EMC® Smarts®
IP Availability Manager Extension for IPv6

7.0

User's Guide

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Preface

This document provides information about EMC Smarts IP Availability Manager Extension for IPv6. With this extension, IP Availability Manager discovers, monitors, and diagnoses IPv6 connectivity problems. IP Availability Manager Extension for IPv6 is a component of the EMC Smarts IP Management Suite.

Audience for this guide

This document is intended to be read by administrators and operators of operations centers who need to monitor IPv6 addresses in the network.

Prerequisites

You must have root or administrative privileges on the local host to perform the configuration tasks. Also, be sure to read the *EMC Smarts IP Management Suite Release Notes* document.

EMC Smarts IP Management Suite installation directory

In this document, the term BASEDIR represents the location where EMC Smarts software is installed.

- For UNIX, this location is: /opt/InCharge*<n>*/*<productsuite>*.
- For Windows, this location is: C:\InCharge*<n>**<productsuite>*.

The <n> represents the EMC Smarts software platform version number. The <productsuite> represents the EMC Smarts product suite to which the product belongs. For example, on UNIX operating systems, EMC Smarts IP Availability Manager is, by default, installed to: /opt/InCharge7/IP/smarts. On Windows operating systems, this product is, by default, installed to: C:\InCharge7\IP\smarts. This location is referred to as BASEDIR/smarts.

Optionally, you can specify the root of BASEDIR to be something other than /opt/InCharge7 (on UNIX) or C:\InCharge7 (on Windows), but you cannot change the <productsuite> location under the root directory.

For more information about the directory structure of EMC Smarts software, refer to the *EMC Smarts System Administration Guide*.

EMC Smarts IP Management Suite products

The EMC Smarts IP Management Suite includes the following products:

- EMC Smarts IP Availability Manager
- EMC Smarts IP Discovery Manager

- EMC Smarts IP Performance Manager
- EMC Smarts IP Server Performance Manager
- EMC Smarts Adapter for HP OpenView NNM
- EMC Smarts Adapter for IBM/Tivoli NetView

Related documentation

In addition to this document, EMC Corporation provides a Help system for command line programs as well as product documentation.

Help for command line programs

Descriptions of command line programs are available as HTML pages. The index.html file, which provides an index to the various commands, is located in the BASEDIR/smarts/doc/html/usage directory.

EMC Smarts documentation

Readers of this guide may find the following related documentation helpful. It can be found in the BASEDIR/smarts/doc/pdf directory.

Note: These documents are updated periodically. Electronic versions of the updated manuals are available on the Powerlink website: `http://Powerlink.EMC.com`.

- *EMC Smarts Documentation Catalog*
- *EMC Smarts System Administration Guide*
- *EMC Smarts ICIM Reference*
- *EMC Smarts Common Information Model Infrastructure Models Chart*
- *EMC Smarts Common Information Model Application/Business Models Chart*
- *EMC Smarts ASL Reference Guide*
- *EMC Smarts Perl Reference Guide*
- *EMC Smarts Dynamic Modeling Tutorial*
- *EMC Smarts MODEL Reference Guide*

EMC Smarts IP Management Suite documentation

The following EMC Smarts documents are relevant to users of the IP Management product suite:

- *EMC Smarts IP Management Suite Installation Guide*
- *EMC Smarts IP Management Suite Deployment Guide*
- *EMC Smarts IP Management Suite Configuration Guide*
- *EMC Smarts IP Management Suite Discovery Guide*
- *EMC Smarts IP Availability Manager User's Guide*
- *EMC Smarts IP Performance Manager and Server Performance Manager User's Guide*
- *EMC Smarts IP Adapters User's Guide*
- *EMC Smarts IP Availability Manager Extension for IPv6 User's Guide*
- *EMC Smarts IP Availability Manager Extension for NAS User's Guide*
- *EMC Smarts Quick Start Guide*

Refer to the *EMC Smarts Documentation Catalog* for documentation resources provided with other EMC Smarts product suites.

Suggestions for searching PDF files

You may search across multiple PDF files using the Adobe Acrobat Reader software.

1. If the documentation is not accessible to all users of the EMC Smarts product suite, copy the contents of the *BASEDIR/smarts/doc/pdf d*irectory to a central location, such as a shared drive on your LAN, that operators and others may view.
2. To search throughout the documentation library, open the Acrobat Reader software.
   1. Choose **Edit** > **Search**, and enter a word or phrase.
   2. In the **Where would you like to search** option, select **All PDF Documents in** and type the pathname of the location where the PDF documents reside.

If you have more than one EMC Smarts product suite installed, you can set up cross-product document searches by copying files from the BASEDIR/smarts/doc/pdf directory for each product suite into this common documentation directory path.

Conventions used in this guide

EMC uses the following conventions for notes and cautions.

Note: A note presents information that is important, but not hazard-related.

IMPORTANT

An important notice contains information essential to the operation of the software.

CAUTION

A caution contains information essential to avoid data loss or damage to the system or equipment. The caution may apply to hardware or software.

Typographical conventions

EMC uses the following conventions in this guide:

Normal font	In running text: • Interface elements (for example, button names, dialog box names) outside of procedures • Items that the user selects outside of procedures • Java classes and interface names • Names of resources, attributes, pools, Boolean expressions, buttons, DQL statements, keywords, clauses, environment variables, filenames, functions, menu names, utilities • Pathnames, URLs, filenames, directory names, computer names, links, groups, service keys, file systems, environment variables (for example, command line and text), notifications
Bold	In procedures: • Names of dialog boxes, buttons, icons, menus, fields, and maps • Selections from the user interface, including menu items, and field entries • Key names • Window names • Code examples • Commands • User interface tabs
Italic	Used for: • Full publications titles referenced in text In procedures: • Directory paths • Filenames • Scripts • Important/unique words • URLs • Utilities • Variables
`Courier`	Used for: • System output • User entry
< >	Angle brackets used to enclose parameter or variable values supplied by the user.
[ ]	Square brackets used to indicate optional values.
|	Vertical bar used to indicate alternate selections. The bar means “or”.
{ }	Braces used to indicate content that you must specify (that is, x or y or z).
...	Ellipses used to indicate nonessential information omitted from the example.
%	Used to indicate a C shell prompt.
#	Used to indicate a C shell superuser prompt.
▼▲	Used to indicate a command is wrapped over one or more lines. The command must be typed as one line.

Pathname conventions

Directory pathnames are shown with forward slashes (/). Users of the Windows operating systems should substitute back slashes (\) for forward slashes.

Graphical conventions

If there are figures illustrating consoles in this document, they represent the consoles as they appear in Windows. Under UNIX, the consoles appear with slight differences.

For example, in views that display items in a tree hierarchy such as the Topology Browser, a plus sign displays for Windows and an open circle displays for UNIX.

Smarts Manager

Unless otherwise specified, the term Smarts Manager is used to refer to EMC Smarts programs such as Domain Managers, Global Managers, and adapters.

Where to get help

EMC support, product, and licensing information can be obtained as follows:

Product information — For documentation, release notes, software updates, or for information about EMC products, licensing, and service, go to the EMC Powerlink™ website (registration required) at:

http://Powerlink.EMC.com

Technical support — For technical support, go to EMC Customer Service on Powerlink. To open a service request through Powerlink, you must have a valid support agreement. Please contact your EMC sales representative for details about obtaining a valid support agreement or to answer any questions about your account.

Sales and customer service contacts — For the list of EMC sales locations, please access the EMC home page at:

http://EMC.com/contact

1

Getting Started

This chapter describes installation requirements and configuration steps needed to start EMC® Smarts® IP Availability Manager Extension for IPv6.

- Software and license requirements 1-2
- Enabling IPv6 address polling 1-3
- Disabling IPv6 features 1-5

Software and license requirements

IP Availability Manager Extension for IPv6 software is automatically installed during installation of the EMC Smarts IP Management Suite release. You must install the 6.5.1 release or later of the EMC Smarts Service Assurance Management Suite in order to view containment information and maps related to IPv6 addresses in the network.

IP Availability Manager Extension for IPv6 software runs only on the following operating systems:

- Solaris 8, 9, 10
- Windows 2003 SP1

A feature license controls whether the IP Availability Manager Extension for IPv6 software is available for configuration. To confirm whether the license for the extension is enabled, check the log for the following text:

```
InCharge IPv6
```

The *EMC Smarts System Administration Guide* describes how to obtain and install a permanent license.

Enabling IPv6 address polling

Polling of IPv6 addresses is disabled by default. To configure EMC Smarts IP Management Suite to enable polling of IPv6 addresses, follow these steps:

1. From the **Polling and Thresholds** screen, choose a domain manager from the **InCharge Manager** list
2. (for example, **INCHARGE-AM**) and expand the tree. Choose the **Polling Groups** that you want to poll for IPv6 addresses (**Switches**, **Routers**, **Hubs** and **Bridges**, or **Other Systems**).
3. Add **Connectivity Polling for IPv6 Addresses** to the **Current Settings** of the polling group. See the example in Figure 1-1.
4. If not already selected, add **Connectivity Polling** to the **Current Settings** of the polling group. (**Connectivity Polling** must be enabled if you are using the **Connectivity Polling for IPv6 Addresses** setting.)

Note: You must have at least one IPv6 address configured on the system where the IPv6 domain manager is running.

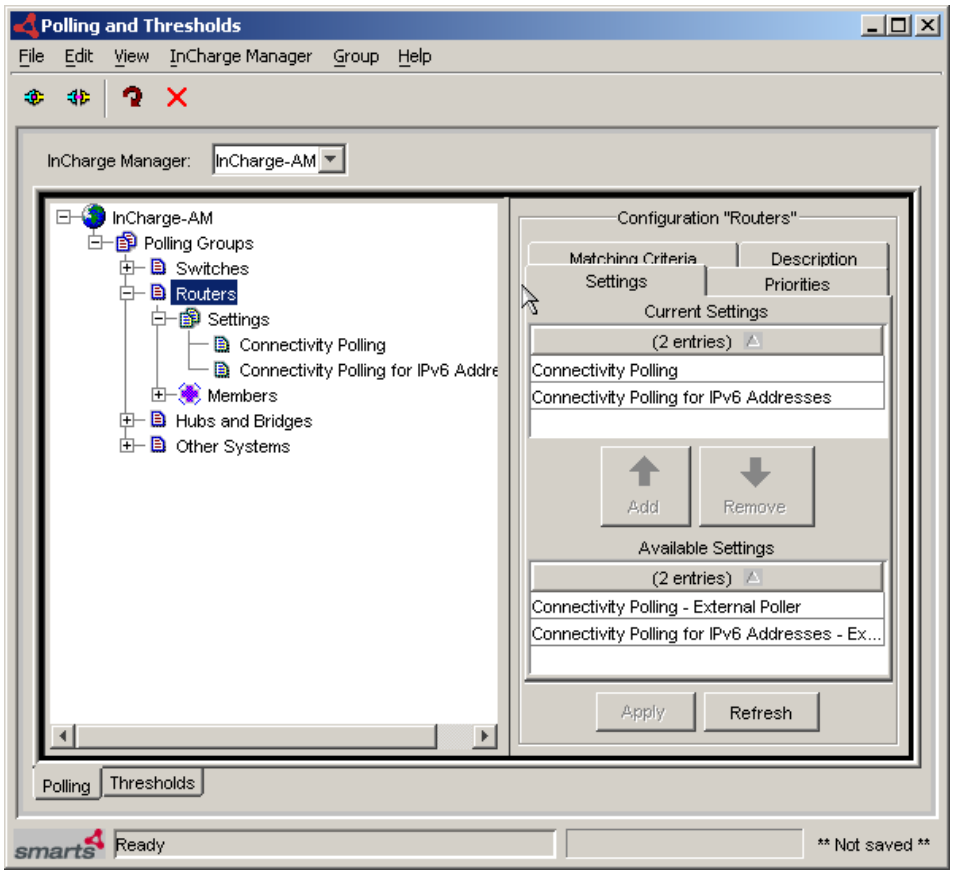

Figure 1-1 **Configuring Polling Groups for IPv6 Connectivity**

Enabling an IPv6 external poller

If you are using an external poller instead of the one included within the EMC Smarts IP Management Suite, you may enable the Connectivity Polling for IPv6 Addresses - External Polling. (Use this only if you have disabled the Connectivity Polling for IPv6 Addresses setting.)

This setting is not assigned to any default group and would only be used in place of the Connectivity Polling for IPv6 setting. Also, you may create an external poller using the EMC Smarts Software Development Kit or EMC Smarts Perl API.

See the *EMC Smarts IP Management Suite Configuration Guide* for more information on using external pollers.

Disabling IPv6 features

Disabling polling

To disable polling of IPv6 devices, remove Connectivity Polling for IPv6 Addresses from the Current Settings of the Polling Group.

If you are using an external poller, remove Connectivity Polling for IPv6 Addresses - External Polling, from the Current Settings of the Polling Group.

Disabling discovery

Discovery of IPv6 addresses is enabled by default in the EMC Smarts IP Management Suite software.

1. From *BASEDIR/smarts/bin*, use the *sm_edit* utility to edit the *discovery.conf* file:

   ```
   sm_edit conf/discovery/discovery.conf
   ```

   For more information on using *sm_edit*, see "Understanding the sm_edit Utility" on page A-1.

2. Change the following value in the *discovery.conf* file:

   ```
   IPv6DiscoveryEnabled = FALSE
   ```

3. Restart IP Availability Manager.

2

Discovery and Monitoring of IPv6 Addresses

The EMC Smarts IP Management Suite supports discovery and monitoring of IPv6 network devices. Specifically, IP Availability Manager Extension for IPv6 does the following:

- Discovers IPv6 addresses using an IPv4 address as the discovery agent
- Polls global unicast IPv6 addresses using an asynchronous ICMPv6 pinger
- Enhances analysis of networks that include dual stack devices (devices configured with both IPv4 and IPv6 addresses)

This chapter describes the methods for discovery and monitoring of IPv6 network devices. It consists of the following sections:

- Discovery 2-2
- Monitoring 2-4
- Scenarios 2-8

Discovery

You may discover the IPv6 network with either the manual or autodiscovery processes as explained in the *EMC Smarts IP Management Suite Discovery Guide*. However, you must initiate the discovery process using an agent or seed file with an IPv4 address.

Enterprise MIBs polled

The IP Availability Manager attempts to discover and monitor IPv6 addresses on devices that implement and populate the following Management Information Bases (MIBs):

- Cisco (IOS): [CISCO-IETF-IP-MIB]
- Juniper (JunOS): M/T/J Series [JUNIPER-IPv6-MIB]

New IPv6 managed elements

EMC Smarts now manages two new IPv6-related topology elements, *IPv6* and *IPv6Network*. See Table 2-1 and Table 2-2 for the associated attributes. Both the *IPv6* and *IPv6Network* classes appear in the Topology Browser and in the Containment views.

Table 2-1 Attributes of IPv6

Attribute	Description
Address	The IPv6 address. Example: 3FFE:80C0:22C:62:1:0:A09:4CFE
Prefix	The computed prefix based on the Address and PrefixLength attribute values. This represents the IPv6 network address. Example: 3FFE:80C0:22C:62:0:0:0:0
PrefixLength	The number of bits used to calculate the Prefix. Example: 64
IsGlobalUnicast	If TRUE, it indicates the address is a public global unicast address.

Table 2-2 Attributes of IPv6Network

Attribute	Description
NetworkNumber	The network prefix.
PrefixLength	The number of bits used to calculate the Prefix. Example: 64

Naming conventions

The IP Availability Manager Extension for IPv6 software recognizes all IPv6 address formats described in the Internet Engineering Task Force (IETF) RFC 3513, Section 2.2, *Text Representation of Addresses*.

The conventions used in naming IPv6 objects and addresses in the EMC Smarts screens are explained below:

- IPv6 addresses display in the preferred address format (see RFC 3513 for more information). For example,

  3FFE:80C0:22C:62:1:0:A09:4CFE

- IPv6 objects are named with *IPv6-* preceding the address, for example:

  IPv6-3FFE:80C0:22C:62:1:0:A09:4CFE

- IPv6 objects representing non-global unicast addresses (for example, Link-local starting with FE80::/10) append the name of the host and interface number to the address to make the name globally unique. For example,

  IPv6-FE80:0:0:0:205:85FF:FEA0:8000/AGRSWP.corp.com/44

  This is required because non-global addresses may co-exist on multiple interfaces on a given node (or even, potentially, on multiple nodes) without causing addressing conflicts.

Note: The format of the names for non-global IPv6 addresses may change in a future release.

Monitoring

After the discovery process is complete, IP network monitoring begins if the Connectivity Poller for IPv6 Addresses is enabled. See "Enabling IPv6 address polling" on page 1-3. By default, global unicast addresses are polled using an asynchronous ICMPv6 pinger. (SNMP over IPv6 is not supported in this release.)

Note: By default, neither Link-local nor Site-local IPv6 addresses are polled in this software release.

IPv6 analysis

The IP Availability Manager Extension for IPv6 provides additional analysis of your network by reporting new IPv6-specific events. These events and the conditions under which they occur are listed in Table 2-3.

Table 2-3 IPv6-Related Conditions and Resulting Events

Topology Element	Event Name	Condition(s)
IPv6	Unresponsive	No response to ping before the polling interval times out (IPStatus=TIMEDOUT)
IPv6	Down	System is unresponsive AND The administrative and operational statuses of the underlying interfaces are UP OR System is responsive AND IPv6 Address is not responsive AND IPv6 is not layered over any interface
IPv6Network	Inaccessible	At least one IPv6 address on this network is down (IPv6::<instance>::Down)

Viewing IPv6 containment

The Containment dialog box, available from the Global Console, displays information about an element's containment in tabular format.

The Containment dialog box has been enhanced for this release of the IP Availability Manager Extension for IPv6 with three new tabs: IPv6 Networks, IPv6 Addresses, and Addresses in Network. See Figure 2-1 for an example of the Containment dialog box.

From the Topology Browser Console, right-click on the class where IPv6 addresses are assigned (for example, Router) and choose Containment. The IPv6 Networks tab in the Containment dialog box displays:

- NetworkNumber
- PrefixLength

The IPv6 Addresses tab appears in this same view of Containment. This tab displays:

- Address
- PrefixLength
- IPStatus

- InterfaceName
- InterfaceAdminStatus
- InterfaceOperStatus

From the Topology Browser Console, right-click on the IPv6 Network class and choose Containment. The Addresses in Network tab displays:

- Address
- PrefixLength
- IPStatus
- InterfaceName
- InterfaceAdminStatus
- InterfaceOperStatus

Note: Containment is not available for user-defined groups and services.

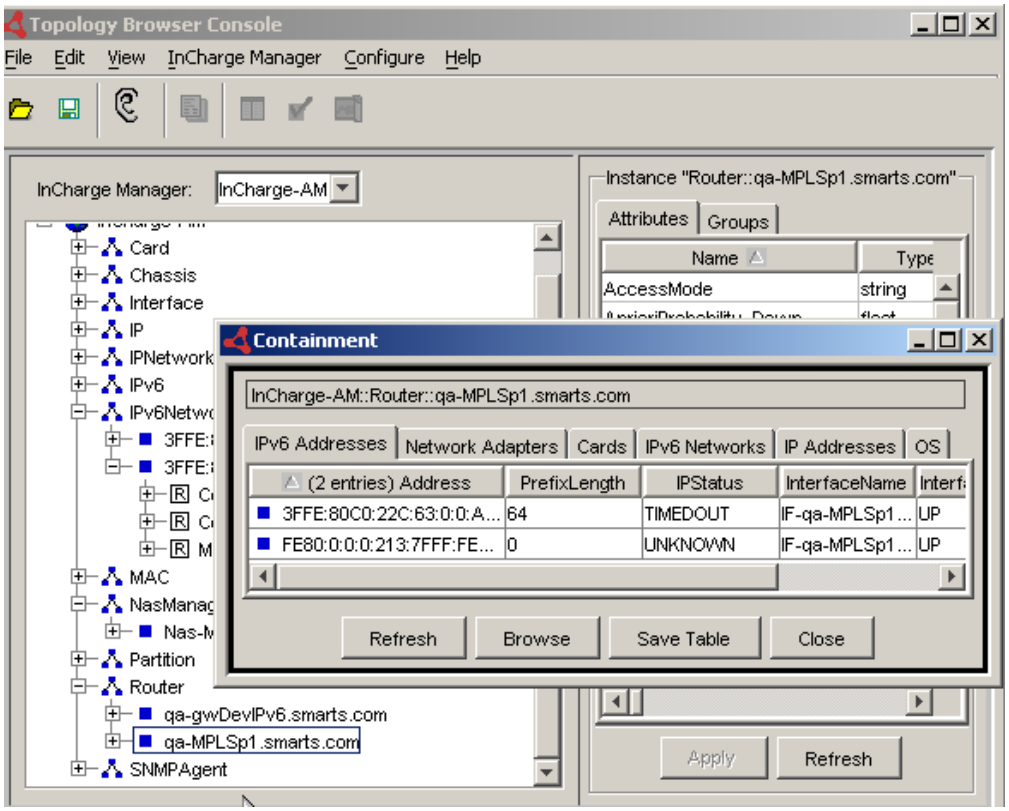

Figure 2-1 Containment View With Both IPv6 Addresses and IPv6 Networks Tabs.

Several methods exist to display a Containment dialog box. For example, you can display containment information in either a dialog box or a view:

- In the pop-up menu of the **Topology Browser Console**, right-click on a selected element in the tree and select **Containment** in the menu. See Figure 2-1. for an example.
- From the **Map Console**, select an instance in the map tree, right-click, and select **Containment** in the pop-up menu.

- In the map tree, right-click on a node and select **Containment** in the pop-up menu. For a green node, double-click on it to display the dialog box.
- From **Find Instance** or **Find System** dialog boxes, click **Containment**.
- In the **Event** menu or the pop-up menu, right-click on a selected notification and select **Containment** in the menu.
- From the **Notification Properties** dialog box, click **Containment**.
- Add a **Containment** view using **View>Add View**.

In the **Containment** dialog box, information is organized using tabs. Each tab consists of a table. Depending upon the type of element and the type of analysis being performed by the underlying domain, different information is available.

The following buttons are available: **Refresh**, **Browse**, **Save Table**, and **Close**. **Save Table** saves the contents of a selected tab locally as a text file. (For more information, see the *EMC Smarts Service Assurance Manager Operator's Guide*.)

Viewing maps

Use the Global Console to view maps of the IPv6 network topology.

1. From the **Topology Browser Console**, select the Global Manager as the **InCharge Manager** (for example, INCHARGE-SA). View the map tree in the left panel of the console and select a class where IPv6 addresses are assigned (for example, Router).
2. Right-click on a member of the class and choose **Show Map** from the drop-down menu. This opens the **Map Console**.
3. From the **Map Console**, view the map tree in the left panel of the console and select a class where IPv6 addresses are assigned (for example, **Router**).
4. Right-click on a member of the class and choose **IP Network Connectivity** from the drop-down menu.

The map that appears in the right-hand panel of the screen displays the IPv6 address associated with the IP network cloud icon. See Figure 2-2 for an example of a map displaying a router configured with both IP and IPv6 network addresses.

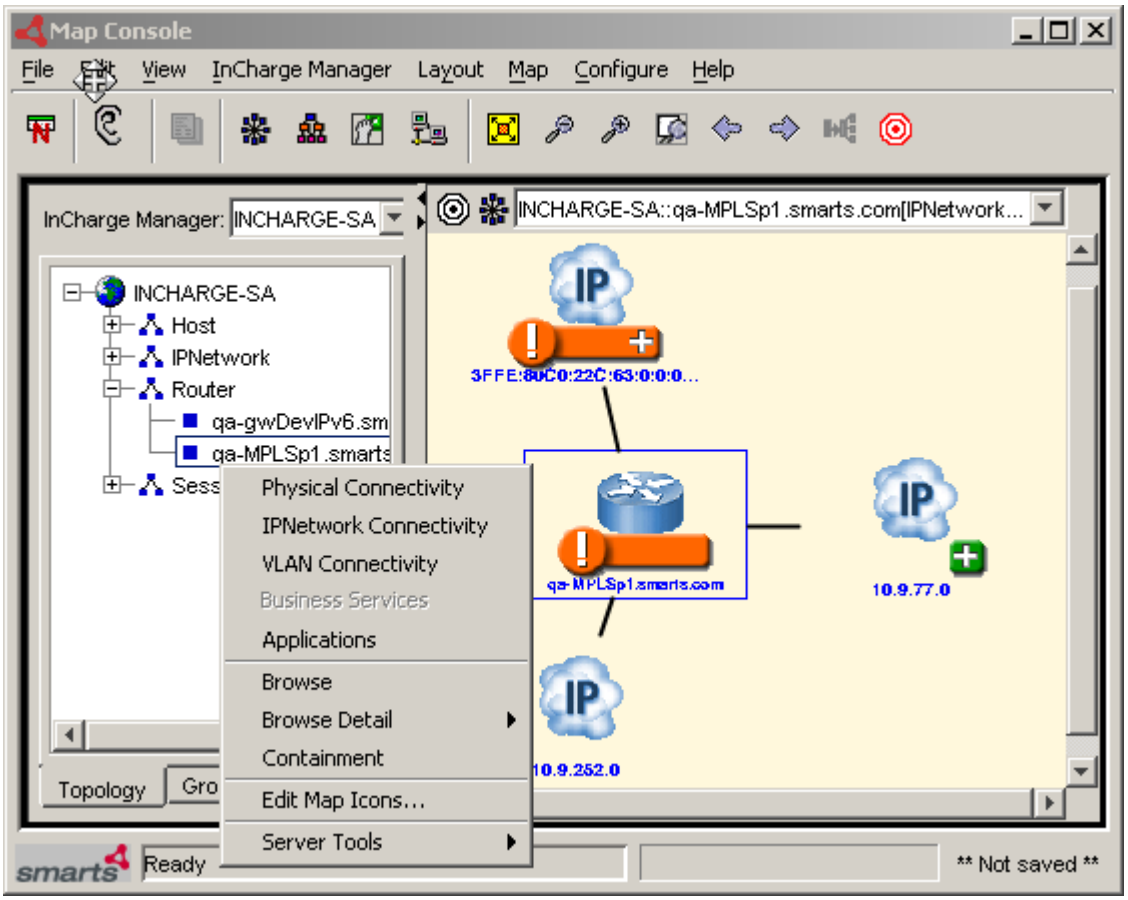

Figure 2-2 Map Console View of IPv6 Network Topology

Scenarios

Here are sample IPv6 network scenarios and events that may cause notifications to appear in the Global Console. Use **Containment Views**, the **Map Console**, and the **Notification Log Console** to obtain information about IPv6 addresses in your network.

Dual stack crashes

If the IPv4 stack crashes and the IPv6 addresses are still responsive, the operator may see IPNetwork Inaccessible in the Notification Log Console for the IPv4 addresses. (IPNetwork Inaccessible is an aggregate of IP Down events.)

If the IPv6 stack crashes, the operator may see a notification for IPv6Network Inaccessible. (IPv6Network Inaccessible is an aggregate of IPv6 Down events). Keep in mind the following

- SNMP over IPv4 is used to discover IPv6 addresses (all SNMP remains over IPv4 at this time).
- IPv6 addresses are pinged by the ICMPv6 asynchronous poller.
- Results from pinging IPv6 addresses are fed in as symptoms to the analysis model.

Note: By default, the IPv6 Down events are not sent to the Global Console. If you want to see IPv6 Down events in the Notification Log Console, you must use the *sm_edit* utility to uncomment the following line in the Subscriptions section of the *InCharge7/SAM/smarts/conf/ics/dxa-conn.conf* or *dxa-conn-perf.conf* files.

```
# sub IPv6::.*::Down/e
```

If you edit a file, be sure to save the file after making your changes. Then restart the server.

Analysis and reporting of IPv6-related events are affected by the status of the interface, the SNMP Agent, and the device assigned the IPv6 address. See Table 2-4 for a list of possible IPv6 network scenarios and the resulting events or notifications.

Table 2-4 IPv6 Network Scenarios

System Status	Interface Status	IPv6 Status	IPv4 Status (Either IPv4 Address or SNMP Agent)	Results
Responsive	No interface	Responsive	Unresponsive	No IPv6 Alarms
Responsive	No interface	Unresponsive	Responsive	IPv6::Unresponsive IPv6::Down IPv6Network::Inaccessible
Responsive	UP	Unresponsive	Responsive	IPv6::Unresponsive IPv6::Down IPv6Network::Inaccessible

Table 2-4 IPv6 Network Scenarios (continued)

Responsive	DOWN	Unresponsive	Responsive	IPv6::Unresponsive
Unresponsive	UNKNOWN	Unresponsive	No IPv4 address	IPv6::Unresponsive UnitaryComputerSystem::Down (Example: Router::Down)
Responsive	UNKNOWN	Responsive	All agent or all IPv4 addresses unresponsive	SNMPAgent::NotResponding

A

Understanding the sm_edit Utility

As part of the EMC Smarts deployment and configuration process, you need to modify certain files. User modifiable files include configuration files, rule set files, templates, and files (such as seed files, and security configuration files) that contain encrypted passwords. Original versions of these files are installed into appropriate subdirectories under the BASEDIR/smarts/ directory.

Examples:

- The original versions of the Global Manager configuration files on UNIX are installed to /opt/InCharge7/SAM/smarts/conf/ics
- The original versions of the Console configuration files on Windows are installed on C:\InCharge7\SAM\smarts\conf\console

Original versions of files should not be altered. If a file requires modification, it must be stored as a local copy of the file in BASEDIR/smarts/local or one of its subdirectories.

Examples:

- A modified ics.conf file on UNIX should be saved to /opt/InCharge7/SAM/smarts/local/conf/ics
- A modified properties.conf file on Windows should be saved to C:\InCharge7\SAM\smarts\local\conf\console.

Smarts software is designed to first search for user modifiable files in BASEDIR/smarts/local or one of its subdirectories. If a modified version of a file is not found in the local area, Smarts software then searches appropriate nonlocal directories.

To facilitate proper file editing, EMC Corporation provides the sm_edit utility with every Smarts product suite. When used to modify an original version of a file, this utility automatically creates a local copy of the file and places it in the appropriate location under BASEDIR/smarts/local. This ensures that the original version of the file remains unchanged. You can invoke sm_edit from the command line. Optionally, you can configure Windows so that sm_edit is automatically invoked when user-modifiable files are double-clicked in Windows Explorer.

To invoke the sm_edit utility from the command line, specify the path and the name of the file to edit under BASEDIR/smarts. If multiple Smarts products are running on the same host, invoke sm_edit from the bin directory of the product suite with the files to edit.

Example:

To edit the configuration file for the Global Manager, invoke the sm_edit utility as follows:

```
# /opt/InCharge7/SAM/smarts/bin>sm_edit conf/ics/ics.conf
```

In this example, the sm_edit utility automatically creates a local copy of the ics.conf file in the /opt/InCharge7/SAM/smarts/local/conf/ics directory and opens the file in a text editor. If a local version of the file already exists, the sm_edit utility opens the local version in a text editor. In addition, sm_edit creates any necessary subdirectories.

The *EMC Smarts System Administration Guide* provides additional information about the sm_edit utility.

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