



Application Connectivity Monitor
2.0

USER'S GUIDE

P/N 300-002-867

REV A01

OL-8953-01

EMC Corporation

Corporate Headquarters:

Hopkinton, MA 01748-9103

1-508-435-1000

www.EMC.com

Copyright 1996-2005 by EMC Corporation ("EMC"). All rights reserved.

EMC believes the information in this publication is accurate as of its publication date. The information is subject to change without notice.

The Software and all intellectual property rights related thereto constitute trade secrets and proprietary data of EMC and any third party from whom EMC has received marketing rights, and nothing herein shall be construed to convey any title or ownership rights to you. Your right to copy the software and this documentation is limited by law. Making unauthorized copies, adaptations, or compilation works is prohibited and constitutes a punishable violation of the law. Use of the software is governed by its accompanying license agreement.

The information in this publication is provided "as is" without warranty of any kind. EMC Corporation makes no representations or warranties of any kind with respect to the information in this publication, and specifically disclaims implied warranties or merchantability or fitness for a particular purpose. In no event shall EMC Corporation be liable for any loss of profits, loss of business, loss of use of data, interruption of business, or for indirect, special, incidental, or consequential damages of any kind, arising from any error in this publication.

The InCharge™ products mentioned in this publication are covered by one or more of the following U.S. Patent Nos. or pending patent applications: 5,528,516, 5,661,668, 6,249,755, 6,868,367 and 11/034,192.

"EMC," "InCharge," the InCharge logo, "SMARTS," the SMARTS logo, "Graphical Visualization," "Authentic Problem," "Codebook Correlation Technology," "Instant Results Technology," "InCharge Viewlet," and "Dashboard Viewlet" are trademarks or registered trademarks of EMC. All other brand or product names are trademarks or registered trademarks of their respective companies or organizations.

Additional copyright notices and license terms applicable to the software product are set forth in the Third-Party Copyright Read Me file included on the accompanying software media.

Contents

Preface	v
Intended Audience	v
Prerequisites	v
Document Organization	v
Documentation Conventions	vi
Application Connectivity Monitor Installation Directory	vii
Application Connectivity Monitor Products	vii
Additional Resources	vii
Command Line Programs	vii
Documentation	viii
Technical Support	viii
EMC Powerlink	viii
1 Explanation of Fault Analysis	1
Topology Created by ACM	1
Faults Diagnosed by ACM	2
Analysis Scenarios	3
Single Application and Single TCP Check	3
Single Application and Two TCP Checks	6
Two Applications on a Single System	9
Impact Analysis with Business Impact Manager	13
2 Viewing Analysis Results and Application Topology	17
Analysis Results Displayed as Notifications	17
About Notifications	17
Viewing the Properties of a Notification	18

Viewing Application Topology in Maps	19
Opening an Applications Map	19
Topology Elements Displayed in an Application Map	20
Index	21

Preface

This document describes the topology and notifications created by Application Connectivity Monitor as it is displayed in the Global Console.

Intended Audience

This guide is intended for operators who are responsible for acting on the analysis provided by Application Connectivity Monitor.

Prerequisites

This guide assumes that Application Connectivity Monitor and Service Assurance Manager are properly deployed and that the user has access to the Global Console.

Document Organization

This guide consists of the following chapters.

Table 1: Document Organization

CHAPTER/APPENDIX	DESCRIPTION
1. EXPLANATION OF FAULT ANALYSIS	Describes the notifications and topology created by Application Connectivity Monitor and presents several failure scenarios.
2. VIEWING ANALYSIS RESULTS AND APPLICATION TOPOLOGY	Provides fundamental descriptions of various Global Console functions.

Documentation Conventions

Several conventions may be used in this document as shown in Table 2.

Table 2: Documentation Conventions

CONVENTION	EXPLANATION
<code>sample code</code>	Indicates code fragments and examples in Courier font
keyword	Indicates commands, keywords, literals, and operators in bold
%	Indicates C shell prompt
#	Indicates C shell superuser prompt
<parameter>	Indicates a user-supplied value or a list of non-terminal items in angle brackets
[option]	Indicates optional terms in brackets
/InCharge	Indicates directory path names in italics
<i>yourDomain</i>	Indicates a user-specific or user-supplied value in bold, italics
<i>File > Open</i>	Indicates a menu path in italics
▼▲	Indicates a command is wrapped over one or more lines. The command must be typed as one line.

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

Also, 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.

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

Application Connectivity Monitor Installation Directory

In this document, the term **BASEDIR** represents the location where the Application Connectivity Monitor software is installed.

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

The `<n>` represents the software platform version number. The `<product>` represents the product name. For example, on UNIX operating systems, Application Connectivity Monitor is, by default, installed to: `/opt/InCharge6/ACM/smarts`. On Windows operating systems, this product is, by default, installed to: `C:\InCharge6\ACM\smarts`. This location is referred to as **BASEDIR**/`smarts`.

Optionally, you can specify the root of **BASEDIR** to be something other than `/opt/InCharge6` (on UNIX) or `C:\InCharge6` (on Windows), but you cannot change the `<product>` location under the root directory.

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

Application Connectivity Monitor Products

Application Connectivity Monitor includes the following products:

- Application Connectivity Monitor

Additional Resources

In addition to this document, EMC Smarts provides the following resources.

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.

Documentation

Readers of this document may find other documentation (also available in the **BASEDIR**/smarts/doc/pdf directory) helpful.

EMC Smarts Documentation

The following documents are product independent and thus relevant to users of all EMC Smarts products:

- *EMC Smarts System Administration Guide*
- *EMC Smarts ASL Reference Guide*
- *EMC Smarts Perl Reference Guide*

Application Connectivity Monitor Documentation

The following documents are relevant to users of Application Connectivity Monitor:

- *EMC Smarts Application Connectivity Monitor Release Notes*
- *EMC Smarts Application Connectivity Monitor Installation Guide*
- *EMC Smarts Application Connectivity Monitor Configuration Guide*
- *EMC Smarts Application Connectivity Monitor User's Guide*

Technical Support

For questions about technical support, call your local sales office or service provider. For service, call one of the following numbers:

United States: 800.782.4362 (SVC.4EMC)

Canada: 800.543.4782 (543.4SVC)

Worldwide: 508.497.7901

EMC Powerlink

EMC Powerlink is the EMC Corporation's secure extranet for customers and partners. Powerlink is an essential tool for obtaining web-based support from the EMC Corporation. Powerlink can be used to submit service or information requests (tickets) and monitor their progress, to review the knowledgebase for known problems and solutions, and to download patches and SmartPacks.

From training on EMC products and technologies, to online support, product announcements, software registration, technical white papers, interoperability information, and a range of configuration tools, Powerlink offers resources unavailable elsewhere.

For quickest access when you do not already have a Powerlink account, ask your EMC representative for the access code for your company and register at the Powerlink site. Visit the EMC Powerlink website at:

<http://powerlink.emc.com>

Explanation of Fault Analysis

Application Connectivity Monitor provides root-cause analysis of application failures. In addition, Application Connectivity Monitor determines the impact of network and system failures on TCP-based applications.

Application Connectivity Monitor (ACM) discovers and monitors the availability of applications that provide network services using the TCP protocol. When a TCP-based application is not available, Application Connectivity Monitor determines whether the problem is the result of a network failure or an application failure.

Topology Created by ACM

Application Connectivity Monitor automatically discovers TCP-based applications that are hosted by systems (for example, hosts, switches, routers) that are present in the topology of the ACM Domain Manager.

For each discovered application, Application Connectivity Monitor creates the following topology elements.

- Applications elements are represented by the Application class and its subclasses; which includes subclasses such as HTTPService and DatabaseServer. An application element is associated with the system it runs on through the HostedBy relationship.

Application elements are visible in the Topology Browser and Applications Map views of the Global Console when attached to the Global Manager.

- TCPConnectivityCheck elements represent the TCP connection initiated by the ACM Domain Manager to check the availability of monitored applications. Application Connectivity Monitor uses the symptoms reported by the TCP checks to perform its analysis.

TCPConnectivityCheck elements may be listed in the Notification Log view or Codebook tab of the Notification Properties dialog of the Global Console when attached to the Global Manager.

TCPConnectivityCheck elements are listed when an event occurs.

Faults Diagnosed by ACM

Application Connectivity Monitor notifies the following problems for application elements.

Down

Down is a root-cause problem that indicates that the application is not running; either because the process has died or stopped. Application Connectivity Monitor diagnoses the Down problem when all TCP checks return TimedOutSymptom events.

Malfunction

Malfunction is a root-cause problem that indicates that the application is not working properly. The application may be providing service to some users but not other users or it may not be providing the correct response. Application Connectivity Monitor diagnoses the Malfunction problem when one or more, but not all, TCP checks return TimedOutSymptoms events. In addition, one or more TCP checks may return the SlowSymptom event.

Degraded

Degraded is a root-cause problem that indicates that the application is running slowly. Application Connectivity Monitor diagnoses the Degraded problem when a TCP check returns the SlowSymptom event.

System Unresponsive

System Unresponsive is a root-cause problem that indicates that a system's protocol endpoints are not responding to ICMP or SNMP polls and that connections to applications hosted by the system are down. Application Connectivity Monitor diagnoses the System Unresponsive problem when it receives an UnresponsiveSymptom from IP Availability Manager.

Analysis Scenarios

This section uses three different topology scenarios to illustrate how Application Connectivity Monitor (ACM) diagnoses problems. In each scenario, Application Connectivity Monitor monitors the application by regularly establishing a TCP connection with the managed application on the specified TCP port. In addition, Application Connectivity Monitor receives network and systems availability information from IP Availability Manager.

Single Application and Single TCP Check

In the following scenario, a mail server, *SMTPService*, is hosted by *host1.example.com*, as shown in Figure 1.

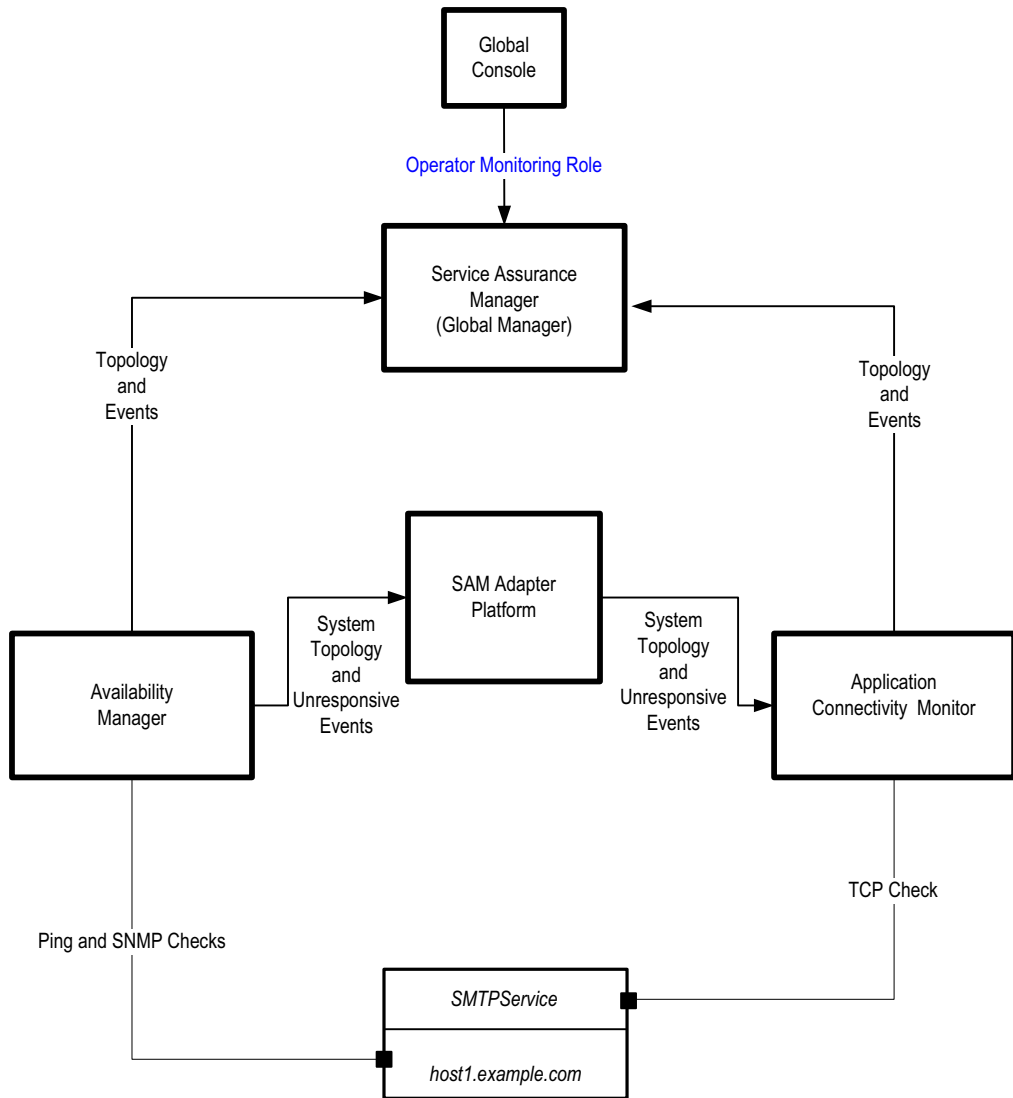


Figure 1: Application Monitored by One Check

Mail Server Down

A Down problem indicates that the host the application is running on is responding but the application is not available.

To diagnose Down in this scenario, ACM observes that the TCP checks sent to *SMTPService* time out, resulting in a *TimedOutSymptom* event. A *TimedOutSymptom* event occurs when ACM does not receive a response to a TCP check.

Host Unresponsive

An Unresponsive problem indicates that the system on which the application is running cannot be reached through the network.

To diagnose System Unresponsive in this scenario, Application Connectivity Monitor receives a *host1.example.com* UnresponsiveSymptom from IP Availability Manager. In addition, ACM may observe SlowSymptom or TimedOutSymptoms events in response to TCP checks.

Application Connectivity Monitor must receive an UnresponsiveSymptom from IP Availability Manager to diagnose an Unresponsive problem.

Mail Server Degraded

A Degraded problem indicates that the application is not performing as expected. This means that the application is responding to TCP checks, but not within the expected time period.

To diagnose Degraded in this scenario, Application Connectivity Monitor observes a SlowSymptom event for a TCP check to *SMTPService*. A SlowSymptom event occurs when an application responds to the TCP check but the response time exceeds the threshold.

Figure 2 shows the Notification Properties dialog for the SMTPService Degraded problem. Application Connectivity Monitor diagnosed a Degraded problem with 100% certainty because it observed the SlowSymptom event in response to a TCP check.

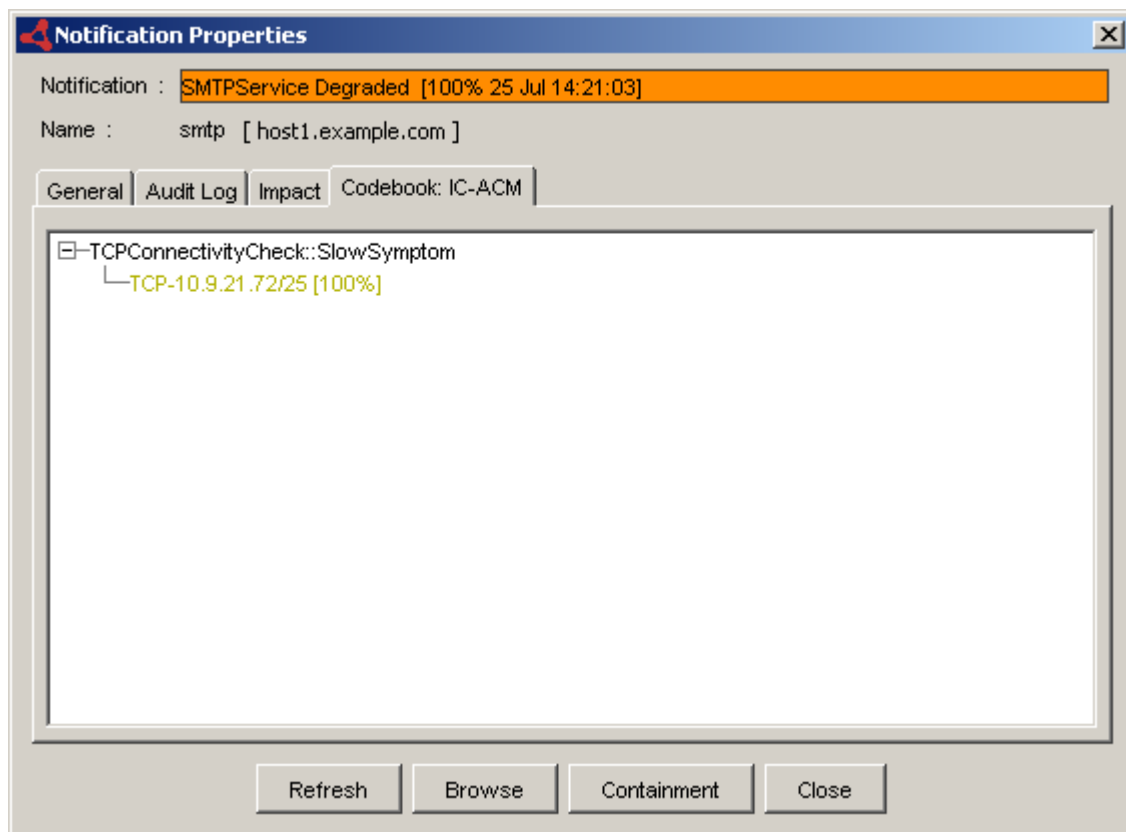


Figure 2: Notification Properties Of Degraded Problem

Single Application and Two TCP Checks

In the following scenario, a Web server, *HTTPService*, is hosted by *host1.example.com*. The Web server is configured to serve content on two separate ports. To ensure that the Web server is functioning properly, an administrator has configured Application Connectivity Monitor to monitor both ports on which the Web server provides content.

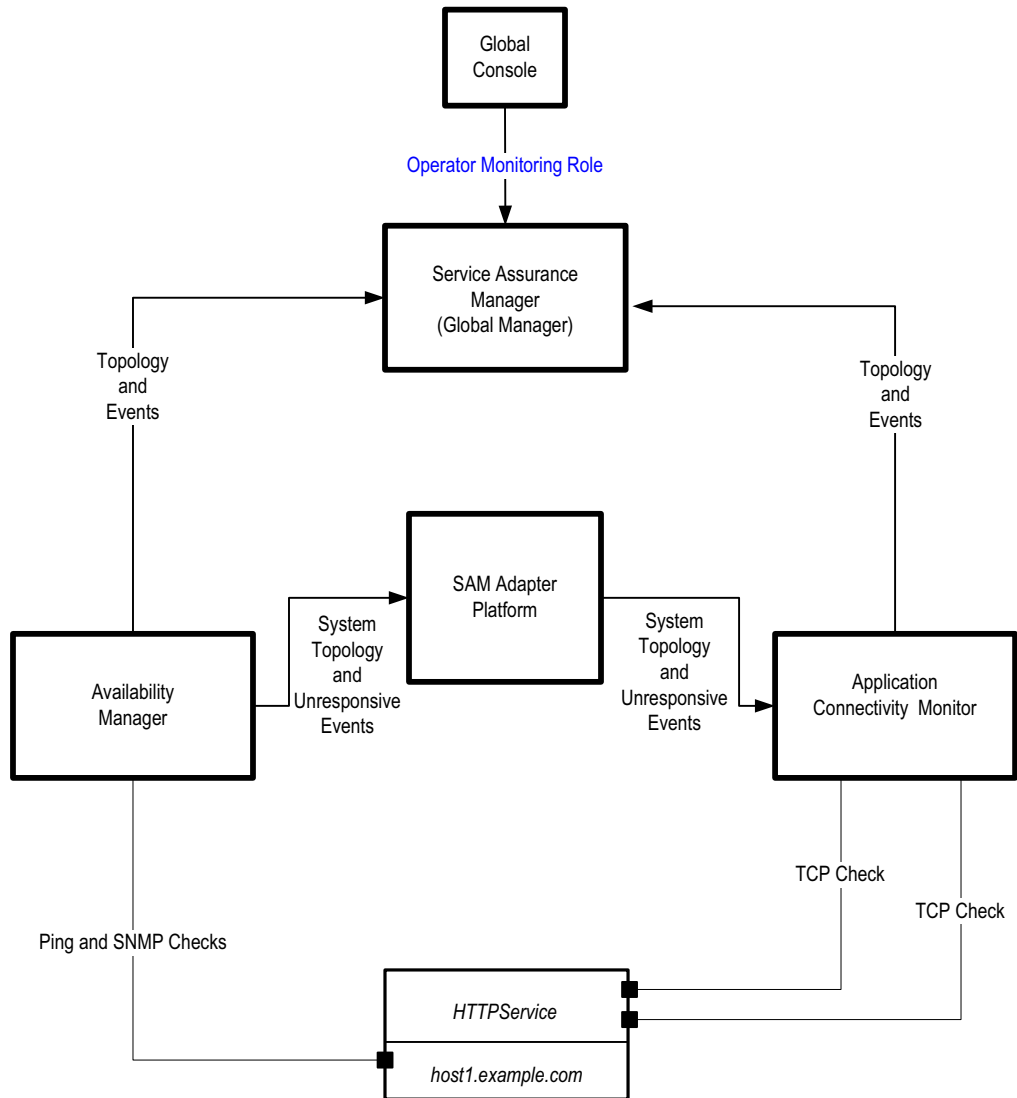


Figure 3: Application Monitored by Two Checks

Web Server Down

A Down problem indicates that the application is not responding to connection requests to any of its ports.

To diagnose Down in this scenario, Application Connectivity Monitor must observe that all TCP checks to both TCP ports in use by *HTTPService* time out, causing *TimedOutSymptom* events. The *TimedOutSymptom* events indicate that the Web server is not responding to connection requests.

Web Server Malfunction

A Malfunction problem indicates that the application is not functioning properly because it responds correctly to certain connection requests and incorrectly to other connection requests.

To diagnose Malfunction in this scenario, Application Connectivity Monitor observes TimedOutSymptom events for TCP checks sent to one of the ports on *HTTPService*. In addition, ACM may observe SlowSymptom events for TCP checks sent to the ports used by *webserver.example.com*.

Figure 4 shows the Notification Properties for the HTTPService Malfunction problem. Application Connectivity Monitor diagnosed the Malfunction problem after observing a TimedOutSymptom event for a TCP check sent to one of the ports of the Web server. Because one port is still responsive, Application Connectivity Monitor does not diagnose this as a Down problem.

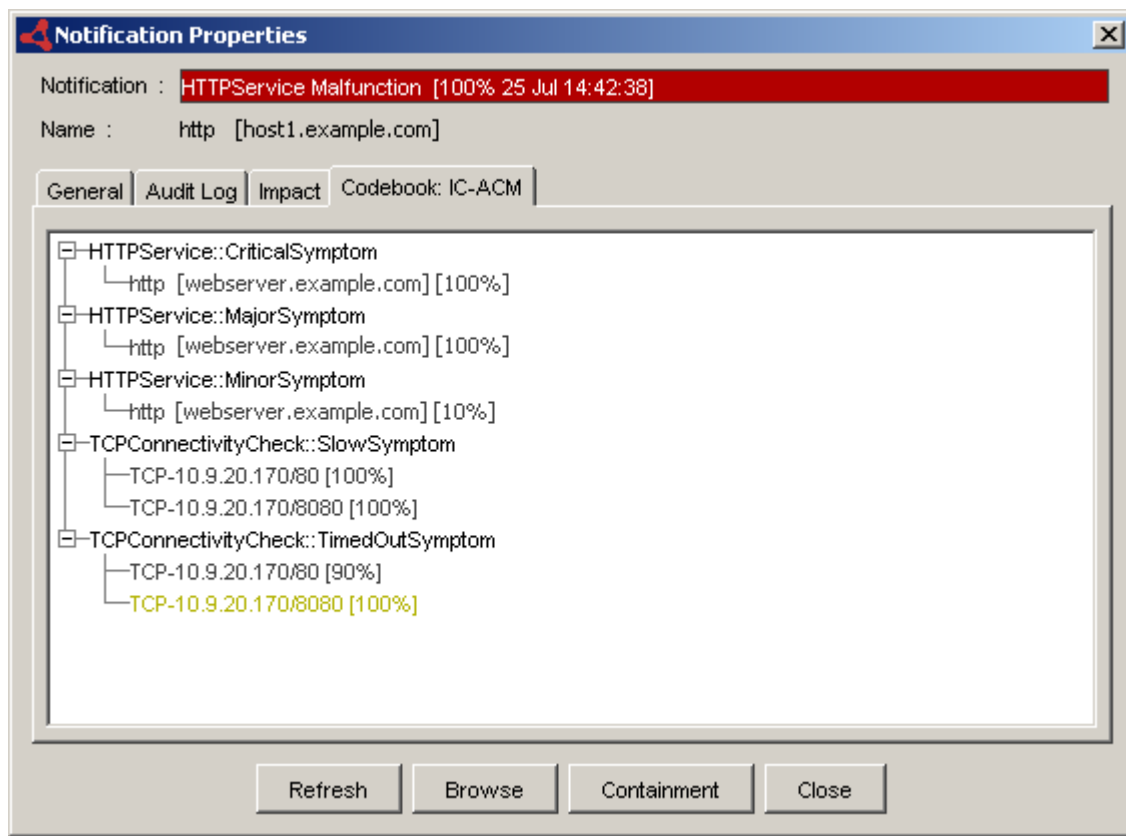


Figure 4: Notifications Properties Of Malfunction Problem

Host Unresponsive

A Host Unresponsive problem indicates that a network or system problem is affecting the system on which the managed application is running.

To diagnose Host Unresponsive in this scenario, Application Connectivity Monitor must receive an UnresponsiveSymptom from IP Availability Manager. Application Connectivity Monitor may also observe TimedOutSymptom or SlowSymptom events for TCP checks sent to the ports used by *HTTPService*.

Web Server Degraded

A Degraded problem indicates that the application is not performing as expected. The application is responding to TCP checks, but not within the expected time period.

To diagnose Degraded in this scenario, Application Connectivity Monitor observes a SlowSymptom event for one of the monitored ports of *HTTPService*.

Two Applications on a Single System

In the following scenario, two applications, *HTTPService* and *SMTPService*, are running on the same system, *host2.example.com*. Application Connectivity Monitor monitors each application with a different TCP check.

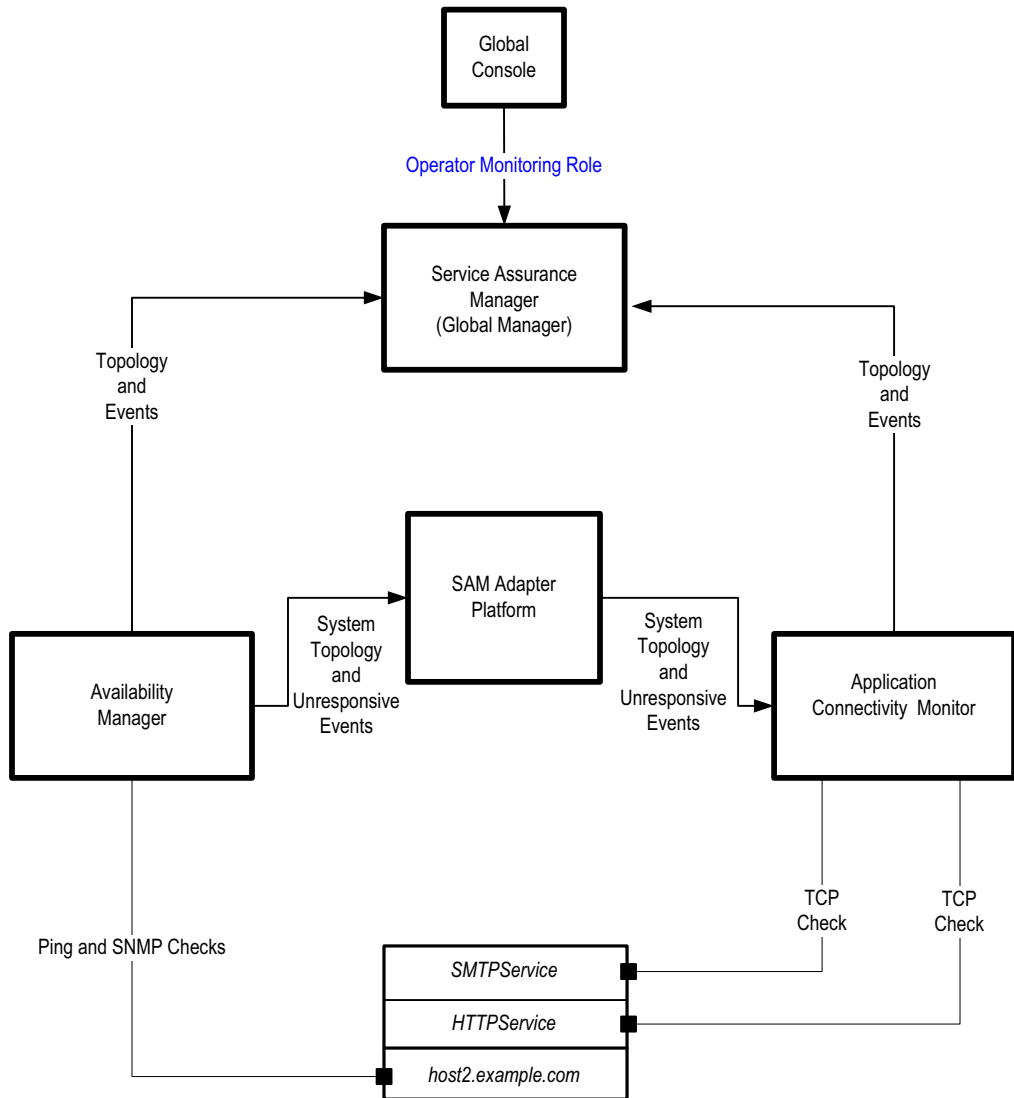


Figure 5: Two Applications Hosted By A Single System

Mail Server Down

A Down problem indicates that the application is not responding to connectivity polls from Application Connectivity Monitor.

To diagnose Mail Server Down in this scenario, Application Connectivity Monitor observes that the TCP checks sent to *SMTPService* time out, resulting in *TimedOutSymptom* events.

The analysis of Mail Server Down is independent of the analysis of other applications running on *host2.example.com*.

Web Server Down

A Down problem indicates that the application is not responding to connectivity polls from Application Connectivity Monitor.

To diagnose Web Server Down in this scenario, Application Connectivity Monitor observes that TCP checks sent to *HTTPService* time out, resulting in *TimedOutSymptom* events.

Figure 6 shows the Notification Properties for the HTTPService Down problem. Application Connectivity Monitor diagnoses the Down problem because it observes the *TimedOutSymptom* event in response to a TCP check.

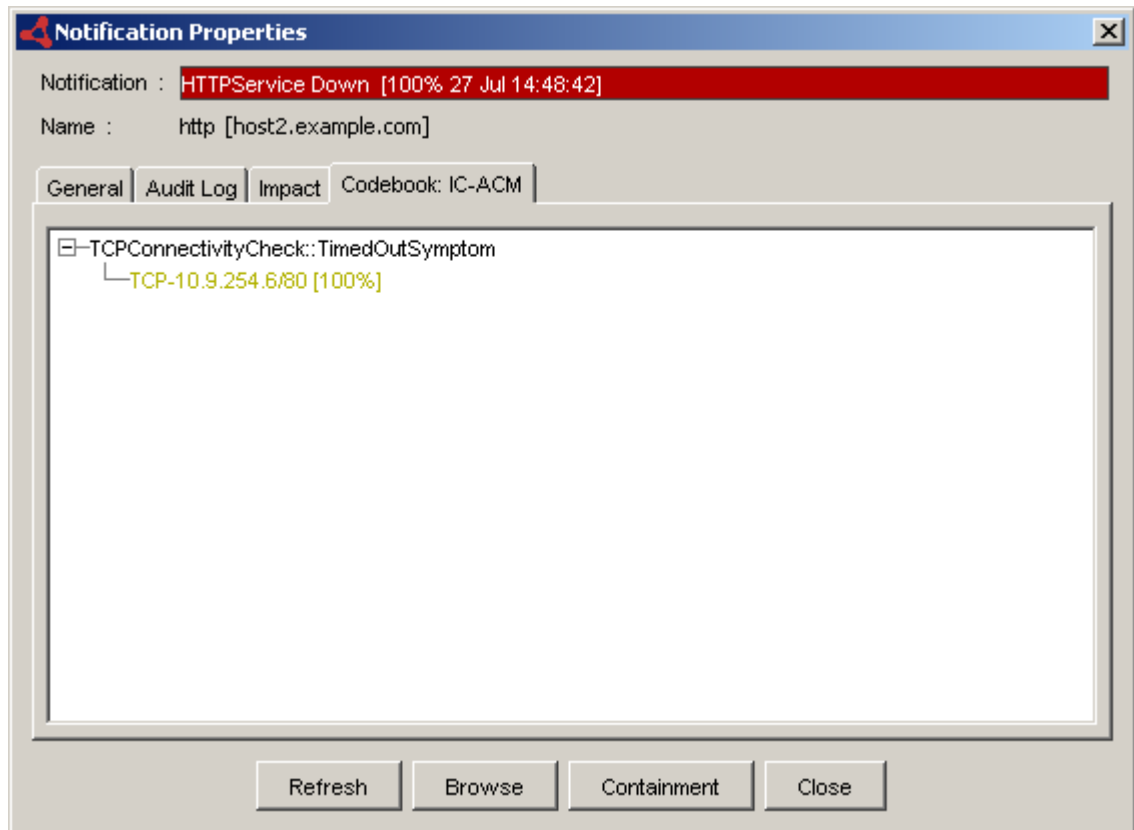


Figure 6: Notification Properties Of Down Problem

Mail Server Degraded

A Degraded problem indicates that the application is not performing as expected. The application is responding to TCP requests, but not within the expected time period.

To diagnose Mail Server Degraded in this scenario, Application Connectivity Monitor observes SlowSymptom events in response to TCP checks sent to *SMTPService*.

The analysis of Mail Server Degraded is independent of the analysis of other applications running on *host2.example.com*.

Web Server Degraded

A Degraded problem indicates that the application is not performing as expected. The application is responding to TCP requests, but not within the expected time period.

To diagnose Web Server Degraded in this scenario, Application Connectivity Monitor observes SlowSymptom events in response to TCP checks sent to *HTTPService*.

Host Unresponsive

A Host Unresponsive problem indicates that a network or system problem is affecting the system on which one or more managed applications are running.

To diagnose Host Unresponsive in this scenario, Application Connectivity Monitor must receive an UnresponsiveSymptom from IP Availability Manager. Application Connectivity Monitor may also observe TimedOutSymptom and SlowSymptom events for TCP connectivity checks sent to *HTTPService* and *SMTPService*.

Figure 7 shows an Applications Map with two applications hosted by *host2.example.com*. The icon representing *host2.example.com* is red, indicating that this system is experiencing a problem. The status of the applications running on *host2.example.com* are affected by this problem, causing their icons to turn yellow.

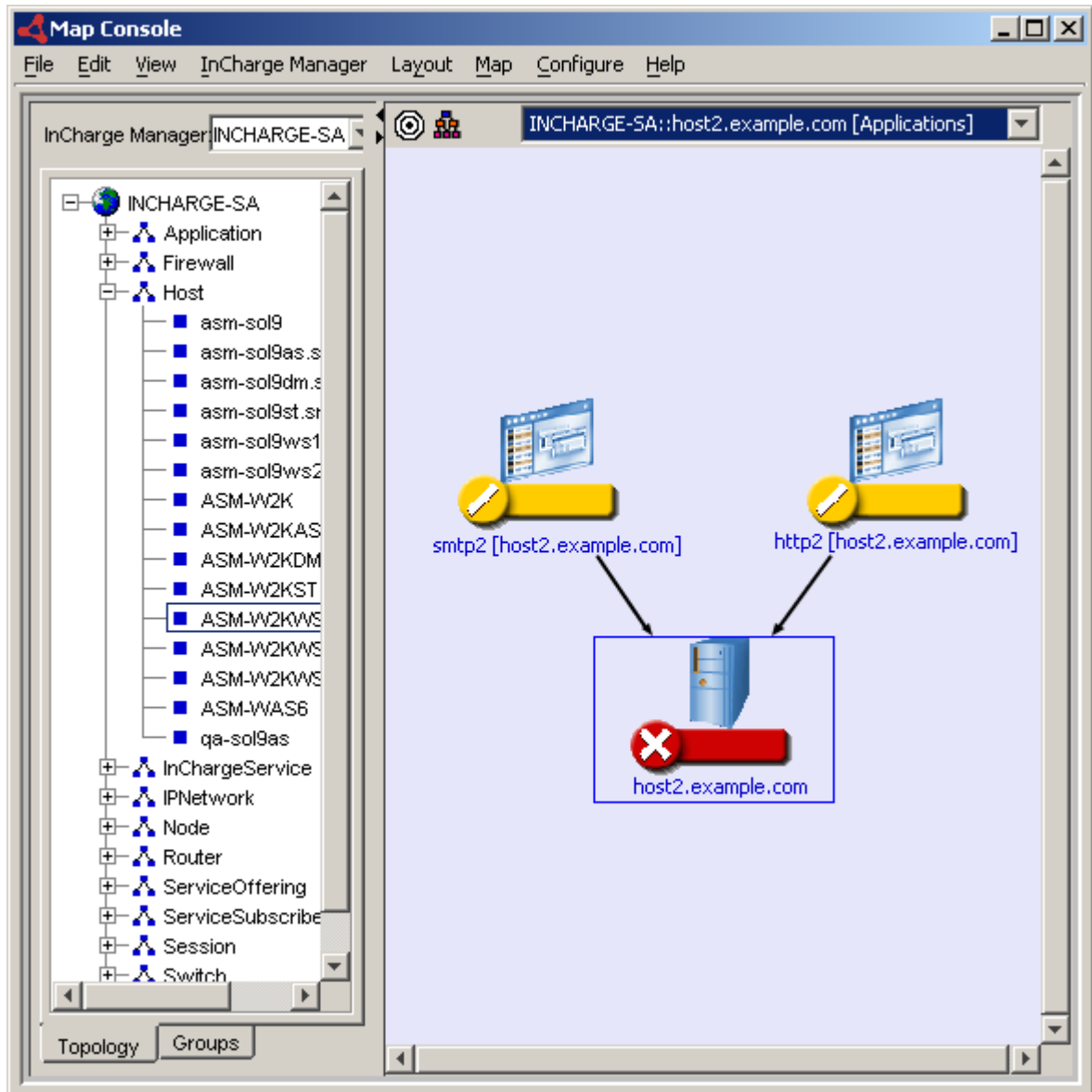


Figure 7: Host Unresponsive Affects Applications

Impact Analysis with Business Impact Manager

When Application Connectivity Monitor is deployed in conjunction with Business Impact Manager, problems diagnosed by ACM for applications and systems result in Impact notifications for ServiceOffering and ServiceSubscriber elements.

In the following scenario, a ServiceOffering, *DNSService*, consists of a DNS server, *DNSServer*, that is hosted by *host3.example.com*. The DNS service, is subscribed to by ACMECorp, a customer of the service provider. In this scenario, Application Connectivity Monitor might diagnose the following problems:

- DNS Server Down
- DNS Server Degraded
- Host Unresponsive

When Application Connectivity Monitor diagnoses one of these problems, Service Assurance Manager notifies an Impact notification for the *DNSService* and ACMECorp elements. The Impact notifications are displayed in the Notification Log, the Business Services Map, and the Impact tab of Notification Properties dialog.

Figure 8 shows a Business Services Map for this scenario. A problem in *DNSServer* propagates to the related ServiceOffering and ServiceSubscriber elements. The severity of the problem in *DNSServer* is reflected in the status of the related business elements.

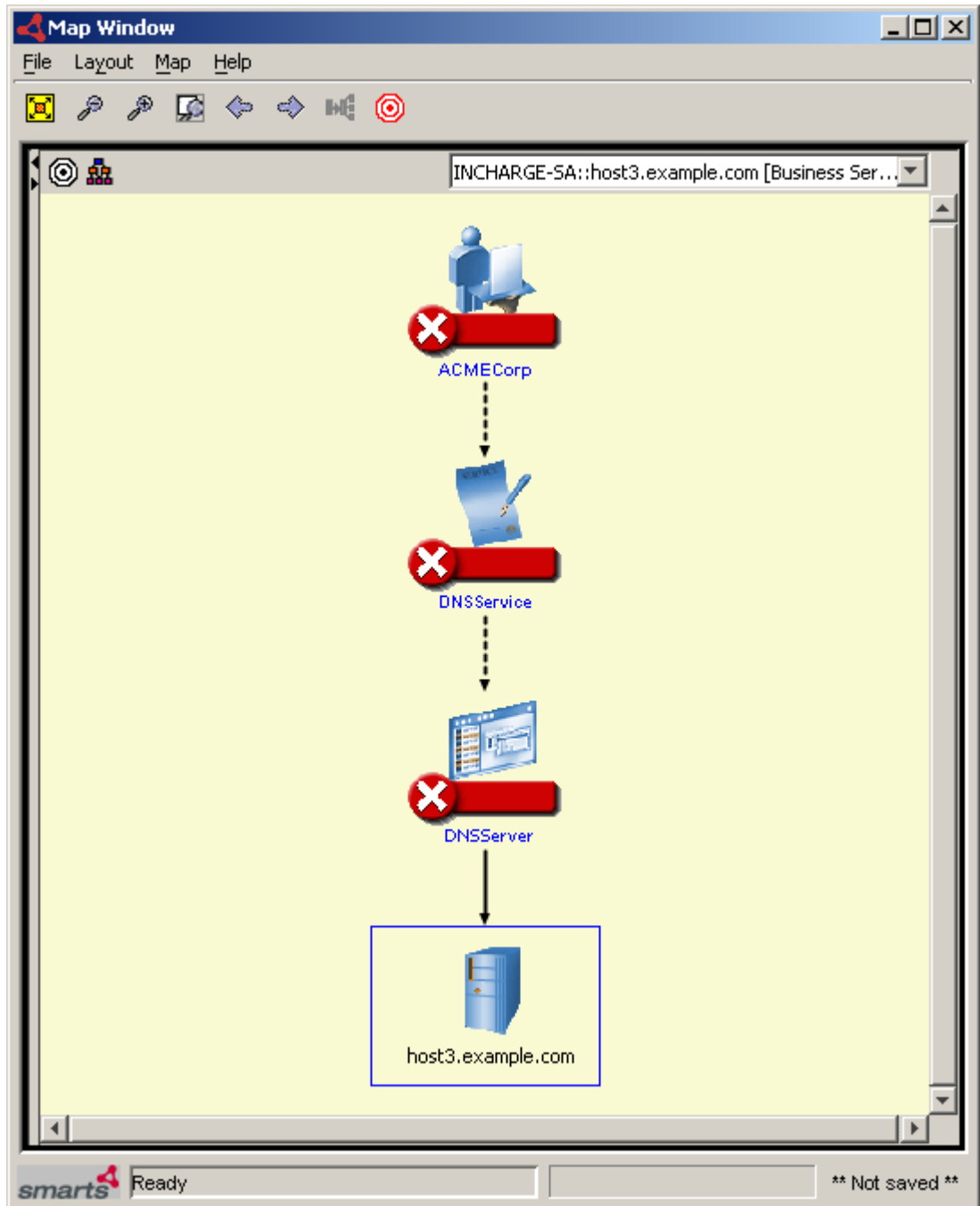


Figure 8: DNSServer Down Propagates to Business Elements

Viewing Analysis Results and Application Topology

This chapter describes using the Global Console to view the analysis provided by Application Connectivity Monitor. This includes a description of the Applications maps, which provide a graphical representation of the application topology.

For information about the Global Console see the *EMC Smarts Service Assurance Manager Operator's Guide*.

Analysis Results Displayed as Notifications

Viewing notifications listed in the Global Console is a common method of obtaining the results of Application Connectivity Monitor's analysis. This section briefly describes how to access the information included with a notification.

About Notifications

Application Connectivity Monitor reports the results of its analysis to Service Assurance Manager. Service Assurance Manager combines the analysis from Application Connectivity Monitor with the analysis from other managed domains and displays this information to users through the Global Console.

When Application Connectivity Monitor diagnoses a problem or detects an abnormal condition, it generates a notification. The Global Console displays notifications in several ways:

- In the tabular format of a Notification Log view.
- In the color state of icons on a map.

Viewing the Properties of a Notification

The Notification Properties dialog box provides detailed information about individual notifications. There are several methods to display the Notification Properties dialog box. The most common method is to double-click on a notification or right-click on a map icon and select Notification Properties in the context menu.

When open, the Notification Properties dialog box displays one or more of the following tabs:

- **General** lists the properties of the notification. Notifications, similar to topology elements, are objects in the repository of the Global Manager. As such, their properties are codified as attributes. A notification's attributes identify the managed element where the problem occurred, the severity of the problem, and the underlying domain, or source, that diagnosed the problem.
- **Audit Log** lists any actions performed on the notification by the system or by a user. Actions can include acknowledging, taking ownership, and invoking a tool.
- **Codebook** lists the symptomatic events used to diagnose a root cause problem. A separate Codebook tab is displayed for each underlying domain that diagnoses the problem as a root cause.
- **Impact** lists managed elements, if any, that are affected by the notification.
- **Details** lists information about the notification from the underlying domain that sent the notification. Information may include attributes of the affected element or threshold values and their related attributes.
- **Caused By** lists the problems or events that are causing the selected notification. This is the inverse of the Codebook tab.
- **Aggregates** lists the component events of a notification.

For more information about the Notification Properties dialog box, see the *EMC Smarts Service Assurance Manager Operator's Guide*.

Viewing Application Topology in Maps

In addition to viewing notifications in a Notification Log, you can also view the results of Application Connectivity Monitor's analysis in a map. A map provides a graphical representation of the topology, and the map icons change color to reflect the status of elements.

Map Terminology

The following terms are used to describe map elements.

Node	A node is the iconic representation of a topological element. Nodes that represent composition, such as Groups, are drawn with a dashed line. A node with a plus sign can be expanded by right-clicking on the icon and selecting Expand Node. A severity icon bar underneath a node is colored to indicate that its state is normal, affected by one or more abnormal conditions, or unknown.
Edge	An edge is a line between two nodes. It can represent a connection or relationship between two nodes or the participation in a logical group.
Hop	The distance between two nodes that are logically or physical connected.

Opening an Applications Map

The Applications maps are available when you attach the Global Console to a Global Manager. Several methods exist to access an Applications map, the most common methods are:

- Open the Map Console from the Global Console (*File > New > Map Console*). In the Topology tab, click on an application-related topology instance to display an Applications map.

You can change the type of map that is displayed by right-clicking the instance and selecting the map type in the context menu.

- Select the Show Map option from any opened console. For example, for a selected application-related notification, the option appears in the Event menu or the context menu if you right-click on it. The option also appears in a context menu if you right-click on an instance in the Topology Browser Console.

- Right-click on a node in a map and select Applications from the submenu.

Topology Elements Displayed in an Application Map

An Applications map displays the topological elements related to the delivery of application services. Such elements may include the systems that host applications, and various types of applications, as shown in Figure 9. In the Map Console, you can select *Map > Map Legend* to see a list of the icons used to represent each type of topological element.

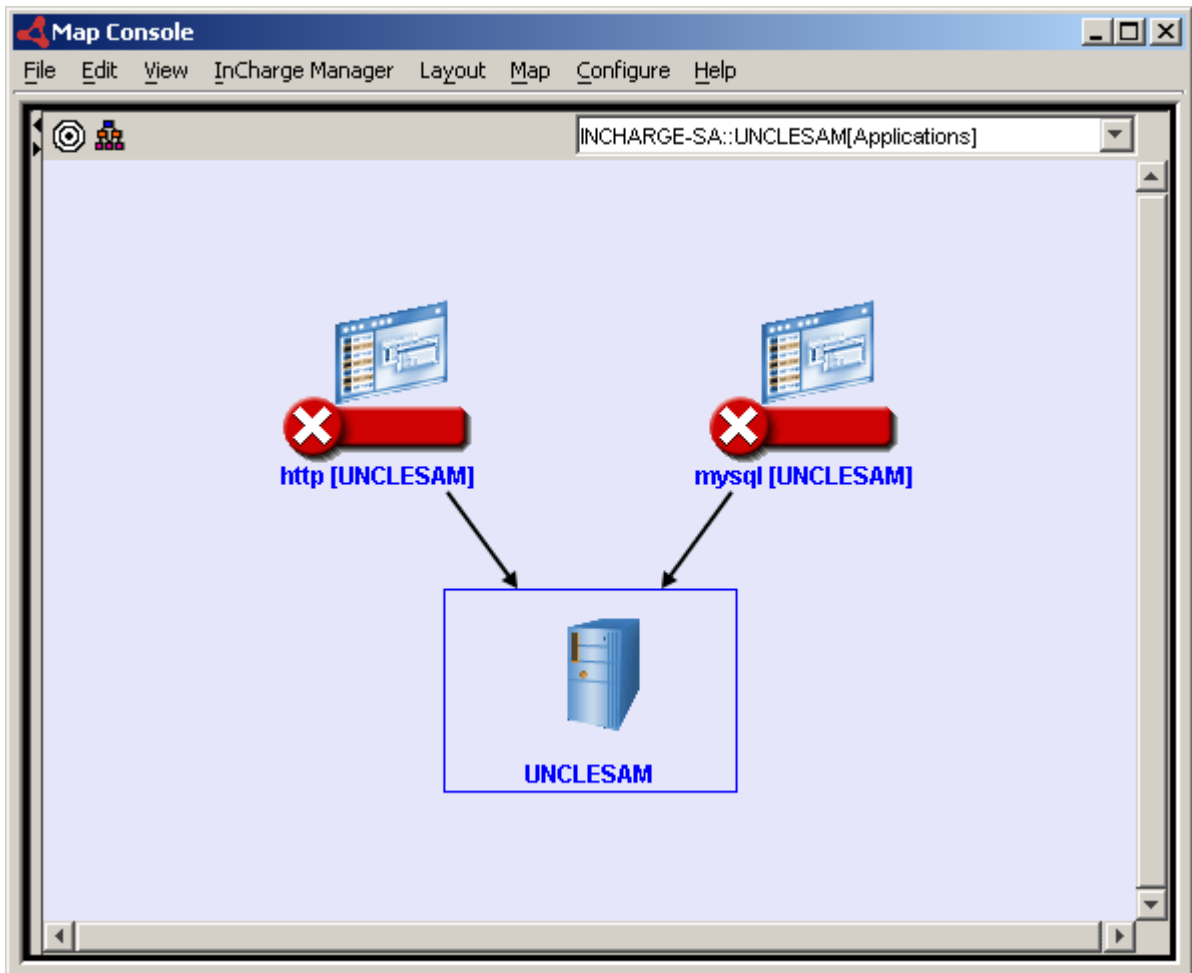


Figure 9: Applications Hosted By System

Index

A

- Aggregates
 - Notification Properties 18
- Application
 - HostedBy relationship 1
- Application maps
 - Opening in Global Console 19
 - Topology elements 20
 - Unresponsive system example 13
- Audit Log
 - Notification Properties 18

B

- BASEDIR vii
- Business Impact Manager 13
- Business Services map 15

C

- Caused By
 - Notification Properties 18
- Codebook
 - Notification Properties 18

D

- Degraded problem 2
- Degraded problem Notification Properties 6
- Details
 - Notification Properties 18
- Down problem 2
- Down problem Notification Properties 11

E

- Edge in application map 19
- Event
 - SlowSymptom 2
 - TimedOutSymptom 2
 - UnresponsiveSymptom 2

G

- General
 - Notification Properties 18

Global Console

- Opening application maps 19
- Viewing notifications 18
- Viewing topology 1

H

- Hop in application map 19
- HostedBy relationship 1

I

- Impact analysis 14
- Impact tab
 - Notification Properties 18
- InCharge Service Assurance Manager 17
- IP Availability Manager
 - UnresponsiveSymptom 2

M

- Malfunction problem 2
- Malfunction problem Notification Properties 8
- Map
 - Edge 19
 - Hop 19
 - Node 19

N

- Node in application map 19
- Notification
 - Properties 18
- Notification Properties
 - Aggregates tab 18
 - Audit Log tab 18
 - Caused By tab 18
 - Codebook tab 18
 - Degraded problem example 6
 - Details tab 18
 - Dialog box 18
 - Down problem example 11
 - General tab 18
 - Impact tab 18
 - Malfunction problem example 8

Notifications

Viewing in Global Console 18

P

Polling

TCPConnectivityCheck 2

R

Root-cause problem

Degraded 2

Down 2

Malfunction 2

System Unresponsive 2

S

ServiceOffering 13

ServiceSubscriber 13

Show Map option 19

SlowSymptom 2

System topology 1

System Unresponsive problem 2

T

TCPConnectivityCheck 2

TimedOutSymptom 2

Topology

Application with one check 4

Application with two checks 7

Systems 1

Two applications on system 10

U

Unresponsive system map example 13

UnresponsiveSystem 2