

Infrastructure Navigator User's Guide

vCenter Infrastructure Navigator 1.1.1

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VMware vCenter Infrastructure Navigator User's Guide

The *VMware vCenter Infrastructure Navigator User's Guide* describes the tasks that users can perform using VMware vCenter™ Infrastructure Navigator.

Intended Audience

This information is intended for virtual infrastructure administrators who are familiar with virtual machine technology and datacenter operations.

Infrastructure Navigator Overview

VMware vCenter Infrastructure Navigator is an application awareness plug-in to the vCenter Server that provides continuous dependency mapping of applications.

Infrastructure Navigator offers application context to the virtual infrastructure administrators to monitor and manage the virtual infrastructure inventory objects and actions. Administrators can use Infrastructure Navigator to understand the impact of the change on the virtual environment in their application infrastructure.

NOTE Plug-ins (also referred to as Extensions) expand the capabilities of vCenter Server by adding features and functionality to the base product.

This chapter includes the following topics:

- [“Infrastructure Navigator Functionality,”](#) on page 7
- [“Infrastructure Navigator Target Users and Benefits,”](#) on page 8
- [“Essential Concepts of Infrastructure Navigator,”](#) on page 8
- [“Infrastructure Navigator Architecture,”](#) on page 9
- [“Components of Infrastructure Navigator,”](#) on page 9

Infrastructure Navigator Functionality

Infrastructure Navigator provides a centralized view of your application environment.

Infrastructure Navigator performs the following high-level functions:

- Maps virtual infrastructure resources such as virtual machines, Web servers, mail servers, database servers, application servers, cache servers, messaging servers, application management servers, and virtualization management servers.
- Displays relationships between virtual machines and external machines through services.
- Detects inconsistencies from the norm.
- Allows you to take advantage of integration with other VMware products such as VMware vCenter Server and VMware vCenter Site Recovery Manager (SRM).

Infrastructure Navigator Target Users and Benefits

Infrastructure Navigator creates a detailed model of the application environment and offers application context to its users.

Infrastructure Navigator helps virtual infrastructure administrators to accurately answer the following questions:

- Which application services are running on my virtual machines?
- What are the dependencies among application services running on different virtual machines?
- Where are the hidden optimization opportunities and how can I capitalize on them?
- How do certain application changes impact my environment?
- What are the risks involved in making changes in the virtual environment?
- How do certain virtual machine's issues impact application operation and how can I prevent or solve these issues?

Essential Concepts of Infrastructure Navigator

Before working with VMware vCenter Infrastructure Navigator, you must understand certain concepts related to Infrastructure Navigator.

Mapping

Mapping is a continuous process that creates and maintains a detailed model of your application environment.

Services

Infrastructure Navigator maps services that are installed and running in your virtual environment. Services include Web servers, mail servers, database servers, application servers, cache servers, messaging servers, application management servers, and virtualization management servers. To view the list of services supported by Infrastructure Navigator, see [“Services Supported,”](#) on page 12

vCenter Entity

A vCenter entity is any entity that is part of the Hosts and Clusters inventory pane except a virtual machine. For example, a vCenter Server, an ESX host, a cluster, a datastore are all vCenter entities.

Change

A change is any modification in the virtual environment. For example, installing a new service is a change.

Incoming Dependency

When a virtual machine or a service running on it requires information from a service running on the selected virtual machine, a dependency exists between the two virtual machines. This dependency is known as an incoming dependency.

For example, if the selected virtual machine serves another virtual machine it is an incoming dependency.

Outgoing Dependency

When the selected virtual machine or a service running on it requires information from a service running on another virtual machine, a dependency exists between the two virtual machines. This dependency is known as an outgoing dependency.

For example, if the selected virtual machine is served by another virtual machine it is an outgoing dependency.

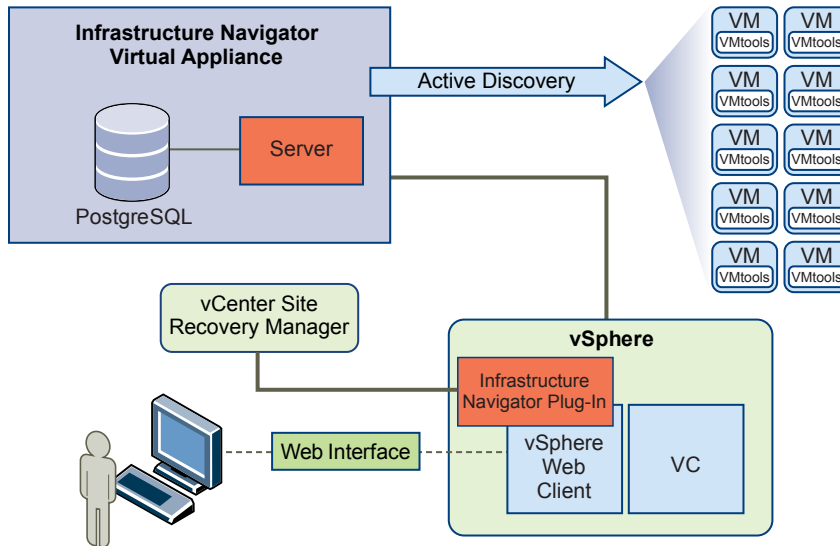
Infrastructure Navigator Architecture

Infrastructure Navigator is a virtual appliance that you can import on the vCenter Server. A virtual appliance is a virtual machine image that contains software designed to run in a virtual machine.

With the components of Infrastructure Navigator, you can map services running in your virtual environment, examine the application discovery status, view and analyze the dependency map, and have a centralized view of the entire application environment.

The architecture illustrates various components of Infrastructure Navigator and their dependencies.

Figure 1-1. Infrastructure Navigator Architecture Diagram



Components of Infrastructure Navigator

A component is a software or software design with a well-defined interface. A component represents specific behavior of the system.

The following table lists and describes principal components of Infrastructure Navigator.

Table 1-1. Infrastructure Navigator Components

Component	Description
Server in Infrastructure Navigator virtual machine	The Server component reconciles the data from Active Discovery and transfers the data to the Database component.
Database in Infrastructure Navigator virtual machine	The Database component stores the data received from the Server component. The Database component also stores Infrastructure Navigator configurations. NOTE Infrastructure Navigator does not support storing of data in an external database.
Infrastructure Navigator Plug-In in the vSphere Web Client	The Infrastructure Navigator Plug-In in the vSphere Web Client provides a graphical user interface that you use to view and analyze dependencies.

Mapping Overview

Mapping is a continuous process that creates and maintains a detailed model of your application environment. The mapping process populates the Infrastructure Navigator Database with the mapped items and identifies the relationships between them.

This chapter includes the following topics:

- [“Mapping Services,”](#) on page 11
- [“Active Discovery,”](#) on page 12
- [“Remapping Services,”](#) on page 12
- [“Services Supported by Infrastructure Navigator,”](#) on page 12

Mapping Services

Infrastructure Navigator maps services that are installed and running in your virtual environment. Services include Web servers, mail servers, database servers, application servers, cache servers, messaging servers, application management servers, and virtualization management servers. With the mapped data, you can visualize dependencies between services and virtual machines through application dependency mapping.

Infrastructure Navigator maps services running on virtual machines only if all the following conditions are satisfied:

- The virtual machine is powered on.
- The virtual machine can be reached on the network.
- The vCenter Server credentials are of administrator level. For more information on credentials, see [“Log in to the Infrastructure Navigator Portal,”](#) on page 15.
- The virtual machine is running on a supported ESX version. The supported ESX versions include ESX/ESXi 3.5 (build 425420), ESX/ESXi 4.0 (build 398348), ESX/ESXi 4.1 (build 433742), and all builds of ESXi 5.x.
- VMware Tools is installed and running on the virtual machine.
- The VMware Tools version is supported by Infrastructure Navigator.
- The virtual machine has a supported guest operating system on it.

NOTE Microsoft Windows NT, Microsoft Windows 2000, Apple Macintosh, FreeBSD, SCO UnixWare 7, Sun Solaris 9, and Sun Solaris 10 (64-bit) are not supported by Infrastructure Navigator. Also, Infrastructure Navigator does not support virtual machines with guest operating system defined during creation as Other (64-bit) and Other (32-bit).

If any one of these condition fails, an Access failed error message is displayed in the Discovery Status field.

Active Discovery

In Infrastructure Navigator, active discovery is the method used to access the virtual machines. Active discovery is a multithreaded process that uses VMware Tools to access virtual machines.

Infrastructure Navigator starts the mapping process shortly after installation and if you provide valid administrator-level vCenter Server credentials. Infrastructure Navigator also supports some minimally privileged users who can start the discovery process on the Administration screen of the vSphere Web Client. For more information on administrator-level credentials and minimally privileged user, see *vCenter Infrastructure Navigator Installation and Administration Guide*. Mapping is continuous, unless you stop or disable Infrastructure Navigator.

Depending on the size of your environment, Infrastructure Navigator begins to populate the inventory table within an hour after you install the virtual appliance and start the discovery process. To view the complete information in the inventory table, dependency map, and dependency table, wait until you have collected at least one hour of data.

NOTE If the initial mapping process is incomplete, a `This VM is pending application mapping` message is displayed in place of the dependency map.

Remapping Services

After initial deployment, Infrastructure Navigator remaps services at a predefined time interval. Remapping ensures that the Infrastructure Navigator database is up to date and is synchronized with the changes in the virtual environment. The default frequency for remapping is one hour, and is displayed in the Successful Discovery field.

A change is any change in the virtual environment. For example, installing a service is a change. A change in the virtual environment takes effect only after remapping.

When the specified time interval has elapsed, Infrastructure Navigator rediscovers the change. For example, if you install a service on a powered-on virtual machine, Infrastructure Navigator discovers this service within one hour, the default frequency for remapping.

Also, the vCenter Infrastructure Navigator server is refreshed with the vCenter Server changes by synchronizing with the vCenter Server every five minutes and the Discovery Status field is updated with the relevant information. For example, consider a virtual machine with services installed and running on it is powered off. Within five minutes after the virtual machine is powered off, Infrastructure Navigator discovers the change as the vCenter Server is refreshed and updates this in the Discovery Status field. The services that have been discovered on the virtual machine before the virtual machine was powered off remain on the virtual machine. The Successful Discovery field displays the time elapsed since Infrastructure Navigator last discovered the virtual machine when it was up and running.

Services Supported by Infrastructure Navigator

Infrastructure Navigator maps services that are installed and running in your virtual environment.

Services Supported

The following table lists and describes the services supported by Infrastructure Navigator along with the supported versions and service name as displayed in the UI.

Table 2-1. Services Supported

Category	Service Name	Version	Description
Web Server	Apache HTTP	2.0.X, 2.2.X	The Apache HTTP Server, also known as Apache, is an open-source Web server that provides HTTP services in sync with the current HTTP standards.
	IIS	6.0.X	The Internet Information Services (IIS) is a flexible, secure, and easy-to-manage Web server developed by Microsoft for use with Microsoft Windows.
	Nginx	0.7, 0.8	The nginx is a lightweight, HTTP, and reverse proxy server, as well as a mail proxy server that runs on UNIX, Linux, BSD variants, Mac OS X, Solaris, and Microsoft Windows.
Cache Server	GemFire	6.0, 6.5	VMware vFabric GemFire is a distributed data management platform that provides dynamic scalability, high performance, and data management capabilities of a database.
Mail Server	Exchange	2003, 2007, 2010	Microsoft Exchange Server is the server side of the messaging application used by enterprises.
Database Server	Oracle DB	11g	The Oracle Database is an Object-Relational Database Management System (ORDBMS).
	MS-SQL DB	9.0, 10.0, 10.5	Microsoft SQL Server is a relational model database server.
	DB2	9.5, 9.7	IBM DB2 Enterprise Server Edition is a relational model database server that runs on Unix, Linux, IBM i, z/OS and Windows servers.
	MySQL DB	5.1, 5.5	MySQL is an open source Relational Database Management System (RDBMS) that runs as a server, providing multi-user access to a number of databases.
	Sybase DB	15.0, 15.5	Adaptive Server Enterprise (ASE) is a Relational Database Management System (RDBMS) developed by Sybase Corporation.
Application Server	Apache Tomcat	6.0.X, 7.0	Apache Tomcat is an open-source software implementation of the Java Servlet and JavaServer Pages (JSP) technologies that provides an environment for Java code to run.
	tc Server	2.0, 2.1.1	tc Server is a lightweight application server that provides an enterprise version of the Apache Tomcat application server optimized for cloud and virtual environments.
	WebSphere	6.1, 7.0	WebSphere Application Server (WAS) is a software application server developed by IBM that builds, deploys, and manages SOA business applications and services.
	WebLogic	10.3	Oracle WebLogic Server is an application server for building and deploying enterprise Java EE applications.
	JBoss	5.1, 6.0	JBoss Application Server is an open-source Java EE-based application server that provides Java EE 5 features along with extended enterprise services including clustering, caching, and persistence.
	SharePoint	2007, 2010	Microsoft SharePoint is a centralized web application platform and a replacement for multiple web applications. In the user interface, the single server installation of SharePoint appears as SharePoint Server, Web-server Front End appears as SharePoint Web Server, and Application appears as SharePoint Application Server.
Virtualization Management	VMware vCenter	4.1, 5.0	VMware vCenter Server centrally manages VMware vSphere environments and improves IT administrators control over the virtual environment.
	VMware vCloud Director	1.1, 1.5	VMware vCloud Director delivers cloud infrastructure on-demand so that the end users can consume virtual resources with maximum agility. Consolidate datacenters and deploy workloads on shared infrastructure with built-in security and role-based access control. Migrate workloads between different clouds and integrate existing management systems using customer extensions, APIs, and open cross-cloud standards.

Table 2-1. Services Supported (Continued)

Category	Service Name	Version	Description
	VMware vShield Manager	4.1, 5.0	VMware vShield Manager provides a central point of control for managing, deploying, reporting, logging and integrating vShield as well as third-party security services. Working in conjunction with vCenter Server, vShield Manager enables role based access control and separation of duties as part of a unified framework for managing virtualization security.
	VMware vCenter Operations Standard	1.0.0, 1.0.1	vCenter Operations Standard is a tool for monitoring and managing the performance of your virtual environment. vCenter Operations Standard collects performance data from each object at every level of your virtual infrastructure, from individual virtual machines and disk drives to entire clusters and data centers. It stores and analyzes the data, and uses that analysis to provide real-time information about problems, or potential problems, anywhere in your enterprise.
Application Management	VMware View Server	4.6, 5.0	VMware View simplifies desktop and application management while increasing security and control. Delivers a personalized high fidelity experience for end-users across sessions and devices.
Messaging Server	RabbitMQ	1.8.1, 2.3.1	RabbitMQ is an open-source, enterprise messaging system that uses Advanced Message Queuing Protocol (AMQP). RabbitMQ provides robust messaging for applications.
Disaster Recovery Server	Site Recovery Manager	4.1, 5.0	Site Recovery Manager is used for disaster protection and site migration for all virtualized applications migration.
	Replication Server	1.0	Replication Server is a part of the host based replication solution for SRM.
	Replication Management Server	1.0	Replication Management Server is a part of the host based replication solution for SRM.

Getting Started with Infrastructure Navigator

3

You can use the Infrastructure Navigator portal to view and analyze the information collected during discovery.

This chapter includes the following topics:

- [“Log in to the Infrastructure Navigator Portal,”](#) on page 15
- [“Enable or Disable Infrastructure Navigator Plug-In,”](#) on page 16
- [“Infrastructure Navigator Notification Messages,”](#) on page 16

Log in to the Infrastructure Navigator Portal

You can access the Infrastructure Navigator portal through the vSphere Web Client. Infrastructure Navigator is compatible only with the vSphere Web Client and does not support the .NET client.

Prerequisites

- Install and deploy the Infrastructure Navigator plug-in on a vCenter Server from which you want to administer Infrastructure Navigator. For more information, see *vCenter Infrastructure Navigator Installation and Administration Guide*.
- You must have administrator privileges to use the services offered by Infrastructure Navigator. An administrator is a user that is assigned the administrator role on the vCenter Server or a user in a group that is assigned the administrators role on the vCenter Server. A user or group must be assigned with the administrator role on the root folder and all the child folders that are propagating from root folder. For more information on assigning privileges, see *vCenter Infrastructure Navigator Installation and Administration Guide*.

Procedure

- 1 Open a Web browser and enter the URL for the vSphere Web Client, **https://client-hostname:port/vsphere-client**.

By default the port is 9443, but this can be changed during vSphere Web Client installation.

- 2 In the **Server** drop-down menu, select the vCenter Server to which you want to connect.
- 3 Enter administrator credentials in the Username and Password fields.
- 4 Click **Login** to connect to the vCenter Server.
- 5 If Infrastructure Navigator plug-in is deployed correctly, you can see the **Navigator** tab both at the vCenter entity level and virtual machine level.

If you have all the required privileges, services running in your virtual environment are displayed. Otherwise, a message Infrastructure Navigator can only be used by vCenter Server administrators is displayed.

NOTE Infrastructure Navigator displays the services running in your virtual environment within an hour or so after you install the virtual appliance. To view the complete information, wait until you have collected at least one hour of data. You can manually start or stop the discovery process, start or stop SRM integration, and uninstall Infrastructure Navigator virtual appliance. For more information, see

vCenter Infrastructure Navigator Installation and Administration Guide.

Enable or Disable Infrastructure Navigator Plug-In

You can enable or disable Infrastructure Navigator plug-in through the Plug-in Manager. After you install the Infrastructure Navigator plug-in, it is enabled by default.

Prerequisites

Install and deploy the Infrastructure Navigator plug-in on a vCenter Server from which you want to administer Infrastructure Navigator. For more information, see *vCenter Infrastructure Navigator Installation and Administration Guide.*

Procedure

- 1 Start the vSphere Web Client and log in to the vCenter Server.
- 2 Navigate to **vCenter Management > System Administration > Plug-in Management**.

The Plug-in Management screen appears.

- 3 Right-click **vCenter Infrastructure Navigator** and navigate to **Other > Disable**.

The Disable Plug-in dialog box appears.

- 4 Click **Yes** to disable the Infrastructure Navigator plug-in.

NOTE Disabling the plug-in does not remove it from the client. You must uninstall the plug-in to remove it.

- 5 To enable the disabled plug-in, right-click **vCenter Infrastructure Navigator** and navigate to **Other > Enable**.

The Enable Plug-in dialog box appears.

- 6 Click **Yes** to enable the Infrastructure Navigator plug-in.





When you disable the plug-in, the **Navigator** tab and the Navigator portlet in the **Summary** tab is not visible in the vSphere Web Client, but Infrastructure Navigator continues the mapping process in the background.

Infrastructure Navigator Notification Messages

Infrastructure Navigator displays notification messages when any general system error or any credentials error. The notification messages appear both at the virtual machine level and the vCenter Entity level in all Navigator tabs. The notification messages related to SRM appears only when SRM server is configured to work with Infrastructure Navigator.

In case of more than one notification message, Infrastructure Navigator displays the most important notification according to the priorities mentioned below.

Table 3-1. Notification Messages

Priority	Icon	Icon Description	Error Summary	Error Description	Resolution
1		Critical	Navigator server is not responding.	Unable to retrieve data from the Navigator server as it is not responding.	Refresh or restart the Navigator server.
2		Info	Discovery is off.	Data might not be accurate because Navigator discovery is off.	Click the Turn on discovery link to start the discovery process.
3		Critical	Invalid or insufficient vCenter credentials.	Data might not be accurate as the vCenter credentials are invalid.	Click Set the vCenter credentials link to enter the vCenter Server credentials.
4		Warning	SRM integration is stopped.	SRM integration is stopped due to invalid credentials.	Click Set the SRM credentials to enter the SRM credentials.

Also, if there is any error in retrieving data from SRM server, the *Error in retrieving data from the SRM server* popup message is displayed. If there is any error in retrieving data from the Infrastructure Navigator server, the *Error in retrieving data from the Infrastructure Navigator server* popup message is displayed. At the vCenter Entity level, if there is any error in retrieving data from the Infrastructure Navigator server there is no popup message, but *Error in retrieving data from the Infrastructure Navigator server* message is displayed in the **Navigator** tab and the portlet is empty.

Application Visibility at the Virtual Machine Level

4

You can view the application dependency of a virtual machine to manage your vSphere inventory. The inventory appears in the left pane and displays all the virtual machines managed by the vCenter Server.

You can view the services offered by Infrastructure Navigator on a virtual machine by selecting a virtual machine from the inventory. The selected virtual machine name is highlighted in the inventory and its details appear in the Navigator portlet in the **Summary** tab.

This chapter includes the following topics:

- [“Understanding the Navigator Portlet,”](#) on page 19
- [“Viewing Application Dependencies of a Virtual Machine,”](#) on page 20
- [“Dependency Map and Table Messages,”](#) on page 20
- [“Viewing the Dependency Map,”](#) on page 21
- [“Viewing the Dependency Table,”](#) on page 23
- [“Viewing Details of a Virtual Machine,”](#) on page 24
- [“Defining an Unknown Service,”](#) on page 25
- [“Discovery of External Entities,”](#) on page 26
- [“Aging Process of Dependencies,”](#) on page 26

Understanding the Navigator Portlet

The Navigator portlet in the **Summary** tab gives a summarized result of the mapping process carried out on the selected virtual machine.

The following table lists and describes the fields in the Navigator portlet.

Table 4-1. Navigator Portlet

Field	Value
Discovery Status	Displays the discovery status of the virtual machine. <ul style="list-style-type: none">■ Normal: Indicates absence of any error. For more information, see “Mapping Services,” on page 11.■ Access failed: Indicates that the mapping process failed on the selected virtual machine and displays an error message stating the reason for failure. The field also displays a green icon for a Normal status and a gray icon for a Access failed status.
Successful Discovery	Displays the time elapsed since the last successful discovery of the virtual machine.

Table 4-1. Navigator Portlet (Continued)

Field	Value
Application services	Displays a comma-separated list of services installed and running on the selected virtual machine. In case of multiple services with the same version or multiple services without any version, the service name is displayed once with number of instances in parenthesis.
Dependencies	Displays the total number of dependencies including incoming and outgoing dependencies. Click Dependencies to view the number of incoming and outgoing dependencies.
Incoming	When a virtual machine or a service running on it requires information from a service running on the selected virtual machine, a dependency exists between the two virtual machines. This dependency is known as an incoming dependency. For example, if the selected virtual machine serves another virtual machine it is an incoming dependency.
Outgoing	When the selected virtual machine or a service running on it requires information from a service running on another virtual machine, a dependency exists between the two virtual machines. This dependency is known as an outgoing dependency. For example, if the selected virtual machine is served by another virtual machine it is an outgoing dependency.

To view the dependency map of the selected virtual machine, click **Show dependencies** at the bottom of the Navigator portlet or click the **Navigator** tab that appears in the toolbar.

Viewing Application Dependencies of a Virtual Machine

By default the **Navigator** tab displays the first level application dependencies in a map and tabular form of the selected virtual machine. The information panel displays additional information about the selected virtual machine, which is present at the bottom of the screen. You can select the way that you want to see the application dependencies in a map or tabular form by using the **Application Dependencies** drop-down menu.

The **Navigator** tab also shows second-level application dependencies in a map form of all the virtual machines except the selected virtual machine. For more information about viewing second-level application dependencies, see [“Viewing Second-Level Application Dependencies,”](#) on page 22.

Dependency Map and Table Messages

Infrastructure Navigator displays messages in the dependency map and dependency table depending on the discovery status of a virtual machine and the information-retrieval action that is being performed on the virtual machine.

You might encounter the following messages while using Infrastructure Navigator.

Table 4-2. Dependency Map and Table Messages








Message	Description
Loading	The dependency map or table is being loaded with relevant data.
Access failed. VMware Tools is not installed	Discovery failed as VMware tools is not installed on the selected virtual machine.
Access failed. VM is powered off or suspended	The selected virtual machine is powered off or suspended.
Retrieving data from SRM	Infrastructure Navigator is retrieving data from the SRM.
SRM integration is stopped	The integration of the SRM is stopped.
This VM is pending application mapping	The initial mapping process is incomplete.
Access failed. The disk is full	Infrastructure Navigator is unable to perform discovery on the targeted virtual machine because the disk of targeted virtual disk is full.

Viewing the Dependency Map

The dependency map is a map of relationships that displays the services installed and running on a virtual machine. The dependency map displays all virtual machines connected to the selected virtual machine by incoming or outgoing dependencies. The name of the selected virtual machine appears at the top of the dependency map. The dependency map also displays the total number of unknown services running on that particular virtual machine that have connections. If you have integrated SRM with Infrastructure Navigator, the SRM Protection Groups and SRM Recovery Plans of the selected virtual machine are also displayed in the dependency map. If a virtual machine is part of a vApp, then the vApp name is also displayed in the dependency map.

The following table lists and describes the icons that is being used in the Infrastructure Navigator dependency map.

Table 4-3. Dependency Map Icons

Icon	Description
	Represents a virtual machine. The name of the virtual machine appears next to the icon. If you select a virtual machine it is highlighted in dark blue.
	Represents services running on the selected virtual machine. The names of the services appear below the virtual machine that you have selected.
	Represents that the particular virtual machine is being protected by SRM. The information related to SRM also appears. Appears only when SRM integration is on and the virtual machine is being protected by SRM.
	Represents a vApp. If a virtual machine is part of a vApp, then the vApp name also appears.
	Represents a critical alarm on a virtual machine. This icon appears next to the virtual machine name. At the tool tip, the total number of warning alarms is listed. If you click the icon, it links to the Alarms page under Monitor tab of that particular virtual machine.
	Represents a warning alarm on a virtual machine. This icon appears next to the virtual machine name. At the tool tip, the total number of warning alarms is listed. If you click the icon, it links to the Alarms page under Monitor tab of that particular virtual machine.
	Represents a button that you can click to view the second level incoming and outgoing dependencies. This button is present in all the virtual machines except the selected virtual machine and external entities. The total number of incoming or outgoing dependencies is displayed on the button. For example, if there are 4 incoming dependencies for any particular virtual machine except the selected virtual machine, the number 4 is displayed on the button. For more information, see “Viewing Second-Level Application Dependencies,” on page 22.

In case of an outgoing connection from the selected virtual machine (VM1) to another virtual machine (VM2) that is part of the virtual environment monitored by Infrastructure Navigator, VM2 appears in the dependency map as an outgoing dependency. In case of an incoming connection from a virtual machine (VM1) to the selected virtual machine (VM2) that is part of the virtual environment monitored by Infrastructure Navigator, VM1 appears in the dependency map as an incoming dependency.

The arrows in a dependency map determine whether a dependency is outgoing or incoming. An outgoing arrow from the selected virtual machine denotes an outgoing dependency and an incoming arrow to the selected virtual machine denotes incoming dependency.

In the dependency map, you can double-click another virtual machine (VM3) to navigate to that virtual machine and view its dependency map. The navigation is successful when the following changes occur:



- The other virtual machine (VM3) is highlighted in dark blue.
- The other virtual machine (VM3) is highlighted in the left inventory pane.


- The information panel displays details of the other virtual machine (VM3).

NOTE If you try to open a dependency map with more than 70 direct connections, the dependency map is not loaded and the Too many connections. Redirecting to table view message is displayed. After three seconds, you will be redirected to table view. Also, Infrastructure Navigator discovers and displays machines, services, and dependencies that are external to the current vCenter Server. For more information, see [“Discovery of External Entities,”](#) on page 26.

Viewing Second-Level Application Dependencies

You can now view the next level of application dependencies that is dependent or serves the virtual machine.

To view second-level application dependencies, two buttons, represented by  are present at the bottom of each virtual machine except the selected virtual machine. The button on the left is for incoming application dependency, and the total number of incoming dependency is displayed on the button. The button on the right is for outgoing application dependency, and the total number of outgoing dependency is displayed on the button. If there are no dependencies to display, the button is disabled and the tool tip shows a No more dependencies to display message. If you click any one of these buttons, it displays the next level of application dependencies that is dependent or serves the virtual machine and the button is grayed out. The first level application dependency is shown in dark blue color and the second-level application dependencies are shown in dark green color. You can remove the newly discovered virtual machines and its connections that have been discovered by this functionality by clicking the  icon on the upper right corner of the virtual machine. If you remove a second-level dependent virtual machine, the count on the button of the original virtual machine is increased by one. You can retrieve all the second-level dependent virtual machines by again clicking on the button of the original virtual machine.

NOTE If a virtual machine has more than 70 incoming or outgoing dependencies, then the  is disabled and at the tool tip

Too many connections. Double-click the virtual machine to see its first level dependencies in table view

message is displayed.

Understanding the Dependency Map Toolbar

You can use the control buttons on the Dependency Map toolbar to manage the dependency map.

The Dependency Map toolbar appears above the dependency map.

Table 4-4. Dependency Map Control Buttons






Control Button	Description
	The Magnifier icon opens a magnifying glass that magnifies the dependency map if you move the glass over the dependency map. Click the icon again to close the magnifier glass.
	The Overview icon opens an overview image to the left of the dependency map. You can click the overview image to navigate within the dependency map. Click the icon again to close the overview image.
	The Fit content icon adjusts the magnification of the dependency map so that the dependency map exactly fits in the rectangular map pane.

Table 4-4. Dependency Map Control Buttons (Continued)

Control Button	Description
	The Zoom in icon magnifies the dependency map by preset levels. You can use your mouse wheel to change the size of the dependency map. Place the cursor on the dependency map and roll the mouse wheel forward to zoom in on the map.
	The Zoom out icon shrinks the dependency map by preset levels. You can use your mouse wheel to change the size of the dependency map. Place the cursor on the dependency map and roll the mouse wheel backward to zoom out.

You can also move the dependency map in any direction. To move the dependency map, left-click the dependency map and drag the mouse in the desired direction without releasing the mouse button.

Viewing the Dependency Table

The dependency table is the dependency map in a tabular form. In addition to the virtual machine name and services installed, it displays the virtual machine state, virtual machine status, discovery status, and the time elapsed since last successful discovery of the selected virtual machine. The name of the selected virtual machine appears at the top of the dependency table.

In the **Navigator** tab, select **Table View** from the **Application Dependencies** drop-down menu to view the first level application dependency table of the selected virtual machine along with the incoming dependency table and outgoing dependency table.

The three tables displayed are the sub tables of the inventory table.

- The Incoming dependencies table displays the details of all virtual machines that depend on the selected virtual machine.
- The *Virtual Machine name* table displays the details of the selected virtual machine.
- The Outgoing dependencies table displays the details of all virtual machines that the selected virtual machine depends on.

If the virtual machine has no incoming dependencies, a **No incoming dependencies** message is displayed in place of the Incoming dependencies table. If the virtual machine has no outgoing dependencies, a **No outgoing dependencies** message is displayed in place of the Outgoing dependencies table.

Table 4-5. Dependency Table

Field	Value
Name	Displays the virtual machine name as displayed in the vCenter inventory panel.
Services	Displays a comma-separated list of mapped services along with their versions that are running on the selected virtual machine. In case of multiple services with the same version or multiple services without any version, the service name is displayed once with the number of instances in parenthesis.
Discovery Status	Displays the discovery status of the virtual machine. <ul style="list-style-type: none"> ■ Normal. Indicates absence of any error. For more information, see “Mapping Services,” on page 11. ■ Access failed. Indicates that the mapping process failed on the selected virtual machine, and displays an error message stating the reason for failure. The field also displays a green icon for a Normal status and a gray icon for Access failed status.
Successful Discovery	Displays the time elapsed since the last successful discovery of the virtual machine.
Protection Group	Displays the SRM protection group of the virtual machine. A blank field indicates that the virtual machine does not belong to any SRM protection group.
Recovery Plans	Displays a comma-separated list of SRM recovery plans for the virtual machine. A blank field indicates that the virtual machine does not belong to any SRM recovery plan.

The Protection Group and Recovery Plans column appears only if you decide to integrate Infrastructure Navigator with SRM. For information about SRM integration, see *vCenter Infrastructure Navigator Installation and Administration Guide*.

Viewing Details of a Virtual Machine

The information panel displays the details of the selected virtual machine and appears at the bottom of the dependency table and dependency map. The information displayed in the information panel is not displayed in the dependency map or the dependency table. The information panel appears very small, although you can drag the link above the information panel to view the complete information.




The following table lists and describes the fields in the **General** tab of the information panel.

Table 4-6. General Tab

Field	Description
Guest OS	The name of the guest operating system installed on the selected virtual machine.
DNS name	The Domain Name System (DNS) name of the selected virtual machine.
IP Addresses	A comma-separated list of IP addresses of the selected virtual machine.
Host	The name of the ESX host on which the selected virtual machine resides.
Cluster	The name of the cluster assigned to the selected virtual machine.
Storage	The name of the storage assigned to the selected virtual machine.
Networks	The name of the network assigned to the selected virtual machine.
VMware Tools	Displays the status of the VMware Tools installed on the selected virtual machine.
vApp Name	The name of the vApp to which the selected virtual machine belongs.

By default, **Services** tab shows all the known services and unknown services that has at least one incoming dependency. If you want to see the unknown services with no incoming dependency, select the checkbox that is present above the table.

Table 4-7. Services Tab

Field	Description
Type	Displays the icons of supported service and unsupported service.
Action	A  icon allows you to create user-defined services out of unknown services. For more information, see "Create User-Defined Service," on page 25. A  icon allows you edit the details of an user-defined service. For more information, see "Edit User-Defined Service," on page 25. A  icon removes the user-defined service. For more information, see "Delete User-Defined Service," on page 26.
Name	Displays the name of the service if it is a supported service. If the service is an unknown service then the name displayed is Unknown Service.
Listening Ports	Comma-separated list of listening port numbers of the selected virtual machine.
Category	Displays the name of the category the supported service belongs to. If the service is an unknown service, then the category name displayed is Unknown.
Process Using Port	Displays the name of the process that runs on the listening port of the selected virtual machine.
# Incoming Dependencies	Displays the number of incoming dependencies to the selected virtual machine.


Defining an Unknown Service

Services that are not part of the Infrastructure Navigator knowledge base are categorized as unknown services. You can define an unknown service as a user-defined service and enlarge the knowledge base.

Create User-Defined Service

You can create user-defined services out of unknown services. If you create a user-defined service, all the virtual machines that run the service on the defined port number and process name display the service.

Procedure

- 1 In the **Services** tab of the information panel, click the  icon.
The Create User Defined Service Definition window appears. If multiple ports or multiple processes are related to the unknown service, you can select them from the drop-down menu.
- 2 Select either **Port** or **Process**, or both check boxes.
If you select both port and process name to define a service, it takes precedence over the service that you have defined by using only port or process name.
- 3 Type a name for the unknown service.
- 4 Select the category from the **Category** drop-down menu.
- 5 Click **OK**.


The user-defined service replaces the unknown service in the information panel and also in the **Summary** tab at the vCenter Entity level.

NOTE On external entities, the definition of unknown services includes port number, name, and category. If you create a user-defined service for internal virtual machines and include process name, this definition does not apply to the external virtual machines.

Edit User-Defined Service

You can edit user defined services that you have already created. The edit definition results in changes to all services that match this definition.

Procedure

- 1 In the **Services** tab of the information panel, click the  icon.
The Edit User Defined Service Definition window appears.
- 2 Select the definition that you want to edit from the drop-down menu.
The **Port** and **Process** information related to the selected definition is populated by default and the current definition name is displayed.
- 3 Type a new name for the definition.
- 4 (Optional) If you want to change the category, select the new category from the drop-down menu.
- 5 Click **OK**.


The new definition name is applied to the user-defined service.

NOTE Only one definition can be edited for each instance of Edit User Defined Service Definition window. If you want to edit another user-defined service, perform the same procedure again.

Delete User-Defined Service

You can delete a user-defined service definition that you have created. Deleting the definition affects all services that match the definition.

Procedure

- 1 In the **Services** tab of the information panel, click the  icon.
The Delete User Defined Service Definition window appears.
- 2 From the drop-down menu, select the definition that you want to delete.
The **Port**, **Process**, **Name**, and **Category** fields are populated by default for the selected definition.
- 3 Click **OK**.

The definition is removed from the Infrastructure Navigator database.

Discovery of External Entities

Infrastructure Navigator discovers and displays machines, services, and dependencies that are external to the current vCenter Server. An external machine with more than one IP address is discovered as separate external machines. Also, different external machines with the same IP address are discovered as a single external machine.

An external virtual machine is shown in a gray color in the dependency map and is represented by its DNS name. If a DNS name does not exist, the dependency map displays the IP address of the external virtual machine. If you select a machine that is external to your current vCenter Server environment, the information panel displays the details of the selected external machine at the bottom of the dependency table and dependency map.

The **Service** tab displays the services running on the external virtual machine. The **General** tab displays the message

This is an external IP address. It can be either a physical machine or a virtual machine, which is not managed by the vCenter Server that Navigator is deployed on.

Aging Process of Dependencies

To keep database, portlets, and the map accurate and updated with relevant connections, Infrastructure Navigator removes non-frequently used dependencies.

To provide only the relevant dependencies among the virtual machines and among services, Infrastructure Navigator removes non-frequently used dependencies for a selected period of inactivity. The inactivity period is non-configurable and is set to three days.

For example, a dependency between a source and a target where the source is a virtual machine and the target is a service, a virtual machine, or an external entity disappears if the dependency has not been discovered in the past inactivity period. Infrastructure Navigator keeps track of the last time the dependency was discovered. If discovery is turned off and later turned back on, Infrastructure Navigator resets the countdown of the inactivity period.

Application Visibility at the vCenter Entity Level

5

You can view the services installed and running on a vCenter entity to manage your vSphere inventory. The inventory appears in the left pane and displays all the vCenter entities managed by the vCenter Server.

You can view the services installed and running on a vCenter entity, by selecting a vCenter entity from the inventory. The selected vCenter entity name is highlighted in the inventory and its details appear in the Navigator portlet in the **Summary** tab.

This chapter includes the following topics:

- [“Understanding the Navigator Portlet,”](#) on page 27
- [“Viewing Application Dependencies of a vCenter Entity,”](#) on page 28
- [“Viewing the Inventory Table,”](#) on page 28
- [“Filter Text in the Inventory Table,”](#) on page 29
- [“Viewing Details of a vCenter Entity,”](#) on page 30

Understanding the Navigator Portlet

The Navigator portlet in the **Summary** tab gives a summarized result of the mapping process carried out on the selected vCenter entity.

The following table lists and describes the fields in the Navigator portlet.

Table 5-1. Navigator Portlet

Field	Value
Known Application Services	Displays the total number of services installed and running on the selected vCenter entity. Services include Web servers, mail servers, database servers, application servers, cache servers, messaging servers, application management servers, and virtualization management servers. You can click Known Application Services to view the number of Web servers, mail servers, database servers, application servers, cache servers, messaging servers, application management servers, and virtualization management servers discovered by Infrastructure Navigator.
Application Server	Displays the number of application servers installed and running on the selected vCenter entity. Supported application servers include Apache Tomcat, tc Server, WebSphere, WebLogic, SharePoint, and JBoss.
Web Server	Displays the number of Web servers installed and running on the selected vCenter entity. Supported Web servers include Apache HTTP, IIS, and Nginx.
Messaging Server	Displays the number of messaging servers installed and running on the selected vCenter entity. RabbitMQ is the only supported messaging server.
Mail Server	Displays the number of mail servers installed and running on the selected vCenter entity. Microsoft Exchange is the only supported mail server.

Table 5-1. Navigator Portlet (Continued)

Field	Value
Database Server	Displays the number of database servers installed and running on the selected vCenter entity. Supported database servers include Oracle DB, MS-SQL DB, DB2, MySQL DB, and Sybase DB.
Cache Server	Displays the number of cache servers installed and running on the selected vCenter entity. GemFire is the only supported cache server.
Application Management	Displays the number of application management servers installed and running on the selected vCenter entity. VMware View Server is the only supported application management server.
Virtualization Management	Displays the number of virtualization management servers installed and running on the selected vCenter entity. Supported virtualization management servers include VMware vCenter, VMware vCloud Director, and VMware vShield Manager.
Disaster Recovery Server	Displays the number of disaster recovery servers installed and running on the selected vCenter entity. Supported disaster recovery servers include Site Recovery Manager, Replication Server, and Replication Management Server.

To view the inventory table of the selected vCenter entity, click **Show all in inventory** at the bottom of the Navigator portlet or click the **Navigator** tab that appears in the toolbar.

Viewing Application Dependencies of a vCenter Entity

The **Navigator** tab displays the inventory table of the selected vCenter entity. **Navigator** tab also displays additional information about the selected vCenter entity in the information panel at the bottom of the screen.

Viewing the Inventory Table

Each row in the inventory table displays information about virtual machines that belong to the selected vCenter entity.

For example, if you select an ESX host, then all the virtual machines on that ESX host are listed in the inventory table. The virtual machine data displayed in each row of the inventory table is identical to the dependency table of that virtual machine.

Table 5-2. Inventory Table

Field	Value
VM Name	Displays the virtual machine name as displayed in the VC inventory panel.
VM State	Displays the current state of the virtual machine. <ul style="list-style-type: none"> ■ Powered Off ■ Powered On
VM Status	Displays the current status of the virtual machine. <ul style="list-style-type: none"> ■ Normal ■ Alert <p>The field also displays a green icon for a Normal status and a red icon for an Alert status.</p>
Services	Displays a comma-separated list of mapped services along with their versions that are running on the selected virtual machine. <p>In case of multiple services with the same version or multiple services without any version, the service name is displayed once with number of instances in parenthesis.</p>
Discovery Status	Displays the discovery status of the virtual machine. <ul style="list-style-type: none"> ■ Normal. Indicates absence of any error. For more information, see "Mapping Services," on page 11. ■ Access failed. Indicates that the mapping process failed on the selected virtual machine and displays an error message stating the reason for failure. <p>The field also displays a green icon for a Normal status and a gray icon for Access failed status.</p>
Successful Discovery	Displays the time elapsed since the last successful discovery of the virtual machine.

Table 5-2. Inventory Table (Continued)

Field	Value
Protection Group	Displays the SRM protection group of the virtual machine. A blank field indicates that the virtual machine does not belong to any SRM protection group.
Recovery Plans	Displays a comma-separated list of SRM recovery plans for the virtual machine. A blank field indicates that the virtual machine does not belong to any SRM recovery plan.

The Protection Group and Recovery Plans column appears only if you decide to integrate Infrastructure Navigator with SRM. For information about SRM integration, see *vCenter Infrastructure Navigator Installation and Administration Guide*.

Customize Inventory Table

You can customize the inventory table by adding or removing columns. By default, Infrastructure Navigator does not display information about the state and the status of virtual machines in the inventory table.

Procedure

- 1 Select a vCenter entity from the inventory pane.
- 2 To view the inventory table for the selected vCenter entity, click the **Navigator** tab.
- 3 Right-click any column heading.
- 4 In the pop-up menu, click **Show/Hide Columns**.
All columns of the inventory table appear in a list.
- 5 To add a column, select an item from the list and click **OK**.
- 6 To hide a column, deselect an item from the list and click **OK**.

Filter Text in the Inventory Table

Infrastructure Navigator enables you to search through the inventory table by filtering the information about a specific object.

You can search while typing and also filter the text alternatively. You can specify the search criteria to search for a specific object. For example, you can enter partial host name as the search criteria.

Procedure

- 1 Select a vCenter entity from the inventory.
- 2 Click the **Navigator** tab.
The **Filter** text box appears above the inventory table.
- 3 In the **Filter** text box, type the search criteria for the object that you want to find in the inventory table.
Only the rows matching the search criteria are retained in the table.
- 4 (Optional) Click **Clear**, to redisplay all the data that was initially displayed in the inventory table.
The filter can be cleared in order to redisplay all the data.

Viewing Details of a vCenter Entity

By default, the information panel displays the details of the virtual machine that appears in the first row of the inventory table of the selected vCenter entity. As you select different rows in the inventory table, the information displayed in the information panel changes accordingly.

The information panel that appears below the inventory table is identical to the information panel that appears below the dependency map and the dependency table of the selected virtual machine.

To view the list and description of the fields in the information panel, see [Table 4-6](#).

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