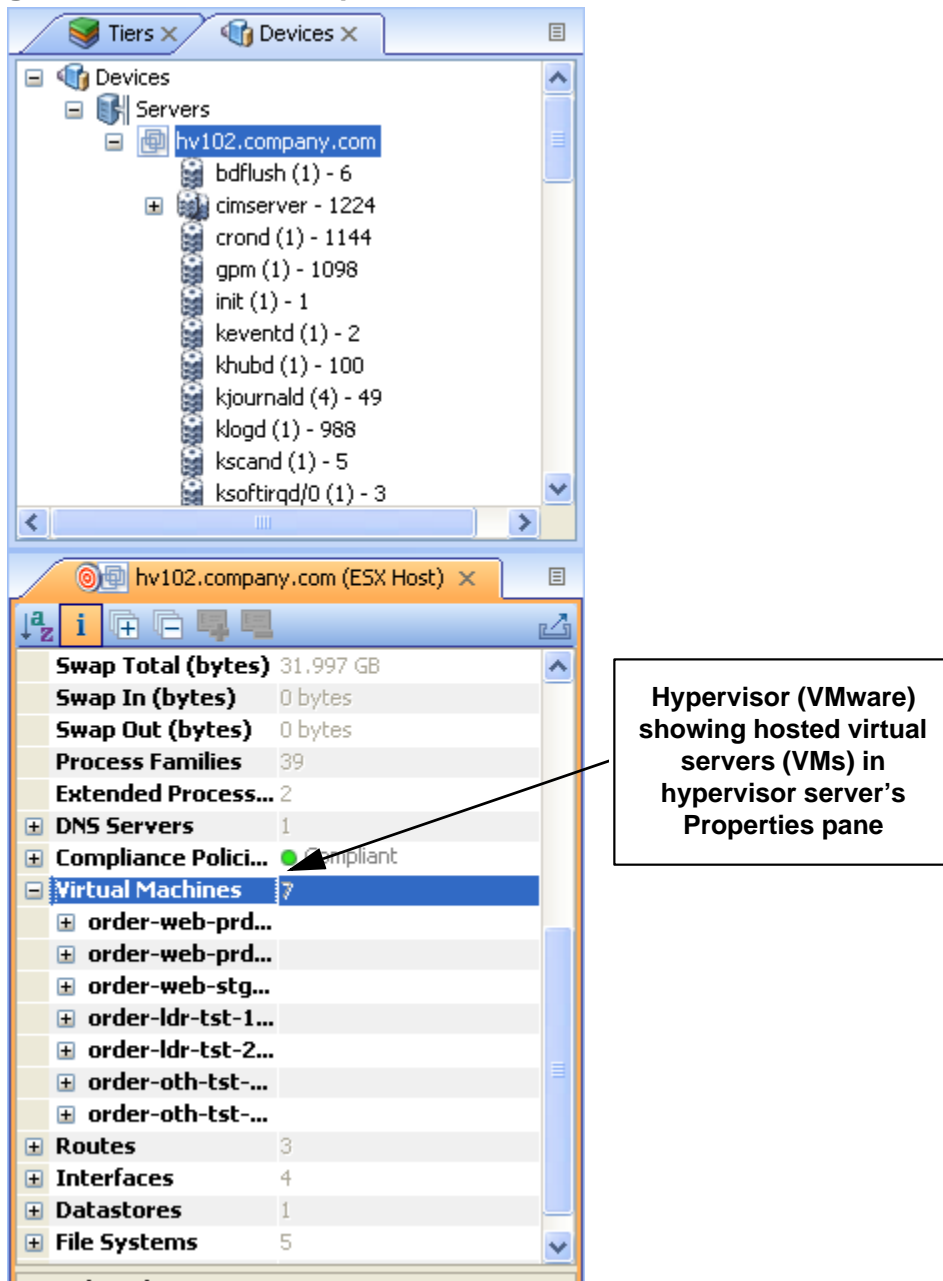
- ▶ A SAV snapshot is not the same thing as a compliance scan, but they are related. A compliance scan can be run from the SA Client or the NA Client and checks a server or device's compliance status and reports this information to the Compliance Dashboard inside of the SA Client (and by extension, a server's properties in SAV), or to the Policy Compliance page in the NA Client user interface.

The actual compliance state you are viewing in SAV may have changed since you last scanned the server or device. To get the most current information, click **Refresh Snapshot**  on the SAV tool bar. For more information on compliance, see the *SA User Guide: Audit and Compliance*.

Virtual Server Properties

The properties of a virtual server display all the same information as a physical server except that VMware and Solaris 10 hypervisors show all hosted virtual servers. VMware ESXi hypervisor servers will not display in the Tiers Tree, although the VMs hosted on the servers may be displayed here. You can expand each hosted virtual server and view its properties. Conversely, each virtual server will contain in its properties the hypervisor that is hosting it. [Figure 15](#) illustrates this feature.

figure 15 Virtual Server Properties



Link Properties for Servers and Network Devices

The Properties Pane for links between servers, external connections, and network devices displays the following information:

- **Protocol:** The TCP or UDP.
- **Port:** The destination port that is associated with this link.
- **Connections:** The number of connections associated with this link. For each connection, the following information is displayed:
 - **End points:** The process families (if known). IP addresses (if unknown).
 - **Ephemeral port number:** A random port that is assigned by the operating system.

Replication

- **Replication Type:** The type of replication for this selected storage array.
- **Copy Type:** Replication copy type.
- **Status:** Status of the volume replicator.
- **Source:** Source volume of the replication.
- **Target:** Target volume of the replication.

Layer 1 Link Properties

Layer 1 Link properties represents the physical connection between devices and contains the following information:

- **Eff. Duplex:** Effective duplex between the two devices. The duplex represented is the actual duplex. If SAV cannot determine the duplex, then it will use the configured duplex.
- **Eff. Speed:** Effective speed between the two devices. The speed represented is the actual speed. If SAV cannot determine the speed, then it will use the configured port speed.
- **Port:**
 - **Name:** Name configured for the port.
 - **MAC Address:** MAC address assigned to the port.
 - **Duplex:** Configured duplex setting for the port (full, half, or automatic).
 - **Neg. Duplex:** Negotiated duplex, which could be different than actual.
 - **Speed:** Configured speed of the port.
 - **Neg. Speed:** Negotiated speed of the port, which could be different than what has been configured.
 - **Network Interfaces:** Network interfaces connected to this port.
 - **Peer MAC Addresses:** Other MAC addresses connected to the port.
- **Interfaces:** All network interfaces connected to this port.

IPC Links

Inter-process communication (IPC) link properties represent the links between processes in your Business Application and consist of the following attributes:

- **Protocol:** The protocol used for inter-process communication. Usually TCP or UDP.
- **Connections:** The number of connections associated with this link.
- **Destination Address:** IP address of the destination of the link.
- **Source Addresses:** Source IP addresses of the processes connection.

Network Devices Properties

The Properties Pane for network devices (routers, switches, firewalls, load balancers, and so on) displays the following information:

- **Name:** The name of the network device.
- **Last Reported Time:** The date of the last successful snapshot of the network device by NA.
- **Manufacturer:** The vendor that manufactures the network device.
- **Model:** The model number of the network device.
- **Operating System:** The operating system running on the network device.
- **Firmware Version:** The firmware version number for the device.
- **Asset Tag:** The assigned number used for tracking the network device.
- **VLANs:** The total number of VLANs that this network device has.
- **Ports:** The total number of ports that this network device has.
- **ACL Config:** Displays a link to view the ACLs configured for the device. You can view or compare ACL configurations by selecting **View ACL Configuration** from the **Manage** menu. This opens the ACL Configuration dialog for the selected network devices that have ACLs.

If you select two network devices, right-click, and select **Compare ACL Configuration**, this opens the Compare ACL Configuration dialog for the selected network devices that have ACLs. This allows you to compare ACL configurations between two devices in the same snapshot, or when in comparison mode, between the same device in the two snapshots. For more information, see [ACLs and Server Pool Configurations](#) on page 74.

- **Server Pool:** Displays a link to view the sever pool members for the selected device. For load balancers, you can view Server Pool members by clicking the Server Pools link in the Properties pane or selecting **View Server Pool Configuration** from the **Manage** menu.

If you select two load balancers in the Devices tree, right-click, and select **Compare Server Pool Configuration**, you can view the Compare Server Pool Configuration window to see any differences in configuration. For more information, see [ACLs and Server Pool Configurations](#) on page 74.

- **Compliance:** For network devices that have compliance policies associated with them, the properties will display its compliance status. For information on Compliance statuses, see [Properties for Servers and Devices with Compliance Policies](#) on page 50.

Network Device Port

Network device port properties display the following information:

- **Name:** Name configured for the port.
- **MAC Address:** The Media Access Control ID assigned to this port.
- **Duplex:** The configured duplex (if it can be collected).
- **Neg. Duplex:** The negotiated duplex (if it can be collected).
- **Speed:** The configured speed in Mbps (if it can be collected).

- **Negotiated Speed:** The negotiated speed in Mbps (if it can be collected).
- **Peer MAC Addresses:** Other MAC addresses connected to the port.

Virtual Switch Properties

Virtual Switch properties displays the following information:

- **Port Groups:** These can be expanded to view port groups configured for the selected vSwitch.
- **Network Interfaces:** These can be expanded to view network interfaces assigned to the selected vSwitch.

Port Group Properties

Port group properties displays the following information:

- **Port Group Name:** The name of port group
- **VLAN ID:** The VLAN ID of port group. This is optional in the VMware management user interface.

Network Interface Properties Pane

The Properties Pane for a network interface displays the following information:

- **IP Address:** The IP address that is associated with a network interface.
- **MAC Address:** The Media Access Control ID that is associated with a network interface.
- **Subnet Mask:** The subnet that is associated with a network interface.
- **Broadcast Address:** The broadcast address that is associated with a network interface.
- **Device:** The device that is associated with a network interface.
- **Duplex:** The configured duplex (if it can be collected).
- **Negotiated Duplex:** The negotiated duplex (if it can be collected).
- **Speed:** The configured speed in Mbps (if it can be collected).
- **Negotiated Speed:** The negotiated speed in Mbps (if it can be collected).
- **Routes:** Network interfaces and servers will show static route information. VMware ESXi hypervisor servers will not show route information.

Storage and SAN Properties

SAV displays property information about the following storage- and SAN-related elements:

- [Server Properties with Storage](#)
- [File Systems](#)
- [LUN IDs](#)
- [SAN Array Properties](#)
- [NAS Filer Properties](#)
- [Fibre Channel Switch](#)
- [SAN Array Disk Volumes](#)
- [Fibre Channel Adapter \(Host Bus Adapter\)](#)
- [Fibre Channel Port](#)
- [Storage Signature](#)

Server Properties with Storage

Servers display the following attribute information in the Properties tab (these elements are visible only in the Storage or SAN Maps):

- **FCA:** Any server that is attached to a SAN storage device will have an HBA (Host Bus Adapter), which SAV labels FCAs (Fibre Channel Adapters). You can expand category in the Properties pane and see a list of all FCAs, each of which can be expanded to display all their ports.
- **File systems:** SAV displays details such as mount options, Type (ext3, NFS), and so on.
- **Disks:** Number of and names of each disk on the server, including type, manufacturer, and disk capacity information.

File Systems

File systems can exist on both servers and NAS Filers (NetApps). SAV displays the following attributes for file systems in the Properties pane:

Mount point/drive letter/export path:

- Capacity
- Free capacity
- Percent used

For server file systems, the following information is displayed:

- Device
- Mount options
- Type (for example, ext3, NFS, and so on)

For NetApp file systems/Qtrees, the following information is displayed:

- Aggregate
- Plexes
- RAID groups

Disk Properties

Disks from SAN arrays, NAS filers, and servers will display the following attributes in the Properties pane:

- Capacity
- Manufacturer
- Model
- Type
- Status
- Serial number
- Firmware version
- Device (only on servers)

SAN Array Properties

SAN Arrays properties include the following information:

- Name
- Description
- Last Reported time
- Manufacturer
- Server ID
- Disks
- Volumes
- Ports

LUN Volume Properties

LUN volume properties include the following information:

- **Name:** Configured name for this LUN.
- **Description:** Description given to the volume.
- **Capacity:** Total space allocated to the volume (bytes).
- **LUN IDs:** All LUN IDs configured for this volume.

NAS Filer Properties

NAS Filers display the following attribute information in the Properties pane:

- **Name:** Name given to the device.
- **Description:** Description of the device.
- **Server ID:** ID that SA uses to identify this device.
- **Hostname:** Host name for the filer.
- **Last Reported Time:** Last time agent on this device reported to SA.
- **Manufacturer:** Manufacturer of the device.
- **Model:** Model number of the device.
- **Operating System Version:** Version of the OS running on the device
- **Serial Number:** Device serial number.
- **Hardware Version:** Device hardware version.
- **Disks:** Number of disks connection to the devices.
- **Ports:** Number of ports in use by the device.
- **Volumes:** Number of LUN volumes connection to the device.
- **Exports:** Number of exports in use by the device.

NFS Export Properties

NFS export properties contain the following information:

- **Export Path:** Path to the remote file system being linked to.
- **Size:** Total capacity of the exported file system.
- **Free Space:** Space available on the exported path.
- **% Used:** Percentage of space being used on the exported file system.
- **Aggregate:**
- **Plexe:** List of all plexes
- **RAID Groups:** List of all raid group (if any) configured on the exported path.

Fibre Channel Switch

Fibre Channel Switches contain the following attribute information in the Properties pane:

- Name
- Description
- Last Reported Time
- Manufacturer
- Model
- Server ID
- Serial number
- Firmware version
- Hardware version
- Ports
- Virtual switches



If a switch is a director-class switch, it could possibly have virtual switch children — these can be expanded as well.

SAN Zones

- **Name:** The name of the SAN zone.

SAN Array Disk Volumes

Volumes on SAN arrays (and NAS Filers acting as arrays) contain the following attributes:

- Name
- Description
- Capacity
- LUN ID

Fibre Channel Adapter (Host Bus Adapter)

Fibre Channel Adapters (known generically as HBAs) display the following attributes in the Properties pane:

- Node WWN
- Manufacturer
- Model
- Serial number
- Driver version
- Firmware version
- Hardware version
- Ports

Fibre Channel Port

Fibre Channel Ports display the following attributes information in the Properties pane:

- **World Wide Name:** The physical port name that identifies the fibre channel port on a SAN.
- **Description:** Description of the port.
- **Port Number:** The port number that identifies fibre-channel cards and cable connections.
- **Status:** Indicates whether or not the port is open and working.
- **Zonesets:** Zonesets to which the port belongs.
- **Zones:** Zones to which the port belongs.
- **Fabric:** Fabric that contains the fibre channel switch and port.

Storage Signature

Storage signatures match remote storage volumes and display the following information in the Properties pane:

- LUN Name
- LUN ID
- Exported path
- Storage System Manufacturer
- Storage System Model

SAN Link Properties

SAV displays the following links or connections between storage signatures in the SAN Map to illustrate how these signatures are related and connected:

- [Fibre Channel Link](#)
- [LUN Mapping Link](#)
- [NFS Mount Link](#)

Fibre Channel Link

Fibre channel links represent physical fiber cables connecting two ports. The Properties pane displays attributes information for endpoint ports.

LUN Mapping Link

LUN mapping links represent the logical connection between a host LUN volume and the corresponding SAN array volume. LUN mapping links display the following information in the Properties pane:

- Number of paths (indicated by thickness)
- Whether any paths are down (in red)
- Server file system consumer
- Array target volume

NFS Mount Link

NFS mount links represent a dependency of a server file system on a remote NAS Filer export and display the following information in the Properties pane:

- **Mounted To:** Directory of the NFS mount on the server this link originates from.
- **Exported From:** The exported path to the exported file system.

SAV Options

For SAV, you can specify the following options:

- [Virtualization Settings](#)
- [Scan Time-Out Preference](#)
- [Discovery Settings](#)
- [Reset All Settings](#)

Virtualization Settings

You can configure SA Client options that allow you to choose whether or not you want to perform a scan on any virtual servers or hypervisors related to the virtual server you want to open in SAV.

For example, if you want to visualize a VMware virtual machine (VM) or Solaris zone in SAV, by default you will be asked if you also want to scan any virtualization relationships — in other words, the system asks if you want SAV to also scan the hypervisor that is hosting the selected virtual server. Depending upon the virtual server you select, SAV might have to scan several related virtual servers in order to visualize a single virtual server in SAV.

Conversely, if you select a hypervisor to open in SAV, you are asked if you want to scan any virtualization relationships — in this case, SAV would need to scan all of the hosted virtual servers, which could take a long time to perform.



Even if you do not request a virtual relationship scan, SAV will display the virtual machines it discovers. However, certain details such as the operating systems on those virtual machines will not be displayed unless you request a virtual relationship scan.

By default, SAV will always ask you if you want to scan virtual relationships, but you can set your own default behavior for scanning related virtual servers with the following virtualization options:

- Ask each time if you want to scan related virtual and host servers.
- Always scan related virtual and host servers.
- Never scan related virtual and hypervisor servers.

To change the virtualization settings, perform the following steps:

- 1 From the **Edit** menu, select **Options**.
- 2 In the Set Options window, in the Views pane, select **Service Automation Visualizer**.
- 3 Specify your desired Virtualization Settings, then click **OK** when you are finished.

Scan Time-Out Preference

SAV is optimized to scan a maximum of 50 servers. A number of factors affect the time it takes for a scan to complete, including the load on the scanned servers and the load on SA. The default scan time-out is set to 300 seconds. You can reset this time-out value to a minimum of 30 seconds or to a maximum of 3600 seconds.

To change the scan time-out, perform the following steps:

- 1 From the **Edit** menu, select **Options**.
- 2 In the Set Options window, in the Views pane, select **Service Automation Visualizer**.
- 3 In the Scan Time-out section, move the slider to increase or decrease the number of seconds at which you want the scanning process to stop.
- 4 Click **OK** to save your changes or click **Cancel** to close the window without saving your changes.

Discovery Settings

If servers are scanned and it is determined that they are dependent on external IP addresses, when this option is selected SAV attempts to determine which servers or network devices those IP addresses refer to.

Keep in mind that this could cause scan time to increase, depending on the numbers of servers you selected for the scan and how many remote dependencies are discovered.

For recurring background business application snapshots, this detection is always done and cannot be turned off.

Reset All Settings

Restores all SAV settings to their defaults, including resizing and repositioning all tabbed views.

You can also access these options from inside the SA Client by selecting **Options** from the **Tools** menu.

Accessing Servers and Devices From SAV

To help you troubleshoot and take action for server and application errors, SAV gives you easy access to servers and devices through the following methods:

- [Opening the Device Explorer](#)
- [Opening a Remote Terminal](#)
- [Opening a Global Shell](#)

Opening the Device Explorer

To view detailed information about a server or a device (network or storage device) using the Device Explorer, perform the following steps:



SAN switches cannot be opened in the Device Explorer from inside SAV.

- 1 In one of the SAV maps, select one or more servers.
- 2 Right-click and then select **Open in Device Explorer** to open a Device Explorer in the SA Client for each selected server.

See the *SA User Guide: Server Automation* for information about how to use the Device Explorer in the SA Client.

Opening a Remote Terminal

The Remote Terminal enables you to log into devices (servers and network devices) and run native commands.



The Open a Remote Terminal feature is not available for VMware ESXi hypervisor servers.

To open a Remote Terminal from SAV, perform one of the following tasks:

- 1 In one of the SAV maps, select one or more servers.
- 2 Right-click and then select **Open Remote Terminal** to open the Select Remote Login window.
- 3 In the Login column, select a login ID from the drop-down list, such as root or LocalSystem, or any of the user logins that might be configured.
- 4 Click **OK** to open a Remote Terminal for each selection.

See the *SA User Guide: Server Automation* for information about using utilities in a Remote Terminal.


Opening a Global Shell

You can use the Global Shell feature to navigate between servers and connected network devices by tracing their layer 1 connections in the `/opsw/Servers/@` and `/opsw/Network/@` directories in the OGFS.

In the OGFS, you can also run scripts to perform the following tasks:

- Find servers and network devices.
- Find all servers that are connected to a certain switch.
- Display the network interfaces of a certain server.
- Get the IP addresses of all devices.
- Compare two files to identify changes made, such as what changes were made to a device configuration (.conf) file.
- Change device details, such as the snmp-location.

To launch the Global Shell, perform one of the following tasks:

- From the **File** Menu, select **Global Shell**.
- Select the  toolbar icon.

See the *SA User Guide: Server Automation* for information about how to use Global Shell.



Running Scripts on Devices

From inside SAV you can run a script, either directly on a selected server or network device (but not on SAN devices), or on the Global File System (OGFS) using the Global Shell — given that your user account has sufficient permissions to run the Global Shell and to perform any operations on servers under SA management.




The Run Scripts feature is not available for VMware ESXi hypervisor servers.

There are three possible scenarios in which you can run a script in SAV:

- By selecting a server and clicking **Run Script**  on the SAV toolbar, or selecting **Run Script** from the **Manage** menu. This launches the Run Script Task window.
- By selecting Run Global Shell Script , which launches the Global Shell, and which gives you access to the OGFS.
- Selecting a network device and click **Run Script** on the SAV toolbar, or selecting **Run Script** from the **Manage** menu, This launches the NA interface, where you can log in to NA and run the script on the selected network device.


For more information about script execution, see the *SA User Guide: Server Automation*. For information on running scripts on network devices, consult the NA online documentation.

To run a script on a server, perform the following steps:


- 1 From inside SAV, select a server from the Devices pane or one of the maps.
- 2 From the **Manage** menu, select **Run Script**, or click Run Script  from the SAV toolbar.

- 3 In the Run Script window, fill out the necessary information and perform the steps to execute the script. For more information on running a script on a server, see the *SA User Guide: Server Automation*.

To run a global shell script in SAV, perform the following steps:

- 1 From inside SAV, from the **Manage** menu, select **Run Global Shell Script**, or click Run Global Shell Script  from the SAV toolbar.
- 2 In the Run Global Shell Script window, fill out the necessary information and perform the steps to execute or schedule the script execution. For more information on running a global shell script on the OGFS, see the *SA User Guide: Server Automation*.

To run a script on a network device, perform the following steps:

- 1 From inside SAV, select a network device from the Devices pane or the Network Map.
- 2 From the **Manage** menu, select **Run Script**, or click Run Script  from the SAV toolbar. This launches the NA web application interface.
- 3 Log in to NA, and on the New Task - Run Command Script page, fill out the necessary information to run or schedule the script execution. For more information on running a script on a network device through NA, consult the NA online documentation by clicking the Help link in the upper right corner of the page.



You must have proper permissions to run global shell scripts and scripts on a device. To obtain these permissions, contact your SA administrator. For more information on permissions, see the *SA Administration Guide*.

Creating Business Application Definitions

A business application definition allows you to transform a data display that contains extraneous and hard-to-understand information into a focused and easy-to-understand view of the relevant data. Based on business application tiers and application and storage signatures that you create, SAV recognizes actual application processes and storage devices and displays them in the Tiers Map according to any visual customizations you make to them.

You create business application definitions in order to recognize processes by giving them meaningful names and appearances (colors). You also use business application definitions to define the logical tiers of an application and display application and storage signatures according to the tier in which they reside.

See [Signature Evaluation Order](#) on page 69 for information on the order in which SAV scans application signatures and matches them to processes and process families on servers.

For information on understanding and creating application definitions, see the following topics:

- [Business Application Tiers](#) on page 67
- [Creating a Tier](#) on page 68
- [Application and Storage Signatures](#) on page 68
- [Creating an Application or Storage Signature](#) on page 71

Business Application Templates

When you first scan servers with SAV and visualize them, the Tiers pane is empty—it has no business application definitions until you create them. (There are, however, some predefined commonly used default applications built into the product, such as Apache, WebSphere, and so on, contained in the Default Signatures folder.) Once you create and define an application definition with tiers and signatures, you can save the application definition as a template, which can be reused by yourself or others on your team to be automatically be applied to new device scans.

You can also set an application definition to use as the default template, so that whenever you open SAV, it always opens using the application definitions saved in the default template. If you make changes to an application that is based upon a template, and do not wish to save the changes, you can restore the default template.

Setting a Default Application Template

If you have made changes to the application definition and want to set this as the default, select **Set as Default Template** from the **File** menu.

Resetting the Default Application Template

If you have made changes to the application definition and want to restore the previously saved default application, select **Reset Default Template** from the **File** menu.

Importing an Application Template

If you would like to import an application template that has already been saved, from the **File** menu, select **Import Template** and select the template to import.



Importing an application template will replace any existing application definitions in your current SAV session.

Saving a Business Application as a Template

You can save business application as a template, which makes it available as a generic template that can be used again and shared among other team members.

Note that When you export a Business Application, by design all scan information will be lost, including the servers and devices and their relationships. Business Application definitions and all the components inside of them remain after an export, but turn red to indicate that relationships between live processes and connections have been lost.

To save business application as a template, perform the following steps:

- 1 From the **File** menu, select **Save As**.
- 2 From the Save in drop-down list, select either Opsware Global File System or Desktop. (Only business applications can be saved to the SA Client Library. SAV archives and templates can be saved to disk or the Global Filesystem.)
- 3 Enter a name for the business application template, and click **Save**.

Creating Business Application Contacts




In SAV, you can create a list of email contacts—and send emails to contacts on this list—by adding email and contact information to the top level tier of a business application.

You can create groups of contacts, and add to each contact such information as email, instant messenger IDs, phone number, and so on. From the **File** menu, select **Send Email**, and you can email any of the contacts you have added to the Business Application

SAV also will display any email addresses configured on network devices scanned by SAV. (Most network devices have an internal configuration setting such as “sysContact” that allows them to associate an email address for the owner of the device.)

You can add contacts through the properties of the Business Application, and then send emails to any email contacts listed.

To create a new contact for your business application, perform the following steps:

- 1 From the Tiers pane, select the top-level Business Application  icon.
- 2 Select the Properties for the business application, and then click **Add Contact**  (at the top of the Properties pane).
- 3 To enter information for a contact, double-click in the field to the right of each entry. After an entry line is filled, press Return to enter the information. If you want to be able to send emails to a contact, be sure to enter the contact’s email address.
- 4 To delete a contact, select the contact in the Properties pane and click **Remove Contact** .

Sending Email to Business Application Contacts

You can send email to any business application contact that has a well-formed email address.

To send an email to a contact, perform the following steps:

- 1 From the **File** menu, select **Send Email**.
- 2 In the Email Contacts window, expand the business application. Each contact that has its name check marked is added to the email. If you do not want to send an email to one of the contacts, remove the check mark next to the name.
- 3 Click **Compose** to write and send the email. (SAV launches whatever email client you have installed and configured on your local system.)

Business Application Tiers

Business application tiers provide an architectural framework to organize and display application and storage signatures. You can add, edit, delete, cut, copy, and paste tiers in the Tiers tree. You can paste a tier before or after a selected position in the Tiers tree to rearrange the order. The order of tiers (and the signatures they contain) is significant because it affects the order that the process families are assigned to signatures. (For more information, see [Signature Evaluation Order](#) on page 69.)

If any tiers have application signatures that do not recognize any process families, they and their ancestors are represented with warning icons in the tree and by red title bars in the view. This allows you to quickly identify signatures that should be running but are not.


Creating a Tier

To create an tier in the Tiers tree, perform the following steps:

- 1 In the Tiers tree or map, select either the top-level business application node or a tier, right-click, and select **New Tier**.
- 2 The Properties pane for the tier becomes active and you can edit the tier's properties, such as, give the tier a name.

Deleting a Tier



To delete an tier from the Tiers tree, perform the following steps:

- 1 In the Tiers tree or map, select a tier.
- 2 From the **Edit** menu, select **Delete** or right-click and then select **Delete** (or, click the delete toolbar button ).

Cutting and Copying a Tier


You can cut and copy a tier to the clipboard. After you do this, you can paste the tier before or after a selected position in the Tiers tree to rearrange the order. The order of application tiers (and the signatures they contain) is significant because it affects the order that the process families are assigned to signatures.

To cut and copy an application tier in the Tiers tree, perform the following steps:

- 1 In the Tiers tree, select a tier.
- 2 From the toolbar select either the  icon or the  icon, or right-click and select **Cut** or **Copy**.

Pasting a Tier

To paste a tier in the Tiers tree, perform the following steps:

- 1 Select a tier in the Tiers tree and then select the Paste icon  . The tiers that you cut or copied to the clipboard will be appended to the selected tier's children. When you select a signature in the Devices tree, the Paste icon will be disabled.

Application and Storage Signatures

Application and storage signatures are organized and displayed in the Tiers pane inside of the SAV application window. A signature always lives inside of a tier.

Application or storage signature contains the following data:

- A name.
- A signature, which is a set of rules that users provide and that SAV uses to identify a process family or storage mapping. For application signatures, these rules use data such as process name, command line, listen port, environment variable, executable path, and so on. For storage signatures, these rules include either a LUN volume or an NFS File System.
- Object properties such as name, color, and whether this object is used by default each time the user opens up an application.

You can add, edit, delete, cut, copy, and paste signatures in the Tiers tree. You can paste a signature before or after a selected position in the Tiers tree to rearrange the order. The order of signatures (and the tiers that contain them) is significant because it affects the order that the process families and storage mappings are assigned to signatures.

SAV comes with a set of predefined default signatures that recognize a variety of commonly used application process families, such as Apache HTTP, Microsoft IIS, WebLogic, JBoss, Oracle, and so on. So, if your server has any of these applications installed, SAV is able to recognize and display them in the Tiers tree and the maps.

SAV also includes a set of SA signatures, such as the Server Agent, SA Build Manager, NA Syslog Server, SA Command Engine, and so on. Many of these signatures appear only if you use SAV to scan the server or servers that the SA core is installed on, while others, like the Server Agent, appear on all reachable managed servers.



Application signatures do not capture process family information on VMware ESXi hypervisor servers.

List of Application Signature Discovery Properties

The full list of application signature properties that can be used to find applications and their process families include:

- Process Name
- Command Line
- Connected To Port
- Listener Port
- Executable Path
- Open Files
- Open Modules
- Environment Variable Name and/or Value

The means by which an application signature discovers applications and process families for environment variables allows you to match application signatures by the name of an environment variable, its value, or both.

“Environment variable” is an application signature property that can be added using the following syntax:

```
NAME=VALUE
```

where NAME is the name of the environment variable, and VALUE is its value. You can type either name, the value, or both to find matching process families. However, if you want to find an exact match, you must use both NAME=VALUE.

Signature Evaluation Order

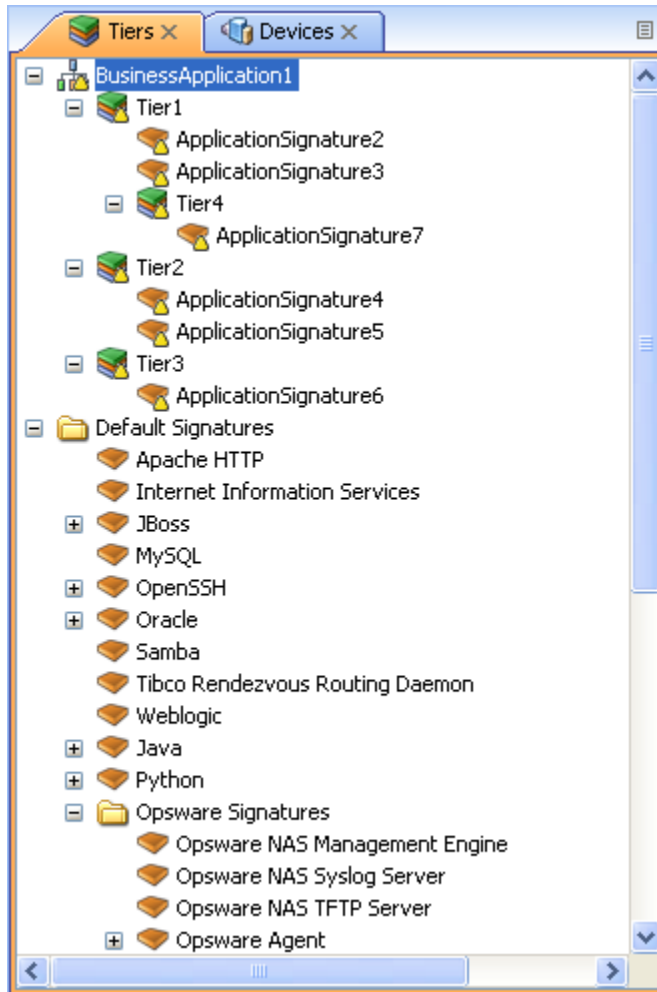
The order that signatures are recognized in SAV is important because a process family or storage mapping is associated with the first signature that it matches in the Tiers tree. Evaluation order is significant especially when the recognition criteria for a signature matches the same process family or storage mapping found in multiple signatures.

Signatures are evaluated in a depth-first, top to bottom order: signatures in a tier's sub-tiers are evaluated before the tier's signatures (depth -first), and tiers in the Tiers tree are evaluated from top to bottom. Signatures are applied in the order in which they appear in each tier.

After all user-created tiers and signature hierarchies are evaluated, then all of the default SA signatures are evaluated; for example, NA Management System, NA Syslog Server, and so on. After the SA signatures are evaluated, then all of the default predefined signatures are evaluated; for example, Apache HTTP, Internet Information Server (IIS), and so on.

Consider an application definition that has the structure shown in Figure 16. In this image, no processes or process families match the signature definitions, and so the signatures are represented with the ⚠ icon.

figure 16 Tiers Signature Evaluation Order



In this application definition example, the signatures are evaluated in the following order:

- 1 ApplicationSignature7
- 2 ApplicationSignature2
- 3 ApplicationSignature3
- 4 ApplicationSignature4
- 5 ApplicationSignature5
- 6 ApplicationSignature6
- 7 NA Management System
- 8 NA Syslog Server
- 9 <All remaining SA signatures, top to bottom>

- 10 Apache HTTP
- 11 Internet Information Services
- 12 <All remaining default signatures, top to bottom>

Creating an Application or Storage Signature

To create an application or storage signature in the Tiers tree, perform the following steps:

- 1 Make sure you have already created a Tier into which you want to create an application or storage signature.
- 1 Select the Tiers into which you want to create the signature in either the Tiers tree or map.
- 2 From the **Application** menu, select **New Application Signature** or **New Storage Signature**. The Properties pane becomes active and ready to be filled out for the new signature.
- 3 In the Properties pane for an *application* signature, enter any of the following information:
 - **Process Name:** The name of the process family.
 - **Command Line:** The command line that a signature was started with.
 - **Executable Path:** The path to the executable file of this application component.
 - **Open Files:** The name of an open file.
 - **Modules:** The shared libraries associated with the process family. These include DLLs on Windows and shared object files on UNIX.
 - **Environment Variables:** For environment variables, enter a name, the value, or both to find matching process families, where NAME is the name of the environment variable, and VALUE is its value. If you want to find an exact match, you must use both NAME=VALUE.
 - **Connected to Port:** The port the signature is connected to.
 - **Listener Port:** The port on which the signatures are listening.
 - **Alias:** The name of the application component as displayed in the different views.
 - **Background color:** Click to change the background color displayed in the different maps.
 - **Foreground color:** Click to change the foreground text color displayed in the different maps.
- 4 If you created a *storage* signature, enter any of the following information:
 - **Name:** The name of the storage device; for example: HiCommand.
 - **Alias:** Alias for the storage device (if any).
 - **Remote Volumes:** Number of remote volumes on the storage device.
 - **LUN ID:** LUN ID number.
 - **LUN Name:** Name of the LUN.
 - **Exported Path:** Remote exported path for NAS filers.
 - **Manufacturer:** Maker of the storage device.
 - **Model:** Model number.
 - **Background color:** Click to change the background color displayed in the different maps.
 - **Foreground color:** Click to change the foreground text color displayed in the different views.
- 5 After each entry, press Return on your keyboard to enter the property.

- 6 When you have finished defining the signature, click **Refresh Snapshot**  on the SAV toolbar so SAV can update the snapshot and scan your data center to find matching process families and storage devices.

Editing Signatures

To edit a signature in the Tiers tree, perform the following steps:

- 1 In the Tiers tree, select a signature.
- 2 From the Properties pane of the selected signature, double-click in the right-side of the property entry and edit the text.
- 3 Press Return on your keyboard to enter the changes.

Deleting Signatures

To delete signatures from the Tiers tree, perform the following steps:

- 1 In the Tiers tree, select an application component.
- 2 From the **Edit** menu, select **Delete** or right-click and then select **Delete**.



Cutting and Copying Signatures

You can cut and copy signatures to the clipboard. After you do this, you can paste the signature before or after a selected position in the Tiers tree to rearrange the order.



Default signatures and SA signatures can be copied and pasted into user-created application tiers, but cannot be deleted or overwritten.

To cut and copy a signature tier in the Tiers tree, perform the following steps:


- 1 In the Tiers tree, select a signature.
- 2 From the toolbar, select the  icon or the  icon, or right-click and select **Cut** or **Copy**.
- 3 Then, click **Paste** from the **Edit** menu, or press Control + V.

Or

- 4 You can press the Control button on your keyboard, and then select and drag a signature from one tier to another, creating a copy of the selected signature.

Pasting a Signature

You can perform the following paste actions if one or more signatures have been cut or copied to the clipboard:

- Select a signature in the Devices tree and then select the Paste icon . The signatures that you cut or copied to the clipboard will be appended to the selected tier's signatures.
- Select a signature in the Devices tree and then select **Paste** from the **Edit** menu. The signatures that you cut or copied to the clipboard will be inserted into the selected signature's parent tier *before* the selected signature.

- Select a signature in the Devices tree and then select the **Paste** from the **Edit** menu. The signatures that you cut or copied to the clipboard will be inserted into the selected signature's parent tier *after* (below) the selected signature.



For default SA signatures, you can copy and paste them into user-created application tiers, but you cannot delete or overwrite them.

SAV Business Application Management


In SAV, a snapshot represents the state of a set of network and storage devices and managed servers, the process families running on those servers, the connections among those process families, local and remote storage devices, file systems, and any external clients and dependencies. Snapshots can be saved as part of a Business Application into the SA Client Library, or as a .vam file to a local or remote file system. A Business Application can contain any number of Snapshots, each of which can be used for Snapshot comparisons.

However, in order to save Business Applications to the Library or OGFS, your user account needs permissions to be able to write to those directories. To obtain the necessary permissions, contact your SA administrator.

Opening a Business Application

After you have launched the SAV, you can open a previously saved Business Application.

To open a Business Application, perform the following steps:

- 1 In the SAV window, select the  toolbar icon or select the **File** menu and then select **Open** to display the Open window.
- 2 In the Look in drop-down list, select the directory on your computer, in the SA Library, or the OGFS where the Business Application was saved.
- 3 Click **Open**.

Saving a Business Application

To save a Business Application, perform the following steps:

- 1 From the **File** menu, select **Save** or **Save As** to open the Save window. (Note that by default, all scan results are selected to be saved.)
- 2 If you chose Save As, in the Save in drop-down list, select the your local computer, the SA Library, or the OGFS and choose where you want to save the Business Application.
- 3 Click **Save**.



If you exit SAV before saving your changes (either application definition changes or Snapshot changes), you are prompted to choose whether you want to save your changes and then exit or exit without saving your changes.

Saving a Business Application as an Application Template

If you would like to save the current application definition as a template, so it can be reused or set to open SAV using that definition, see [Business Application Templates](#) on page 66.

ACLs and Server Pool Configurations

For network devices — such as firewalls, load balancers, routers, switches — you can view Access Control List (ACL) configuration information. For load balancers, you can view server pool configuration (in addition to ACLs).

You also can compare ACL and server pool configurations between two devices in the same snapshot, or when in comparison mode, between the *same* device in the two *different* snapshots.

This section shows you how to perform the following tasks:

- [Viewing ACLs](#)
- [Comparing ACLs — Two Devices In Same Snapshot](#)
- [Viewing Server Pool Configuration](#)
- [Comparing Server Pool Configuration](#)

Viewing ACLs

In SAV, you can view ACLs for network devices such as firewalls, load balancers, routers, switches.

To view ACL configuration information, perform the following steps:

- 1 In the Network Map or Devices Tree, select a network device that has ACLs configured for it, right-click, and select View ACL Configuration. The Access Control Lists window opens.
You can also access the Access Control Lists window by:
 - From the Properties pane of the selected device, click the View link in the ACLs property.
 - Select View ACL Configuration from the **Manage** menu, or right-click on the device.
- 2 In the Access Control List window, you can select and copy the text information. Also, from the drop-down list at the top of the window, you can select other devices in the snapshot that contain ACLs and view them. You can also search for specific text strings in the current ACL configuration, highlight strings, and perform other search functions.
- 3 When you are finished viewing ACLs, click **Close**.

Comparing ACLs — Two Devices In Same Snapshot

You can compare ACL configurations between any two devices in the same snapshot, or you can compare ACLs between the same device in two different snapshots. For information on how to compare the same device between two snapshots, see [Comparing ACLs — Same Device Between Two Snapshots](#) on page 75.

To compare ACL configurations for two devices in the same snapshot, perform the following steps:

- 1 From the Devices Tree, expand the Network Devices node.
- 2 Press and hold the Control button on your keyboard, and then select two network devices that have ACLs configured, such as a load balancer, a firewall, router, or LAN switch. (To see if a network device has ACLs configured, select the device and look for ACLs in the Properties pane.)
- 3 From the **Manage** menu (or, right-click), select **Compare ACL Configuration**. In the Compare window, you see two panes side by side, each representing one of the devices you are comparing. At the bottom of each pane is the name of the device.

To indicate the differences for each ACL configuration, the Comparison window uses the following colors:


- **Green:** This indicates that information only exists in device on the right side of the window.
- **Blue:** This indicates that information has been modified.
- **Red:** This indicates that information only exists in device on the left side of the window.
- **Black:** This indicates no changes.


To move through differences between the two configurations, click the arrow buttons at the right top of the window.

- 4 When you are finished viewing the differences, click **Close**.

Comparing ACLs — Same Device Between Two Snapshots

To compare ACLs between the same device in two different snapshots, perform the following steps:

- 1 From the **View** menu, select **Compare**. (Or, click **Compare**  **Compare** on the SAV toolbar). The Compare pane appears.
- 2 Click **Select**. The Select Comparison Snapshot window opens.
- 3 Select a snapshot you want to compare against the currently loaded snapshot.
- 4 Next, select if you want to show either ANY or ALL of the selected objects (plus their attributes) that are different to show when you compare snapshots.
- 5 From the drop-down list, select an object category for the device type for which you want to compare ACLs.
- 6 As you create comparison rules, SAV automatically displays any or all differences in the Differences pane.

- 7 To view differences in other maps, you can select a map, and all objects that are found to exist will appear normally. All objects that are listed as missing appears grayed out. You can also select other criteria in the Difference pane drop-down list to filter the results of the comparison in more granular detail.
- 1 To close the Compare pane, from the **View** menu, select **Compare** again. (Or, click **Compare**  on the SAV toolbar.)

Comparing Server Pool Configuration

You can compare server pool configurations between any two load balancers in the same snapshot.

(To compare server pool configurations between the same load balancer in two different snapshots, see [Comparing Snapshots](#) on page 77 for more information.)

To compare server pool configurations for two load balancers in the same snapshot, perform the following steps:

- 1 From the Devices Tree, expand the Network Devices node.
- 2 Press and hold the Control button on your keyboard, and then select two load balancers that have a server pool configuration. (To see if a load balancer has a server pool configured, select the device and look for Server Pools in the Properties pane.)
- 3 From the **Manage** menu (or, right-click), select **Compare Server Pool Configuration**. In the Compare window, you see two panes side by side, each representing one of the devices you are comparing. At the bottom of each pane is the name of the device.

To indicate the differences for each server pool configuration, the Comparison window uses the following colors:

- **Green:** This indicates that information only exists in device on the right side of the window.
- **Blue:** This indicates that information has been modified.
- **Red:** This indicates that information only exists in device on the left side of the window.
- **Black:** This indicates no changes.

To move through differences between the two configurations, click the arrow buttons at the right top of the window.

- 4 When you are finished viewing the differences, click **Close**.

Viewing Server Pool Configuration

To view server pool configuration for a load balancer, perform the following steps:


- 1 In the Network Map or Devices Tree, select a load balancer that has server pool configurations, right-click, and select **View Server Pool Configuration**. The Server Pools window opens.

You can also access the Server Pools window by:

- From the Properties pane of the selected device, click the View Server Pools in the load balancer properties.
- Select View Server Pool Configuration from the **Manage** menu.

- 2 In the Server Pools window, you can select and copy the text information. Also, from the drop-down list at the top of the window, you can select other devices in the snapshot that contain server pool configurations and view them. You can also search for specific text strings in the current server pool configurations, highlight strings, and perform other search functions.
- 3 When you are finished viewing server pool configuration, click **Close**.

Comparing Snapshots

When you click **Refresh Snapshot**  on the SAV toolbar and then click **Save**, SAV captures and saves all information related to your Business Application. A snapshot including all servers and processes associated with the business application, the current state of all running processes, all local and remote storage devices, and all values and signature definitions you have created in the Tiers tree.

Each time you refresh a snapshot and then save the Business Application, snapshot results are saved within the currently loaded Business Application. You can also schedule snapshots to occur at later time on a one time or recurring schedule.


Each saved snapshot can be used in a one to one comparison between the currently loaded snapshot and a saved one. You can take snapshots from the currently loaded Business Application or from another Business Application to help you determine if any changes have occurred between the current state of the business application and its state as captured in a previously saved snapshot.

When you compare scan results, SAV evaluates certain key objects and their attributes on a one to one basis, and displays any differences in value between those objects. The results of the comparison are displayed in the Differences pane in the SAV window.

Creating a Snapshot

Create a snapshot in SAV any time you want to capture the current state of your business application. Because a data center and all the devices and elements within it are constantly changing, it is a good idea to capture the current state so you can compare the current state of a business application with one you captured in the past.

To create a snapshot, perform the following steps:

- 1 Click **Refresh Snapshot**  on the SAV toolbar.
- 2 From the **File** menu, select **Save**. (Or, click **Save** on the SAV toolbar) A new snapshot has been created.
- 3 To see the snapshot and give it a name, from the **Application** menu, select **Show Snapshots**.
- 4 In the Snapshots window displays all saved snapshots. To rename a snapshot, click the name cell of the list and type a name.

Opening a Snapshot

To view a previous state of a business application, you can load and view a saved snapshot.

To open a saved snapshot, perform the following steps:

- 1 From the **Application** menu, select **Show Snapshots**.
- 2 In the Snapshots window, select a saved snapshot and click **Open**.

- 3 The business application snapshot opens inside of the SAV application window. To delete a snapshot, select it and click **Delete**.

Scheduling a Snapshot

You can automate snapshot creation by scheduling a snapshot at a future point in time, or you can schedule a recurring snapshot to regularly capture the state of your business application.



You can only schedule snapshots for those Business Applications that have been saved to the SA Client Library

To schedule a snapshot, perform the following steps:

- 1 From the **Application** menu, select **Scheduled Snapshots**.
- 2 In the Scheduled Snapshots window, click **New Schedule**.
- 3 Type a name for the snapshot schedule in the Name field.
- 4 In the Scheduled Frequency section, select one of the following snapshot frequency options:
 - **Daily**: Choose to run the snapshot on a daily basis.
 - **Weekly**: Choose a day of the week to run the snapshot.
 - **Monthly**: Choose the months to run the snapshot specification job.
 - **Custom**: In the Custom Crontab string field, enter a string that indicates a time schedule. The crontab string can include serial (1,2,3,4) and range (1-5) values. For example, the following crontab string will create the snapshot at midnight every weekday:

```
0 0 * * 1-5
```

An asterisk (*) in any of these fields represents all days of the month, all months of the year, all days of the week, and so on. For more information about crontab entry formats, consult the UNIX man pages.

- 5 In the Time and Duration section, select a start and end time and day of the month.
- 6 When you are finished filling out the schedule, click **Close**.

“Source” and “Comparison” Snapshot

The currently loaded snapshot in SAV is referred to as the *source* snapshot, while the set of scan results you are comparing against the currently loaded snapshot is called the *comparison* snapshot. When you compare snapshots, you are always comparing the currently loaded scan result (*source*) with another saved snapshot result (*comparison*). (Remember that to create a new snapshot, you need to click **Refresh**

Snapshot  on the SAV toolbar and then click **Save**.)

Comparison Types

SAV displays comparison results based on the following criteria:

- [Object Existence Comparison](#)
- [Object Attribute Difference](#)
- [“Significant” Object Attribute Differences](#)

Object Existence Comparison

Comparing two snapshots helps determine whether or not an object exists between the them. If an object exists in one snapshot, but does not exist in the other, the comparison results display the object with an attribute named “existence” and describes it as either “found” or “missing” on either the source or comparison snapshot.

A process family could be running (and thus, “exist”) when you refresh a snapshot and save the Business Application. But if the process is no longer running, and you refresh the snapshot again and save the Business Application, the results change. When you compare the saved snapshot (the “comparison” snapshot) with the currently loaded snapshot (source), the results of the comparison display in the Differences pane.

The results of the selected row show that on the target snapshot, all the listed LUN volumes are missing, meaning they did not exist in the comparison snapshot, but they exist now in the current snapshot.

Object Attribute Difference

The SAV compare feature also evaluates two snapshots to determine any differences in the value of an object attribute. If the same attribute does not match between the two snapshots, then it is marked as a “difference” and displayed in the comparison results. For attribute values with numerical differences, the comparison results display both the numerical difference and percentage of change.

For example, if you scan a server in SAV and the server shows that it has 2 gigabytes of RAM, and then at a later point in time, one gigabyte of RAM is removed from the server, then when you perform a comparison, the results show the server’s total memory as having a difference of one gigabyte. The results also indicate that the target (the earlier saved scan results) had a value of two gigabytes, and the source (currently loaded scan results) has a value of one gigabyte.

Table 2 lists all object attributes evaluated during a scan results comparison.

table 2 Object Attributes Checked for Difference in Snapshot Comparison

Object Category	Object Attributes Compared
Database	Existence, version
Database file	Existence, size (in bytes)
Disk (applies to servers, SAN arrays, and NAS filers)	Existence, firmware version, status
Compliance Policy	Existence, compliance status (compliant, partial, noncompliant, scan failure, scan needed, scanning)
Fibre Channel Adapter	Driver version
Fibre Channel Port (applies to servers, SAN arrays, and NAS filers)	Connected port, existence, fabric, name, zone
File System	Existence, mount options, mount point, significant change in % free space, size (bytes), type
LUN Volume	Capacity (bytes), existence, LUN ID, name
NAS Filer	Existence, hostname, name, operating system version
NFS Export	Existence, export path, significant change in % of free space, size (bytes)

table 2 Object Attributes Checked for Difference in Snapshot Comparison

Object Category	Object Attributes Compared
Network Device	ACLs, existence, firmware version, name, operating system, server pools
Network Interface	Broadcast address, connected switch, connected switch port, connected VLAN, duplex, existence, IP address, MAC address, neg. duplex, neg. speed, subnet mask
Network Port	Duplex, existence, MAC address, neg. duplex, neg. speed, speed, VLAN
Process Family	Max CPU utilization, significant change in # of connections, significant change in # of open files
SAN Array	Existence, firmware version, name
SAN Switch	Existence, firmware version, name
Server	Boot time, codeset, DNS server, existence, kernel, name, operating system
Tablespace	Existence, size (in bytes)
VLAN	Existence

“Significant” Object Attribute Differences

SAV also compares a set of attributes by using special heuristics specific to certain attributes, so that differences SAV considers “significant” is shown.

If an attribute value in one of the snapshots exceeds a minimum (or maximum) threshold and its value changes by at least a certain percentage between the snapshots being compared, then SAV presents this in the comparison results.


Table 3 shows special object attribute differences.

table 3 “Significant” Object Attribute Differences in SAV





Object	Object Attributes Compared
Server	Load average, percentage of free memory on a server, percentage of free swap memory
Server’s file system	Percentage of free space
Process families	Number of open files, total number of all related connections, total count of process family member connections
NFS Export on NAS Filer	Percentage of free space

For more information on the heuristics used to calculate what is considered a significant difference, see [Significant Scan Result Difference Heuristics](#) on page 81.

Comparing Snapshots

In order to compare two snapshots, you must have at least one saved snapshot. If you select **Save** from the **File** menu, this saves the currently loaded snapshot. If you click **Refresh Snapshot**  on the SAV toolbar, and then save again, this creates and save a new snapshot.

To compare snapshots in SAV, perform the following steps:

- 1 From the **View** menu, select **Compare**. (Or, click **Compare**  on the SAV toolbar). The Compare pane appears.
- 2 Click **Select**. The Select Comparison Snapshot window opens.
- 3 Select a snapshot you want to compare against the currently loaded snapshot.
- 4 Next, select if you want to show either ANY or ALL of the selected objects (plus their attributes) that are different to show when you compare snapshots.
- 5 From the drop-down list, select an object category to compare and create a comparison rule. You can select any of the object categories, such as file systems, or select All Categories.
- 6 To select another comparison rule, click **Add**  to add another criteria selector. To remove a comparison rule, click **Remove** .
- 7 As you create comparison rules, SAV automatically displays any or all differences in the Differences pane.
- 8 To view differences in other maps, you can select a map, and all objects that are found to exist will appear normally. All objects that are listed as missing appears grayed out. You can also select other criteria in the Difference pane drop-down list to filter the results of the comparison in more granular detail.
- 9 To close the Compare pane, from the **View** menu, select **Compare** again. (Or, click **Compare**  on the SAV toolbar.)

Significant Scan Result Difference Heuristics

When you compare scan results in SAV, specific objects and their attributes are evaluated between each scan result and any differences (and non-existence of objects) is displayed in the comparison results. (For information on the standard set of objects and attributes compared in a scan results comparison, see [Comparing Snapshots](#) on page 77.)

In addition to the basic set of attributes evaluated in a comparison, SAV also applies a certain set of heuristics to some attributes in order to discover unique differences that SAV has determined to be interesting or useful.

Specifically, if an attribute value in one of the scan results exceeds a minimum (or maximum) threshold and its value changes by at least a certain percentage between the scan results, then SAV presents this in the comparison results.

The following special object attribute differences are compared:

- **Server:** Load average, percentage of free memory on a server, percentage of free swap memory.
- **Server's File System:** Percentage of free space.

- **NAS Filer NFS Exported File System:** Percentage of free space.
- **Process Families:** Number of open files, total number of all related connections, total count of process family member connections.

The heuristics applied to certain attributes in scan results during a comparison are listed in [Table 4](#).

The following variables are used in the expressions:

- X = The maximum value of the attribute between the two scan results.
- N = The minimum value of the attribute between the two scan results.
- P = The percentage change in value of the attribute between scan results.

table 4 Scan Results Comparison Heuristics

Object Attribute	Equation
server — 15 minutes load average	$X > 0.8 * \text{cpu count AND } P > 20\%$ OR $X > \max(1, 0.25 * \text{cpu count}) \text{ AND } P > 100\%$
server — percentage memory free (%)	$N < 0.1 * \text{total mem AND } P > 25\%$
filesystem — percentage free (%)	$N < 0.2 * \text{size AND } P > 10\%$
process family — open file count (on any member process)	$X > 50 \text{ AND } P > 50\%$
process family — connection count (aggregate across all member processes)	$X > 50 * \text{process count AND } P > 30\%$
process family - connection count (on any member process)	$X > 50 \text{ AND } P > 50\%$

Filtering SAV Data


When you select Filter from the **View** menu, or, click **Filter**  on the SAV tool bar, a search control appears above the maps and tabs that allows you to filter according to the following objects (if they were captured as part of the scan) and their attributes, listed in [Table 5](#).

table 5 Objects and Their Attributes You Can Filter in SAV

Object	Attributes Filtered
Compliance Policy	Name, compliance status (compliant, partial, noncompliant, scan failure, scan needed, scanning)
Databases	Name, status, type, version
Database Files	Name, location, type, path, description, size, free space, % used, status.
Disk (applies to servers, SAN arrays, and NAS filers)	Device, manufacturer, model, serial number, size (bytes), type

table 5 **Objects and Their Attributes You Can Filter in SAV**

Object	Attributes Filtered
Fibre Channel Adapter	Driver version, firmware version, hardware version, model, node world wide name, serial number
Fibre Channel Port (applies to servers, SAN arrays, and NAS filers)	Fabric, name, port number, status, world wide name
File System	% used, device, free space (bytes), mount options, mount point, size (bytes), type
LUN Volume	Capacity (bytes), name
NAS Filer	Hardware version, hostname, manufacturer, model, name, operating system version, Server ID, serial number
NFS Export	% used, export path, free space (bytes), size (bytes)
Network Device	Asset tag, firmware version, manufacturer, model, name, operating system, Server ID, processor
Network Interface	Broadcast address, device, duplex, IP address, MAC address, neg. duplex, neg. speed, speed
Network Port	Duplex, MAC address, neg. duplex, neg. speed, speed
Process Family	CPU utilization, command line, connected port, environment variables, listener port, modules, name, open files
SAN Array	Firmware version, manufacturer, model, name, Server ID, serial number
SAN Switch	Firmware version, hardware version, manufacturer, model, name, Server ID, serial number
SAN Zone	Name
Server	1 minute load average, 15 minute load average, 5 minute load average, codeset, free memory (bytes), kernel, name, operating system
Tablespaces	Name, location, description, size, free space, % used, status.
VLAN	Descriptions, ports, VLAN ID




You can filter the current snapshot in according to one or several of the objects in the list, as well as applying operators and attributes, according to certain attributes, and then apply operators to the attributes, depending if the object is a string or a number.

Filter results appear in the Tabs and Maps. In the maps, while all other objects that do not meet the filtering criteria appear grayed out in the maps.

For more information on filtering criteria and regular expressions, see [Filter Criteria](#) on page 84.

Creating a Data Filter in SAV

To filter data that was collected in the currently loaded SAV snapshot, perform the following steps:

- 1 From the **View** menu, select **Filter**. (Or, from the SAV toolbar, click **Filter** ) The Filter pane appears above the maps.
- 2 In the Filter pane rule criteria, choose if you want to show either ANY or ALL of the selected objects (plus their attributes) that meet your filtering criteria.
- 3 From the drop-down list, select an object category to filter in the current snapshot and add criteria to narrow the filter, such as Compliance Policy, File System, Process Family, SAN Array, and so on.
- 4 Using the criteria drop down list, create a meaningful expression. For example, if you chose Disk as a category, you could set Size (bytes) is greater than (>) 5000 (bytes). For more information on expressions, see [Filter Criteria](#) on page 84 and [Examples of Regular Expressions](#) on page 85.
- 5 To select another filter criteria rule, click **Add** . To remove a comparison rule, click **Remove** .
- 6 As you create filter rules, SAV automatically displays any or all results in any of the maps or the Infrastructure pane. All results that meet the criteria appear normally in the maps and the Infrastructure pane. Any results in the snapshot that do not meet the criteria are shown in the maps grayed out.
- 7 From any of the results related to server, you can select the server on which the results were found, right-click, and select **Open Remote Terminal** or **Open Device Explorer** to browse the server.

Filter Criteria

In the filter criteria text boxes in the Filter pane, enter Perl 5 compatible regular expressions as filtering criteria. You can filter by using standard text matching and also by adding any regular expression patterns.

Strings Operators

- Contains (default)
- Does Not Contain
- Is
- Is Not
- Starts With
- Ends With
- Matches Regular Expression

Numbers

- == is equal to
- != not
- < less than
- > Greater than
- <= less than or equal to

- `>=` greater than or equal to

All filtering is performed in case-sensitive mode.

The units of measure for filtered items should match what is shown in the Filter Results and Properties Pane, such as:

- **Memory:** Bytes
- **Uptime:** Days
- **Percentages:** A number from 0 to 100, (such as disk space used and CPU utilization)
- **Disk space:** Bytes




Examples of Regular Expressions

The following examples show how to use regular expressions in filter text boxes:

- **Operating System:** To find all servers that are not running a Windows operating system, look for servers whose operating system does not begin with an “M” (for Microsoft Windows). For example, enter `^[^M]` in this text box.
- **Kernel:** To find servers whose kernel is one of 2.6.5, 2.6.6 or 2.6.7, enter `2.6.[5-7]` in this text box.
- **Mount Point:** To find all mounted UNIX file systems other than `/`, enter `/.+` in this text box.

SAV Scan Error Messages

SAV indicates when an error occurred on a managed server by displaying the following server icons when you move your mouse pointer over the icon:

- **Server Error Icon** : There was an error in gathering information from the server when SAV scanned it (see [Table 6](#) for possible causes for the error).
- **Server Unreachable Error Icon** : The SA core was not able to communicate with the SA Agent installed on the server.
- **Server Unknown** : SAV is unable to scan the server at all, possibly because the server is no longer in the core and under SA management.

It shows these icons before the server name in the Devices tree, Network Map, Virtualization Map, and Server Map. You can move your cursor over the server name to display the detailed error message.



Scan failures and scan time-outs typically occur when the SA managed server is very busy, or when network traffic is very heavy or running over a low bandwidth connection. If these types of errors occur too frequently, please contact your SA administrator for assistance.

Server Scan Errors

Table 6 describes server scan errors and recommended actions.

table 6 Server Error Messages in SAV

Error	Description	Action
Not Enough Disk Space	A selected managed server does not have enough disk space to perform a scan.	Free up disk space.
Remediation Failed	The Runtime State Server Module failed to remediate on the selected server.	Select the server from the Devices Tree, and then in the property pane. Click the Remediation job number link and the job window from the SA Client opens. Or, select the server, right-click, and select Open Device Explorer to troubleshoot the error.
Scan Timed Out	The scan process has exceeded the time-out limit.	See Scan Time-Out Preference on page 62.
Server Access Denied	By using the OGFS, you are unable to access the server's file system as root (on a UNIX server) or as LocalSystem (on a Windows server).	Contact your SA administrator for the required permissions.
Server Capture Failed	The remote capture of data or the transfer of data back to the SA core failed.	Review the log file that is in /tmp/.sitemap/<number> for details in your global shell session.
Server ID Invalid	The server's directory was not found in the OGFS, which means that SA does not know the server exists.	
Server Scan Agent Failed	The driver used to collect data could not be correctly copied to the managed server. This could be caused by a checksum mismatch.	Contact HP Support and provide the log file.
Server Unreachable	The managed server is unreachable by SA. This could be caused if the SA core cannot communicate with the server's agent.	Try again later. If this condition persists, contact your HP administrator.

table 6 Server Error Messages in SAV (cont'd)

Error	Description	Action
Unknown Scan Error	An unknown error occurred during the scanning process.	Try again later. If this condition persists, contact your HP administrator.
Unsupported Agent for Scan	The SAV does not support the Server Agent version running on a selected managed server.	SA Agent 7.0 or higher is required.
Unsupported OS for Scan	The SAV does not support the operating system running on a selected managed server.	See Supported Operating Systems on page 11.

Network Device Scan Errors

[Table 7](#) describes network device scan errors and recommended actions.

table 7 Network Device Scan Error Messages in SAV

Error	Description	Action
NA Scan Timed Out	The time needed to gather NA data exceeded the timeout	Scan fewer devices or wait until the NA server can handle this request.
NA Scan Failed	Gathering NA data failed.	Save this snapshot to a Business Application and contact your SA administrator.

Storage Scan Errors

[Table 8](#) describes network device scan errors and recommended actions.

table 8 Storage Scan Error Messages in SAV

Error	Description	Action
Scan Timed Out	The time needed to gather storage data exceeded the timeout	Scan fewer devices or wait until the SA core server can handle this request.
NAS Scan Failed	Gathering storage data failed.	Export this snapshot to a Business Application and contact your SA administrator.

SAV Platform Support

For updated information about platform support, refer to the *SA Support and Compatibility Matrix* at: <http://support.openview.hp.com/selfsolve/manuals>.

