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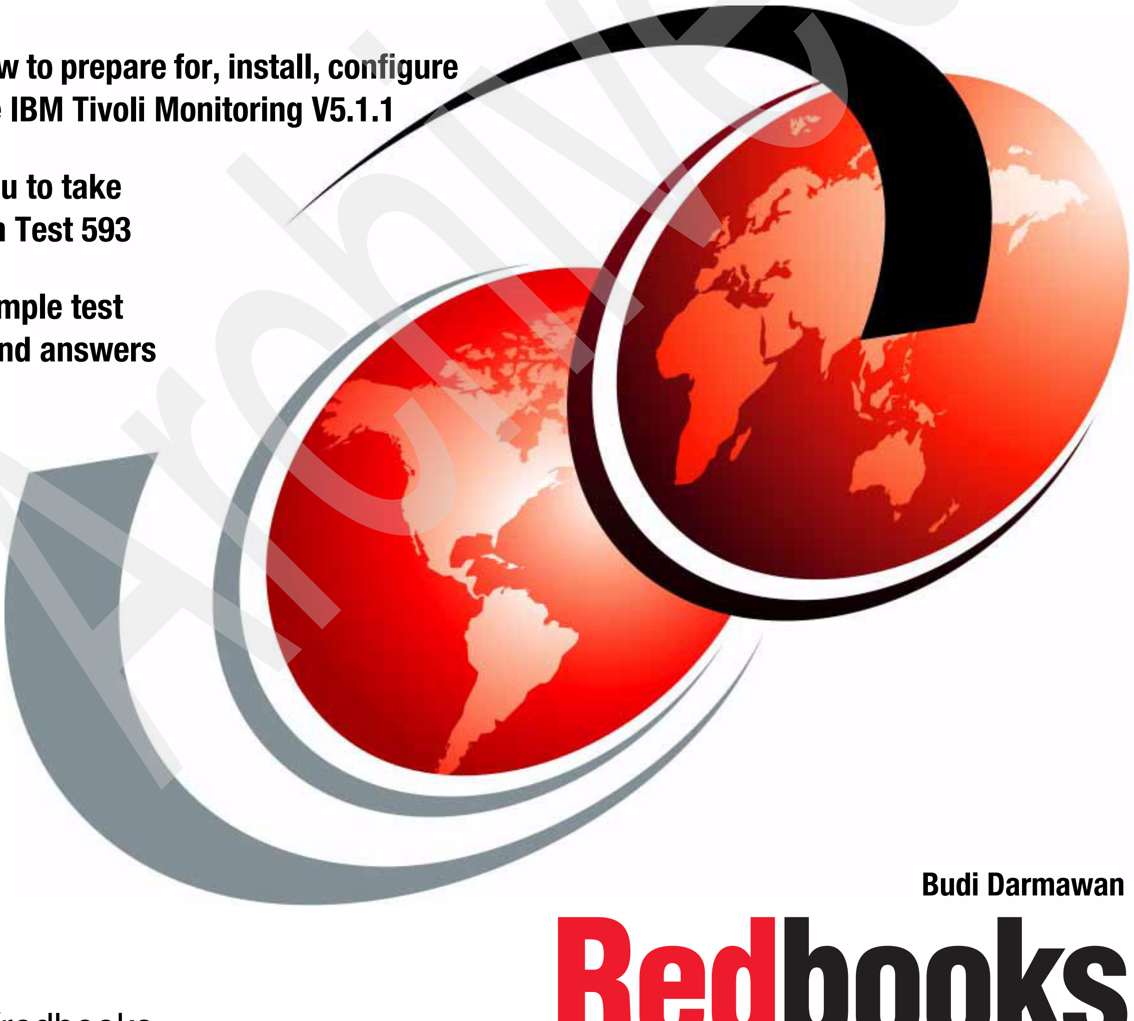
IBM Tivoli Monitoring V5.1.1 Implementation Certification Study Guide

Explains how to prepare for, install, configure and operate IBM Tivoli Monitoring V5.1.1

Prepares you to take Certification Test 593

Includes sample test questions and answers



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IBM Tivoli Monitoring V5.1.1 Implementation Certification Study Guide

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Note: Before using this information and the product it supports, read the information in “Notices” on page vii.

First Edition (May 2005)

This edition applies to Version 5, Release 1, Modification 1 of IBM Tivoli Monitoring (product number 5698-EMN).

Contents

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Preface

This IBM® Redbook prepares you with the necessary knowledge to help you complete Certification Test 593: *IBM Tivoli Monitoring V5.1.1 Implementation*. This test leads to certification for Tivoli® Certified Deployment Professional for IBM Tivoli Monitoring.

The scope of the certification tests your ability to demonstrate the following areas of expertise required for IBM Tivoli Monitoring V5.1.1:

- Prerequisite knowledge for IBM Tivoli Monitoring
- Planning the implementation
- Installation prerequisites
- The installation process
- Configuration of the IBM Tivoli Monitoring server
- Problem determination
- General operations
- IBM Tivoli Monitoring Workbench

You can find the information that you need about these topics all in this IBM Redbook. Plus, you have a chance to test your knowledge using the sample questions at the back of the book.

The team that wrote this redbook

This redbook was produced by a team of specialists from around the world working at the International Technical Support Organization (ITSO), Austin Center.

Budi Darmawan is a Tivoli Project Leader at the ITSO, Austin Center. He writes extensively and teaches IBM classes worldwide on all areas of systems management. Before joining the ITSO six years ago, Budi worked in Integrated Technology Services, IBM Indonesia as lead implementer and solution architect. He currently specializes in general systems management area, especially in availability and operation management and business service management.

Thanks to the following people for their contributions to this project:

- Authors of *IBM Tivoli Monitoring Version 5.1: Advanced Resource Monitoring*, SG24-5519
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Familiarizing yourself with this guide

This IBM Redbook serves as a guide to prepare you for Certification Test 593: *IBM Tivoli Monitoring V5.1.1 Implementation*. This chapter explains what the test covers and its objectives. It also points you to other resources to help you prepare for the test.

1.1 Certification

This test is part of the certification for:

- IBM Certified Advanced Deployment Professional – Tivoli Enterprise™ Management Solution 2004
- IBM Certified Deployment Professional – IBM Tivoli Monitoring 5.1.1

The following sections describe these certifications.

1.1.1 Tivoli Enterprise Management Solution: Advanced deployment

A person who has earned IBM Certified Advanced Deployment Professional – Tivoli Enterprise Management Solutions 2004 certification has demonstrated a higher level of implementation knowledge and skill both in breadth and in depth in the IBM Tivoli Enterprise Management solutions area. To attain the IBM Certified Advanced Deployment Professional – Tivoli Enterprise Management Solutions 2004 certification, candidates must pass five required tests.

The core requirements for certification include the following three tests:

- Test 593: *IBM Tivoli Monitoring 5.1.1 Implementation*
- Test 594: *IBM Tivoli Enterprise Console® V3.9 Implementation*
- Test 786: *IBM Tivoli Configuration Manager V4.2 Implementation*

This certification also requires two of the following tests:

- Test 340: *WebSphere® Application Server V5.0, Basic Administration*
- Test 701: *DB2® UDB V8.1 for Linux®, UNIX®, and Windows® Database Administration*
- Test 773: *IBM Tivoli Data Warehouse V1.2 Implementation*
- Test 778: *IBM Tivoli License Manager V2.1 Implementation*
- Test 779: *IBM Tivoli Workload Scheduler V8.2 Implementation*
- Test 798: *IBM Tivoli Monitoring for Transaction Performance V5.2 Implementation*

1.1.2 IBM Tivoli Monitoring 5.1.1: Deployment

An IBM Certified Deployment Professional – Tivoli Monitoring V5.1.1 is a technical professional who is responsible for planning, installation, configuration, operations, administration, and maintenance of an IBM Tivoli Monitoring V5.1.1 solution. This individual is expected to perform these tasks with limited assistance from peers, product documentation, and support resources.

To attain the IBM Certified Deployment Professional – Tivoli Monitoring V5.1.1 certification, candidates must pass one test.

The *required prerequisites* for the test are that you must have:

- A strong working knowledge of Tivoli Framework V3.7x or higher
- A basic understanding of the operating system and networking concepts
- A working knowledge of TCP/IP
- A basic understanding of JavaScript

Additional recommended prerequisites for the test include having:

- A working knowledge of Java™ Runtime Environment (JRE), JavaServer Pages (JSP), and Extensible Markup Language (XML)
- A basic understanding of Common Information Model (CIM) and Microsoft® Windows Management Instrumentation (WMI)
- A working knowledge of shell and Perl scripting
- A basic understanding of Web servers
- A basic understanding of Java scripting and Visual Basic or equivalent programming experience
- A basic understanding of database concepts

1.2 Test objectives

This section explains the objectives of the tests as well as the required knowledge that you need to pass the test questions. Each objective is discussed in more detail in the subsequent chapters of this book.

1.2.1 Prerequisite knowledge for IBM Tivoli Monitoring V5.1.1

Given a client requirement to install IBM Tivoli Monitoring V5.1.1, you must demonstrate your knowledge and understanding of the fundamentals of deploying and maintaining IBM Tivoli Monitoring V5.1.1. This knowledge requires an emphasis on a basic understanding of Distributed Management Task Force (DMTF), CIM, Managed Object Format (MOF), Web-Based Enterprise Management (WBEM), WMI, Java, JavaBeans, WebSphere, Visual Basic, JavaScript, database concepts, and Tivoli Framework 3.7x. Chapter 2, “Basic concepts for IBM Tivoli Monitoring V5.1.1” on page 15, discusses this objective further.

1.2.2 Planning the implementation of IBM Tivoli Monitoring V5.1.1

This objective relates to items that are needed to help you decide on various configuration options before you actually install and deploy IBM Tivoli Monitoring V5.1.1. Chapter 3, “Planning for IBM Tivoli Monitoring V5.1.1 deployment” on page 39, provides a more detailed discussion about this objective. This objective requires you to know about the following items:

- Given a client’s current server specifications, application environment, and network diagrams, you must be able to determine the client’s topology to identify their requirements, resources to be monitored, and Tivoli integration points such as TEC, Tivoli Business Systems Manager (TBSM), and TEDW. Specifically, you must be able to perform the following steps:

  a. Identify machines to be managed.
  b. Identify business processes.
  c. Identify applications to be managed.
  d. Identify Tivoli integration points.

- Given an architected Tivoli solution, you must be able to perform an analysis of the existing environment to determine the necessary IBM Tivoli Monitoring V5.1.1 installation methods and hardware requirements to implement the solution. Specifically, you must be able to analyze the existing environment.

- Given the IBM Tivoli Monitoring V5.1.1 documentation, you must be able to plan the deployment of the Health Console to create a deployment plan and determine the hardware requirements. Specifically, you must be able to:

  a. Determine Health Console location and if other Web servers exist.
  b. Determine ports to use.
  c. Determine CPU and disk space.
  d. Define Tivoli Framework managed node.

- Given the network and database environment, you must be able to determine the TEDW data collection requirements to create a deployment plan and determine the database size and hardware requirements. Specifically, you must be able to:

  a. Define the RDBMS interface module (RIM) location.
  b. Determine the amount of data.

- Given a list of resources to be managed, you must be able to determine the IBM Tivoli Monitoring V5.1.1 Workbench development requirements to obtain a list of installation destinations and hardware requirements. Specifically, you must be able to:

  a. Determine Workbench workstations.
  b. List framework requirements.
  c. Determine software levels.

1.2.3 Installation prerequisites of IBM Tivoli Monitoring V5.1.1

This objective relates to the prerequisites that must be in place before you install IBM Tivoli Monitoring V5.1.1 and how to check them. Chapter 3, "Planning for IBM Tivoli Monitoring V5.1.1 deployment" on page 39, explains this objective further. This objective requires you to know about the following items:

- Given an existing Tivoli environment and IBM Tivoli Monitoring V5.1.1 requirements, you must be able to validate the managed node prerequisites so that you can determine a list of hardware and software upgrades. Specifically, you must be able to:

  a. Compare hardware requirements with existing hardware.
  b. Compare operating system software requirements with existing software.
  c. Compare framework software requirements.
  d. Verify framework roles for IBM Tivoli Monitoring V5.1.1 installation.
  e. Validate Structured Query Language (SQL) client levels for the data collection database.
  f. Validate SQL client access to the data collection database.

- Given an existing Tivoli environment and IBM Tivoli Monitoring V5.1.1 requirements, you must be able to validate the endpoint prerequisites so that you can determine a list of hardware and software upgrades. Specifically, you must be able to:

  a. Verify the JRE requirements.
  b. Verify WMI, Open Database Connectivity (ODBC), and CScript requirements.
  c. Verify Simple Network Management Protocol (SNMP) and Diskperf requirements.
  d. Verify operating system levels.
  e. Validate the LCF levels.

- Given IBM Tivoli Monitoring V5.1.1 Health Console requirements, you must be able to validate the Health Console prerequisites so that you can determine a list of hardware and software upgrades. Specifically, you must be able to:

  a. Verify that Internet Explorer 6.0 or later is installed on a client.
  b. Verify the operating system levels.
  c. Verify network connectivity to the managed node.
  d. Verify if there are other Web servers.
  e. If WebSphere Application Server exists, verify the version.

- Given the IBM Tivoli Monitoring V5.1.1 Workbench requirements, you must be able to validate the Workbench prerequisites so that you can determine a list of hardware and software upgrades. Specifically, you must be able to:

  a. Verify the operating system levels.
  b. Verify that WMI is installed.

1.2.4 Installation of IBM Tivoli Monitoring V5.1.1

This objective relates to installing IBM Tivoli Monitoring V5.1.1. Chapter 4, "Installing IBM Tivoli Monitoring V5.1.1" on page 49, offers a more detailed discussion about this objective.

- Given the IBM Tivoli Monitoring V5.1.1 media and an existing Distributed Monitoring Advanced Edition V4.1 or IBM Tivoli Monitoring V5.1.1 installation, you must be able to upgrade to the IBM Tivoli Monitoring V5.1.1 core components. Specifically, you must be able to:

  a. Determine which components to install.
  b. List all upgrade scenarios.
  c. Determine the appropriate installation methods (Software Installation Service (SIS), command line interface (CLI), etc.).
  d. Perform the upgrade.

- Given the IBM Tivoli Monitoring V5.1.1 media and an existing Tivoli environment, you must be able to install the IBM Tivoli Monitoring V5.1.1 core components. Specifically, you must be able to:

  a. Determine which components to install.
  b. Define the installation method (SIS, CLI, etc.).
  c. Perform the installation.

- Given a list of software prerequisites for IBM Tivoli Monitoring V5.1.1 endpoints, you must be able to install and configure them to support operation of the IBM Tivoli Monitoring V5.1.1 engine. Specifically, you must be able to:

  a. Determine the source for ODBC, WMI, CScript, and JRE installation images.
  b. Retrieve ODBC, WMI, and CScript installation images.
  c. Install the endpoint prerequisites.
  d. Verify the endpoint prerequisite installation.
  e. Use DMLinkJRE to define the JRE location.

- Given the IBM Tivoli Monitoring V5.1.1 Web Health Console media, install the Health Console components. Specifically, you must be able to:

  a. Determine installation method.
  b. Install Health Console.
  c. Verify the installation of Health Console.

- Given the IBM Tivoli Monitoring V5.1.1 Workbench media, you must be able to install Workbench.

1.2.5 Configuration of the IBM Tivoli Monitoring server

This objective relates to actions to perform so you can configure the IBM Tivoli Monitoring server and enable the interfaces for further monitoring actions. Chapter 5, “Configuring IBM Tivoli Monitoring V5.1.1 server” on page 59, offers a more detailed discussion about this objective.

- Given an existing Tivoli environment, you must be able to assign the appropriate roles and create the policy regions and profile manager to support IBM Tivoli Monitoring V5.1.1. Specifically, you must be able to:

  a. Configure the administrator roles.
  b. Create the policy regions.
  c. Configure the policy regions (managed resources, “tmw2k”).
  d. Create the profile managers.

- Given the client’s monitoring and escalation requirements, you must be able to configure IBM Tivoli Monitoring V5.1.1 profiles to support the forwarding of events to enterprise applications. Specifically, you must be able to:

  a. Configure the default distribution options.
  b. Enable TEC forwarding and TBSM.

- Given an IBM Tivoli Monitoring V5.1.1 profile, you must be able to add and configure resource models so that resource models may be distributed. Specifically, you must be able to:

  a. Enable Diskperf.
  b. Install SNMP and Network Monitoring Agent if required.
  c. Add the required resource models.

- Given a list of gateways and assigned endpoints, you must be able to perform the steps to allow data collection. Specifically, you must be able to:

  a. Create IBM Tivoli Monitoring V5.1.1 DB.
  b. Create and configure RIM.
  c. Configure the collection interval.
  d. Define the RIM object to use.

- Given a list of gateways and assigned endpoints, you must be able to configure and start the heartbeat function to monitor IBM Tivoli Monitoring V5.1.1 functionality on the endpoint. Specifically, you must be able to:

  a. Configure the heartbeat interval.
  b. View the heartbeat interval.
  c. Configure heartbeat TEC forwarding.
  d. Configure the heartbeat restart.

- Given a list of gateways and assigned endpoints, you must be able to configure the TBSM common listener to send data to TBSM. Specifically, you must be able to define the TBSM server to the gateway.

- Given a list of resource models and a working TEC environment, you must be able to configure TEC so that it can receive events from IBM Tivoli Monitoring V5.1.1. Specifically, you must be able to:

  a. Load the TEC rules.
  b. Load the TEC classes.
  c. Deploy ACF to the gateway.
  d. Define the clearing event.

1.2.6 Problem determination for IBM Tivoli Monitoring V5.1.1

This objective relates to troubleshooting and the problem determination action that you can perform on the server, gateway, and endpoint for IBM Tivoli Monitoring V5.1.1 problems. Refer to Chapter 6, “Problem determination for IBM Tivoli Monitoring V5.1.1” on page 83, for details about this objective.

- Given an IBM Tivoli Monitoring V5.1.1 profile distribution problem, you must be able to analyze the problem to resolve the issue or provide adequate details to Tivoli Support. Specifically, you must be able to:

  a. Adjust the tracing or logging levels.
  b. View the trace or log files.
  c. Use Mdist2 to track and diagnose the distribution issues.
  d. Collect the endpoint logs.

- Given an IBM Tivoli Monitoring V5.1.1 engine problem, you must be able to analyze the problem to resolve the issue or provide adequate details to Tivoli Support. Specifically, you must be able to:

  a. View the log or trace files.
  b. Adjust the trace or logging levels.
  c. Stop, start, clear, or uninstall the IBM Tivoli Monitoring V5.1.1 engine.
  d. Collect the endpoint logs.

- Given an IBM Tivoli Monitoring V5.1.1 resource model problem, you must be able to analyze the problem to resolve the issue or provide adequate details to Tivoli Support. Specifically, you must be able to:

  a. View the log or trace files.
  b. Adjust the tracing or logging levels.
  c. Collect the endpoint logs.
  d. Clear, stop, or start the resource model or profile.

- Given an IBM Tivoli Monitoring V5.1.1 data collection problem, you must be able to analyze the problem to resolve the issue or provide adequate details to Tivoli Support. Specifically, you must be able to:

  a. View the log or trace files.
  b. Adjust the tracing or logging levels.
  c. Use RIM tracing to diagnose database issues.

- Given an IBM Tivoli Monitoring V5.1.1 Health Console problem, you must be able to analyze the problem to resolve the issue or provide adequate details to Tivoli Support. Specifically, you must be able to:
  a. View the log or trace files.
  b. Adjust the tracing or logging levels.

1.2.7 Operations of IBM Tivoli Monitoring V5.1.1

This objective relates to profile and monitoring management of IBM Tivoli Monitoring V5.1.1 and its various facilities including using the Web Health Console. Chapter 7, "Operating IBM Tivoli Monitoring V5.1.1" on page 101, provides greater detail about this objective.

- Given an IBM Tivoli Monitoring V5.1.1 profile, you must be able to perform a distribution and monitor its progress. Specifically, you must be able to:
  a. Distribute a profile.
  b. Monitor the distribution using MDist2.
  c. Manage the distribution using MDist2.
- Given an existing IBM Tivoli Monitoring V5.1.1 environment, you must be able to use the CLI to manage the IBM Tivoli Monitoring V5.1.1 engine. Specifically, you must be able to:
  a. Use the **wdmlseng** command to check the endpoint.
  b. Use the **wdmeng** command to start or stop the resource models.
  c. Use the **wdmcmd** command to start or stop the engine.
- Given an existing IBM Tivoli Monitoring V5.1.1 environment, you must be able to use the CLI to manage the IBM Tivoli Monitoring V5.1.1 gateway processes. Specifically, you must be able to:
  a. Display endpoints uploaded to TBSM.
  b. Perform the TBSM upload.
  c. Use the **wdmmn** command to start or stop the gateway processes.
  d. Use the **wdmmncache** command to list or clear the registered endpoints.
- Given a successful implementation of the IBM Tivoli Monitoring V5.1.1 Web Health Console, you must be able to use the Health Console to view historical data, determine endpoint health, and administer resource models. Specifically, you must be able to:
  a. Log on to DMWHC from an Internet browser.
  b. Add or edit the endpoint list.
  c. Browse by endpoint.
  d. Browse by resource model.
  e. Stop or start the resource model.
  f. View historical date or in real time.
  g. Change the graph type.

- Given an IBM Tivoli Monitoring V5.1.1 profile, you must be able use the CLI to maintain and modify the profile. Specifically, you must be able to:
  a. Use the **wdmdumpprf** and **wdmloadprf** commands to maintain IBM Tivoli Monitoring V5.1.1 profiles.
  b. Use the **wdmeditprf** command to maintain IBM Tivoli Monitoring V5.1.1 profiles.
- Given an IBM Tivoli Monitoring V5.1.1 resource model, you must be able to use the CLI to add or remove the resource model from the IBM Tivoli Monitoring V5.1.1 environment. Specifically, you must be able to use the **wdmrm** command to load and manage resource models.

1.2.8 IBM Tivoli Monitoring Workbench

This objective relates to the usage of IBM Tivoli Monitoring V5.1.1 Workbench that allows you to create and modify the resource model. Chapter 8, "IBM Tivoli Monitoring Workbench" on page 125, discusses this objective in more detail.

- Given a set of monitoring requirements, you must be able to use the IBM Tivoli Monitoring V5.1.1 Workbench to create or customize a resource model. Specifically, you must be able to:
  a. Understand the components of a resource model.
  b. Build a resource model using Workbench.
- Given an existing DM Classic V3.7 environment, you must be able to perform the steps necessary to migrate the monitors to IBM Tivoli Monitoring V5.1.1 resource models. Specifically, you must be able to:
  a. Use SentryAnalyser to create a mapping report.
  b. Extract the DM Classic V3.7 collection definition.
  c. Create a resource model to encapsulate the DM Classic V3.7 probe.

1.3 Resources for preparation

Several courses and publications are offered to help you prepare for the certification tests. Before you take a certification test, we recommend that you take a course, although this is not required. If you want to purchase Web-based training courses or are unable to locate a Web-based course or classroom course at the time and location you desire, contact one of our delivery management teams:

- Americas: `tivamedu@us.ibm.com`
- EMEA: `tived@uk.ibm.com`
- AP: `tivtrainingap@au1.ibm.com`

1.3.1 Courses

Course names, course numbers, or both vary depending on the education delivery arm used in each geography. Refer to the Tivoli software education Web site to find the appropriate course and education delivery vendor for each geography:

`http://www-306.ibm.com/software/tivoli/education/`

For general training information, see the IBM IT Training Web site at:

`http://ibm.com/training`

Note: Course offerings are continuously added and updated. If you do not see the course or courses that are listed in the following sections for your geography, contact the delivery management team by e-mail as specified in the previous section.

Course IBM Tivoli Monitoring 5.1

IBM Tivoli Monitoring is an intelligent tool that provides IT administrators the capability to closely monitor the status and performance of mission-critical distributed applications and computing resources. This course provides the knowledge and skills needed to install, configure, operate, customize, and troubleshoot IBM Tivoli Monitoring 5.1.

Course duration	12 hours (self paced)
Course number	Course numbers vary depending on the education delivery arm used in each geography.
Geo education page	Worldwide schedules available at the Tivoli software education site.

Note: This course is *not* approved for IBM PartnerWorld® You-Pass, We-Pay.

Course IBM Tivoli Monitoring 5.1

IBM Tivoli Monitoring is an efficient, reliable, automated tool that provides IT administrators the capabilities to closely monitor the status and performance of mission-critical distributed applications and computing resources. Gain the knowledge and skills needed to configure, operate, customize, and troubleshoot IBM Tivoli Monitoring. Included are multiple opportunities for you to practice your skills in a lab environment. A series of carefully constructed hands-on activities allows you to immediately reinforce the important lessons in this course.

Course duration	2 days
Course number	(TM230) Course numbers vary depending on the education delivery arm used in each geography.
Geo education page	Worldwide schedules are available at the Tivoli software education Web site.

Note: This course is approved for IBM PartnerWorld You-Pass, We-Pay.

1.3.2 Publications

Before you take Certification Test 593: *IBM Tivoli Monitoring V5.1.1 Implementation*, we recommend that you read the IBM Tivoli Monitoring library manuals and IBM Redbooks listed in the following sections. You may order these publications using any of the following methods:

- Accessing IBM Publications Center on the Web at:

  `http://www.ibm.com/shop/publications/order`

- Calling IBM Direct Publications at 1-800-879-2755 (U.S.) 1-800-426-4968 (Canada)
- Purchasing from any non-IBM bookstore

For additional ordering information, see "Related publications" on page 161.

IBM Tivoli Monitoring product manuals

You may want to refer to the following manuals:

- *IBM Tivoli Monitoring Release Notes Version 5.1.1,* GI10-5797
- *IBM Tivoli Monitoring Resource Model Reference Version 5.1,* SH19-4570
- *IBM Tivoli Monitoring User's Guide Version 5.1.1*, SH19-4569
- *IBM Tivoli Monitoring Workbench User's Guide Version 5.1.1*, SH19-4571

IBM Tivoli Monitoring Redbooks

Consult the following IBM Redbooks regarding IBM Tivoli Monitoring:

- *IBM Tivoli Monitoring Version 5.1.1 Creating Resource Models and Providers*, SG24-6900

  This IBM Redbook focuses on using the IBM Tivoli Monitoring Workbench to build resource models that use existing ILT providers and custom ILT Java providers. You learn how to create a custom Instrumentation Library Type (ILT) provider using the supplied Java templates to examine and provide data to IBM Tivoli Monitoring for analysis within the resource model that you created through the IBM Tivoli Monitoring Workbench.

  The IBM Tivoli Monitoring Workbench is used to develop, debug, and package resource models for IBM Tivoli Monitoring. You learn how to use the step-by-step wizards provided by the IBM Tivoli Monitoring Workbench to create resource models to monitor any number of your IT resources, including operating systems, databases, hardware, and networking resources and applications.

  In addition, you learn about the CIM used to store metrics and how to collect data stored in a CIM format. Upon completion, you will be able to create, test, and deploy monitoring solutions quickly and efficiently to create an autonomic environment.

- *IBM Tivoli Monitoring Version 5.1: Advanced Resource Monitoring*, SG24-5519

  This redbook updates and unifies both Tivoli Distributed Monitoring (Advanced Edition) 4.1 Redbooks into one redbook. This includes both monitoring and Workbench software. This redbook proves invaluable to Tivoli system administrators who are migrating from earlier releases of Tivoli Distributed Monitoring. Various examples of creating resource models to replace custom monitors are included.

2

Basic concepts for IBM Tivoli Monitoring V5.1.1

This chapter discusses the necessary concepts of IBM Tivoli Monitoring V5.1.1. It provides the prerequisite and fundamental knowledge that you need to deploy and maintain IBM Tivoli Monitoring V5.1.1.

2.1 Desktop Management Task Force

The Distributed Management Task Force, Inc. (DMTF) provides systems management specifications for the standardization of managing an IT environment. It provides industry standards for systems management of back-office environments and Web-services based environments.

The standards are platform-independent and not aligned to a specific technology implementation. They include information models, control protocols, and management services specifications.

For more information about DMTF, see their Web site at:

`http://www.dmtf.org`

The following sections provide some specifications from DMTF that are used by IBM Tivoli Monitoring V5.1.1.

2.1.1 Common Information Model standards

The Common Information Model (CIM) defines the format of system management information. It includes a specification about how the information should be written. And it includes a base data structure (schema) for what should be defined.

The structure is extensible for any implementation-specific information as indicated in the specification. This CIM-based common definition allows different products and platforms to exchange management information seamlessly.

2.1.2 Managed Object Format

Managed Object Format (MOF) is the format for CIM-based information. It is based on the Interface Definition Language (IDL) from the Object Management Group. This allows for the definition of object classes and instances in plain text format to provide readability for both the human reader and computer parsing. MOF-based files can be edited by any text editor.

2.1.3 Web-Based Enterprise Management initiative

Web-Based Enterprise Management (WBEM) extends systems management to include Web-based management. Since this is a standard developed by DMTF, it is primarily based on the CIM data model.

The WBEM provides additional specification for XML encoding for CIM, called *xmlCIM*. And it provides specification for transporting the CIM information over

HTTP. The xmlCIM specification defines the XML elements in a standard Document Type Definition (DTD) format. It represents CIM classes and instances, not in MOF format, but XML. The XML format allows easier transport over HTTP because it is a natural extension to the HTML format.

2.2 Windows Management Instrumentation

Microsoft implemented WBEM on Microsoft Windows platform in Windows Management Instrumentation (WMI). As we discuss in 2.1, “Desktop Management Task Force” on page 16, WMI uses CIM as an industry standard for management information. WMI allows the automation of management tasks on a Windows-based platform.

Currently different versions of Windows have different options of WMI installation, such as:

- Windows Server 2003: WMI is preinstalled.
- Windows XP: WMI is preinstalled.
- Windows Me: WMI is preinstalled.
- Windows 2000: WMI is preinstalled.
- Windows NT 4.0 SP4: WMI can be installed using Add/Remove Windows components in Control Panel as a WBEM installation option.
- Windows 95 and 98: WMI Core 1.5 can be downloaded from:

  `http://download.microsoft.com/download/platformsdk/wmicore/1.5/W9XNT4/EN-US/wmicore.EXE`

  WMI CORE 1.5 (for Windows 95, 98, and NT 4.0) requires Microsoft Internet Explorer Version 5 or later 2.

2.3 Java and JavaBeans

The Java platform is a software-only platform that masks the differences of hardware-based platforms. It hides the details about hardware-based storage, memory, network connection, and computing power capabilities. Java platforms can be used to develop and deploy applications to various hardware-based platforms.

The differences in application needs also induce the emergence of several types of Java environments, such as:

- Java 2 Platform, Standard Edition (J2SE), provides an environment for the Core Java and Desktop Java applications development. It is the basis for Java

2 Platform, Enterprise Edition (J2EE) and Java Web Services technologies. It has the compiler, tools, runtimes, and Java application programming interfaces (APIs) that let you write, test, deploy, and run applets and applications.

- Java 2 Platform, Enterprise Edition, defines the standard for developing component-based multitier enterprise applications. It is based on J2SE and provides additional services, tools, and APIs to support simplified enterprise applications development.
- Java 2 Platform, Micro Edition (J2ME), is a set of technologies and specifications targeted at consumer and embedded devices, such as mobile phones, personal digital assistants (PDAs), printers, and TV set-top boxes.
- Java Card technology adapts the Java platform to enable smart cards and other intelligent devices with limited memory and processing capabilities to benefit from many of the advantages of Java technology.

The technology that allows component-based development in a Java platform is called *JavaBeans*. It conforms to the J2SE specification. JavaBeans provide reusable software components that can be assembled to create a complex application. The JavaBeans specification is available from:

http://java.sun.com/products/javabeans/docs/spec.html

2.4 WebSphere Application Server

IBM WebSphere Application Servers are a suite of servers that implement the J2EE specification. This simply means that any Web applications that are written to the J2EE specification can be installed and deployed on any of the servers in the WebSphere Application Server family.

The foundation of the IBM WebSphere brand is the application server. The application server provides the runtime environment and management tools for J2EE and Web Services-based applications.

WebSphere Application Servers are available in multiple configurations to meet specific business needs. They also serve as the base for other WebSphere products, such as WebSphere Commerce, by providing the application server required for running these specialized applications.

WebSphere Application Servers are available on a wide range of platforms, including UNIX-based platforms, Microsoft operating systems, IBM z/OS®, and IBM @server iSeries™ servers. Although branded for the iSeries server, WebSphere Application Server products for the iSeries are functionally equivalent to those for the UNIX and Microsoft platforms.

2.5 Visual Basic and JavaScript

Visual Basic and JavaScript are widely used scripting languages. IBM Tivoli Monitoring supports Visual Basic and JavaScript for building the logic of the resource models.

2.5.1 Visual Basic

Visual Basic is a scripting language developed by Microsoft that is based on the BASIC programming language. With Visual Basic, the BASIC language is extended to support object-oriented programming concepts. Microsoft Visual Basic provides a graphical user interface (GUI) to manipulate and modify parts of the code, typically the object's methods, which are written in the BASIC language format.

2.5.2 JavaScript

JavaScript is a Web page extension scripting language developed by NetScape Inc. It is typically used inside an HTML file to allow dynamic content and modify viewing behavior on Web pages. JavaScript is independent from the Java programming language by Sun Microsystems.

2.6 Database concepts

IBM Tivoli Monitoring supports collection of historical data into a relational database management system (RDBMS). The relational database is accessed using services provided by Tivoli Framework called *RDBMS interface module* (RIM). Some important terms related to relational database are:

Database	A set of tables that may be interrelated that stores data and information supporting a certain application
Database instance	A group of databases that are served by a single database process
Tablespace	Physical storage that is reserved for a set of tables, typically implemented as a file system or directory path
Table	A collection of records with structured information with predefined fields
Row	A single record in a database table
Column	A field in a database table
Index	Precollected information from a table that assists in searching table rows

Relationship	A connection between two or more tables that shows a the inherent dependency between data
Stored procedure	A program that runs, when requested, in the database system to perform a canned function
Trigger	A program that runs, when there is a change to a table (insert, update or delete of a row), in the database system to perform a canned function

2.7 IBM Tivoli Management Framework

The Tivoli Framework provides the basic system management services, such as communications, presentation, security, and so on, that all Tivoli systems management applications use, ensuring consistency and integration. At its core, the Tivoli Framework provides the facilities to transfer files and execute commands on remote systems with security.

These facilities are performed in the context of profiles. A profile is a collection of application-specific information that can be manipulated and distributed to machines in the Tivoli environment. This management model is often cited as *management by subscription*.

This section explains the general concepts of creating and distributing a profile. These concepts are common across Tivoli applications, such as software distribution, resource monitoring, system configuration, and so on. It also explains the built-in security-based rules, called *policies*, and authorization roles.

Most Tivoli systems management tasks, regardless of the application or component that is to be managed, may be performed by using the Tivoli desktop, which provides a user interface consistent throughout management applications. However, you are not limited to use the Tivoli desktop because you can run many jobs and tasks using the command line interface (CLI).

2.7.1 Tivoli Management Environment

Many components of Tivoli Enterprise software are used to manage an enterprise environment. Although the requirements of a particular enterprise may dictate which components are installed and used, there is still a common infrastructure that is used in all environments. To understand this infrastructure, certain concepts and terminology must be introduced.

Tivoli Management Region

The basic unit of Tivoli functionality is the Tivoli Management Region (TMR). A TMR is a partition of your network. It consists of at least of one TMR server and the clients that the server is managing.

The TMR server provides facilities required to manage the environment. One of its major distinguishing points is that it contains and controls the major portion of a distributed database that contains information regarding the managed resources and objects used to manage the environment.

A TMR can be composed of:

- A TMR server and endpoint manager
- Managed nodes and endpoint gateways
- Tivoli Management Agent (TMA) endpoints

You may need to split your TMR. The TMRs can then be connected to work together to form a complete management solution. Some reasons for multiple TMRs are to:

- Provide a different security level and policy for administrators
- Balance the server load between multiple TMR servers
- Provide a different set of resources for each TMR that may or may not be shared

Common concepts of operations

Most Tivoli products operate under the same set of concepts, as described here.

- The primary communication within the Tivoli environment is performed by the **oserv** daemon. This daemon runs on the TMR server and all managed nodes. Communications to a TMA endpoint use a subset of the facilities provided by the **oserv** daemon. The TMA endpoint only communicates directly with its associated endpoint gateway.
- The information relating to all objects in the Tivoli environment, along with application-specific information, is stored in a distributed, object-oriented database. This database is distributed between the TMR server and all managed nodes in the TMR.
- A GUI, called the *Tivoli Desktop*, enables operators to access all Tivoli management applications.
- Most Tivoli application-specific functions are performed in the context of profiles. A *profile* is a collection of application-specific information that can be manipulated and distributed to machines in the Tivoli environment. The general concepts of creating and distributing a profile are common across Tivoli applications. This is called *management by subscription*.

- Management operations in the Tivoli environment are subject to policies or rules. This allows management to define the policies, which provides the parameters under which an administrator may perform management functions.

Now that you understand the Tivoli environment and the common concepts of operations in this environment, you can learn about the role of each system in a Tivoli Management Environment® (TME®) and the benefits of each role.

Tivoli managed objects

To define your enterprise computing environment on Tivoli, you need to create a TMR server and as many TMR clients as needed.

- Managed nodes

  Tivoli clients running the **oserv** daemon are represented as managed nodes. Managed nodes maintain a local database. Managed nodes have the graphical Tivoli desktop capability. The TMR server itself is configured automatically as the first managed node on the Tivoli desktop. Other managed nodes are defined and appear on the desktop when the Tivoli Management Framework is installed on them. Typically you can find installation failure messages in the installation log $TEMP/tivoli.cinstall or in the $DBDIR/oservlog database log file. Communication is established between the **oserv** daemons running on each system.

- Endpoints

  A machine running a TMA is called a *TMA endpoint*. Like a managed node, a TMA endpoint can receive distributions, execute tasks, run monitors, and send events. Due to the expected large number (thousands) of TMA endpoints, a TMA endpoint has no icon representation on the desktop. A TMA endpoint is listed in the endpoint manager under an endpoint gateway. A TMA endpoint icon appears if the TMA endpoint is a subscriber of a profile manager. In a single TMR, it is only supported to have at most 20 000 endpoints. However, most installations are defined with fewer endpoints per TMR.

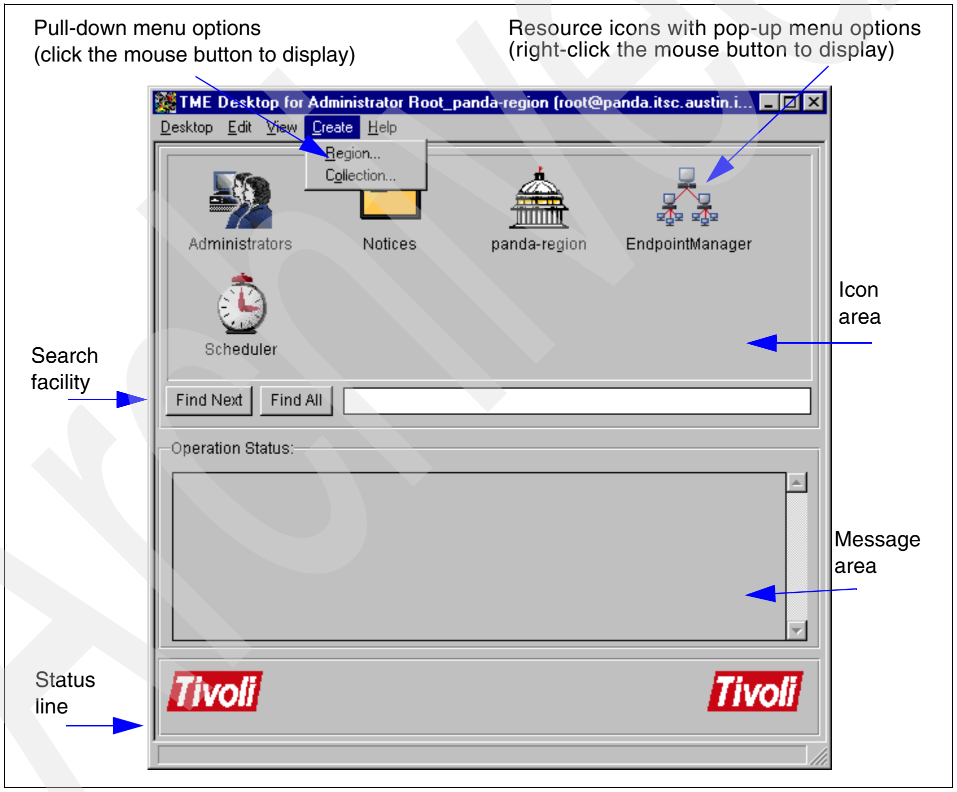
This environment is what conceptually is called the *three-tiered architecture*. The TMR server runs the Endpoint Manager, and the managed nodes run the Endpoint Gateways and endpoints. When it is started, an endpoint logs into the gateway assigned in its data file (lcf.dat). In turn, the gateway checks the endpoint from its endpoint list cache. The login processing then continues by running several log-in policy scripts in which the endpoint is assigned a gateway. If this gateway does not respond, the endpoint is considered isolated.

The endpoint runs a minimum code for connecting to the gateway. When an action needs to be performed, such as by profile distribution, it downloads the necessary binaries and files from the gateway. The binaries and files are then stored in a method cache on the endpoint until it is restarted.

2.7.2 Tivoli desktop

The Tivoli GUI, or desktop, is the administrator's view of the environment being managed by Tivoli products. The desktop allows users to graphically access resources and perform tasks. Tivoli also provides a CLI to allow many of the functions that the desktop provides to be performed from a shell. Some functions can be performed only from the CLI. Some functions can be performed only through the desktop GUI.

Figure 2-1 shows the initial view after the desktop is started.



Pull-down menu options (click the mouse button to display)
Resource icons with pop-up menu options (right-click the mouse button to display)
TME Desktop for Administrator Root_panda-region (root@panda.itsc.austin.i...
Desktop
Edit
View
Create
Help
Region...
Collection...
Administrators
Notices
panda-region
EndpointManager
Scheduler
Icon area
Search facility
Find Next
Find All
Operation Status:
Message area
Status line
Tivoli
Tivoli

Figure 2-1 Initial desktop view

2.7.3 Resources

Resources are important concepts in understanding the Tivoli Enterprise environment. Resources may be any hardware or software entity (machine, service, system, or facility) in the enterprise. Each resource is represented by an object in the Tivoli database and has an icon on the Tivoli desktop. Resources that are subject to certain sets of rules within the Tivoli environment are called *managed resources*, and the predefined rules are called *policies*.

Managed resources are contained within *policy regions*, which are special collections of managed resources that are subject to the same set of rules. As more products are installed in the Tivoli environment, more managed resource types become available for use.

The important resources in the Tivoli Enterprise environment are:

- **Policy region**: A collection of managed resources that share one or more common sets of rules; also represent administrative domains that can be assigned to administrators
- **Administrator collection**: A container that holds the icons for all administrators defined for theTivoli Enterprise environment

  Within the administrator collection is an icon for each administrator. An administrator is defined to allow Tivoli Management Framework to identify the userID a task should run and who can use this administrative authority.
- **Bulletin board**: Contains notices that are sent by Tivoli applications to inform the administrators of changes in the Tivoli Enterprise environment

  The icon for the bulletin board can appear in two different states, one showing there are no new notices, shown on the left, and one showing that there are new notices, shown on the right.
- **Profiles**: Application-specific information that can be manipulated and distributed to machines in the Tivoli environment

  This information can relate to a large variety of things, such as users, software, hardware, and so on. The icon of the profile depends on the Tivoli application.
- **Profile managers**: Usually an association between one or more profiles and their subscribers (usually a machine that Tivoli manages)

  There are two kinds of profile manager: database mode and dataless mode.
- **Endpoint manager**: Contains the list of endpoint gateways defined in the TMR

  Using the endpoint manager, you can look at individual gateways and list which TMA endpoints are associated with them. Also, through this interface, certain properties of the individual TMA endpoints can be inspected. The icon represents a 3-tier architecture.

- **Task library**: A managed resource that allows an administrator to create and store tasks and jobs (see the following definitions); icon represents multiple notes
- **Task**: A resource that represents an action or operation that needs to be performed within the Tivoli environment

  Because a task can't be executed without supplying additional information, the icon uses cleared boxes.
- **Job**: A resource that represents a task, which is executed on specific managed resources

  Check boxes are used for the job icon.
- **Scheduler**: Allows tasks to be performed within the Tivoli environment

  These tasks can be scheduled for any time of the day or night and any day of the week. If you need more scheduling restrictions, use Tivoli Workload Scheduler.

2.7.4 Policy and policy regions

In the Tivoli Enterprise environment, a *policy* is a set of rules that are applied to managed resources. A policy enables you to control the default values of newly-created resources (default policy) and to maintain the guidelines when administrators perform management operations on resources (validation policy). A specific rule in a policy is referred to as a *policy method*. A *default policy method* can supply a constant value or run a shell script or a program that generates a value. A *validation policy method* usually runs a program or shell script to verify values supplied by the administrator. Administrators can define and maintain policies.

Policy regions are containers for managed resources that use the same set of policies. As Tivoli applications are added, additional rules and permissions may be installed on the system. Policy regions help to organize the managed resources in the desktop and can be helpful in defining and limiting administrator access to these resources. Only resources assigned to the policy region can be created or stored in the policy region.

Policy regions can be arranged hierarchically by creating policy subregions. Each policy subregion has its own subset of resources. When the subregion is initially defined, it has the same policies and managed resource types as its parent. After the initial definition, these things can be changed and do not depend at all on the parent's definitions.

As previously mentioned, policy regions and subregions are collections of resources for which the same set of policies apply. Different criteria can be used to build these entities, such as administrator locations, administrator permission hierarchy, geography, departments, machine types, and so on. The policy region architecture is designed to be flexible so that resources can be laid out to reflect each company's individual structure and policies.

2.7.5 Administrator and roles

An administrator in Tivoli Framework is an object that:

- Has an assigned login user for executing a task (defined in the Create administrator dialog). The login must be valid on the managed node on which the administrator is defined.
- Maps a logical administrator into an operating system login defined in the Set Logins dialog. This account is mapped from a login request that comes from any managed nodes in the region.
- Assigns roles for resources within the TMR or for a specific policy region.

Sometimes an administrator must be mapped to a different user ID on different platforms. The mapping happens, for example, to execute a certain task. Only one user name can be specified in the Create administrator dialog. The solution is the usage of a user ID map, which allows an association to be made for a different user name on a different platform. A user ID map is specified with a dollar ($) sign.

A default user ID map is defined called *$root_user*. It maps the root user to the administrator in Windows platforms. The **widmap** command, as shown in Example 2-1, is used to manipulate a user ID map.

Example 2-1 Sample widmap command

```
# widmap list_entries root_user
default   root
w32-ix86  Administrator
```

A major concept relating to the security is that of authorization roles. *Authorization roles* are predefined names for sets of management task abilities. These roles are discrete and not hierarchical, meaning that each role has specific functions it can perform. Some functions can be executed by only one role. Others can be executed by more than one role.

The role or roles given to an administrator define what that administrator can do to a particular set of resources. These authorization roles can be delegated for the entire TMR or for individual policy regions or special resources, such as an administrator or scheduler.

2.7.6 Profiles and profile managers

Profiles and profile managers form the configuration management portion of the Tivoli Management Framework. Together, these objects organize, create, and distribute information to remote systems.

Profiles are Tivoli objects that represent a collection of information that corresponds to a system resource. A strong understanding of profile and profile manager concepts is imperative for anyone who will use the Tivoli Management Framework and applications to manage resources.

Figure 2-2 shows the Tivoli Profile Manager desktop view with its profiles and subscribers, which are all described in the sections that follow. To display this dialog, double-click **Policy Region** and double-click **Profile Manager**.

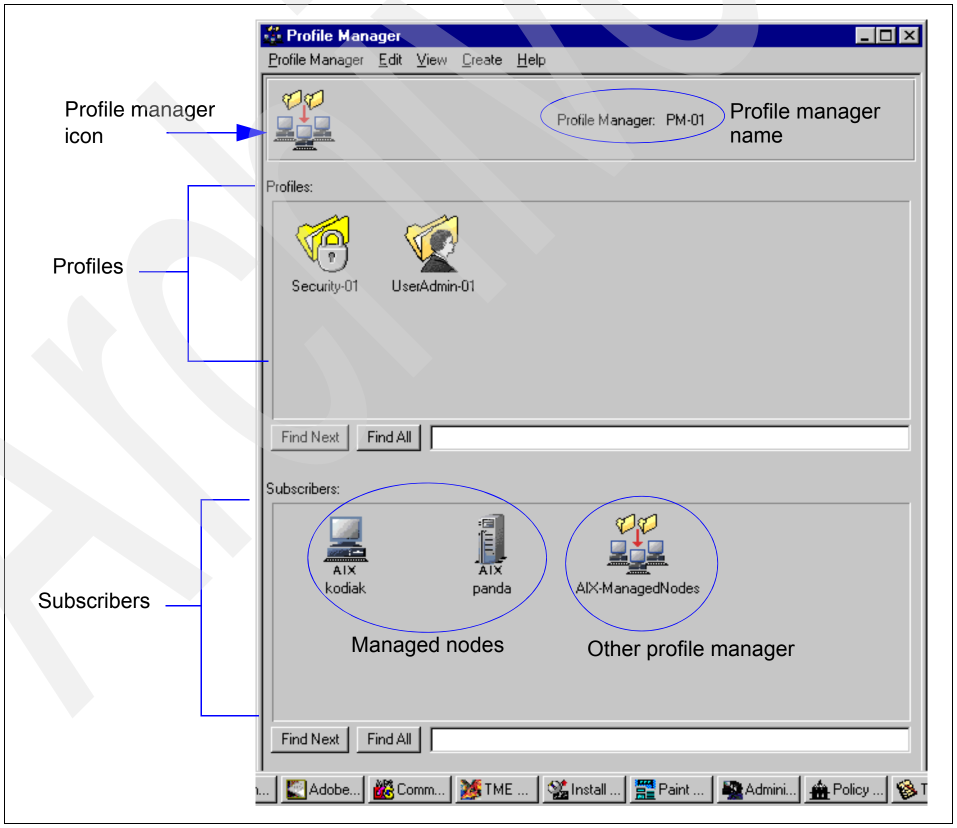


Figure 2-2 Profile Manager desktop view

Profiles

Although profiles are part of the Tivoli Management Framework infrastructure, they are application specific. That is, each Tivoli application defines specialized profile types used by that application. Profiles are created and maintained in profile managers. Profiles can be changed without immediately putting the changes into effect on the managed machines. Editing and distributing the profiles are two separate functions.

Depending on the profile type, when creating a profile, the administrator can enter the data in the dialog boxes that are provided. Or the administrator can extract the information from existing system files or databases to populate the profile.

To continue the previous example using the user profile, you could retrieve the information for your user profile from several remote systems /etc/passwd or NIS files. You can specify the hosts from which to obtain information and whether the information should replace or be appended to an existing profile. The ability to do these types of operations depends on the type of profile you are creating and the information that already exists.

Profile managers

A profile manager provides a place to create and organize groups of profiles and link subscribers to them. A profile manager can contain multiple profiles of the same type, or it can contain profiles of more than one type. Profile managers also control the distribution of profiles and help organize resources.

As shown in Figure 2-2, you can logically view a profile manager as having two sections. One section contains profiles, and the other section contains subscribers. A *subscriber* is a *profile endpoint* or another profile manager that receives profile records from the profile manager.

A *profile endpoint* is a system that is the final destination for a profile. *Target machine* is another term for profile endpoint. Examples of profile endpoints can be managed nodes, PC managed nodes, TMA endpoints, or NIS domains. In the case of PC managed nodes, the profile is distributed to the UNIX or Windows NT system sponsoring the PC running the PC agent software, which is then distributed to that PC. The same situation is true for NetWare Managed Sites. The profile is distributed to the NetWare server, which is then distributed to its set of clients.

At the time of distribution, the administrator can choose to select a subset of subscribers for the particular distribution (as well as a subset of the profiles) and can choose various options related to the distribution.

- Profile managers in database mode

  When distributing a profile from a profile manager in database mode, the information in the profile is distributed to the Tivoli database of the subscriber or subscribers. It is also possible to subscribe other profile managers to a profile manager in database mode. This scenario provides a mechanism to hierarchically manage the environment. The database profile managers can be deleted only when all subscribers are removed.

- Profile managers in dataless mode

  To support dataless TMA endpoints running the Tivoli Management Agent, the Tivoli Management Framework now supports a new type of profile manager. In many ways, it is similar to the original profile manager, but it differs in a few important ways.

  Profile managers in dataless mode also contain two logical sections: profiles and subscribers. However, when a profile is distributed, it does not copy the profile to the database at the next level. Rather, it applies the changes contained in the profile to the system.

  However, profile managers in dataless mode have been created to support TMA endpoints. You can also subscribe a managed node to a dataless profile manager and distribute a profile to it. In this scenario, the managed node functions more like a TMA endpoint processing the profile data immediately without copying the profile to its own database.

Based on the previous discussion about the two profile manager types, all subscriber types, except TMA endpoints, are supported by profile managers in database mode. All subscriber types, except profile managers, are supported by profile managers in dataless mode. Other than the operational differences of how the data is distributed, the net of this discussion is that you cannot subscribe profile managers and TMA endpoints to the same profile manager.

This leads us to building profile manager hierarchies where the higher level profile managers are running in database mode. Also, only the leaf profile managers (those at the lowest level) have TMA endpoints as subscribers.

It is possible to build a hierarchy where both managed nodes and profile managers are subscribed to higher-level profile managers running in database mode. Figure 2-3 illustrates a standard profile manager hierarchy that makes it much easier to add TMA endpoints to the environment.

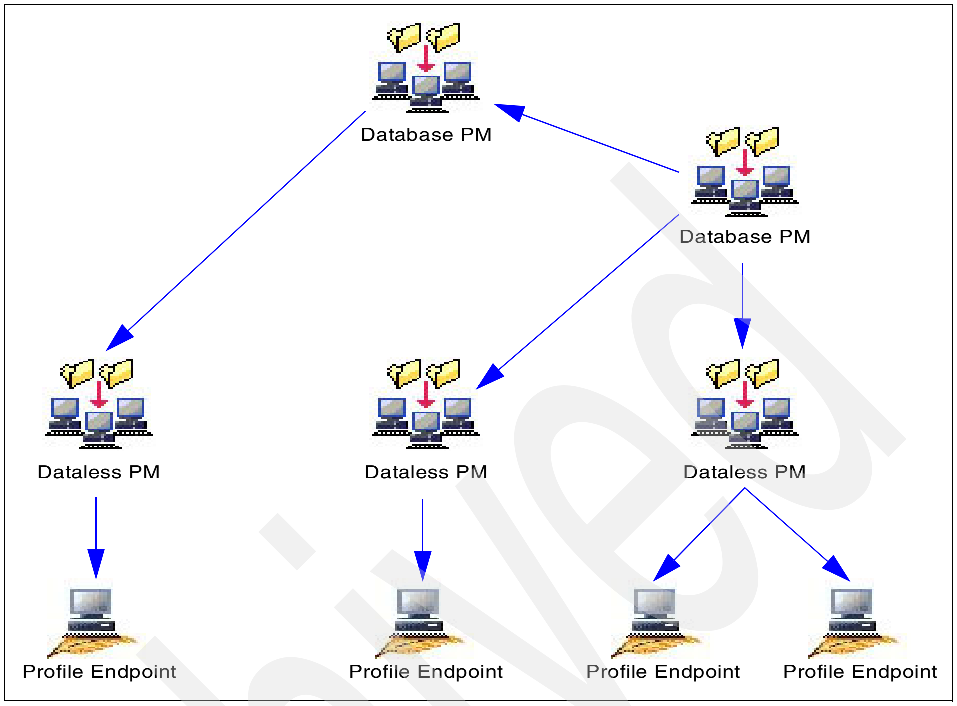


Figure 2-3 Standard profile manager hierarchy

2.7.7 RDBMS interface module

The RIM is the interface between Tivoli applications that use a relational database and the relational database. The RIM provides a common interface used by Tivoli applications to store and retrieve information from several databases. There is no separate RIM installation. It is installed as a Tivoli Framework component.

The data stored in an RDBMS by a Tivoli application can be shared by any application (Tivoli or non-Tivoli) that can access SQL data. Moreover, the Tivoli applications that use a relational database benefit from the advanced features of a RDBMS, such as scalability, performance, and reliability.

The RIM is composed of a RIM object. Each time you install an application using the RIM, an instance of a RIM object is created and then the Tivoli application can connect to the relational database defined in this instance.

The RIM object is divided into three layers:

- The API layer, which provides an interface to the Tivoli applications that want to use the RIM services
- The Translation layer, which translates the API commands to data types and SQL statements that can be specific for each RDBMS vendor
- The Adapter layer, which implements the RDBMS commands for each database vendor

No Tivoli icon is created to represent the RIM object. You create an instance of the RIM object either by using the `wcrtrim` command or by installing and configuring a Tivoli application that uses the RIM interface. See the appropriate Tivoli application manual for more details about setting the RIM object.

2.7.8 MDist 2 distribution

MDist2 is a Tivoli Framework service that provides Tivoli applications with the functionalities required to perform mass data transfers through a hierarchy of repeaters to one or more endpoints. It provides utilities to fully control and automate the application profile distributions. MDist2 enables you to control the total amount of resources used by a repeater. This makes distributing data fast and efficient, improving performance and throughput.

You can set the network load, target network load, number of priority connections, packet size, debug level, maximum memory, and maximum disk space. You also can set intervals for how often the database is updated and the frequency and length of time that a repeater retries unavailable or interrupted targets.

The components of MDist2, as shown in Figure 2-4, are:

- **Repeater manager**: The Tivoli object that maintains configuration data for all repeaters in the TMR and determines the distribution path. There is one repeater manager per TMR.
- **Repeater site**: The intermediate client that receives a single copy of data and sends it to another repeater site or target client.
- **Repeater depot**: The storage site for MDist2 distributions. Every repeater has a depot. Thus, data can be stored on any repeater in the Tivoli environment. This storage mechanism helps reduce network traffic for frequently distributed data sets.
- **Repeater queue**: The queuing mechanism for MDist2 distributions. Every repeater has a queue. The distribution is queued and its persistent information is kept as a local file. This queuing mechanism includes a retry function that enhances support for unreachable targets.

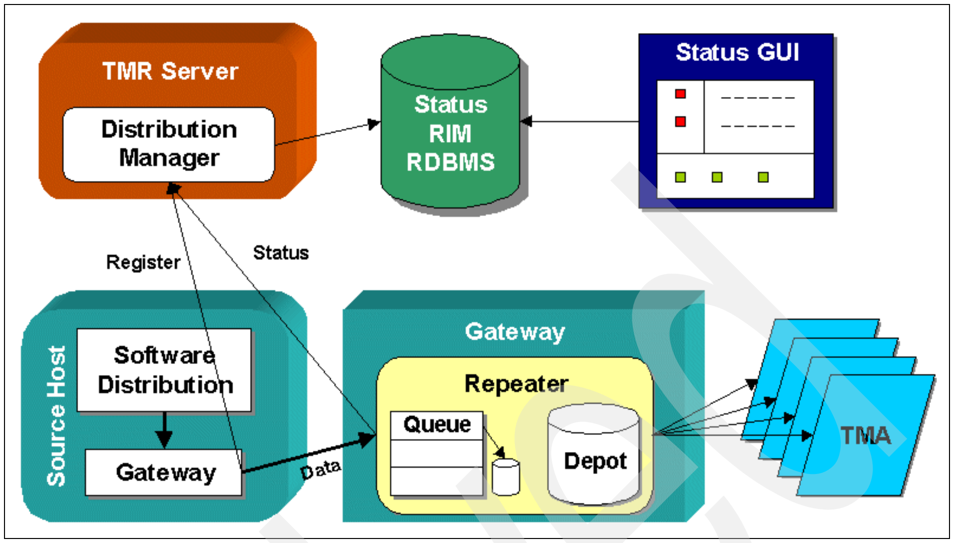


Figure 2-4 MDist2 components

- **Distribution manager**: The Tivoli object that updates status in the database. There is one distribution manager per TMR. Thus, each TMR keeps track of all distributions it launches.
- **GUI**: The Java interface used to view status and control distributions. This Java GUI component requires the Tivoli Java RIM, Java Component Framework (JCF) and Java Runtime, which are all available from the Tivoli Framework distribution media.
- **RIM**: A common interface that Tivoli applications can use to store and retrieve information from a relational database, and to store MDist2 distribution data. The required tables for this database are DIST_STATE and DIST_NODE_STATE.

The two repeater types in MDist2 are:

- *Gateway repeater* (TMF/LCF/gateway) is linked into the gateway.
- *Managed node repeater* (TAS/MANAGED_NODE/rpt2) is a stand-alone binary that runs on a managed node.

2.7.9 Command line interface

This section discusses some commonly used commands within the TMR.

odadmin

The **`odadmin`** command performs as a generic interface to **`oserv`**. Here are some variations of this command:

- Running **`odadmin`** without any argument shows the status of **`oserv`** and displays basic characteristic of it.
- The **`odadmin odlist`** command lists the managed nodes (TMR server and Tivoli clients) within the TMR, their dispatcher number and its status. If the client can be contacted, the letter `c` is displayed in the status column.
- The **`odadmin start`** command starts a non-Windows-based managed node, and the **`odadmin shutdown`** command shuts down any managed node.
- A multihome host, which is behind a network address translation (NAT) gateway, needs to be contacted by its name. To enable this facility, you issue the **`odadmin set_iom_by_name TRUE all`** command.
- To allow a managed node to have a dynamic IP address using DHCP, you issue the **`odadmin allow_dynamic_ipaddr TRUE`**. command.

wlookup

The **`wlookup`** command allows a lookup to the name registry, which stores all classes and their instances. This is particularly useful for getting a resource name or listing a resource type. Some useful **`wlookup`** formats are:

- The **`wlookup -R`** command retrieves all resource types.
- The **`wlookup -ar`** ***`class`*** command retrieves all resource with the type class.

wlsinst

The **`wlsinst`** command obtains the product installation status. It retrieves a list of installed products, patches, or both. Some useful **`wlsinst`** command formats are to obtain:

- All installed products using the **`wlsinst -p`** command
- All installed patches using the **`wlsinst -P`** command
- All installed products and patches using the **`wlsinst -a`** command
- The installation status by host, for example by adding the **`-h`** option to obtain all installed products by host using the **`wlsinst -p -h`** command

wbkupdb

The **`wbkupdb`** command allows you to back up and restore the Tivoli object database. For example, consider the default directory $DBDIR/../backups.

- To back up to this directory, use the **`wbkupdb`** command.
- To restore this directory, use the **`wbkupdb -r -d`** ***`filename`*** command.

wchkdb

The **`wchkdb`** command allows you to check the integrity of the object database. It also allows recovery and repair of the object database for minor inconsistencies.

- The **`wchkdb`** command checks the consistency of the object database.
- The **`wchkdb -u`** command checks and repairs the object database.
- The **`wchkdb -x`** command checks across TMR connections.

wmdist

The **`wmdist`** command retrieves the status of MDist2 distributions.

- The **`wmdist -l`** command lists the currently active distribution and its status.
- The **`wmdist -s`** command displays the currently used configurations.

2.8 IBM Tivoli Monitoring concepts

Figure 2-5 presents a high-level overview of the interaction between various components of IBM Tivoli Monitoring 5.1. The IBM Tivoli Monitoring 5.1 profile contains, among other information, a resource model. The *resource model* is a collection of monitors that correlate amongst themselves before attempting to perform a notification action.

The IBM Tivoli Monitoring 5.1 profile is distributed to the endpoints to monitor one or more resources (examples of typical resources are hard disk space, paging space, and process or service). Based on configuration settings in the IBM Tivoli Monitoring 5.1 profile, the engine runs on the endpoint and performs the necessary monitoring on the resources that are specified in the distributed resource model or models. The Web Health Console obtains logged data from selected endpoints and displays the *health* of the endpoints for their resources.

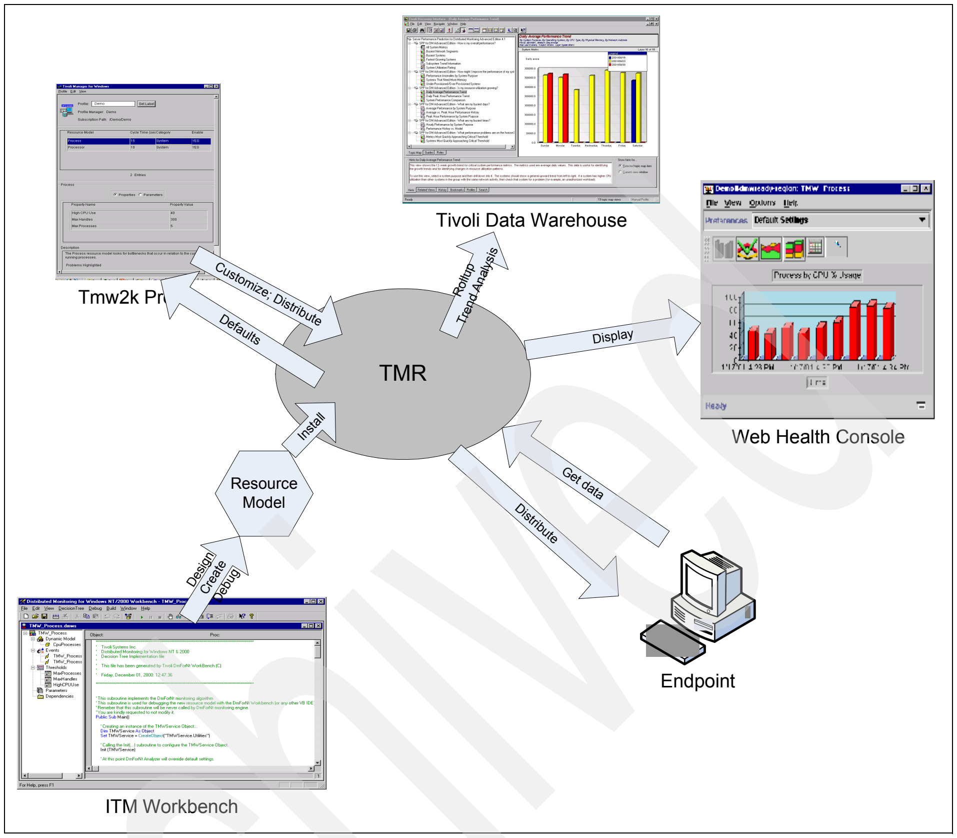


Figure 2-5 High-level overview

The following sections describe the CIM architecture and the three key components of IBM Tivoli Monitoring 5.1, which are:

- Profile
- Resource models
- Engine

2.8.1 Integration with the Common Information Model

The CIM is part of the industry-wide initiative, DMTF, for providing a common model for the management of environments across multiple vendor-specific products. WBEM is another initiative that includes the CIM standard.

CIM is a conceptual model for describing implementation-independent management. The ultimate goal of CIM compliance is to build applications that can extract and use management data from products released by different vendors, whether for hardware or software. IBM Tivoli Monitoring 5.1 is CIM-compliant and, therefore, can collect, store, and analyze management data from other CIM-compliant base products in a common format (CIM). The advantage of using CIM-based resource monitoring is that, when newer versions of the product whose resources are being monitored are released, the monitor is not required to know the implementation details of the system. The monitor only interacts with it through an accepted management interface (CIM Schema).

CIM is basically an object-oriented modeling of both hardware and software elements. CIM consists of two parts:

- **CIM Specification**: Describes the language, naming, meta-schema, and mapping techniques to other management models such as Simple Network Management Protocol (SNMP), Management Information Base (MIB), etc.
- **CIM Schema**: Provides the actual model descriptions by giving the set of classes with properties and associations to model the particular environment

The CIM Schema is comprised of the core model and common model.

- **Core model**: The platform-independent base model and other models are built as extensions of the core model. It is described by the core schema and contains a top-level set of classes that apply to all management domains.
- **Common model**: An extension of the core model, which is also platform-independent, but specifies the management area. Presently, there are five areas that are defined in the common model: systems, devices, applications, networks, and physical.

Beyond the CIM Schema are extension schemas. The *extension schemas* are specific to the technologies that are defined in them. Examples of extension schemas include schemas for Microsoft Windows operating systems, various UNIX environments, and so on.

Each schema is a collection of one or more classes, and each class is a collection of similar objects. A *class* is defined as the basic unit of management. Observing the object-oriented paradigm, classes are either defined as static or dynamic.

Static classes are stored by the CIM Object Manager in the CIM Object Management (CIMOM) Repository. Applications query object data from the CIMOM Repository through the CIM Object Manager. The basic CIM-compliant instrumentation layer is either provided by the operating systems vendor or a software that is compliant with CIM specifications that is installed on the operating system. It enables management applications, such as Tivoli Distributed Monitoring, to retrieve management data about various resources in the system.

On Windows 2000 systems, the CIM-compliant Microsoft implementation WMI is already installed as part of the operating system. Windows NT 4.0 servers require WMI software to be installed prior to the use of IBM Tivoli Monitoring.

Note: The WMI software is available as a download from Microsoft.

Therefore, IBM Tivoli Monitoring 5.1 directly interacts with WMI to pull management data at runtime. In UNIX systems, CIM-compliant instrumentation called *TouchPoint* is embedded in the IBM Tivoli Monitoring 5.1 engine to facilitate the retrieval of management data. The TouchPoint infrastructure has two interfaces: Touchpoint Service Layer (TSL) and Resource Interface Instrumentation Library Type (ILT).

Figure 2-6 shows a layout of CIM implementation for systems management.

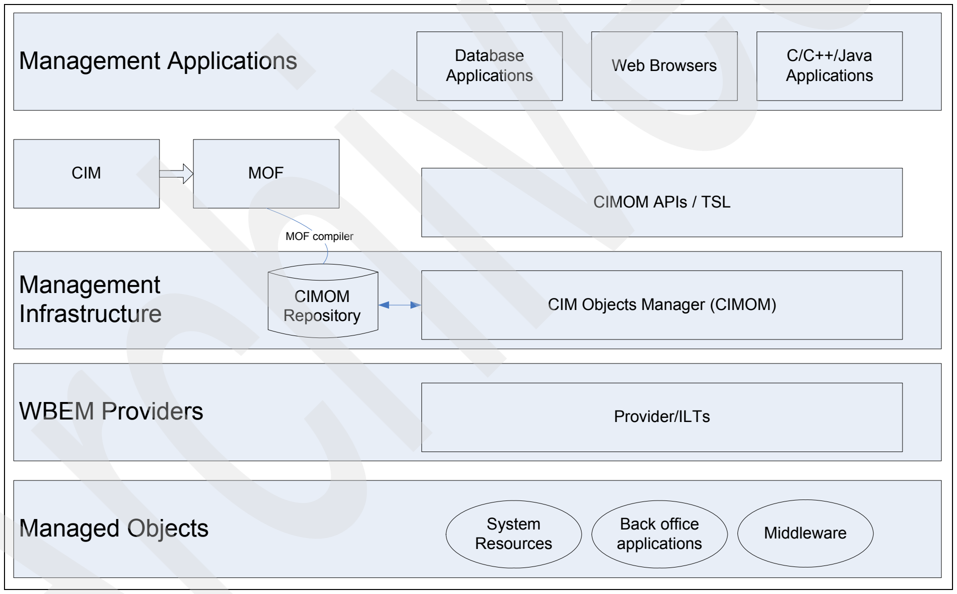


Figure 2-6 CIM implementation for systems management

2.8.2 Resource model

The resource model is a monitoring model. It contains the program scheme necessary to determine what data is to be accessed from an endpoint at runtime and how this data is to be handled. This model is equivalent to an implementation of monitors from previous editions of Tivoli Distributed Monitoring. However, it uses the object-oriented modeling approach and integration with CIM.

Each resource model obtains resource data from the endpoint to which it is distributed, performs root cause analysis using a built-in algorithm, and reacts accordingly in the form of built-in actions or user-defined tasks. An example of a resource model is the TMW_Services resource model, which is used to monitor the Windows Services-like server, browser, event log, and so on.

The major components of a resource model are the configuration file, MOF file, decision tree file, message catalog for building the Tivoli Enterprise Console, and Tivoli Business Systems Manager (TBSM) events, and class files to interface with the native library. The MOF file contains the particular resource model's class description and event definitions.

The classes are derived from the corresponding base classes of the resources. The base classes for the model-to-resources association, and classes that describe physical resources used in the resource models with respect to the instance providers, are provided in a base MOF file and a resources MOF file, respectively. These additional MOF files are distributed to the endpoint the first time an IBM Tivoli Monitoring 5.1 profile is distributed to it. The configuration details of the resource model are obtained by the engine from the configuration file. These details include the resource model name, platform name, name of the decision tree file, and names of the MOF files.

The decision tree file is in VisualBasic script or JavaScript for Windows platform and JavaScript for UNIX or LINUX platforms. It contains both the initialization settings for the resource model and the algorithm that is used by the IBM Tivoli Monitoring 5.1 analyzer to determine if a problem is encountered in the resources described by the resource model.

When an IBM Tivoli Monitoring 5.1 profile containing a resource model is distributed to the endpoint, the following actions take place:

1. Resource model files are unzipped from the resource model-specific ZIP file.
2. MOF files specific to the resource model are compiled.
3. All components of the IBM Tivoli Monitoring 5.1 engine are created, loaded in memory, and started (logger, analyzer, action manager, event aggregator, and event correlator).

3

Planning for IBM Tivoli Monitoring V5.1.1 deployment

This chapter discusses the necessary planning stage before you implement IBM Tivoli Monitoring V5.1.1. It examines the client's IT environment, topology, and the existing management environment. It looks at endpoint software verification, Health Console and data warehouse planning, and the Workbench development requirements.

3.1 Environment and topology

At the client's request to implement IBM Tivoli Monitoring V5.1.1, you must be able to analyze important information from their environment to successfully deploy IBM Tivoli Monitoring V5.1.1. An initial assessment that you must perform is on the client's IT environment and interconnection topology. The results of this assessment influence the design of the solution, in terms of Tivoli Framework structure.

- The physical network structure defines how profile distribution and data collection will be performed by the Tivoli environment, typically by configuring MDist II repeaters.
- The logical ownership of the network determines how policy region hierarchy will be implemented as the policy region represents an authorization unit in Tivoli.
- The machine architecture, operating system level, and its usage can determine how profile managers will be used and created to achieve maximum flexibility for distributing profiles.

You need to identify the machines that IBM Tivoli Monitoring V5.1.1 will manage. These machines are typically application servers that need to be monitored and managed. You need to check the operating system level of these machines to make sure that IBM Tivoli Monitoring supports these levels as specified in the IBM Tivoli Monitoring V5.1.1 release notes. Later, you need to deploy and install the prerequisite software and Tivoli Management Agent.

From these machines, you may want to determine the resources that will be monitored. This helps you to evaluate the monitoring requirement, such as the number of resource models that can be used and the resource model that needs to be custom created. You can also analyze the monitoring capacity requirement and determine the required database size to hold the monitoring data. In addition, this can help you to determine the additional space required to store the data in central data warehouse in Tivoli Data Warehouse.

IBM Tivoli Monitoring V5.1.1 can forward events to other Tivoli applications, such as IBM Tivoli Enterprise Console and IBM Tivoli Business Systems Manager (TBSM). If the client wants or needs this integration, consider an additional level of information, such as:

- The application to which the monitored resource belongs
- The business system that will be affected with the outage of the resource
- Automation (if any) that needs to be performed whenever a resource is not considered healthy

You can install IBM Tivoli Monitoring V5.1.1 on the platforms listed in Table 3-1.

Table 3-1 Supported platform

Operating system	**Versions**	**Server**	**Gateway**	**Endpoint**
AIX®	4.3.3, 5.1.0.C, 5.2	x	x	x
Solaris	2.6, 7, 8, 9	x	x	x
Windows NT	Version 4.0 SP 6 and 6a	x	x	x
Windows 2000	Server, Advanced Server, Professional SP3 and later	x	x	x
Windows Server 2003	Standard, Enterprise	x	x	x
Windows XP	Professional			x
Turbo Linux	Svr 6.1, 6.5	x	x	x
SuSE	6.4, 7.0, 7.1, 7.2, 8.0, and 8.1	x	x	x
SuSE SLES	7.0	x	x	x
SLES	7.0 for S/390® and z/Series	x	x	x
HP-UX	11, 11i	x	x	x
OS/400®	5.1, 5.2			x
RedHat Server (IA32)	7.0, 7.1, 7.2 and 7.3	x	x	x
RedHat Ent Linux (IA32)	2.1	x	x	x
RedHat for OS/390®	6.0	x	x	x
RedHat for Intel®	7.3, 8.0	x	x	x
UL (SLES 8)	1.0 for IA32 SP2+	x	x	x
UL (SLES 8)	1.0 for IBM @server zSeries® SP2+	x	x	x
UL (SLES 8)	1.0 for PowerPC®			x

Restriction: No TBSM adapter is available for gateways running HP-UX.

3.2 Existing management environment

When implementing IBM Tivoli Monitoring V5.1.1, you need to collect information regarding the existing management environment. This is crucial so that you can evaluate the options on implementing the configuration.

You must collect the following information:

- Tivoli Framework structure

  IBM Tivoli Monitoring V5.1.1 can be deployed in either a new Tivoli Management Region (TMR), or merged to an existing TMR. For a completely new implementation, decide which installation options to use. For a pre-existing environment, understand how the existing TMRs are structured. Typically you must know how the relationship between multiple regions and the design of the profile managers as the monitoring profiles must be distributed to the endpoints.

- Other existing monitoring infrastructure

  The current monitoring practice largely determines how the new implementation can replace the existing one. You must understand which monitors are currently in place. For example, the client may be using Tivoli Distributed Monitoring or a custom program developed by the administrator or involving third-party tools. Regardless of the infrastructure is, they must be integrated to the overall monitoring infrastructure with IBM Tivoli Monitoring V5.1.1.

  The Tivoli Distributed Monitoring profile can be migrated to the IBM Tivoli Monitoring V5.1.1 resource model. Custom monitoring scripts can be used in data collection for resource models. Understanding the intervals and threshold used in the monitoring tools is also beneficial because it serves as the basis of the IBM Tivoli Monitoring V5.1.1 implementation.

The following sections explain the prerequisites for installing IBM Tivoli Monitoring V5.1.1.

3.2.1 Tivoli Management Framework requirement

You need to obtain the software levels of the existing Tivoli environment. IBM Tivoli Monitoring V5.1.1 requires, as a minimum, Tivoli Management Framework Version 3.7B, but we recommend Version 3.7.1 or 4.1. If you have Tivoli Management Framework Version 4.1, we recommend that you install patches 4.1-TMF-0013 and 4.1-TMF-0014. If you have Tivoli Management Framework Version 3.7.1, we recommend that you install patches 3.7.1-TMF-0097, 3.7.1-TMF-0098, 3.7.1-TMF-0099, and 3.7.1-TMF-0114.

Some platforms have specific patch requirements, as follows:

- Windows 2000 on Tivoli Management Framework, 3.7B, patch 3.7-TMF-0010 is a prerequisite for any version of the Windows 2000 operating system. We recommend that you install it on all other platforms where it is available.
- Windows XP for Windows XP Professional endpoints patch 3.7.1-TMF-0044 is required.
- Linux for iSeries and pSeries® endpoints requires 3.7.1-TMF-107 or 4.1-TMF-0015.

For more information, see the *IBM Tivoli Monitoring V5.1.1 User's Guide*, SH19-4569.

3.2.2 Available installation methods

Based on the *IBM Tivoli Monitoring V5.1.1 User's Guide*, SH19-4569, there are three ways to install IBM Tivoli Monitoring V5.1.1:

- Using the installation wizard, also called *Rapid Deployment*

  This wizard allows you to install a running environment on a single machine from a plain operating system process.
- Using Tivoli Software Installation Service (SIS)

  SIS can install multiple Tivoli products on multiple systems in parallel. This Java-based product can install more products on more systems in much less time than the Framework's installation facility. SIS performs product prerequisite checks and, if defined, user-specified prerequisite checks, ensuring as few installation failures as possible. In most cases, failures occur only when machines are turned off or removed from the network.
- From the Tivoli desktop, installing individual products within the Tivoli Management Framework environment

  You can install the following components individually:

  – IBM Tivoli Monitoring Version 5.1.1: This is the server and gateway code that needs to be installed on the TMR server and all gateways.

  – Tivoli Monitoring TBSM Adapter, Version 5.1.1: This is the common listener adapter feed to TBSM that must be installed on all gateways that connect to the TBSM common listener.

  – Tivoli Monitoring Gathering Historical Data Component, Version 5.1.2: This is the interface to the older Tivoli Decision Support's Server Performance Prediction.

  - Tivoli Monitoring Tivoli Enterprise Data Warehouse Support Version 5.1.2: This is the interface to Tivoli Data Warehouse and must be installed on one of the managed nodes to access the database.

3.2.3 Hardware requirements

The hardware requirements are:

- **Server**: CPU and memory have the same requirements as Framework. The disk space is 85 MB.
- **Gateway**: CPU and memory have the same requirements as Framework. The disk space is 85 MB. An additional 2 MB is required for the TBSM adapter.
- **Windows endpoint**: The CPU is 266 MHz, Memory 128 MB, 30 MB of disk space.
- **UNIX or Linux endpoint**: CPU and memory have the same requirements as Framework. The disk space is 100 MB.
- **OS/400 endpoint**: CPU and memory have the same requirements as Framework. The disk space is 20 MB.

3.3 Endpoint software verification

To run IBM Tivoli Monitoring V5.1.1 monitors on the endpoint, several requirements must be fulfilled. This section discusses these requirements.

The endpoint code for IBM Tivoli Monitoring V5.1.1 runs in a Java Virtual Machine (JVM). The endpoint needs to have Java Runtime Environment (JRE) installed in the endpoint. Later we need to tell IBM Tivoli Monitoring V5.1.1 where the JRE is installed. Typically, when JRE is installed, the following happens:

- JAVA_HOME environment variable is set to the installation directory of the JRE.
- The java.exe file represent the JRE executable that should exist.
- Checking the JRE version is performed using the **`java -version`** command.

The **`wdmcheckprereq`** command checks a set of prerequisites on a Windows endpoint and returns the results. The set of prerequisites verified by the command includes:

- Windows Management Instrumentation (WMI) version
- Open Database Connectivity (ODBC) driver version
- Jet Engine version
- JRE version
- Windows Script Host (CScript) version

You must also verify the level of the endpoint code that runs on each endpoint. To locate the endpoint version, from a managed node, run the following command:

```
wadminep endpoint view_version
```

3.4 Health Console planning

The IBM Tivoli Monitoring V5.1.1 Web Health Console is a Web application server that converts Web browser requests into communication with IBM Tivoli Monitoring V5.1.1 server within the TMR. This Web application server does not need to belong to the TMR. A single Web Health Console can serve multiple TMRs. Plus you can have multiple Web Health Consoles accessing a single TMR.

Because the Web Health Console serves as a Web server, by default, it is installed to use TCP/IP port 80. This is the standard port number for Hypertext Transport Protocol (HTTP). The Web Health Console uses IBM HTTP Server. You must check whether other processes in the machine also use the default HTTP port, port 80. This may interfere with the Web Health Console. Typical processes are:

- Apache server
- Microsoft Internet Information Server (for a Windows-based machine)

You may need to re-assign the port that is used by the Web server processes or re-assign the Web Health Console port.

The Web Health Console server has the following system requirements:

- The target machine for installing the Web Health Console has minimum memory requirements of 384 MB, but we recommend 512 MB.
- The disk space requirements within the temp directory and the selected install directory for the single computer selected are:
  - The install directory during the installation needs 500 MB.
  - The install directory after the installation needs 230 MB.
  - The temporary directory needs 100 MB.

You must perform additional actions to verify network connectivity from the Web Health Console server to the managed node to which you will connect.

The Web Health Console user specifies a managed node name when they sign in. This managed node is used to authenticate the user and access the TMR. You may want to specify a managed node to serve Web Health Console requests if you expect a large number of users to use the Web Health Console.

The Web Health Console runs using a Web browser with either:

- Netscape 6.x or later
- Internet Explorer 6.x

The Web Health Console is supported on:

- AIX 5.1
- HP-UX 11.0
- Red Hat Linux for Intel 7.1
- Solaris 2.8,
- Windows 2000 Server and Advanced Server SP3
- Windows NT Server Version 4.0 SP6

3.5 Data Warehouse planning

IBM Tivoli Monitoring V5.1.1 supports collecting data into a database. The data is stored using a facility of TMR called relational database management system (RDBMS) Interface Module (RIM). This RIM object provides a mechanism for the object database to interact with an RDBMS. RIM objects are hosted on a managed node with client-level access to the database. As the RIM database, IBM Tivoli Monitoring V5.1.1 supports DB2, Informix®, Microsoft SQL Server, Oracle, and Sybase.

You need to specify in the IBM Tivoli Monitoring V5.1.1 monitoring profile that you want the data to be stored in the database. This relates to the size of the data that you want to collect. Individual storage of data multiplied by the number of occurrences of the monitor and the number of monitors generally gives the expected growth of data in the database.

Monitoring data collected from IBM Tivoli Monitoring V5.1.1 can then be stored in the Tivoli Data Warehouse for analysis and reporting. IBM Tivoli Monitoring V5.1.1 data further adds to the data requirement for Tivoli Data Warehouse. The data is typically stored in the central data warehouse and the reporting data mart for each of the IBM Tivoli Monitoring V5.1.1 modules.

3.6 Workbench development requirements

The largest portion of the implementation effort is typically spent on developing monitors that are not readily available or supplied by IBM Tivoli Monitoring V5.1.1. Although IBM Tivoli Monitoring V5.1.1 already has a tremendous amount of canned monitors, and additional monitors are available using the IBM Tivoli Monitoring V5.1.1 monitoring modules, some monitors may still need to be developed or migrated.

To do this, IBM Tivoli Monitoring V5.1.1 workbench must be installed. First, identify the number of IBM Tivoli Monitoring V5.1.1 workbench workstations to install. Then install the workbench on one of the following operating systems:

- Windows NT 4.0 Service Pack 5 or higher, plus WMI Version 1.1 or higher (recommended 1.5)
- Windows 2000
- Windows XP Professional Code

To acquire the operating system level from the System property applet that is started, select **Start** →**Settings** →**Control Panel**. To retrieve the WMI level, use the **<>** command.

To debug JavaScript resource models for Windows on Windows systems, you need a JavaScript debugger. You can download a Microsoft debugger from:

`http://msdn.microsoft.com/library/default.asp?url=/library/en-us/dnanchor/html/scriptinga.asp`

The minimum hardware requirements for the workbench are:

- **Disk space**: 10 MB
- **RAM**: 64 MB
- **Processor**: 133 MHz

4

Installing IBM Tivoli Monitoring V5.1.1

This chapter explains how to install IBM Tivoli Monitoring V5.1.1. It discusses how to migrate from Tivoli Distributed Monitoring V4.1, installing on an existing Tivoli environment, configuring IBM Tivoli Monitoring endpoints, as well as installing Web Health Console and IBM Tivoli Monitoring Workbench.

4.1 Migrating from Tivoli Distributed Monitoring V4.1

Tivoli Distributed Monitoring V4.1 Advanced Edition *cannot* coexist with IBM Tivoli Monitoring V5.1.1. You must upgrade Tivoli Distributed Monitoring to IBM Tivoli Monitoring V5.1.1. Because there is no direct migration path from Tivoli Distributed Monitoring V4.1 Advanced Edition to IBM Tivoli Monitoring V5.1.1, you must upgrade first to IBM Tivoli Monitoring V5.1.

Upgrade versions of Tivoli Manager for Windows NT and older versions of Tivoli Distributed Monitoring for Windows in the following sequence:

1. Tivoli Distributed Monitoring for Windows NT 3.7
2. Tivoli Distributed Monitoring (Advanced Edition) 4.1
3. Tivoli Monitoring 5.1
4. Tivoli Monitoring 5.1.1
5. Tivoli Monitoring 5.1.2

After you install IBM Tivoli Monitoring V5.1, the upgrade to IBM Tivoli Monitoring V5.1.1 is similar to a new installation of IBM Tivoli Monitoring V5.1.1. It supports the Tivoli Software Installation Service or the Tivoli Desktop installation method. Rapid deployment is not applicable since this is an existing environment.

While upgrading IBM Tivoli Monitoring, we recommend that you stop the IBM Tivoli Monitoring engine on all endpoints. To stop these processes, enter:

```
wdmcmd -stop -m all
```

After the upgrade processing is completed, wait for at least 15 minutes to allow in the code changes and the endpoint cache status to time out before you restart all IBM Tivoli Monitoring engines. Then, enter:

```
wdmcmd -restart -m all
```

4.2 Installing on an existing Tivoli environment

There are several installation options for installing IBM Tivoli Monitoring V5.1.1 on an existing Tivoli environment, especially for interfaces with other products and environments. It supports the Tivoli Software Installation Service or the Tivoli Desktop installation method. Rapid deployment is not applicable because this is an existing environment.

You can install the following components individually:

- IBM Tivoli Monitoring Version 5.1.1

  This is the server and gateway code that needs to be installed on the Tivoli Management Region (TMR) server and all gateways.

- Tivoli Monitoring Tivoli Business Systems Manager (TBSM) Adapter, Version 5.1.1

  This is the Common listener adapter feed to TBSM. It must be installed on the TMR server and all gateways which connect to the TBSM common listener.

- Tivoli Monitoring Gathering Historical Data Component, Version 5.1.2

  This is the interface to the older Tivoli Decision Support's Server Performance Prediction.

- Tivoli Monitoring Tivoli Enterprise Data Warehouse Support Version 5.1.2

  This is the interface to Tivoli Data Warehouse. It must be installed on one of the managed nodes to access the database. This feature also allows the collection of monitoring metrics from resource models into a RDBMS interface module (RIM) database.

To begin the installation, from the Tivoli Desktop, complete these tasks:

1. Select **Desktop** →**Install** → **Install Product**.
2. Select the component that you want to install.
3. Install the IBM Tivoli Monitoring V5.1.1 component first and then install individually other components.

To perform a command line installation, type:

```
winstall -c cdrom_dir -i ind_file
```

Installation using Tivoli Software Installation Service goes through the steps of importing the software media to the Tivoli Software Installation Service (SIS) depot. Then you can select the software to be installed to the target machines.

To install the IBM Tivoli Monitoring V5.1.1.1 product using Tivoli Desktop, follow these steps:

1. Back up the object database and the Tivoli file system using either of the following options:

   – From the Tivoli desktop, select **Desktop** →**Backup**.
   – Enter the **wbkupdb** command.

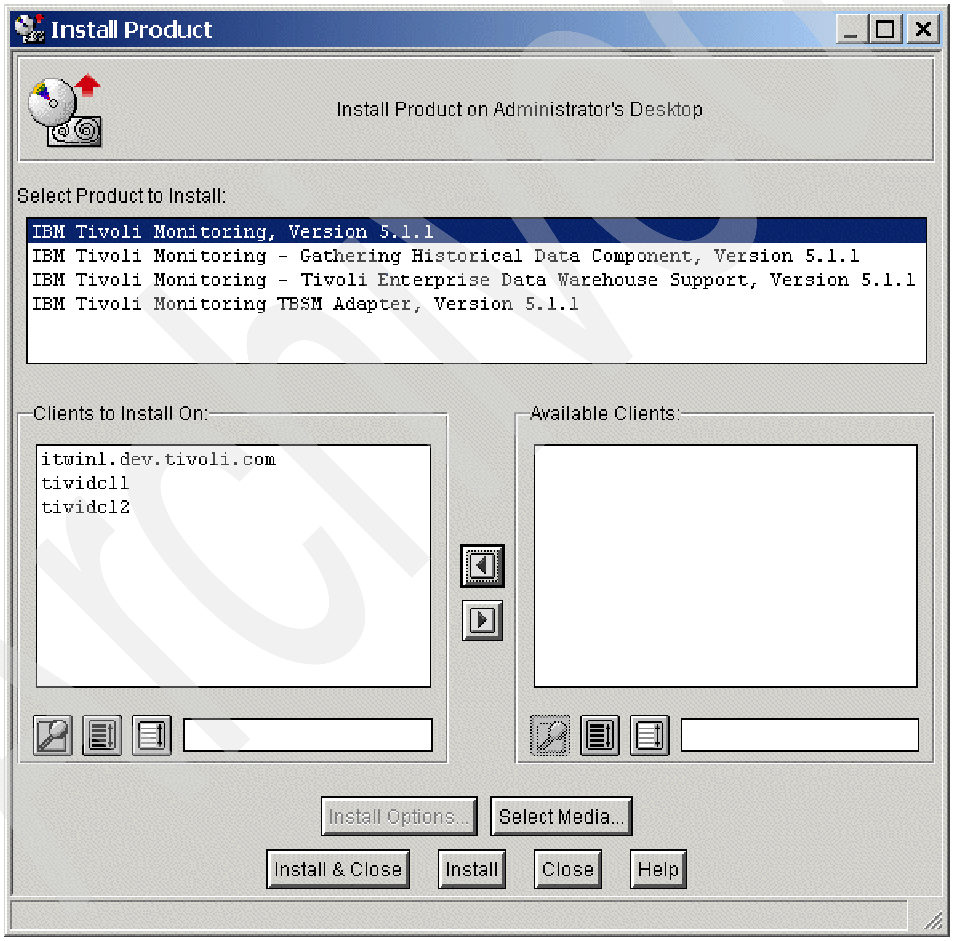
   We recommend that you back up the entire Tivoli file system of the node on which the product will be installed.

2. Install the IBM Tivoli Monitoring V5.1.1 product on the TMR server and gateways.

Tip: If any problems occur during the installation process, they are registered in the /tmp/tivoli.cinstall (UNIX) or %DBDIR%/tmp/tivoli.cinstall (Windows) file.

In our ITSO environment, we installed the product using the following steps:

1. From the Tivoli desktop, select **Desktop →Install →Install Product**.
2. The Install Product window (Figure 4-1) shows three products that are available to install.
   a. Select **IBM Tivoli Monitoring V5.1.1**.
   b. Select your TMR server and the gateways on which you want to install IBM Tivoli Monitoring V5.1.1.
   c. Click **Install**.
3. Follow the standard installation windows.



```
IBM Tivoli Monitoring, Version 5.1.1
IBM Tivoli Monitoring - Gathering Historical Data Component, Version 5.1.1
IBM Tivoli Monitoring - Tivoli Enterprise Data Warehouse Support, Version 5.1.1
IBM Tivoli Monitoring TBSM Adapter, Version 5.1.1
```

```
itwinl.dev.tivoli.com
tividcl1
tividcl2
```

Figure 4-1 Products to install

Tip: If you are installing or upgrading IBM Tivoli Monitoring V5.1.1 on a Windows TMR server environment, you must perform the following the procedures to create the IBM Tivoli Monitoring V5.1.1 Task Libraries.

In the Windows-based TMR box, set the Tivoli environment variables and enter in bash mode. Run the after_install_win.sh script. Example 4-1 shows the script contents.

Example 4-1   Contents of the after_install_win.sh script

```
IRO=`wlookup InterRegion`
IROname=`idlattr -t -g $IRO name string`
IROname=`eval echo $IROname`
DefaultMw2kRegionName=”TivoliDefaultMw2kRegion-$IROname"
wtll -r -p $DefaultMw2kRegionName -P $BINDIR/tools/cat
$BINDIR/TME/Tmw2k/tmnt.tll
wtll -r -p $DefaultMw2kRegionName -P $BINDIR/tools/cat
$BINDIR/TME/Tmw2k/tmnt_util.tll
```

This completes the installation of the base IBM Tivoli Monitoring V5.1.1 code.

During the installation, policy region TivoliDefaultMw2kRegion-*regionname* is created. To access this policy region, select **Desktop** →**TMR Connections** →**Top Level Policy Region**. This policy region contains a profile manager and two task libraries, as shown in Figure 4-2.

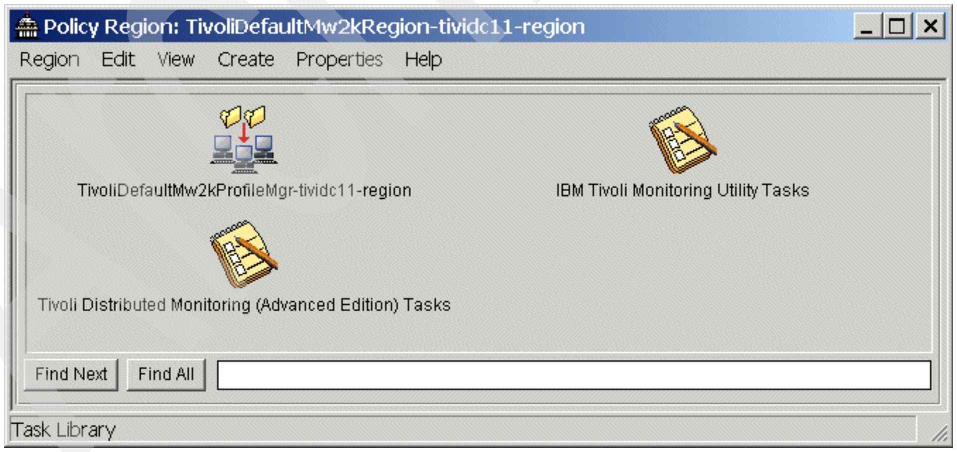

Policy Region: TivoliDefaultMw2kRegion-tividc11-region
Region
Edit
View
Create
Properties
Help
TivoliDefaultMw2kProfileMgr-tividc11-region
IBM Tivoli Monitoring Utility Tasks
Tivoli Distributed Monitoring (Advanced Edition) Tasks
Find Next
Find All
Task Library

Figure 4-2   Profile manager and task library

4.3 Configuring IBM Tivoli Monitoring endpoints

This section discusses the point at which you have all the IBM Tivoli Monitoring V5.1.1 components installed on the TMR server and gateways. You need to install the prerequisite software on the endpoints, such as Java Runtime Environment (JRE), Windows Management Instrumentation (WMI), and disk performance enabled.

4.3.1 Java Runtime Environment

You can install the JRE using the following methods:

- From the product CD for installation using the Tivoli SIS
- From the product CD in compressed format, for manual installation or installation using the **`wdmdistrib –J`** command

You may already have an appropriate version of JRE installed. Installing the JRE manually is not a supported option. After you install JRE, you need only to link the product component to the existing JRE using a task provided with the product. This creates a symbolic link in the Tivoli directory structure under $BINDIR. The task that does this is called *DMLinkJre*, which resides within TivoliDefaultMw2kRegion policy region under the Tivoli Monitoring Tasks task library. The base path of the JRE installation is the only argument for the task.

4.3.2 Windows-based endpoint setup

For a Windows-based endpoint, consider the following setup requirements:

- Windows NT, Windows 95 and 98 do not have WMI installed by default. Install WMI from the Microsoft Web site.
- Data logging on a Windows NT-based endpoint requires Microsoft Access 2000 or Microsoft Data Access Components V2.1 or later.
- For Windows 2000, a JavaScript-based resource model requires the usage of Windows Script Host to be installed.
- You need to run the **`diskperf -y`** command to enable disk performance data collection resource models. You must also:
  a. Determine the source for Open Database Connectivity (ODBC), WMI, CScript, and JRE installation images.
  b. Retrieve ODBC, WMI, CScript install images.

4.4 Installing the Web Health Console

The Web Health Console is installed on a separate machine that may or may not be part of your TMR. It runs IBM HTTP Server and WebSphere Application Server, Single Server Edition Version 4.0.2. The Web Health Console installation requires at least 450 MB of temporary space.

You can install Web Health Console from the CD-ROM media and run the appropriate setup executables for the platform involved. It launches the installation wizard for you. When completed, you can access the Web Health Console from:

```
http://whcserver/dmwhc
```

4.4.1 Installing on a Windows environment

To install the Web Health Console on Windows, follow these steps:

1. Using Web Health Console disk 2, double-click the **setupwin32.exe** file. If the temporary directory does not have enough space, you see an error message. To avoid this, enter the following command:

   ```
   setupwin32 -is:tempdir TMPdir
   ```

   Here *TMPdir* is the name of the temporary directory.

2. Follow the instructions presented in the installation windows. In particular, specify the following information:

   a. Provide the directory name for the location on which you want to install the Web Health Console Server. The directory name must *not* contain spaces.

   b. Provide the user name under which the Web server will run.

   c. Specify **Act As Operating System access** for this user.

   d. Provide the password for the user.

To install in silent mode using the command line, provide the following arguments:

```
-silent
-P base_install.installLocation=DirectoryName
-W user_input.user=User Name
-W user_input.password=Password
```

You can also include these arguments in a file and pass the file to the launcher using the switch -options options file.

4.4.2 Installing on a UNIX environment

To install the Web Health Console on UNIX, complete these steps:

1. Using Web Health Console disk 1, run one of the following files depending on the UNIX platform you are using:

   – setupaix.bin on AIX
   – setuphp1020.bin on HP-UX10.2
   – setuphp11x.bin on HP-UX11.x
   – setupsolarisSparc.bin on Sun Solaris
   – setuplinux.bin on Linux

   Note: If the temporary directory does not have enough space, you may see an error message. To avoid this, enter the command (corresponding to your UNIX platform):

   ```
   setupaix -is:tempdir TMPdir
   ```

   Here *TMPdir* is the name of the temporary directory.

2. Follow the instructions presented in the installation windows. In particular, provide the directory name for the location on which you want to install the Web Health Console Server.

To install in silent mode using the command line, provide the following arguments to the setup command indicated earlier:

```
-silent
-P base_install.installLocation=.Directory Name....
```

You can also include these arguments in a file and pass the file to the launcher using the switch -options options file.

Note: The UNIX installation installs the IBM HTTP Server into a standard location regardless of the directory that you specify. The rest of the installation goes to the directory that you have specified. When starting the application server, you must set the DISPLAY environment variable correctly. Otherwise you cannot display any graphs with the AMW4805E message.

The standard locations are:

- AIX: /usr/HTTPServer
- Sun Solaris: /opt/IBMHTTPD
- Linux: /opt/IBMHTTPServer
- HP: /opt/HTTPServer

4.4.3 Installing the monitoring modules

For any additional resource models that are installed, you can add the national language-enabled resources definition to display the resource model and metric names. Simply copy the message class files into the directory path *install_dir*/ installedApps/dm.ear/dm.war/WEB-INF/classes/com/tivoli /DmForNt/resources.

4.5 Installing IBM Tivoli Monitoring Workbench

Before you install the workbench, you must install WMI, especially for the Windows NT or Windows 2000 platform. To install IBM Tivoli Monitoring workbench, from the IBM Tivoli Monitoring V5.1.1 Workbench CD, open the **ITM5.1WB** → **Disk1** folder, and run `setup`. This launches the installation wizard.

Additionally, to debug JavaScript resource models, you need a JavaScript debugger. You can download a Microsoft debugger from:

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/dnanchor/html/scriptinga.asp

5

Configuring IBM Tivoli Monitoring V5.1.1 server

This chapter discusses the configuration process for IBM Tivoli Monitoring V5.1.1. It discusses various way to configure IBM Tivoli Monitoring in the Tivoli environment and its features and interaction with other Tivoli products.

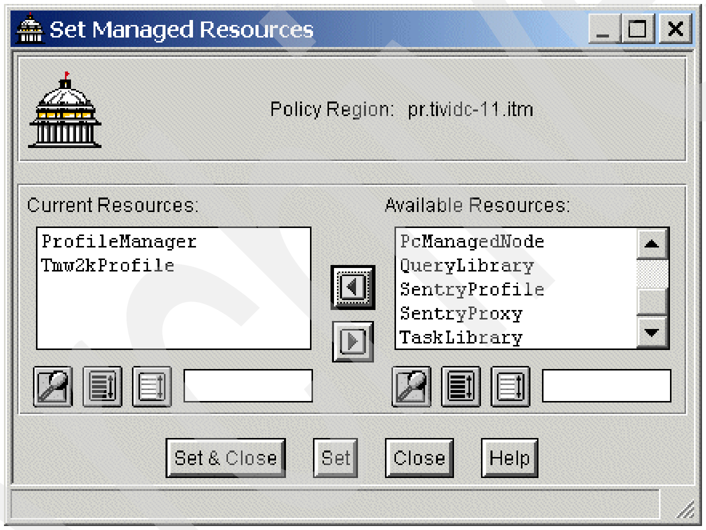
5.1 Configuring the Tivoli environment

With the introduction of IBM Tivoli Monitoring V5.1.1 into your environment, you may need to change some settings in your Tivoli Management Region (TMR).

The administrator typically performs the following steps:

1. From the policy region point of view, include the IBM Tivoli Monitoring V5.1.1 monitoring profile as a managed resource under the associated policy region. From the Tivoli Desktop, select **Properties** →**Managed Resource**.
2. In the Set Managed Resources window (Figure 5-1), under Available Resources, move Tmw2kProfile and ProfileManager into Current Resources. Alternatively you can run the **`wsetpr`** command to assign the managed resource. This task requires the administrator role.

   Click **Set & Close**, click **Set**, and then click **Close**.



Policy Region: pr.tividc-11.itm

Current Resources:

```
ProfileManager
Tmw2kProfile
```

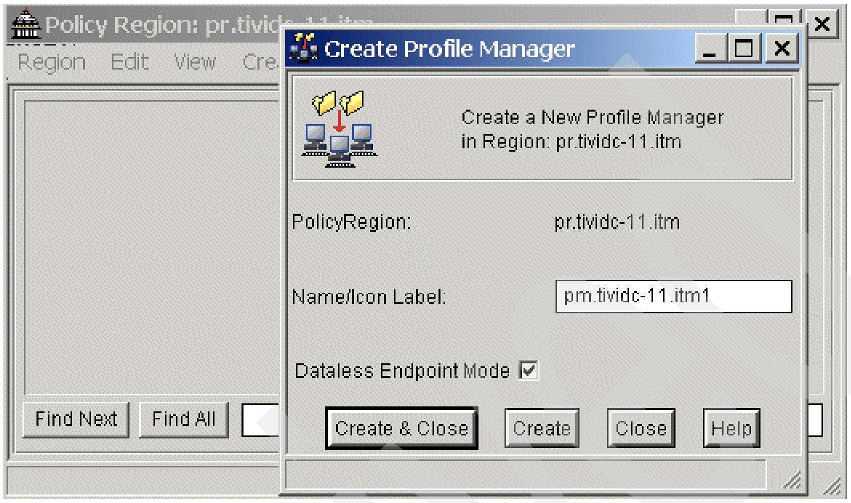
Available Resources:

```
PcManagedNode
QueryLibrary
SentryProfile
SentryProxy
TaskLibrary
```

Figure 5-1 Setting managed resources

3. Define a profile manager to host the IBM Tivoli Monitoring V5.1.1 profiles in the policy region that has Tmw2kProfile as a managed resource. From the Tivoli Desktop, within the policy region, select **Create** →**ProfileManager** or enter the **`wcrtprfmgr`** CLI command.

4. The Create Profile Manager window (Figure 5-2) opens. This task requires the administrator role. For Name/Icon Label, type the profile manager name, and select **Dataless Endpoint Mode**. Then click **Create & Close**.



Create a New Profile Manager
in Region: pr.tividc-11.itm

PolicyRegion: pr.tividc-11.itm

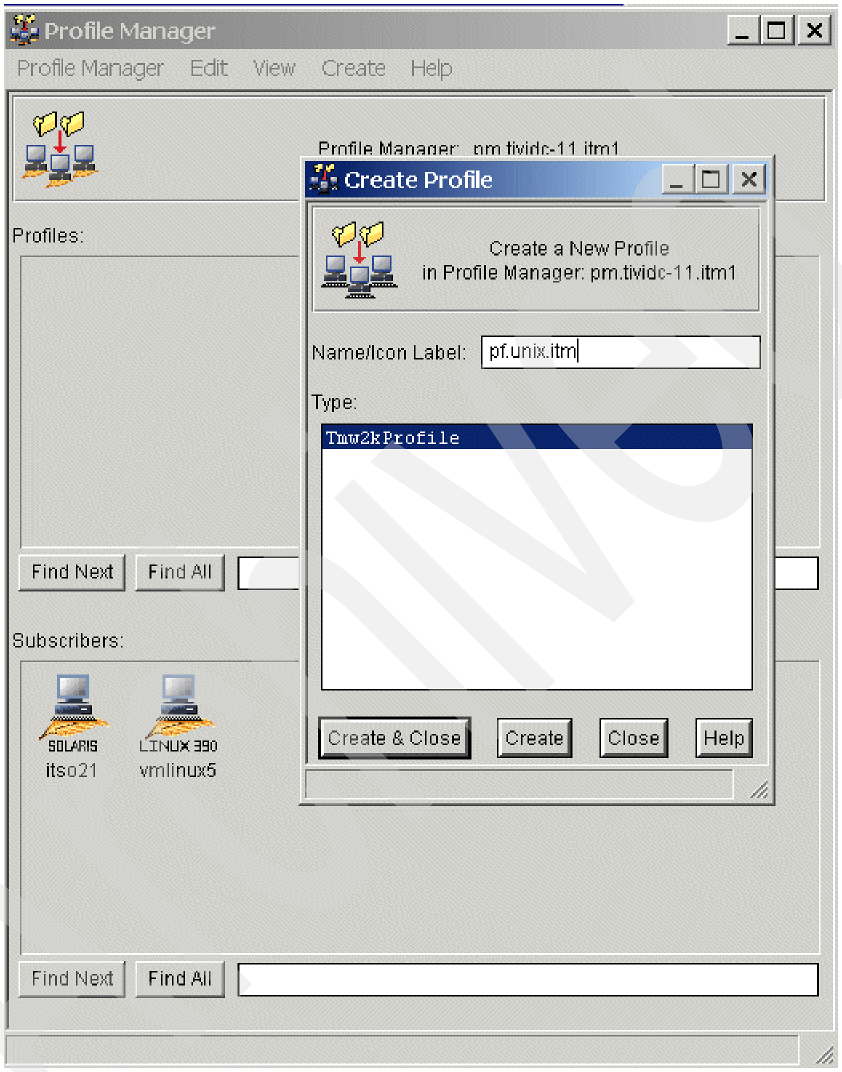
Name/Icon Label: pm.tividc-11.itm1

Dataless Endpoint Mode ✓

Figure 5-2 Creating profile manager

5. Create a monitoring profile, also called Tmw2kProfile, in the profile manager, which hosts the resource models that are incorporated into that profile. To do this, using the Tivoli Desktop, select **Create →Profiles** or type the **`wcrtprf`** CLI command.

6. The Create Profile window (Figure 5-3) opens. This task requires the administrator role. For Name/Icon Label, type the profile manager name and specify the Type. Then click **Create & Close**.


Profile Manager
Profile Manager Edit View Create Help
Profile Manager: pm.tividc-11.itm1
Profiles:
Find Next Find All
Subscribers:
SOLARIS itso21
LINUX 390 vmlinux5
Find Next Find All
Create Profile
Create a New Profile
in Profile Manager: pm.tividc-11.itm1
Create & Close Create Close Help

Name/Icon Label: pf.unix.itm

Type:

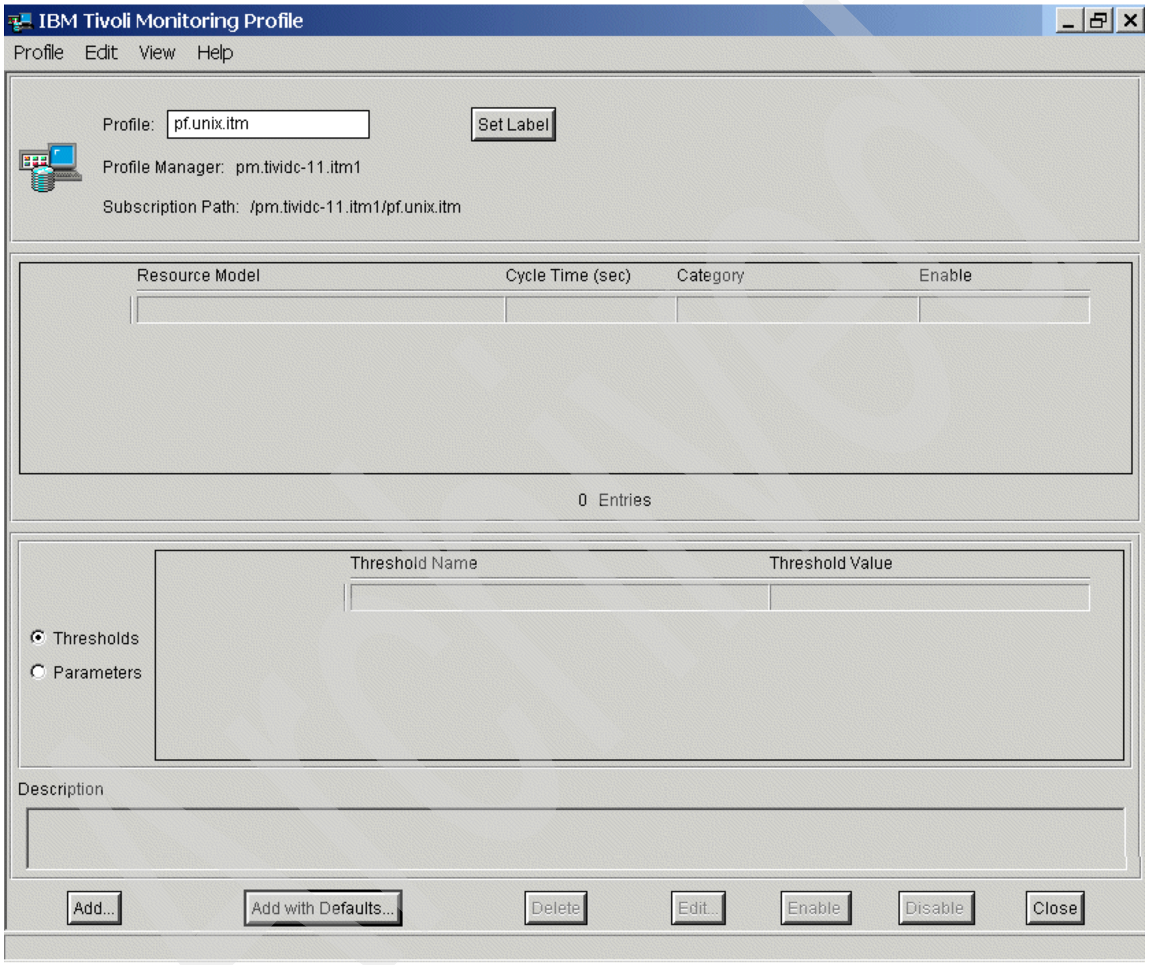
Tmw2kProfile

Figure 5-3 Profile creation

7. Distribute the monitoring profile to the endpoints and start monitoring the environment. You can do this using the drag and drop method, the Distribute menu command, or the **`wdmdistrib`** CLI command. This task requires an administrator, senior, or super role.

5.2 Configuring the IBM Tivoli Monitoring profiles

After you reach the Tmw2kProfile resource, configure the profile. The best way to do this is to use the Tivoli Desktop or a command line. Figure 5-4 shows the IBM Tivoli Monitoring Profile window (Tmw2kProfile) without any values.



Profile: pf.unix.itm

Profile Manager: pm.tividc-11.itm1

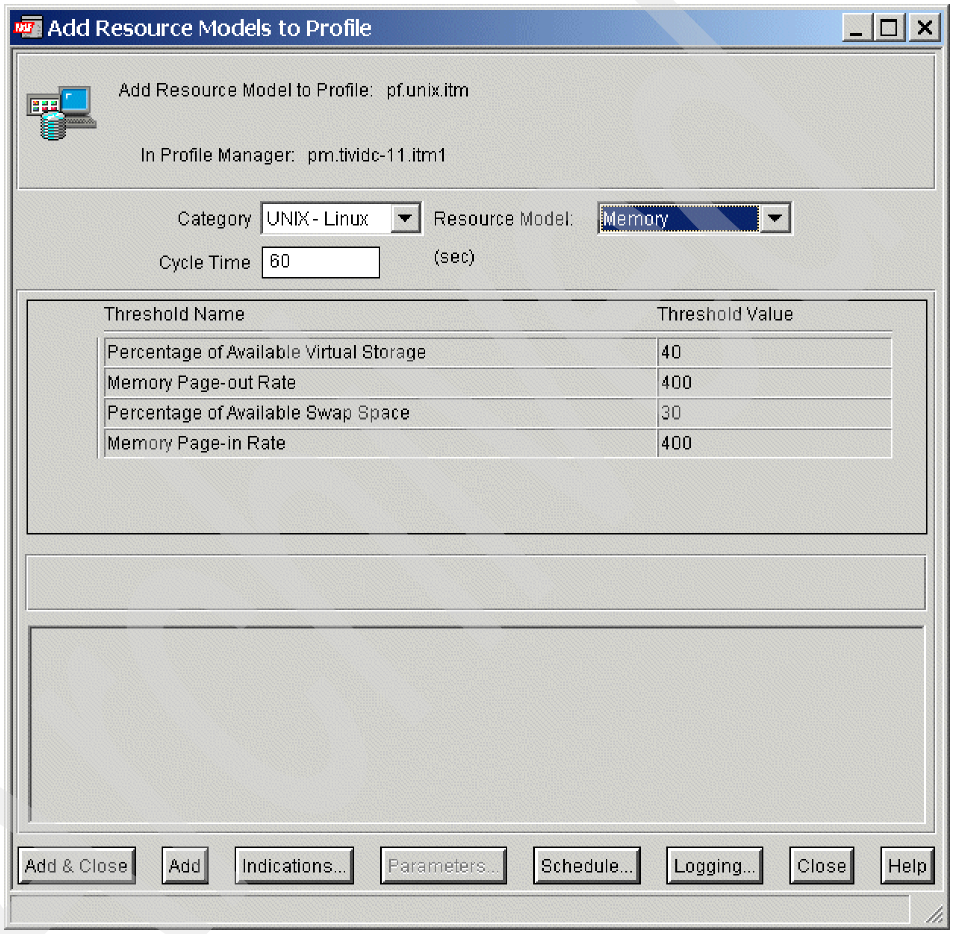
Subscription Path: /pm.tividc-11.itm1/pf.unix.itm

0 Entries

(● Thresholds) ○ Parameters

Figure 5-4 Empty Tmw2kProfile

From this profile window, you can add resource models in the profiles. You can click Add to add the resource models with empty values, or click Add with Defaults to add the resource models with default values. The Add buttons open the Add Resource Models to Profile window (Figure 5-5). Then you can customize all the out-of-the-box parameters that are set, based on the monitoring requirements for your environment.


Add Resource Models to Profile

Add Resource Model to Profile: pf.unix.itm

In Profile Manager: pm.tividc-11.itm1

Category: UNIX - Linux

Resource Model: Memory

Cycle Time: 60 (sec)

Threshold Name	Threshold Value
Percentage of Available Virtual Storage	40
Memory Page-out Rate	400
Percentage of Available Swap Space	30
Memory Page-in Rate	400

Figure 5-5 Add Resource Models to Profile window

5.2.1 Customizing the cycle time and thresholds

When you add the resource model, default cycle time, threshold name, and default threshold, values for the resource model are displayed. The cycle time is the regular interval at which a resource model is required to collect data. You can change this value, as well as the threshold and related values. Threshold values are compared to system resource values that are provided by the Common Information Model (CIM)-compliant data providers. The analyzer can use both the cycle time and thresholds to determine how often to run through the decision tree and which values to compare the system resource data with.

- To change the cycle time, type a new value in the Cycle Time box. When you finish the customization, click **Add & Close**. Then the new cycle time is added to the profile.
- To change the thresholds, select the threshold. Change the value of the threshold and click **Apply**.

As mentioned earlier, an indication is comprised of several thresholds. Before you modify the default threshold values, you must understand the relationship between the thresholds and the indication.

5.2.2 Customizing the indications

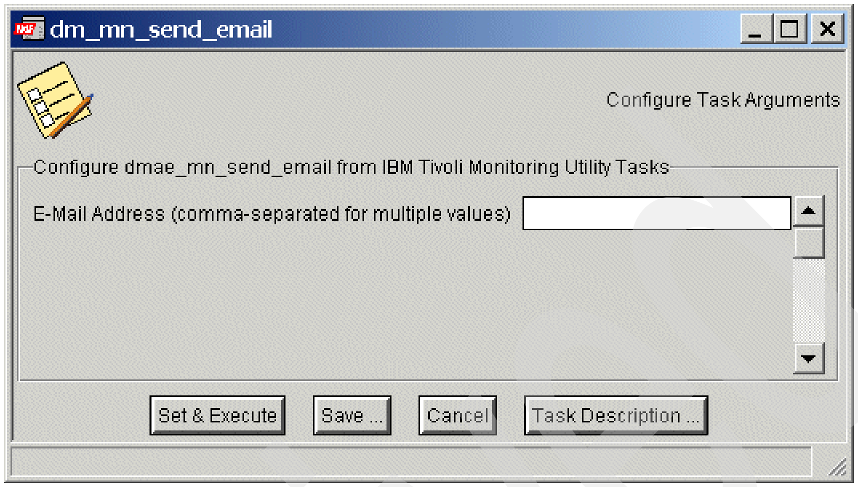
The second component that can be modified is the indications. Click the **Indications** button. Then the Indications and Actions window opens. Configure the following items:

- For each indication, configure the number of occurrences and holes that must be met before an event is generated.
- Configure to where events are to be sent, that is, Tivoli Enterprise Console, Tivoli Business Systems Manager (TBSM), or both. You can also change severity levels of the events.
- Built-in tasks are tasks that the certain resource models are configured to execute when an event is generated. You can enable and disable these tasks from here.
- If you have a requirement to run an external script, you can create a task to run the script and then add it to the resource model to be called when an event is generated.

Built-in tasks

IBM Tivoli Monitoring 5.1 provides, in the IBM Tivoli Monitoring Utility Tasks library, two new responses that can be used as actions when configuring the action list.

- *dm_mn_send_email* requires the parameter e-mail address. Use commas (,) to separate multiple e-mail addresses, as shown in Figure 5-6.

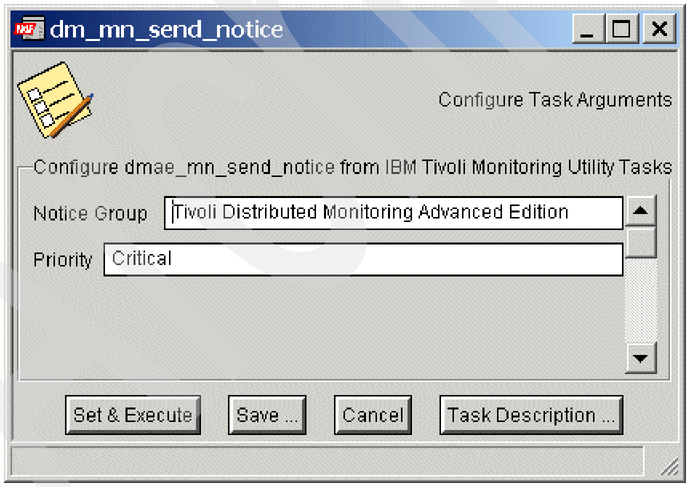


Configure dmae_mn_send_email from IBM Tivoli Monitoring Utility Tasks

E-Mail Address (comma-separated for multiple values)

Figure 5-6 Task dm_mn_send_email

- *dm_mn_send_notice* requires the Notice Group and Priority parameters, as shown in Figure 5-7.



Configure dmae_mn_send_notice from IBM Tivoli Monitoring Utility Tasks

Notice Group: Tivoli Distributed Monitoring Advanced Edition

Priority: Critical

Figure 5-7 Task dm_mn_send_notices

Note: Both tasks are run on the managed node or gateway where the target endpoint is logged on. To check the task execution on the managed node, use the **`odstat`** command.

5.2.3 Customizing the scheduler

The third component is the scheduler. By default, the scheduler is configured to collect monitoring at all times. If you have a requirement to monitor certain types of devices during predefined time periods, you can configure the scheduler to monitor a certain endpoint based on your requirements. To schedule monitoring, follow these steps:

1. From the Add Resource Models to Profile window (Figure 5-5 on page 64), click the **Schedule** button.
2. Deselect the **Always** check box and enter your scheduling requirements.
3. Click **Modify & Close**.

5.2.4 Customizing data logging

The fourth component that you can configure is logging. Logging allows for capturing performance data and storing it locally on the endpoint. You can view this data by the Web Health Console and store it in a central relational database management system (RDBMS) for further analysis. By default, no performance data is logged. The data that is logged can be kept for up to 24 hours. To log data, follow these steps:

1. In the Add Resource Models to Profile window (Figure 5-5 on page 64), click the **Logging** button.
2. In the Logging window, select the **Enable Data Logging** check box.

Logging data stores the raw data for the resource models on the endpoint. To aggregate the data, select the **Aggregate Data** check box and provide the aggregation period. You also need to specify how long to keep the historical data before it is deleted from the database. The database is local to the endpoint. This data can be rolled up to a central RDBMS. Using Tivoli Enterprise Data Warehouse, you can report on the data.

Note: On Windows endpoints, the data logging records information in the $LCF_DATDIR/LCFNEW/Tmw2k/db/tmw2kdb.mdb file. To provide ODBC access to this file, the system data source name *tmw2k* is created.

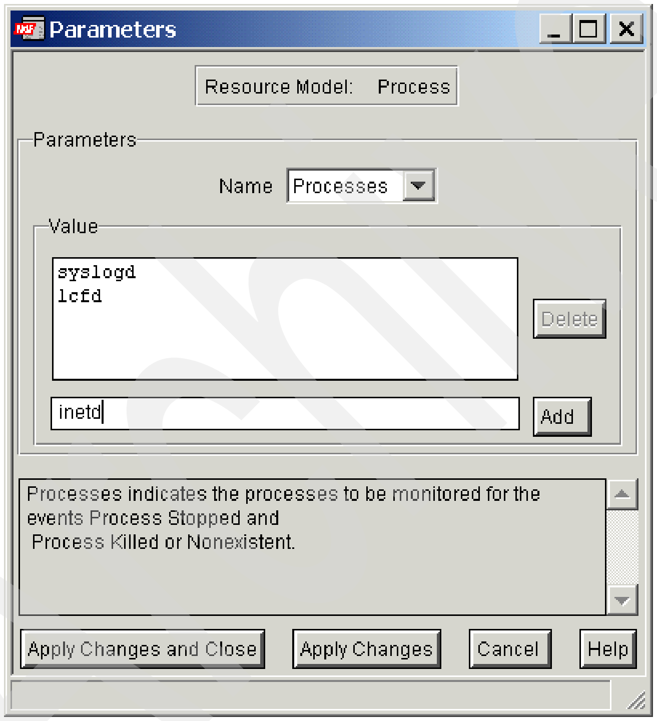
On UNIX endpoints, the data logging records information in the $LCF_DATDIR/LCFNEW/Tmw2k/Unix/data/logger/dblogger/datafile file.

The data files are created when there is a need to log data.

5.2.5 Customizing parameters

You can configure parameters for certain types of resource models. Consider the UNIX Processes resource model, which contains processes to monitor. By default, it monitors the `syslogd` and the `lcfd` processes. If you require monitoring of additional processes, you can add them here, as shown in Figure 5-8. To add other processes, follow these steps:

1. In the Add Resource Models to Profile window (Figure 5-5 on page 64), for Category, select **UNIX-Linux** and select **Processes**. Click the **Parameters** button.
2. In the Parameters window (Figure 5-8), select a valid process to monitor and click the **Add** button. Then click **Apply Changes and Close**.



Resource Model: Process

Name: Processes

```
syslogd
lcfd
```

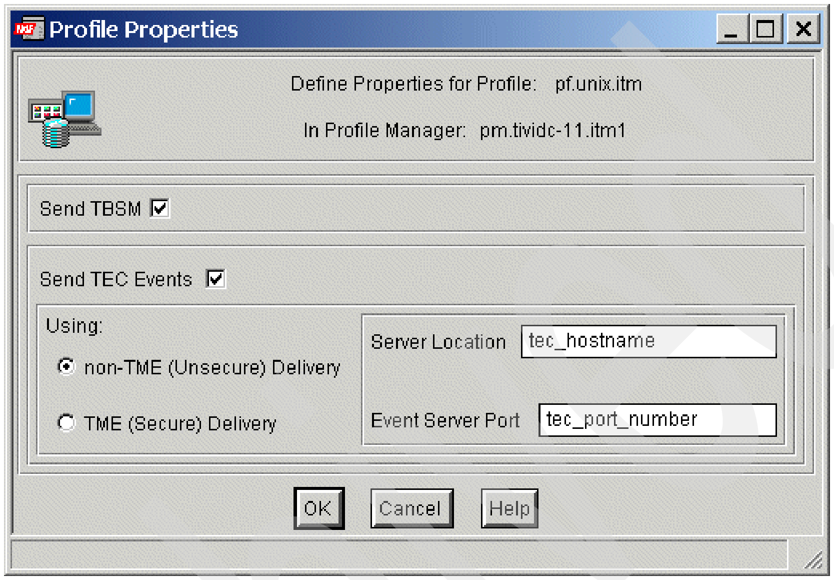
inetd

Processes indicates the processes to be monitored for the events Process Stopped and Process Killed or Nonexistent.

Figure 5-8 Changing the parameters of the resource model

5.2.6 Customizing a profile

From the Profile Configuration window (Figure 5-4), select **Edit →Properties**. The Profile Properties window (Figure 5-9) opens. In this window, you specify whether to send events to Tivoli Enterprise Console, Tivoli Business Systems Manager, or both. You also choose whether the events are to be secure or non-secure. If events are to be forwarded to Tivoli Enterprise Console using a secure connection, you must also specify the Tivoli Enterprise Console server. If you are using a non-secure connection, then you must specify the IP address and port of the Tivoli Enterprise Console server.



Define Properties for Profile: pf.unix.itm

In Profile Manager: pm.tividc-11.itm1

Send TBSM ☑

Send TEC Events ☑

Using:

● non-TME (Unsecure) Delivery

○ TME (Secure) Delivery

Server Location: tec_hostname

Event Server Port: tec_port_number

Figure 5-9 Profile properties

An alternative way to manipulate the profile is to use the following CLI commands:

- **`wdmdumpprf`**: Writes the full details of a profile to the standard output
- **`wdmeditprf`**: Allows you to customize a profile, including all resource model details
- **`wdmloadprf`**: Loads and updates profiles at a TMR server

The **`wdmeditprf`** command is comparable to the Tivoli Desktop to set the various attributes of an IBM Tivoli Monitoring monitoring profile. The capability includes setting the following items:

- Globally setting the profile parameters, including event forwarding capabilities to TEC, TBSM, or both
- Adding resource models with default values or with value supplied by you
- Editing the resource model details

- Defining the destination monitors for events generated by the resource model, such as TEC or TBSM forwarding, from logging to historical database
- Defining the tasks triggered by events, generated by the resource model

After you edit the profile and save it, you can distribute the profile to endpoints, using the `wdmdistrib` command. When the direct subscriber of an IBM Tivoli Monitoring monitoring profile is a Dataless Profile Manager that contains endpoints, change the distribution defaults to All Levels/Make Exact Copy.

5.3 Resource models

This section discusses a resource model. A resource model is built using IBM Tivoli Monitoring workbench. The major components of a resource model are:

- **Configuration file**: This file contains configuration details including the resource model name, platform name, name of the decision tree file, and names of the Managed Object Format (MOF) files.
- **MOF file**: This file contains the particular resource model's class description and event definitions. The classes are derived from the corresponding base classes of the resources.

  The base classes for the model-to-resources association are provided in a base MOF file. The classes that describe physical resources used in the resource models, with respect to the instance providers, are provided in a resources MOF file. These additional MOF files are distributed to the endpoint the first time an IBM Tivoli Monitoring 5.1 profile is distributed to it.
- **Decision tree file**: This file contains both the initialization settings for the resource model and the algorithm that is used by the IBM Tivoli Monitoring 5.1 analyzer to determine if a problem is encountered in the resources described by the resource model. In Windows, this is VisualBasic script or JavaScript, and for UNIX and LINUX platforms, it is JavaScript.
- **Message catalog**: This catalog is for building the Tivoli Enterprise Console and Tivoli Business Systems Manager events.
- **Class files**: These files interface with the native library that collects performance metrics.

When an IBM Tivoli Monitoring 5.1 profile that contains a resource model is distributed to the endpoint, the following actions take place:

- Resource model files are unzipped from the resource model-specific ZIP file.
- MOF files that are specific to the resource model are compiled.

- All components of the IBM Tivoli Monitoring 5.1 engine are created, loaded in memory, and started (logger, analyzer, action manager, event aggregator, and event correlator).

The profile then associates the resource model with the monitoring parameters. The available monitoring parameters within a resource model for a metric are:

- **Threshold**: Determines what is OK and not OK
- **Monitoring interval**: Determines how often to check a metric; each interval is also called a *cycle*
- **Occurrence**: Refers to a cycle during which an indication occurs for a given resource model
- **Hole**: Refers to a cycle during which an indication does not occur for a given resource model; none of the conditions specified for the generation of any indication are met

You can configure the resource model to accept predefined occurrences and holes before triggering the notification to prevent false alarms and event floods. The algorithm to generate the notification follows this sequence:

1. An occurrence starts the counter.
2. It counts all occurrences and holes. When the number of holes exceeds the predefined number, it resets the counter. Any exception resets the number of holes.
3. When the number of occurrences exceeds the predefined number, it generates an exception.
4. When the number of holes exceeds the predefined number, a clearing event is generated and all counters are reset.

5.4 Historical data collection

Data collected from the resource models can be stored in a database. This database is based on the RDBMS interface module (RIM) technology in Tivoli Management Framework. This facility is installed with the IBM Tivoli Monitoring V5.1.1 Data Warehouse integration component.

After you install the feature, you can create the database using the scripts stored in $BINDIR/TME/Tmw2k/warehousecfg. The script is called **`cr_tedw_rim.sh`**. You must supply the information similar to the parameter of the **`wcrtrim`** command to create the RIM object. The default RIM object name is `itm_rim_`*`host name`*. Table 5-1 lists the various database type attributes.

Table 5-1 RIM database parameter

Vendor (-v)	DB ID (-d)	DB home (-H)	DB Server ID (-s)	DB Instance (-I)
DB2	Database name	Client install directory	$DB2COMM (TCP/IP)	Instance directory
Informix	ODBC DSN name	Client install directory	Server name in sqlhosts	-
Microsoft SQL	Database name	Client install directory	Host name	-
Oracle	$Oracle_SID or Oracle Service name	$ORACLE_HOME	$TWO_TASK	-
Sybase	Database name	$SYBASE	$DSQUERY	-

Alternatively you can create the RIM database manually using the **`wcrtrim`** command and create the database schema using the SQL script **`cr_db_`*`vendor`*`.sql`**.

You can define, in the Tmw2kProfile, the data collection setting to enable data logging to TEDW. This data logging collects metrics information at the endpoint. When the Monitoring engine starts collecting data, a period of aggregation is specified in the profile. After 20 minutes from the end of the aggregation period, the data is exported from the endpoint database into an XML file. This file is then sent to the gateway under the $DBDIR/dmml.

The **`wdmconfig`** command allows configuration of specific IBM Tivoli Monitoring V5.1.1 gateway options. The syntax is as follows:

```
wdmconfig [–m {managed_node | @managed_nodes_file | all}] {–D key=value [–D
key=value] ... | –G key}
```

Related to data collection, you may want to modify the following keys:

- **datacollector.db_purge_interval**: Specifies the number of days the data is kept on the database. Older data is removed automatically from the database. The value can range from 10 to 60. The default is 30 days.
- **datacollector.delay**: Specifies the time delay (in minutes, compared to the hour) after which the data collector process uploads data from the endpoints. The value can range from 10 to 60 minutes. The default is 30 minutes.
- **datacollector.max_retry_time**: Specifies the maximum number of times an XML data file must be processed before being archived when an error occurs. The default is three times.

- **datacollector.rim_name**: Specifies the name of the RIM object that the data collection process uses to load data to the database. The default is itm_rim_RIM host name.
- **datacollector.sleep_time**: Specifies the time interval (in minutes) between two consecutive requests of data uploading generated by the data collector processor. The value can range from 10 to 60 minutes. The default is 10 minutes.
- **datacollector.trace_level**: Specifies the level of the data collector trace. The minimum value is 0, the maximum is 2, and the default is 1.
- **datacollector.trace_size**: Specifies the size in bytes of the data collector trace. The default is 500000.

The **wdmcollect** command defines the collection property of specific endpoints. The syntax of the command is:

```
wdmcollect {{{-e {endpoint_name | @endpoints_file} {-s time_interval | -t | -r
}} | -t | -q} [ -m managed_node ]} | { -m all { -t | -q }}
wdmcollect -p
```

The options that you can specify or modify using the **wdmconfig** command are:

-e	Endpoint list
-s	Collection time interval
-t	Terminate collection
-r	Process XML files
-q	Query status
-p	Purge data according to db_purge_interval key

Collection to the RIM database is performed typically using the **wdmcollect** command or automatically (for the central data warehouse) at the next full hour after profile distribution time. At that point, after an aggregation period of one hour, the data is stored in the endpoint database. Finally, 20 minutes later, the data is exported from the endpoint database into an XML file. These XML files are then written to the RIM database.

5.5 Heartbeat function

IBM Tivoli Monitoring 5.1 includes a heartbeat function, which monitors the basic signs of life at endpoints attached to the gateway at which it is enabled. Therefore, the heartbeat monitoring process is performed from the gateway.

One problem that clients faced with older versions of Distributed Monitoring was that, if the engine on the endpoint failed, they had no way of knowing this. Now, the heartbeat function regularly monitors the endpoints, checking if they are running correctly. Events may be sent to any of the following locations:

- The Tivoli Business Systems Manager provided that the Tivoli Business Systems Manager Adapter component is installed at the gateway
- The Tivoli Enterprise Console for Tivoli Management Environment (TME) or secure events only
- Tivoli notice group when using Tivoli Distributed Monitoring Advanced Edition

The function can register the following statuses for an endpoint in its cache. The statuses are divided into two groups, depending on whether information or an error event is sent to the monitors:

- Statuses for which an information event is sent:
  - Alive
  - Heartbeat has been stopped
- Statuses for which an error event is sent:
  - Resource model in error status
  - IBM Tivoli Monitoring 5.1 engine stopped
  - Endpoint not available

The heartbeat function is enabled on the managed node or gateway of the endpoints that you want to monitor. The heartbeat monitoring engine has the ability to forward events to the Tivoli Enterprise Console, Tivoli Business Systems Manager, or both and send notices to the Tivoli Notice Groups. Three activities make up the heartbeat function:

- Endpoint registration
- Heartbeat monitoring
- Viewing endpoint cache

5.5.1 Endpoint registration

Consider a case where an IBM Tivoli Monitoring 5.1 profile is pushed to an endpoint for the first time or the IBM Tivoli Monitoring 5.1 engine is restarted on an endpoint. In this situation, the information in the endpoint cache is updated when the gateway receives a message from the endpoint. The message informs the gateway that its IBM Tivoli Monitoring 5.1 engine has been started. Figure 5-10 illustrates the flow of data.

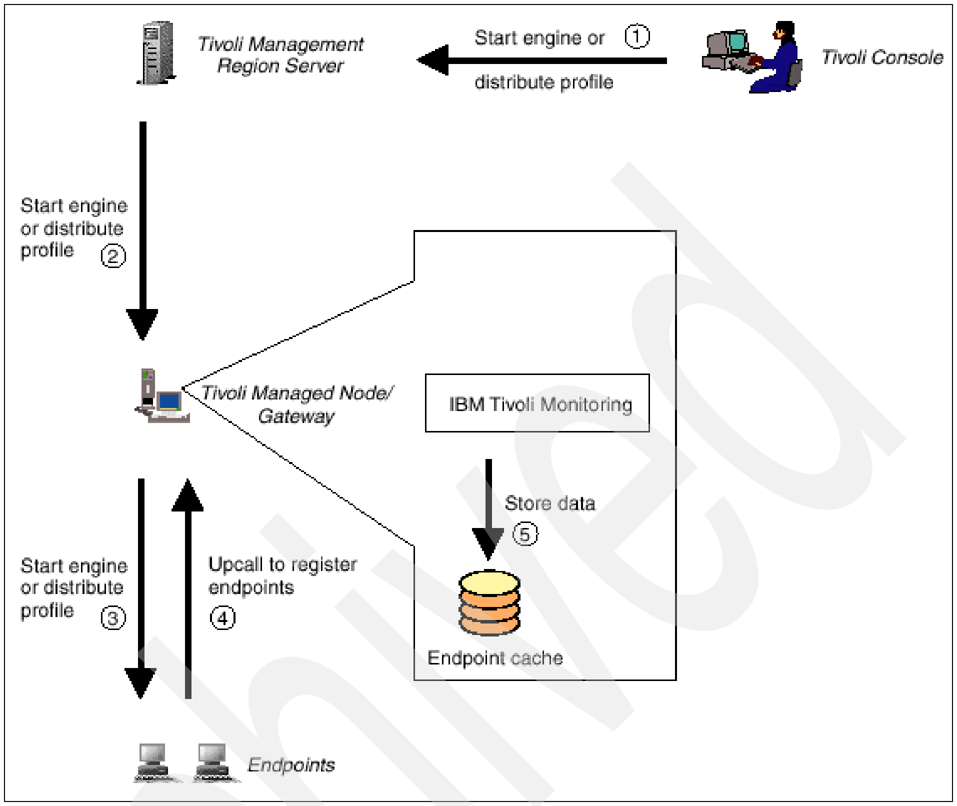

Tivoli Management Region Server
Start engine or ① distribute profile
Tivoli Console
Start engine or distribute profile ②
Tivoli Managed Node/ Gateway
IBM Tivoli Monitoring
Store data ⑤
Start engine or distribute profile ③
Upcall to register endpoints ④
Endpoint cache
Endpoints

Figure 5-10 Heartbeat endpoint registration data flow

After the profile is distributed to the endpoint or the IBM Tivoli Monitoring 5.1 engine is restarted on the endpoint, it sends an upcall (a method called *register_endpoint*) to the gateway. The gateway then registers the endpoint in the endpoint cache. Additionally, while the engine is active, it sends this register_endpoint upcall to its gateway every 18 minutes. This behavior helps to track endpoint migration between gateways. With this release, this upcall cannot be configured for a different time interval, nor can it be disabled. Also this upcall occurs regardless of whether the heartbeat is turned on or turned off.

5.5.2 Heartbeat monitoring

The heartbeat status check of endpoints is initiated from the gateway. Therefore, the granularity of control is at a *per-gateway* level. Either all registered endpoints on a given gateway are eligible for a heartbeat (the heartbeat is turned on for that gateway) or none of them are (the heartbeat is turned off on the gateway).

Figure 5-11 shows the flow of data during the heartbeat monitoring process.

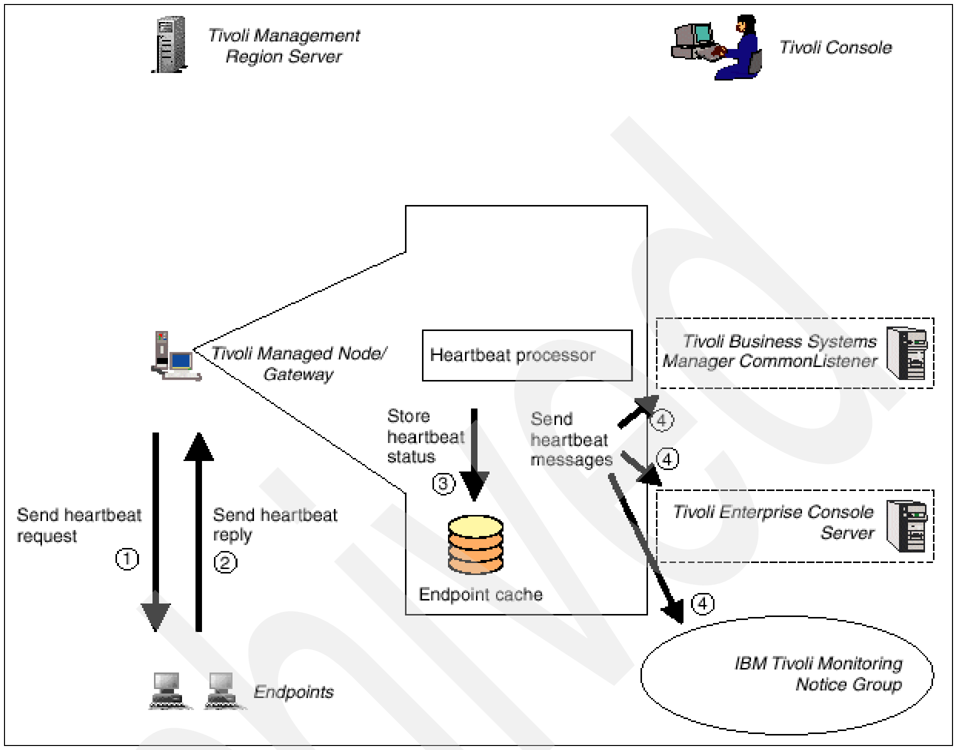

Tivoli Management Region Server
Tivoli Console
Tivoli Managed Node/ Gateway
Heartbeat processor
Tivoli Business Systems Manager CommonListener
Store heartbeat status
③
Send heartbeat messages
④
④
Tivoli Enterprise Console Server
Send heartbeat request
①
Send heartbeat reply
②
Endpoint cache
④
IBM Tivoli Monitoring Notice Group
Endpoints

Figure 5-11 Heartbeat monitoring data flow

The gateway issues periodic heartbeat requests (downcalls) to all attached endpoints. The data that is returned is then stored in the endpoint cache, and events are sent to the configured event targets.

5.5.3 Viewing the endpoint cache

When the heartbeat monitor detects problems with the resource model, the IBM Tivoli Monitoring 5.1 engine, or endpoint, it sends events to Tivoli Enterprise Console, Tivoli Business Systems Manager, or the Tivoli notice groups. In addition, you can view the heartbeat information in the endpoint cache by using the **wdmmngcache** command.

Figure 5-12 shows the flow of data when you enter this command.

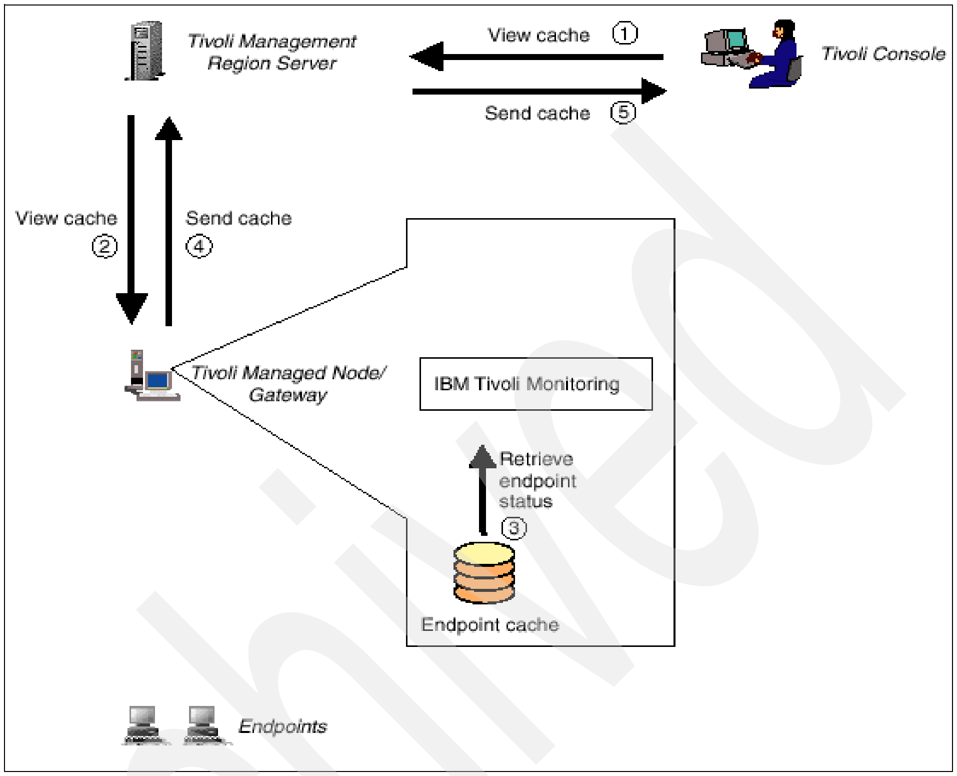


Figure 5-12 Endpoint cache retrieval data flow

5.5.4 Useful commands

You can use several commands to configure and control the heartbeat function:

- **`wdmconfig`**: This command enables you to amend various aspects of the configuration of the IBM Tivoli Monitoring 5.1 components at a gateway. The file is located in the $BINDIR\bin directory. Some of the parameters that are specific to the heartbeat are:
  - heartbeat.send_events_to_tbsm (default=false)
  - heartbeat.send_events_to_tec (default=false)
  - heartbeat.tec_server (default=[null])
  - heartbeat.send_events_to_notice (default=true)
  - heartbeat.reboot_engine_if_down (default=false)

  These five parameters are necessary to configure the heartbeat. Refer to the *IBM Tivoli Monitoring Version 5.1 User's Guide*, SH19-4569, for more information.

- **`wdmheartbeat`**: This command stops or starts the heartbeat function on gateways. It also configures the frequency and queries the status of the heartbeat processor.
- **`wdmmn`**: This command stops and starts the following processes on the gateway:
  - Task engine
  - Tivoli Business Systems Manager adapter
  - Heartbeat engine (stop only)

  Note: You can stop the heartbeat engine with the **`wdmmn`** command, but not restart it. After you stop the engine, you must use the **`wdmheartbeat`** command to reconfigure the frequency and restart the heartbeat engine.

- **`wdmmngcache`**: This command can perform a number of functions, one of which is to retrieve the endpoint cache from a gateway.

5.6 TBSM common listener

IBM Tivoli Business Systems Manager integration is performed to enable Tivoli Business Systems Manager to view the resources monitored by IBM Tivoli Monitoring V5.1.1. The integration provides a complete availability solution that you can view at the business level. IBM Tivoli Monitoring V5.1.1 feeds the availability status of various resources to Tivoli Business Systems Manager and the configured LOB views present the Business Systems Manager critical data to manage the business objects. With this view, the Business Systems Manager can understand the business impact that the availability status of a resource can have.

The integration between IBM Tivoli Monitoring V5.1.1 and Tivoli Business Systems Manager is achieved by:

- Installing and configuring the CommonListener service on the Tivoli Business Systems Manager Management Server
- Installing and configuring the TBSM Adapter on each of the gateways whose attached endpoints are to be monitored

By integrating Tivoli Business Systems Manager with IBM Tivoli Monitoring V5.1.1, the following actions are performed:

- TBSM Adapter performs endpoint registration and discovery when you issue the **`wdmdiscovery`** command on the gateway.

- IBM Tivoli Monitoring V5.1.1 events are sent directly to Tivoli Business Systems Manager through the TBSM Adapter on the endpoint gateway.
- IBM Tivoli Monitoring V5.1.1 Health Console can be launched from the Tivoli Business Systems Manager Java Console.

The IBM Tivoli Monitoring V5.1.1 TBSM Adapter is installed on each gateway that is required to send events from its endpoints to Tivoli Business Systems Manager.

Note: Before you install the IBM Tivoli Monitoring V5.1.1 TBSM Adapter, add jre_root/jre/bin;/*jre_root*/jre/bin/classic (*jre_root* is the directory where JRE is installed) to the PATH environment variable in both UNIX and Windows systems.

You configure the IBM Tivoli Monitoring V5.1.1 TBSM Adapter using the **`wdmconfig`** command. You must do this before IBM Tivoli Monitoring V5.1.1 can interact with Tivoli Business Systems Manager. Configure the following parameters for this functionality:

- **transport.server.mqe.port**: This is the port number that is used by the CommonListener to listen. The default port number is 8082.
- **transport.server.ip.address**: This is the IP address of the Tivoli Business Systems Manager server where the CommonListener service is installed.
- **tbsma.jre_root**: This is the root path of the JRE installation, if it is not specified at the time of installing the IBM Tivoli Monitoring V5.1.1 TBSM Adapter.

Other key/value pairs that you can use for the TBSM Adapter configuration are provided in the following list. All these of these pairs and their values are contained in the $DBDIR/dmml/.config file, which you can read, but not modify manually. If you want to modify this file, use the **`wdmconfig`** command.

- **adapter.trace.enable**: Set this to `true` if you want to write to the file identified in trace.filename, all trace messages regarding the operations of the adapter. The default is `false`.
- **adapter.trace.level**: Set this to `low`, `medium`, or `high`, according to the level of detail that you require if you enabled adapter trace messages. The default is `low`.
- **adapter.working.dir**: This is the working directory that is used by the adapter. The default, which you are recommended to use, is the Tivoli Monitoring middle layer directory ($DBDIR/dmml).

- **subnet-mask:network_id**: This is the subnet mask of the CommonListener component, for example:

  ```
  subnet-mask:mynetworkid=255.255.255.0
  ```

- **tbsma.jre_root**: This parameter is set during the installation of the Tivoli Business Systems Manager Adapter. You do not need to change it manually.

  However, for example, if you want to install the adapter on a group of gateways using one instance of the install action or command, you must change this parameter on any gateways in the group that have JRE installed at a location different from the one that is supplied in the Install Options window. Set this parameter to the complete path of the root directory of JRE 1.3.0 (excluding the /bin directory).

  Note: In a Windows NT workstation, if the install target path contains a directory with spaces in the name, you must specify the directory name between single quotation marks, for example, `D:\'Program Files'\jre`.

- **trace.filename**: This is the file name to which the trace messages from the adapter are written. The default is `dm.trc`.
- **transport.mqe.usefiller**: Set this parameter to `true` if the gateway on which the adapter is installed is running Windows NT 4.0 Service Pack 5. Otherwise leave it is as the default value of `false`.
- **transport.trace.enable = false**: Set this parameter to `true` if you want to write, to the file identified in trace.filename, all messages regarding the transport of adapter-acquired data to the CommonListener. The default is `false`.
- **transport.trace.level**: Set this value to `low`, `medium`, or `high`, according to the level of detail that you require if you enabled transport trace messages. The default is `low`.

After you install and configure the adapter, the adapter provides its services in a fully automatic way, without needing to be independently started or stopped. It carries out the following activities:

- Bulk discovery

  You can issue the **`wdmdiscovery`** command from the Tivoli desktop to carry out a bulk discovery. The adapter sends details of all systems that it has in its cache to the Tivoli Business Systems Manager's CommonListener.

- Delta discovery

  You can also issue the **`wdmdiscovery`** command from the Tivoli desktop to carry out a delta discovery. The adapter sends details of all changes since the last discovery to the Tivoli Business Systems Manager’s CommonListener.

The Tivoli Business Systems Manager Management Server is populated with the resources monitored by IBM Tivoli Monitoring V5.1.1 through the TBSM Adapter by using the `wdmdiscovery` command. When the `wdmdiscovery` command is issued the first time with the bulk discovery switch, the resource objects monitored by IBM Tivoli Monitoring V5.1.1 are automatically created in the TSBM server. When the `wdmdiscovery` command is issued, the TBSM Adapter retrieves the endpoint list from the epcache.db file in the $DBDIR/dmml directory and communicates the discovered resources to the Tivoli Business Systems Manager server through the CommonListener.

If the `wdmdiscovery` command is issued with the bulk discovery option again, then existing objects that were populated by the command issued before are deleted before recreating objects for discovered resources. Therefore, we recommend that you issue the command with the delta discovery switch if there are no significant changes in the IBM Tivoli Monitoring V5.1.1 monitoring environment.

5.7 Event forwarding to TEC

You perform the configuration required to forward events to IBM Tivoli Enterprise Console on both the IBM Tivoli Monitoring V5.1.1 and IBM Tivoli Enterprise Console.

5.7.1 Setting up the IBM Tivoli Monitoring V5.1.1 profile

To set up the profile, follow these steps:

1. From any Tmw2kProfile window, select **Edit →Properties**.
2. The Profile Properties window (Figure 5-13) opens.
   a. Select the **Send TEC Events** check box to enable sending events to the Tivoli Enterprise Console server.
   b. Choose the delivery mode for sending the events. The choices are:
      - **Non-TME (Unsecure) Delivery**: You must specify the event server port and server location where the event will be sent. Specify the event server port if the TEC server runs on Windows (default is 5529). Otherwise, set this value to `0`. Enter the server location as a fully qualified Tivoli Enterprise Console server host name (DNS name) or IP address.
      - **TME (Secure) Delivery**: From the Choose TEC Server list, select the Tivoli Enterprise Console server. The Tivoli Enterprise Console Adapter Configuration Facility (ACF) must be installed on the gateway if you choose the TME (secure) delivery mode.

Important: You *cannot* use secure delivery for endpoints running on IBM i5/OS™ and OS/400.

The individual resource model typically has a default setting to send some indications to IBM Tivoli Enterprise Console. You can modify this setting or keep the default.

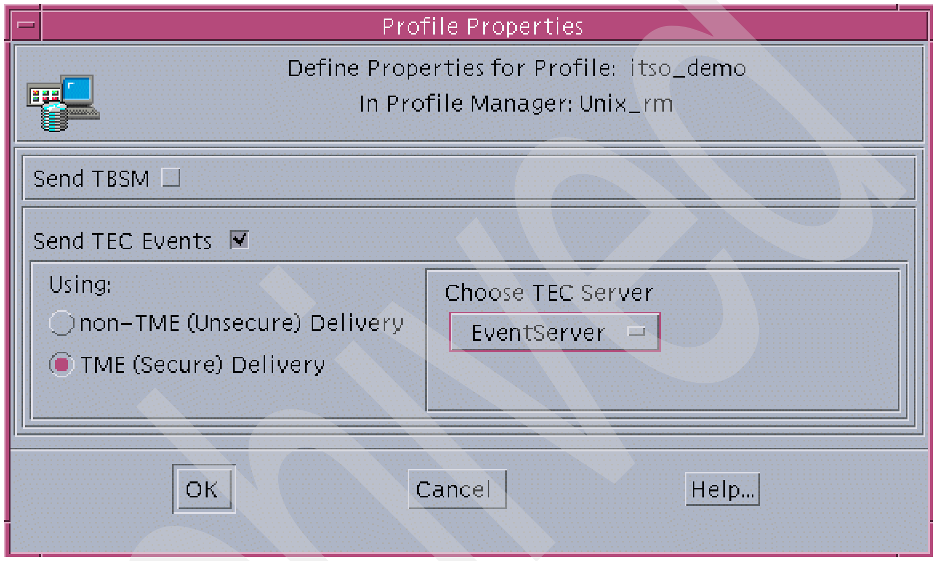


Figure 5-13 Profile Properties window

5.7.2 Enabling IBM Tivoli Enterprise Console

IBM Tivoli Monitoring V5.1.1 provides a script to enable IBM Tivoli Enterprise Console to receive IBM Tivoli Monitoring V5.1.1 events. The script resides in the $BINDIR/TME/TEC/dmae_tec_inst.sh script.

When you run this script, it loads the TEC classes of IBM Tivoli Monitoring V5.1.1 into a new TEC rulebase. It also compiles the rulebase, loads it, and restarts the Event Server. Newer versions of IBM Tivoli Enterprise Console V3.9 have these classes loaded by default.

Note: For IBM Tivoli Enterprise Console, if you need to correlate the events, the clearing event for all IBM Tivoli Monitoring V5.1.1 events is of the TMW_Clearing class.

6

Problem determination for IBM Tivoli Monitoring V5.1.1

This chapter discusses various techniques for debugging and problem determination. This includes tracing and finding log files.

6.1 TMR server logs and traces

In Tivoli Management Region (TMR) servers, IBM Tivoli Monitoring V5.1.1 provides a distribution log in addition to the Tivoli Framework log files.

6.1.1 Profile distribution process

The profile distribution process records information about distribution and status on the TMR server. Therefore, you should analyze distribution problem gathering logs from the TMR server.

The log file maintained in the TMR contains information about profile distribution to any of the subscribers. It includes the following details:

- **Name of the log file**: msg_Tmw2kProfilename.log
- **Location of the log file**: $DBDIR/AMW/logs
- **Configuration**: To configure the log when distributing by means of the **`wdmdistrib`** command, use the options **`- e`**, **`- i`**, and **`- w`**. There are no configuration options when the graphical user interface (GUI) is used to perform a distribution. The default is that all options are specified.

The profile distribution process uses MDist2. Therefore, you may need to check the MDist2 logs.

- TMR Distribution Manager: $DBDIR/distmgr.log
- Gateway Repeater: $DBDIR/gatelog
- Managed node Repeater: $DBDIR/rpt2log
- Endpoint: $LCF_DATDIR/lcfd.log

Tip: You can use the **`wmdist -D`** command to change the level of detail for distmgr.log. Valid debug numbers are from 0 (least information) through 9 (most information). The default value is 3.

6.2 Gateway logs and traces

At the gateway, IBM Tivoli Monitoring V5.1.1 maintains five traces, each of which is explained in the following sections:

- Heartbeat engine traces
- Task engine trace
- Endpoint upcall traces
- Request manager trace
- Profile core trace

All managed node components produce traces. Traces can be configured using the following commands:

```
wdmconfig -m node –D component_name.trace_level=value
wdmconfig -m node –D component_name.trace_size=value
```

Here *component_name* is the name of the component that produces the trace. The component may be one of the following types:

- **heartbeat**: For the heartbeat engine
- **task**: For the task engine
- **core**: For the profile core engine
- **request-manager**: For the request manager engine
- **gw**: For the endpoint upcall
- **dmml**: For the distributed middle layer

The trace_level of the components can be configured as follows:

0 No trace information generated
1 MID trace information
2 MAX trace information

Table 6-1 summarizes the configuration of the available trace components.

Table 6-1 Summary of gateway trace components

Component name	Process name	Location	Trace name
Heartbeat engine	tmnt_hb_eng	$DBDIR/AMW/logs	trace_tmnt_hb_engn.log
Task engine	tmnt_task_eng	$DBDIR/AMW/logs	trace_tmnt_task_engn.log
Endpoint upcall traces	tmnt_gtw_eng	$‘wtemp‘/TMP/traces	trace_tmnt_gtw_engn.log
Request manager trace	tmnt_rm_eng	$DBDIR/AMW/logs	trace_tmnt_rm_engn.log
Profile core trace	tmw2k_profile_core	$DBDIR/AMW/logs	trace_tmnt_profile_coren.log

6.2.1 Heartbeat engine traces

A trace is maintained at the gateway of the activities carried out when the heartbeat engine is running. It records all messages output by the process tmnt_hb_eng. Here are the details:

- **Process name**: tmnt_hb_eng, executable location $BINDIR/TME/Tmw2k
- **Trace name**: trace_tmnt_hb_engn.log (where *n* is a number in the range 1 through 9; as each file becomes full, the number is incremented, cycling back to 1 when file 9 is full)
- **Location**: $DBDIR/AMW/logs

- **Configuration**: To configure the log, use the command:

  ```
  wdmconfig -m node –D heartbeat.trace_level= 0 - 2
  wdmconfig -m node –D heartbeat.trace_size=value
  ```

After you change the trace level or size, restart the heartbeat engine to reflect the changes. To stop the heartbeat engine, use the command:

```
wdmmn -stop -m node -h
```

To start the heartbeat engine, enter the command:

```
wdmheartbeat -m node -s frequency
```

6.2.2 Task engine trace

A trace is maintained at the gateway of the activities carried out when the task engine is running, to perform tasks on attached endpoints, as determined by resource model definitions. It records all messages output by the process tmnt_task_eng. Here are the details:

- **Process name**: tmnt_task_eng, executable location $BINDIR/TME/Tmw2k
- **Trace name**: trace_tmnt_task_engn.log (where *n* is a number in the range 1 through 9; as each file becomes full, the number is incremented, cycling back to 1 when file 9 is full)
- **Location**: $DBDIR/AMW/logs
- **Configuration**: To configure the log, use the commands:

  ```
  wdmconfig -m node –D task.trace_level= 0 - 2
  wdmconfig -m node –D task.trace_size=value
  ```

After you change the trace level or size, restart the task engine to reflect the changes. To stop the task engine, use the command:

```
wdmmn -stop -m node -t
```

To start the task engine, type the command:

```
wdmmn -start -m node -t
```

6.2.3 Endpoint upcall traces

A trace is maintained at the gateway of the upcall messages sent to the gateway from the endpoints. It contains the following details:

- Endpoint registration upcalls
- Events and indications sent from the endpoint component
- Task upcalls

It records all messages output by the process tmnt_gtw_eng, which receives the upcalls. Here are the details:

- **Process name**: tmnt_gtw_eng, executable location $BINDIR/TME/Tmw2k
- **Trace name**: trace_tmnt_gtw_engn.log (where *n* is a number in the range 1 through 9; as each file becomes full, the number is incremented, cycling back to 1 when file 9 is full)
- **Location**:
  - UNIX or Linux: /tmp/AMW/logs
  - Windows: $DBDIR/tmp/AMW/logs
- **Configuration**: To configure the log, use the commands:

  ```
  wdmconfig –D gw.trace_level = <value1>
  wdmconfig –D gw.trace_size = <value2>
  ```

Note: In our environment, the process tmnt_gtw could not generate trace information about the trace_tmnt_gtw_engn.log file, even when the trace_level was configured to the higher trace level.

6.2.4 Request manager trace

A trace is maintained at the gateway of the activities carried out when the request manager process is running. It records all messages output by the process tmnt_rm_eng. Here are the details:

- **Process name**: tmnt_trm_eng, executable location $BINDIR/TME/Tmw2k
- **Trace name**: trace_tmnt_rm_engn.log (where *n* is a number in the range 1 through 9; as each file becomes full, the number is incremented, cycling back to 1 when file 9 is full)
- **Location**: $DBDIR/AMW/logs
- **Configuration**: To configure the log, use the commands:

  ```
  wdmconfig -m node –D request-manager.trace_level= 0 - 2
  wdmconfig -m node –D request-manager.trace_size= value
  ```

After you change the trace level or size, restart the request manager to reflect the changes. To stop the request manager, use the command:

```
wdmmn -stop -m node -r
```

To start the request manager, type the command:

```
wdmmn -start -m node -r
```

6.2.5 Profile core trace

A log is maintained at the gateway of the activities carried out when the profile core engine is running. It records all messages output by the process tmw2k_profile_core. Here are the details:

- **Process name**: tmw2k_profile_core, executable location $BINDIR/TME/Tmw2k
- **Trace name**: trace_tmnt_profile_coren.log (where *n* is a number in the range 1 through 9; as each file becomes full, the number is incremented, cycling back to 1 when file 9 is full)
- **Location**: $DBDIR/AMW/logs
- **Configuration**: To configure the log, use the **`wdmconfig`** command to change the following variables:

  ```
  wdmconfig -m node –D core.trace_level= 0 - 2
  wdmconfig -m node –D core.trace_size=value
  ```

6.3 Endpoint logs

Different log files are available depending on the platform of the operating system. Logs and traces maintained at Windows endpoints are different from those at non-Windows endpoints.

6.3.1 Common endpoint logs

The common endpoint logs are primarily profile distribution endpoint logs. IBM Tivoli Monitoring V5.1.1 uses lcfd.log as a profile distribution endpoint log.

The IBM Tivoli Monitoring V5.1.1 distribution process records the MDist2 activities of the engine update, as follows:

- **Process name**: Tmw2k_ep
- **Log name**: lcfd.log
- **Location**: $LCF_DATDIR
- **Configuration**: To configure the log, you can edit the last.cfg, and then change the parameter log_threshold to 3 or enter the following command:

  ```
  wadminep endpoint reexec_lcfd -D log_threshold=3
  ```

6.3.2 Windows endpoint logs

IBM Tivoli Monitoring V5.1.1 maintains an endpoint engine log at Windows endpoints, and there are also logs maintained by Windows Management Instrumentation (WMI).

Windows endpoint engine log

The main trace log generated by the IBM Tivoli Monitoring V5.1.1 engine at Windows endpoints records the activities of the endpoint engine, as follows:

- **Process name**:
  - Tmw2k, executable location %LCF_DATDIIR%\LCFNEW\Tmw2k\bin
  - Tmw2k_ep, executable location %LCF_DATDIIR%\cache\bin\w32-ix86\TME\Tmw2k
- **Trace name**: Tmw2k.log (when the log is full, the oldest 20% of messages is deleted)
- **Location**: %LCF_DATDIR%/LCFNEW/Tmw2k
- **Configuration**: To configure the trace, issue the `wdmtrceng` command from the server or managed node. Identify the endpoint at which you want to configure the log. You can set any of the following parameters:
  - Trace: Tmw2k.log.
  - Trace level: Default is 0, or you can set the level to the following modes:

    0 Errors
    1 Warnings and errors
    2 All steps of the monitoring process
    3 Verbose output, all operations of the monitoring process
  - Maximum file size: Default is 5000000 (5.0 MB).

Note: We recommend that you do not change the trace level for performance reasons.

The `wdmtrceng` command changes the following registry hives:

- HKEY_LOCAL_MACHINE →SOFTWARE →Tivoli →Tmw → DisplayThreshold
- HKEY_LOCAL_MACHINE →SOFTWARE →Tivoli →Tmw →MaxFileLogSize

Each line in the log contains the following columns:

- Date
- Trace level

- Component/classes
  - ActionManager: Executes corrective actions (built-in tasks)
  - Adapters: Sends events to TEC and Tivoli Business Systems Manager (TBSM)
  - Analyzer: Collects and analyses the performance data
  - ComponentManager: Provides the default implementation for creation/profile as push, start, stop, or delete
  - Dispatcher: Responsible for forwarding the events or operations to the subscribed components

    Note: This is because the upcall is not thread safe. Therefore, events or operations that need to perform upcall need to pass through the dispatcher.

  - EventAggregator: Receives indications from decision trees and processes those based on the occurrences and holes
  - EventCorrelator: Consolidates and correlates events generated between different resource models
  - InstallSharedDll: Installs the shared dynamic linked library (DLL)
  - Logger: Stores the data locally on the endpoint
  - MsgQueueManager
  - MofCompiler
  - TemporarySink: A virtual utility that provides a wrapping to WMI for facilitating the implementation of WMI event listeners; also provides support for checking the correct behavior, ensuring that WMI does not unload the listeners
  - TMNT_Upcall
  - TMWMethodProv: The WMI method provider; responsible for implementing the Common Information Model (CIM) class methods
  - TMWService: An object that allows the scripts implementing the best practices to configure and set the default values for parameters and thresholds to specify the data sources that will be used; also useful to use such IBM Tivoli Monitoring V5.1.1 services as event sending, tracing, running monitors and scripts, and data logging; basically, a way the scripts interface the engine and the underlying CIM implementation
  - WbemConnector

- Thread ID
- Message

After you change the trace settings, restart the endpoint monitoring engine to reflect the changes. To stop the monitoring engine, use the command:

```
wdmcmd -stop -e endpoint_label
```

To start the monitoring engine, enter the command:

```
wdmcmd -restart -e endpoint_label
```

Tip: When you enter the **`wdmtrceng`** command on a Windows target system, you must use the forward slash (/) in the directory path, for example:

```
wdmtrceng -e itsotiv1 c:/progra~1/tivoli/lcf/dat /1/LCFNEW/ Tmw2k/Tmw2k.log
3 800000
```

WMI

You can use the Workbench to see the functionality of the Windows resource model, and then use CIM Studio to browse the CIM repository. CIM Studio provides the **`wbemdump`** command, which is a command line interface (CLI) tool that can query the CIM repository. These kinds of tools can be useful to determine the efficiency of the probes.

The WMI log files record the activities of WMI in collecting the data required by the resource models. These log files are located in the %SystemRoot%/system32/wbem/logs directory.

For details, see the WMI documentation available in Windows Help, or refer to the WMI Tutorial on the Web at:

`http://www.microsoft.com/downloads/release.asp?releaseid=12570`

6.3.3 Non-Windows endpoint logs

IBM Tivoli Monitoring V5.1.1 maintains four logs at the endpoint:

- Endpoint engine update log
- Endpoint engine log and trace
- Endpoint native trace
- Endpoint JMX log

The following sections explain each of these logs in more detail.

Note: The endpoint engine update log, endpoint engine log, endpoint native trace, and endpoint JMX log use the same configuration file for tracing. Therefore, changing the trace level of one log affects the settings of the other logs.

The **wdmtrceng** command changes the files:

- $LCF_DATDIR/LCFNEW/Tmw2k/Unix/data/log_level
- $LCF_DATDIR/LCFNEW/Tmw2k/Unix/data/log_size

In our environment, to change all trace levels to 3 and the trace size to 8000000, we entered the following command:

```
wdmtrceng -e itsodev3 /Tivoli/lcf/dat/1/LCFNEW/Tmw2k/Unix/data/log_level 3
8000000
```

Endpoint engine update log

The endpoint engine update log maintains details of the activities of the engine update process, which is the process that launches and controls the endpoint engine, as follows:

- **Process name**: The tmw2k_ep process starts and finishes quickly, so it is not possible to see the running process.
- **Log name**: When the trace_dmxeu.log log is full, it is renamed as dmxeu.old, deleting any existing file with that name, and a new log file is created.
- **Location**: The log is located in $LCFDATDIR/LCFNEW/AMW/logs.
- **Configuration**: To configure the trace, issue the **wdmtrceng** command from the server or managed node, identifying the endpoint at which you want to configure the log. You can set any of the following parameters:
  - Trace trace_dmxeu.log
  - Trace level: Default is 0 or you can set the following modes:

    0 Errors
    1 Warnings and errors: Trace level MID
    2 All steps of the monitoring: Trace level MAX
    3 Verbose output, all operations of the monitoring process: Trace level MAX and OTHER

Endpoint engine log and trace

The endpoint engine log and trace maintain details of the activities of the engine. This is the process that runs the resource models and sends events and indications to the gateway, as follows:

- **Process name**: java com.tivoli.dmunix.ep.agent.Main
- **Log name**: msg_dmxengine.log (when the log is full, it is renamed as dmxengine.old, deleting any existing file with that name; a new log file is created)
- **Trace name**: trace_dmxengine.log (when the log is full, it is renamed as dmxengine.old, deleting any existing file with that name; a new log file is created)
- **Location**: $LCF_DATDIR/LCFNEW/AMW/logs
- **Configuration**: To configure the trace, issue the `wdmtrceng` command from the server or managed node, identifying the endpoint at which you want to configure the log. You can set any of the following parameters:
  - Trace trace_dmxeu.log
  - Trace level: Default is 0 or you can set to the following modes:

    0 Errors
    1 Warnings and errors: Trace level MID
    2 All steps of the monitoring: Trace level MAX
    3 Verbose output, all operations of the monitoring process: Trace level MAX and OTHER

Endpoint native trace

The endpoint native trace maintains details about the activities of the native processes. This process obtains the resource information required by the resource models, as follows:

- **Process name**: java com.tivoli.dmunix.ep.agent.Main
- **Log name**: trace_dmxntv.log (when the log is full, it is renamed as dmxntv.old, deleting any existing file with that name; a new log file is created)
- **Location**: $LCFDATDIR/LCFNEW/AMW/logs
- **Configuration**: To configure the trace, issue the `wdmtrceng` command from the server or managed node, identifying the endpoint at which you want to configure the log. You can set any of the following parameters:
  - Trace trace_dmxeu.log
  - Trace level: The default is 0 or you can set this to the following modes:

    2 All steps of the monitoring: Trace level MAX
    3 Verbose output, all operations of the monitoring process: Trace level MAX and OTHER

Endpoint JMX log

The endpoint JMX log maintains details of the activities of the JMX process, which is a Tivoli implementation of Java Management Extension. It is only written when the trace level is set to 3. Here are the details:

- **Process name**: Tmx4j
- **Log name**: Tmx4j_1.log (when the log is full, it is renamed as Tmnx4j_2.log, deleting any existing file with that name; a new log file is created)
- **Location**: $LCF_DATDIR/LCFNEW/Tmw2k/UNIX
- **Configuration**: To configure the log, issue the **`wdmtrceng`** command from the server or managed node, identifying the endpoint at which you want to configure the log. Note that this command maintains a common configuration for all logs at a non-Windows endpoint. You can set the Trace level: 2 (verbose) parameter.

Note: For the log's endpoint native trace and endpoint JMX, we noticed that only some information is registered in the log after setting log_level to a minimum value of 2.

6.4 Web Health Console logs and traces

The Web Health Console has a facility for both standard message logging and advanced debug tracing. Message logging and minimum level debug tracing are always on and writing to their own files. You can find these files in the /usr/Tivoli/AMW/logs directory.

6.4.1 Modifying Web Health Console tracing parameters

You can adjust tracing by modifying the tracing parameters for the Web Health Console application. Edit the WHC_INSTALL_DIR\installedApps\dm.ear\dm.war\WEB-INF\classes\com\ibm \dm\web\util\PDLog.properties file. Depending on how much tracing you want, MIN, MID or MAX, you can change the line:

```
tmeLogger.trc.level=DEBUG_MIN
tmeLogger.trc.level=DEBUG_MID
tmeLogger.trc.level=DEBUG_MAX
```

MID provides a good amount of Web Health Console operation, and MAX provides a great deal of detailed internal operation.

You can also adjust the following lines to change the number of trace files written and the maximum size of the files before it roles over to a new file:

```
file.maxFiles=3
file.maxFileSize=1024
```

After you make these changes, stop and start the WebSphere Application Server to enable the changes, using the following commands:

- UNIX

  ```
  export DISPLAY=machineName:0.0
  WHC_INSTALL_DIR/bin/stopServer.sh
  WHC_INSTALL_DIR/bin/startServer.sh
  ```

- Windows

  ```
  WHC_INSTALL_DIR/bin/stopServer.bat
  WHC_INSTALL_DIR/bin/startServer.bat
  ```

Note: The Web Health Console runs slower while in MID or MAX tracing. Change the tracing level to the MIN setting as soon as possible.

6.4.2 WebSphere tracing

You can also set WebSphere Application Server tracing. This enables you to see all the requests and operations in the ApplicationServer perspective. To enable WebSphere tracing, enter the following commands:

```
$WHC_INSTALL_DIR/bin/DrAdmin.sh -serverPort 7000 -setRingBufferSize 2048
$WHC_INSTALL_DIR/bin/DrAdmin.sh -serverPort 7000 -setTrace
"com.ibm.*=all=enabled"
```

After you run these commands, the trace log is located in $WHC_HOME/logs/default_server_stdout.log and $WHC_HOME/logs/default_server_stderr.log.

To disable WebSphere tracing, enter the following command:

```
$WHC_INSTALL_DIR/bin/DrAdmin.sh -serverPort 7000 -setTrace
"com.ibm.*=all=disabled"
```

For further reference about troubleshooting WebSphere, see *IBM WebSphere Version 4.0 Advanced Edition Handbook,* SG24-6176.

6.5 Tools

This section describes the tools that are provided with IBM Tivoli Monitoring V5.1.1, as well as other available tools.

6.5.1 Tool to generate XML file

The formatter program creates an XML-based file from the log or trace generated by IBM Tivoli Monitoring V5.1.1. It is located on the IBM Tivoli Monitoring V5.1.1 Tools CD in the directory LogToXML. It accepts three parameters:

- The first parameter defines whether IBM Tivoli Monitoring V5.1.1 is dealing with a log file or a message file.
- The second parameter is the name of the source file (either a log or a message file).
- The third parameter is the name of the file to be created in XML.

Here is an example:

```
prepareLog LOG trace_x.log trace_x.xml
```

Note: Before you run the prepare log program, set the Java Virtual Machine 1.3.0 path.

6.5.2 Serviceability tasks

IBM Tivoli Monitoring V5.1.1 provides three serviceability tasks:

- DMCollectEpLog
- DMCollectMnLog
- DMCollectEpEnv

DMCollectEpLog

The DMCollectEpLog task collects (in a tar file created at the endpoint) all the endpoint logs and information about the size and dates of the binaries. It also collects the current and universal time the logs were created. The task accepts the name of the tar file as an argument. You can find the tar file in the endpoint directory $LCF_DATDIR.

For UNIX and Linux platforms, the following files are collected:

- $LCF_DATDIR/lcfd.log
- $LCF_DATDIR/lcfd.bk
- $LCF_DATDIR/last.cfg
- $LCF_DATDIR/LCFNEW/Tmw2k/Unix/Tmx4j1.log

- $LCF_DATDIR/LCFNEW/Tmw2k/Unix/Tmx4j2.log
- $LCF_DATDIR/LCFNEW/AMW/logs/trace_xxxxx.log
- $LCF_DATDIR/LCFNEW/AMW/logs/msg_xxxxx.log
- $LCF_DATDIR/LCFNEW/Tmw2k/Unix/data/dmxout.log (This file traces errors at Java engine startup.)

For Windows platforms, the following files are collected:

- %LCF_DATDIR%/lcfd.log
- %LCF_DATDIR%/lcfd.bk
- %LCF_DATDIR%/last.cfg
- %LCF_DATDIR%/LCFNEW/Tmw2k/Unix/Tmw2k.log

Any core dumps from the engine are not included in the tar file to avoid impacting the task performance. You can find core dumps in the $LCF_DATDIR \LCFNEW\Tmw2k\Unix directory.

DMCollectMnLog

The DMCollectMnLog task collects (in a tar file created at the managed node in the $DBDIR directory) all the managed node logs and traces, including event logs for Windows platforms. The task accepts the name of the tar file as an argument. You can find the tar file in the managed node directory $DBDIR.

For UNIX and Linux platforms, the following files are collected:

- $DBDIR/oservlog
- $DBDIR/gatelog
- /tmp/traces/trace_tnmt_gtw_engn.log
- $DBDIR/AMW/logs/trace_xxxx.log
- $DBDIR/<odstat output>
- $DBDIR/<wtrace -jHk $DBDIR output>

For Windows platforms, the following files are collected:

- %DBDIR%/oservlog
- %DBDIR%/gatelog
- %DBDIR%/tmp/traces/trace_tnmt_gtw_engn.log
- %DBDIR%/AMW/logs/trace_xxxx.log
- %DBDIR%/<odstat output>
- %DBDIR%/<wtrace -jHk $DBDIR output>

DMCollectEpEnv

The DMCollectEpEnv task collects information about the environment at the endpoint. The data collected is written to a file using the Execute Task window (Save to File option). This task does not accept arguments. For UNIX and Linux platforms, the following information is collected:

- Operating system version
- Disk space statistics and file system installation at the endpoint
- Memory statistics (available and used)
- Environment variable settings
- List of system patches installed

For Windows platforms, the output from the **winmsd** command is collected.

- For Windows 2000, the report is created in %LCF_DATDIR%/winmsdreport.txt.
- For Windows NT, the report is created in %LCF_DATDIR%/*host name*.txt.

6.6 Helpful troubleshooting procedures

This section discusses common problem determination procedures for IBM Tivoli Monitoring V5.1.1.

6.6.1 Profile distribution problems

Profile distribution is performed using the MDist 2 facility. There are several symptoms of profile distribution problems, such as:

- Monitors are not shown for the endpoint in the Web Health Console.
- There are no TEC event or TBSM changes.
- Data is not collected in the historical database.

Some initial verification that you must perform is:

- Run the following command to verify that the profile is not received:

  ```
  wdmlseng -e endpoint
  ```

- Check the MDist2 distribution status using the following command and check for distribution called *profilename(install)*:

  ```
  wmdist -l
  ```

- Verify that the endpoint is running using following command:

  ```
  wep endpoint status
  ```

- Verify that the gateway is running using the following command:

  ```
  wgateway
  ```

If the result from those commands cannot yield a sufficient clue, you may need to consult the distribution logs:

- In the TMR server: rpt2log, msg_*profilename*.log
- In the gateways: rpt2log
- In the endpoints: lcfd.log

6.6.2 IBM Tivoli Monitoring engine troubleshooting

When the IBM Tivoli Monitoring engine has problem, some symptoms may be:

- There are no TEC event or TBSM changes.
- Data is not collected in the historical database.
- Monitor is shown for the endpoint in the Web Health Console.

Some initial verification that you need to performed is:

- Run the following command to verify that the IBM Tivoli Monitoring engine is running:

  ```
  wdmlseng -e endpoint
  ```

- Run the following commands to stop and start the IBM Tivoli Monitoring engine:

  ```
  wdmcmd -stop -e endpoint
  wdmcmd -restart -e endpoint
  ```

- Clear the endpoint engine profile cache, by removing the *.dmprf and engine.pid files.
- Remove the method cache in the LCFNEW directory.

Perform further troubleshooting on the endpoint by analyzing the lcfd.log and Tmw2k.log files. Ultimately you can also run the DMEndpointUninstall task to remove the IBM Tivoli Monitoring engine and clean the resource cache.

6.6.3 Resolving resource model problems

Resource model problems are caused by the following symptoms:

- There are no TEC event or TBSM changes.
- Data is not collected in the historical database.
- Monitor is shown for the endpoint in the Web Health Console with a non-running status.

Some initial verification that you need to perform is:

- Check the resource model status using the following command:

  ```
  wdmlseng -e endpoint -verbose
  ```

- Restart the resource model on the endpoint using the following command:

  ```
  wdmeng
  ```

- Check options in the profile itself, such as TEC event or TBSM event generation.
- Verify the prerequisites, such as:
  - Java Runtime Environment (JRE) linking from DMLink JRE
  - Simple Network Management Protocol (SNMP) service for Windows
  - Running the **`diskperf`** command for Windows
- Examine the endpoint profile logs (see 6.3, “Endpoint logs” on page 88).

7

Operating IBM Tivoli Monitoring V5.1.1

This chapter discusses various operational and management issues with IBM Tivoli Monitoring V5.1.1.

7.1 MDist profile distribution

This section explains the IBM Tivoli Monitoring V5.1.1 profile distribution using MDist2.

7.1.1 MDist2 support

IBM Tivoli Monitoring V5.1.1 uses Tivoli Management Framework Multiplexed Distribution service (MDist2) to perform profile distribution. It fully uses the following MDist2 functions:

- **Asynchronous delivery**

  MDist2 uses an asynchronous interface to applications. This means that, when IBM Tivoli Monitoring V5.1.1 submits a distribution request, it immediately receives a distribution identifier and confirmation that the distribution is in progress.

- **Assured delivery**

  The distribution of IBM Tivoli Monitoring V5.1.1 profiles is assured even when there are network interruptions, power-off machines, or disconnected endpoints.

- **Check-point and restart**

  A distribution data stream that has been interrupted can be resumed by IBM Tivoli Monitoring V5.1.1 from the last successful checkpoint. This means that it is not necessary to resend all of the profile data when the distribution is resumed by MDist2. The IBM Tivoli Monitoring V5.1.1 receiver method requests only the data that was not sent when the interruption occurred.

- **Data depoting**

  MDist2 allows the storage of distribution segments at a depot close to the endpoint, and for the distribution to be submitted to the endpoints from that depot.

7.1.2 Profile distribution using MDist2

IBM Tivoli Monitoring V5.1.1 only supports profile distribution to ProfileManager, TMA endpoint, Application Proxy, and Application Services.

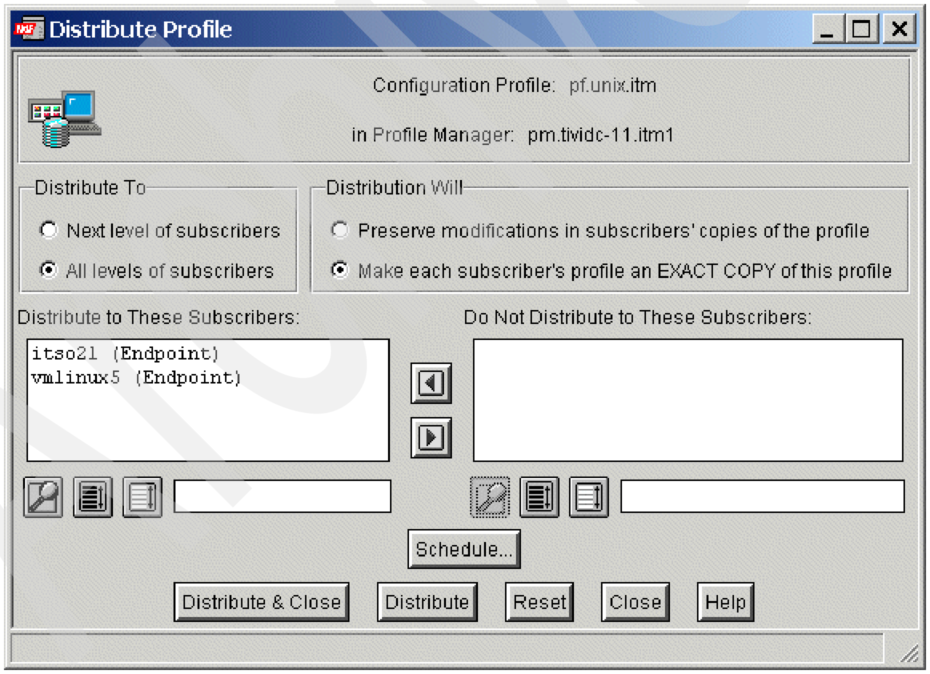
You can configure the following options in a profile distribution. In the Profile Manager window, open a profile to be distributed. Click **Profile** →**Distribute**. The IBM Tivoli Monitoring V5.1.1 Profile window (Figure 7-1) opens.

The Distribute Profile window presents two options for Distribute To:

- **Next level of subscribers**: This option distributes the profile only to the subscribers of the profile manager. It does not distribute to lower-level subscribers. If a profile manager with subscribers resides at the next lower level, you may need to perform the distribution process from profile managers at more than one level to reach all the profile endpoints.
- **All levels of subscribers**: Distributes the profile to all subscribers in the hierarchy. Select this option if you want to distribute a profile in which your endpoint is the only subscriber.

Select the Distribution Will option **Make subscriber's profile an EXACT COPY of this profile**. This overwrites the subscribers profile with an exact copy of the profile that is being distributed. You must *always* use this option. From the Do Not Distribute to These Subscribers list, select the subscribers to receive the profile and move them to the Distribute to These Subscribers, as shown in Figure 7-1.

You can also configure the Distribution Defaults option. Then every distribution of this profile is done with the default settings that you provided.



Configuration Profile: pf.unix.itm

in Profile Manager: pm.tividc-11.itm1

Distribute To: Next level of subscribers [✓ All levels of subscribers]

Distribution Will: Preserve modifications in subscribers' copies of the profile [✓ Make each subscriber's profile an EXACT COPY of this profile]

Distribute to These Subscribers:

```
itso21 (Endpoint)
vmlinux5 (Endpoint)
```

Do Not Distribute to These Subscribers:

Figure 7-1 Distribute Profile window

There are three possible ways to perform profile distribution in IBM Tivoli Monitoring V5.1.1:

- Graphical user interface (GUI) distribution

  a. Drag and drop the profile in the target subscriber.

  b. In the Profile Manager window, open the profile to be distributed. The IBM Tivoli Monitoring V5.1.1 Profile window opens. Click **Profile** →**Distribute**.

- Framework **`wdistrib`** CLI command

  The following command example is for distributing a profile called pf.unix.itm to an endpoint called vmlinux5:

  ```
  wdistrib -l over_all @Tmw2kProfile:pf.unix.itm @Endpoint:vmlinux5
  ```

- IBM Tivoli Monitoring V5.1.1 **`wdmdistrib`** CLI command

  This new MDist2-based command offers a richer set of options to distribute an IBM Tivoli Monitoring V5.1.1 profile to subscribers. You can have the profile storage in the MDist2 depot permanent or temporary.

  You can use the following flags with the **`wdmdistrib`** CLI command:

  ```
  wdmdistrib -p <profile-name> [-D <MDist2_property=value>...] [-e][-w][-i]
  [-J  <JRE_location_dir>][-d][-R][-l]  [-s <subscribers-file>]
  [subscriber...]
  ```

  For further reference about **`wdmdistrib`** usage, see *IBM Tivoli Monitoring User's Guide Version 5.1*, SH19-4569.

7.1.3 TMF MDist2 commands

The Tivoli Management Framework (TMF) **`wmdist`** and **`wdepot`** commands provide many options for you to check and manage distribution packages. You can also perform MDist2 management using the GUI provided with MDist2.

Note: In a distribution on a Tmw2kProfile that is always labelled with the status of *install*, for example, the distribution of profile `Monitor.pf` is called `Monitor.pf(install)`.

The following commands can be useful to monitor IBM Tivoli Monitoring V5.1.1 profile distribution status:

- List distributions

  ```
  wmdist –l [-I dist_id] [-a] [-v]
  ```

  -I Specific distribution ID
  -a Shows only active distributions
  -v Verbose output

- Endpoint distribution status

  ```
  wmdist –e dist_id [-t endpoint_id]
  ```

  -t Status for specific endpoint

- Cancel distributions

  ```
  wmdist –c dist_id [endpoint…]
  ```

- Pause distributions

  ```
  wmdist –p dist_id [endpoint…]
  ```

- Resume distributions

  ```
  wmdist –r dist_id [endpoint…]
  ```

- List repeater depot

  ```
  wdepot repeater_name list -l
  ```

- View repeater depot statistics

  ```
  wdepot repeater_name describe
  ```

For more information about MDist2 commands, refer to *Tivoli Framework Version 3.7.1 Installation Guide,* GC32-0395.

7.2 Maintaining the Tivoli environment

This section describes the new command line, directory structure, and log files to be monitored. The maintenance of the Framework environment is not described in this chapter. However, you can find a good reference in *Maintaining Your Tivoli Environment,* SG24-5013.

7.2.1 IBM Tivoli Monitoring V5.1.1 command line

This section explains, with examples, some of the commands provided with IBM Tivoli Monitoring V5.1.1.

- **wdmconfig**: This command creates and updates the configuration file ($DBDIR/dmml/.config) on a gateway. Here is an example of using the **wdmconfig** command to configure the trace of components size to 800000 bytes and the trace details to verbose:

  ```
  wdmconfig -m all -D dmml.trace_size=8000000 -D dmml.trace_level=4
  Role needed: super or senior.
  ```

- **wdmmn**: This command stops or starts selected IBM Tivoli Monitoring V5.1.1 processes on one or all managed nodes or gateways. The role needed is super, senior or administrator.

The processes that can be started and stopped are:

- Task engine (tmnt_task_eng), flag -t
- Tivoli Business Systems Manager (TBSM) Adapter, flag -b
- Heartbeat engine (tmnt_gtw), flag -h
- Resource model engine (tmnt_rm_eng), flag -r

- **wdmcmd**: This command stops or restarts IBM Tivoli Monitoring V5.1.1 on one or more endpoints from a managed node, gateway, or server. You can specify endpoints or a profile manager. If you specify a profile manager, it affects all endpoints that are subscribers of the profile manager. The role needed is super, senior, or administrator.
- **wdmeng**: This command stops or starts profiles or resource models at endpoints. It also deletes profiles at endpoints. The role needed is super, senior, or administrator.
- **wdmlseng**: This command lists the running resource models and their statuses of specified endpoints. It can also output the result in XML. The command can be used for a specified endpoint or a specified indicator within the endpoint. The role needed is super, senior, administrative, or user.
- **wdmrm**: This adds, lists, or removes a specified resource model at the Tivoli Management Region (TMR) server or managed node or gateway from where it is issued. It also adds the national language support (NLS) catalog to an already installed default resource model. The resource models are also registered in the Name Registry and can be queried using the following command:

  ```
  wlookup -ar Tmw2kProfile
  ```

  The role needed is super, senior, or administrator.
- **wdmcollect**: This command manages the data collection for monitoring metrics from the gateway for specific endpoints. The role needed is super, senior, administrator, or user.

7.2.2 Heartbeat maintenance

If you are using the heartbeat functionality, be aware that, when you delete an endpoint from the Tivoli environment, and this endpoint is monitored by the heartbeat, it is not removed automatically from the heartbeat database.

To remove an endpoint from the heartbeat database, run the command:

```
wdmmngcache -m gateway -d endpoint_label
```

To manage heartbeat process on the gateways, you use the **wdmheartbeat** command.

7.2.3 Managing profiles

This section discusses usage of the profile manipulation commands, of which some are in IBM Tivoli Monitoring V5.1.1. These commands are useful to manage the monitoring profiles from a batch file or shell script.

- **`wdmeditprf`**: This command enables you to change various attributes of a profile. Resource models can be added using all of the default values supplied. Alternatively you can add a model with one or more values modified to suit your environment. You can also edit any of the details of an existing resource model. And you can change and define event generations and action tasks.
- **`wdmdumpprf`**: This command writes the full details of the selected profile to the standard output, in Tivoli Management Framework format or XML format. You can save the output and edit and reload it as a new or amended profile using the **`wdmloadprf`** command.
- **`wdmloadprf`**: This command makes new profiles available on the Tivoli server. If the command identifies an existing profile, the command updates the profile. It requires you to choose whether to merge the new resource models with the existing ones, substitute the existing resource models for the new ones, or keep the existing resource models.

7.2.4 Managing resource models

The **`wdmrm`** command enables you to manage resource models from a command line. You can add, list, or remove a specified default resource model at the TMR server or managed node or gateway from where you issue it. It also adds the NLS catalog to an already installed default resource model. The command works only for the server and managed nodes of the local region.

The command syntax is:

```
wdmrm –add resource_model_tarfile
wdmrm –addcat resource_model [–f catalog_file –l locale]
wdmrm –list wdmrm –remove resource_model
```

7.3 Web Health Console usage

Figure 7-2 shows the relationship between the various windows in the Web Health Console. You can view both the current online data and historical data.

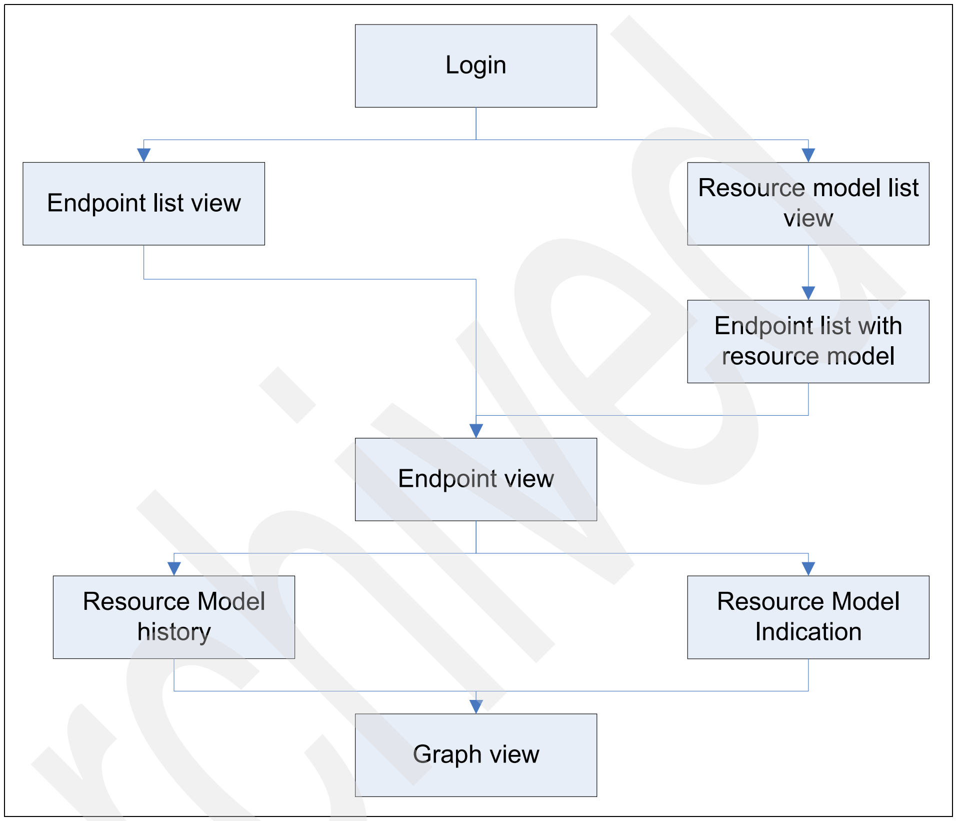


Figure 7-2 Web Health Console windows

7.3.1 Logging on to the Web Health Console

You can connect the Web Health Console to any TMR server or managed node. Then you can configure it to monitor any or all of the endpoints that are found in that region. To connect to the Web Health Console you need access to the server on which the Web Health Console server is installed and the TMR on which you want to monitor health. All user management and security is handled through the IBM Tivoli management environment.

To start the Web Health Console, open you browser and type the following URL:

```
http://server_name/dmwhc
```

Here *server_name* is the host name of the server on which you installed the Web Health Console Server.

You are prompted to enter a user ID, password, and the host name of your TMR server or managed node, as shown in Figure 7-3. The user ID that you specify does not require any special Tivoli role to successfully log on to the Web Health Console. However, to operate the Web Health Console, the user requires TMR roles of user or administrator.

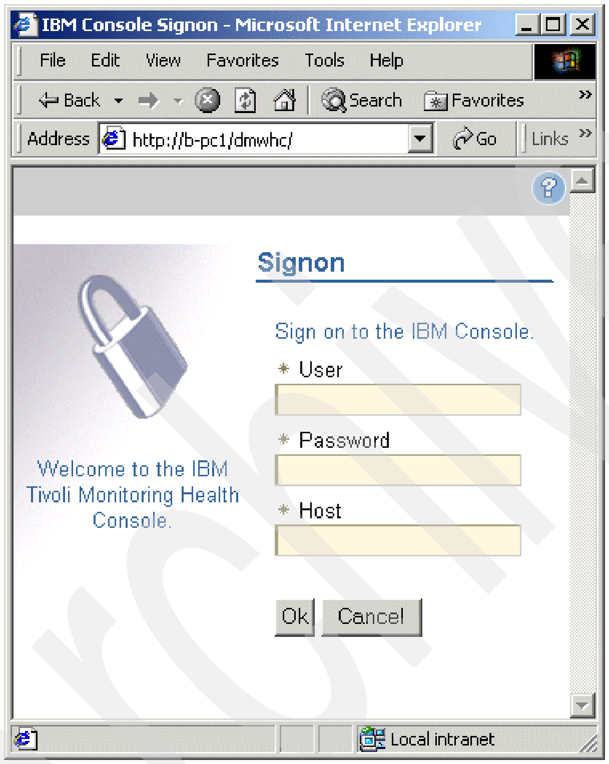

IBM Console Signon - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address http://b-pc1/dmwhc/ Go Links
Signon
Sign on to the IBM Console.
* User
* Password
* Host
Ok Cancel
Welcome to the IBM Tivoli Monitoring Health Console.
Local intranet

Figure 7-3 Web Health Console login page

When you successfully login the first time, you see the Preferences view (Figure 7-4). At this point, you are required to import endpoints that you need to monitor. The Web Health Console can only monitor endpoints that are defined in the TMR to which it is connected.

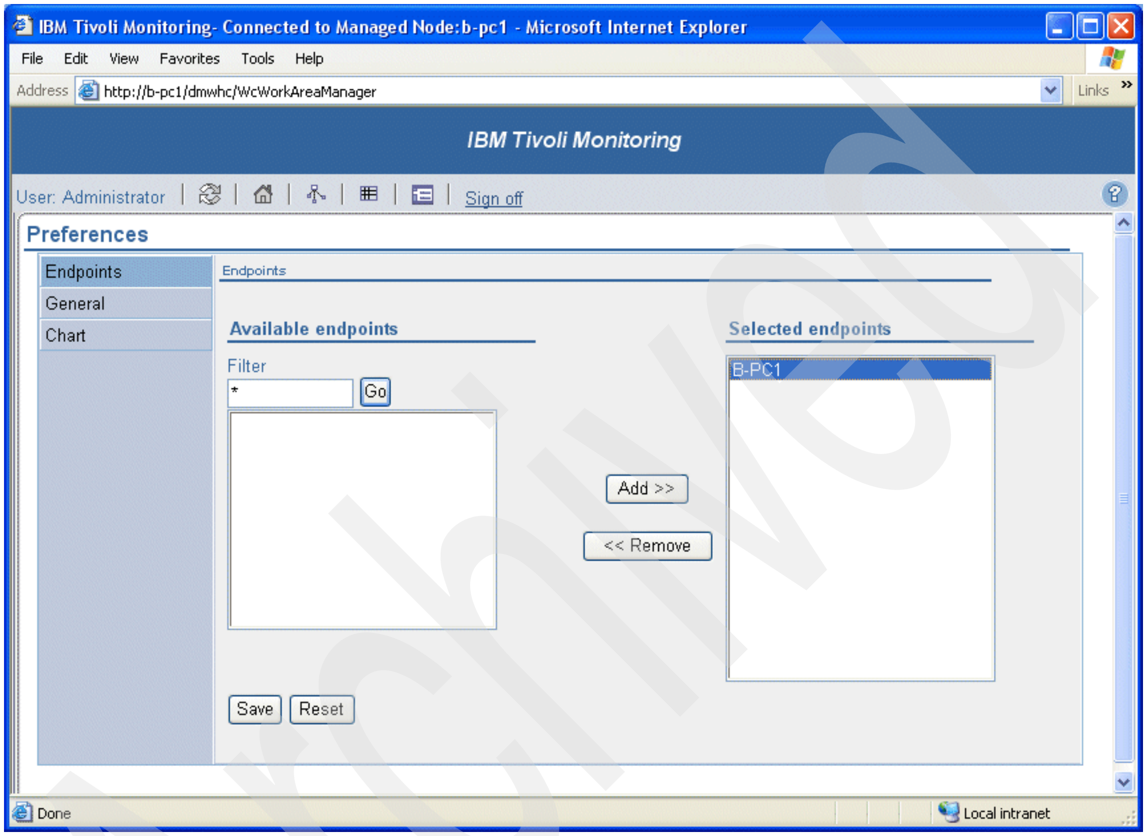
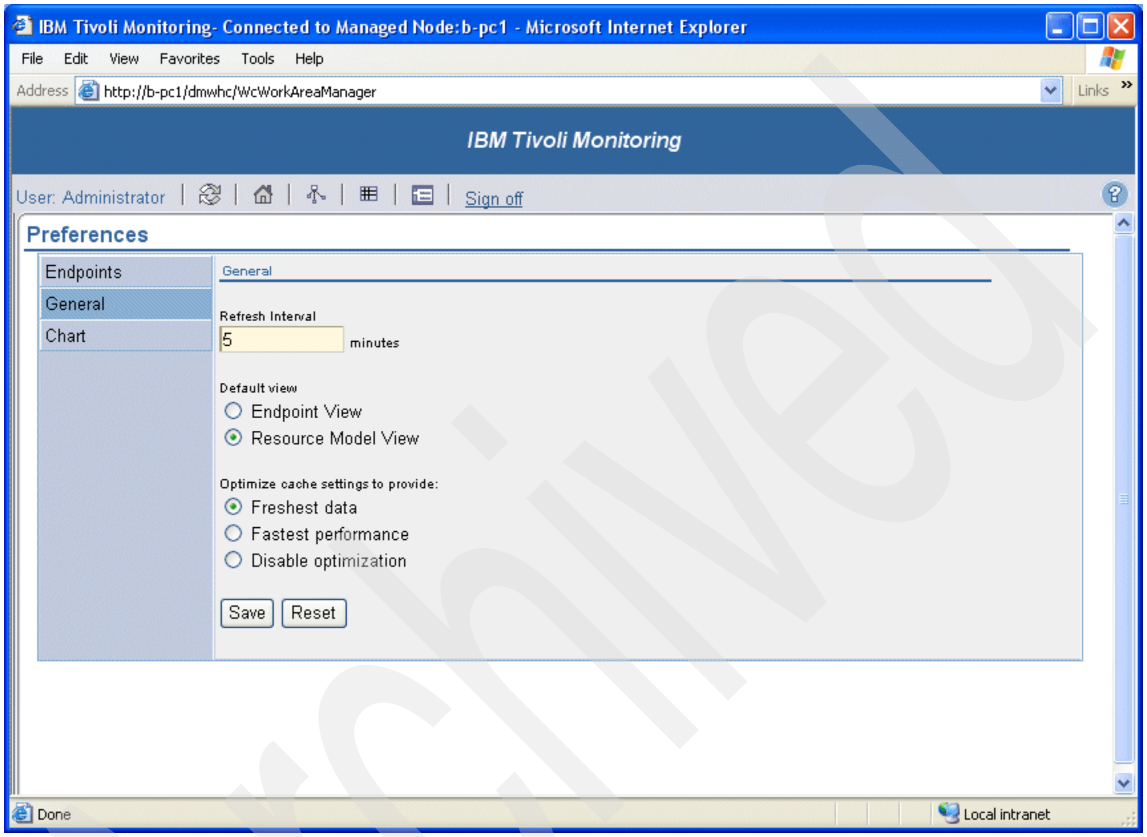


Figure 7-4 Web Health Console Preferences -> Endpoint view

You need the user or administrator role to view the endpoint list. After you save the endpoint list, in a subsequent session, your endpoint list is automatically loaded.

As shown in Figure 7-5, you can use the General option on the Preferences page to configure the Refresh Interval, Default View, and Optimize Cache settings, which are used by the Web Health Console.


IBM Tivoli Monitoring- Connected to Managed Node:b-pc1 - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Address http://b-pc1/dmwhc/WcWorkAreaManager
Links
IBM Tivoli Monitoring
User: Administrator
Sign off
Preferences
Endpoints
General
Chart
Save
Reset
Done
Local intranet

General

Refresh Interval
5 minutes

Default view
( ) Endpoint View
(●) Resource Model View

Optimize cache settings to provide:
(●) Freshest data
( ) Fastest performance
( ) Disable optimization

Figure 7-5 Web Health Console Preferences General view

7.3.2 The Web Health Console main view

When you start the Web Health Console, the top portion of every view of the Web Health Console, except the Login view, contains a common menu bar, as shown in Figure 7-6. This navigation bar has fly-over help associated with each button.

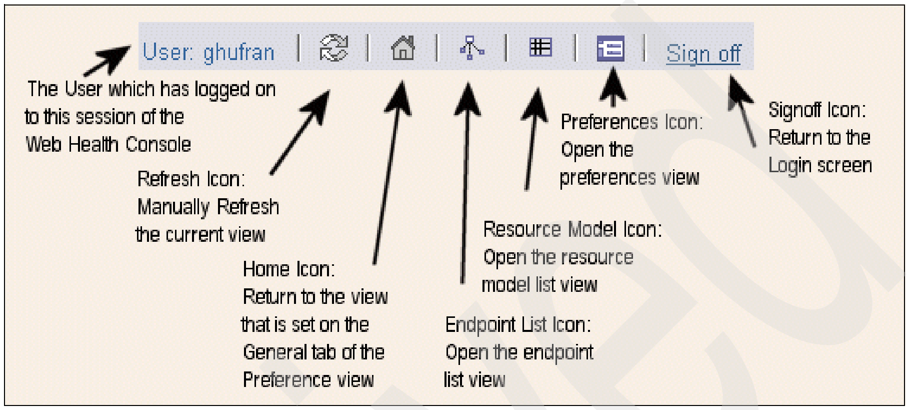
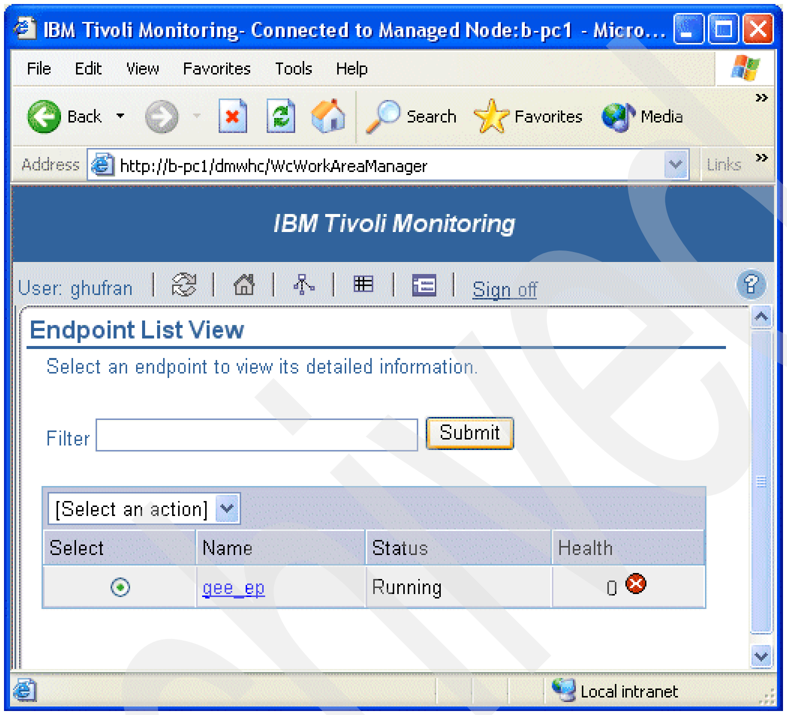

User: ghufran
Sign off
The User which has logged on to this session of the Web Health Console
Refresh Icon: Manually Refresh the current view
Home Icon: Return to the view that is set on the General tab of the Preference view
Endpoint List Icon: Open the endpoint list view
Resource Model Icon: Open the resource model list view
Preferences Icon: Open the preferences view
Signoff Icon: Return to the Login screen

Figure 7-6 Web Health Console common menu bar

7.3.3 The Endpoint List View

The Endpoint List View (Figure 7-7) shows the current health of all the selected endpoints. You can filter the displayed endpoints using the Filter field.


IBM Tivoli Monitoring- Connected to Managed Node:b-pc1 - Micro...
File Edit View Favorites Tools Help
Back Search Favorites Media
Address http://b-pc1/dmwhc/WcWorkAreaManager
Links
IBM Tivoli Monitoring
User: ghufran
Sign off
Submit
Local intranet

Endpoint List View

Select an endpoint to view its detailed information.

Filter

[Select an action]

Select	Name	Status	Health
●	gee_ep	Running	0 ⊗

Figure 7-7 Endpoint List View

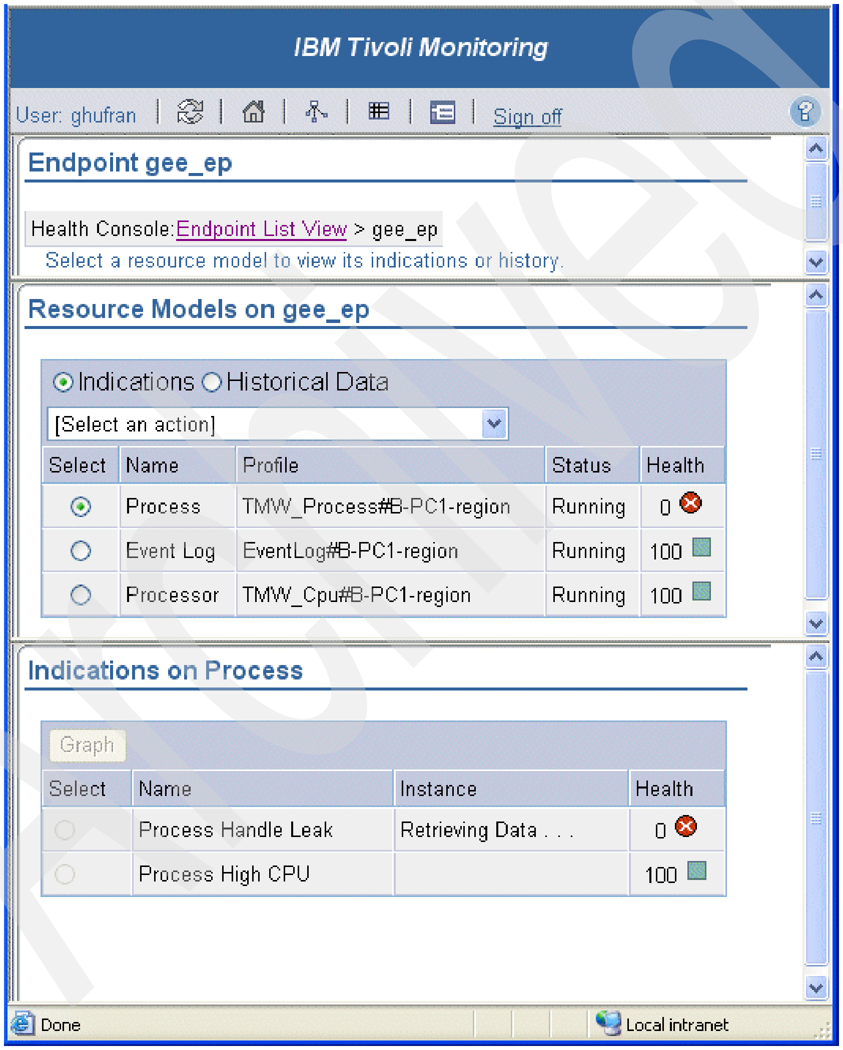
The Web Health Console sorts the endpoints by health order, with the lowest health displayed first. For example, an endpoint with a health percentage of 0 is listed before an endpoint with a health of 70%. If there is a problem contacting an endpoint, the Web Health Console displays a message indicating the problem.

The Endpoint List View table provides information about the status of the specific endpoint being monitored (Running or Engine could not be reached) and the lowest health of all the resource models installed on the endpoint. For example, if the endpoint has two resource models installed and one is at 50% health and the other is at 90% health, this column displays 50. The health is displayed as an exact health percentage and as an icon representation of possible states of alert.

Three icons indicate the endpoint health. The 100 🟩 icon shows the health of all resource models installed on the endpoint at 100%. The 70 🟩 icon shows the health of at least one resource model installed on the endpoint as less than

100% but greater than 0. The 0 ⊗ icon shows the health of at least one of the resource models installed on the endpoint at 0.

If the IBM Tivoli Monitoring V5.1.1 engine is switched off on a particular endpoint, then the Web Health Console reports this. To start or stop the engine, the user who is logged in must have the TMR administrator role. Then click the endpoint name to drill down and obtain more information about the resource models that are running on the endpoint. See Figure 7-8.



Endpoint gee_ep

Health Console:Endpoint List View > gee_ep

Select a resource model to view its indications or history.

Resource Models on gee_ep

(● Indications ○ Historical Data)

[Select an action]

Select	Name	Profile	Status	Health
●	Process	TMW_Process#B-PC1-region	Running	0 ⊗
○	Event Log	EventLog#B-PC1-region	Running	100 🟩
○	Processor	TMW_Cpu#B-PC1-region	Running	100 🟩

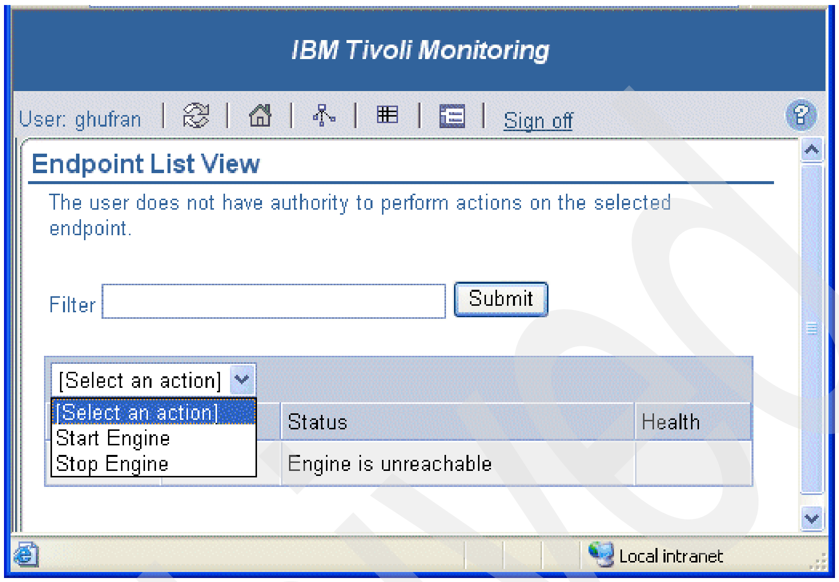
Indications on Process

Graph

Select	Name	Instance	Health
○	Process Handle Leak	Retrieving Data . . .	0 ⊗
○	Process High CPU		100 🟩

Figure 7-8 Web Health Console and the endpoint resource model information

To start or stop the IBM Tivoli Monitoring V5.1.1 engine, use the [Select an action] drop-down list, as shown in Figure 7-9.


IBM Tivoli Monitoring

User: ghufran | Sign off

Endpoint List View

The user does not have authority to perform actions on the selected endpoint.

Filter [ ] Submit

[Select an action]
- [Select an action]
- Start Engine
- Stop Engine

	Status	Health
	Engine is unreachable	

Local intranet

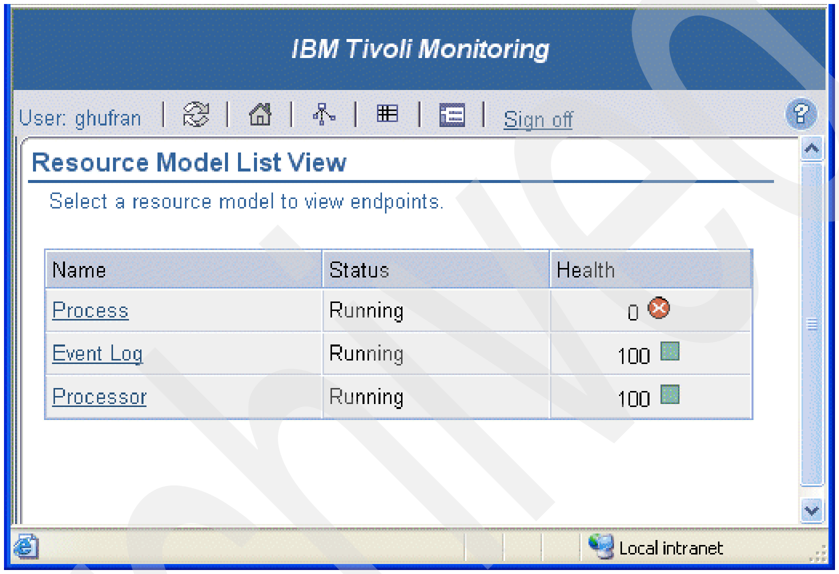
Figure 7-9 Starting or stopping the IBM Tivoli Monitoring V5.1.1 engine

To successfully stop or start the engine, the administrator must have the administrator, super, or senior role.

7.3.4 The Resource Model List View

The Resource Model List View (Figure 7-10) shows all of the resource models installed on the endpoints specified in the Endpoint List page of the Preferences view. See Figure 7-5 on page 111 for more information about preferences.

The Web Health Console sorts the resource models by health order, displaying the lowest health first. For example, a resource model with 30% health is listed before a resource model with 70% health.

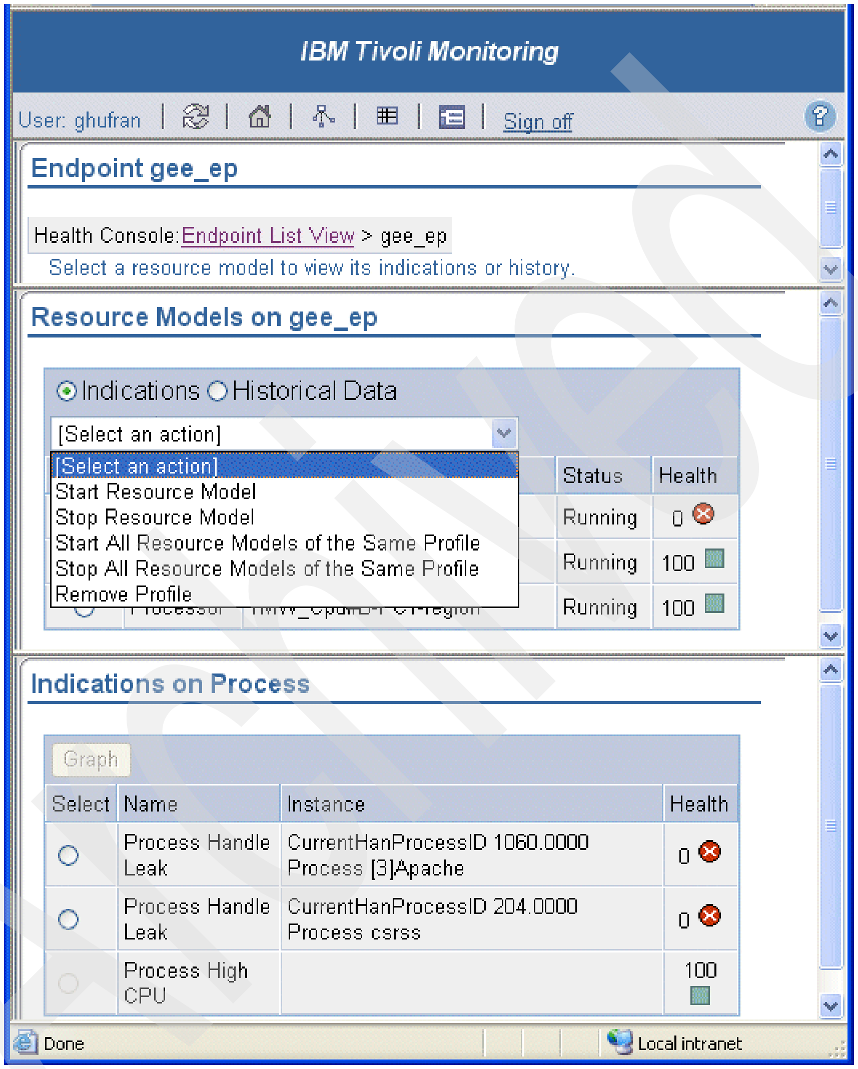


Select a resource model to view endpoints.

Name	Status	Health
Process	Running	0 ⊗
Event Log	Running	100 🟩
Processor	Running	100 🟩

Figure 7-10 Resource Model List View

You can drill down a particular resource model and see a list of endpoints on which the model is running. As shown in Figure 7-11, you can stop or start a resource model, and even remove the profile, from the selected endpoints.

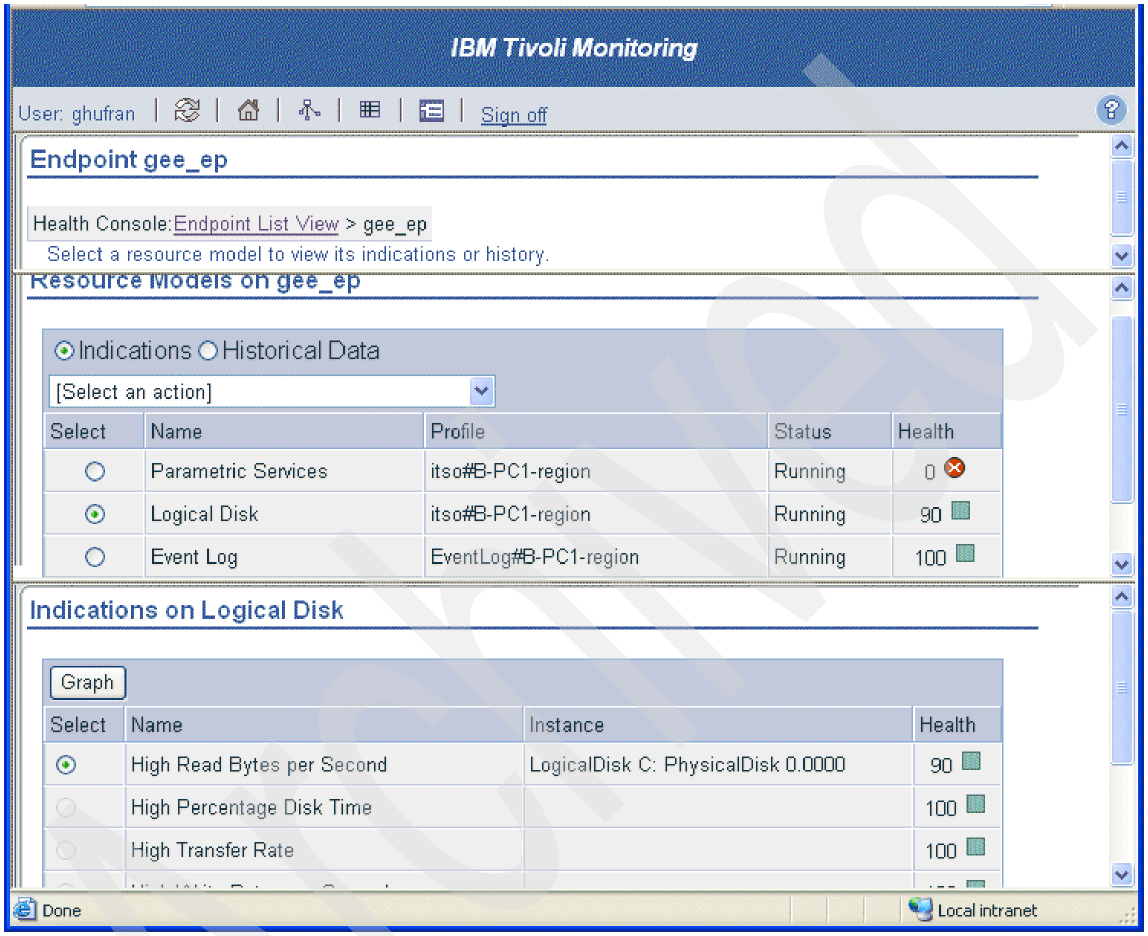


Status	Health
Running	0
Running	100 🟩
Running	100 🟩

Select	Name	Instance	Health
○	Process Handle Leak	CurrentHanProcessID 1060.0000 Process [3]Apache	0
○	Process Handle Leak	CurrentHanProcessID 204.0000 Process csrss	0
○	Process High CPU		100 🟩

Figure 7-11 Managing the resource model on an endpoint

If an indication is generated, then you can view an online graph that displays the data relevant to the indication by selecting the indication, as shown in Figure 7-12.


IBM Tivoli Monitoring

User: ghufran | Sign off

Endpoint gee_ep

Health Console:Endpoint List View > gee_ep

Select a resource model to view its indications or history.

Resource Models on gee_ep

[✓ Indications] Historical Data

[Select an action]

Select	Name	Profile	Status	Health
○	Parametric Services	itso#B-PC1-region	Running	0 ✗
[✓ ●]	Logical Disk	itso#B-PC1-region	Running	90 🟩
○	Event Log	EventLog#B-PC1-region	Running	100 🟩

Indications on Logical Disk

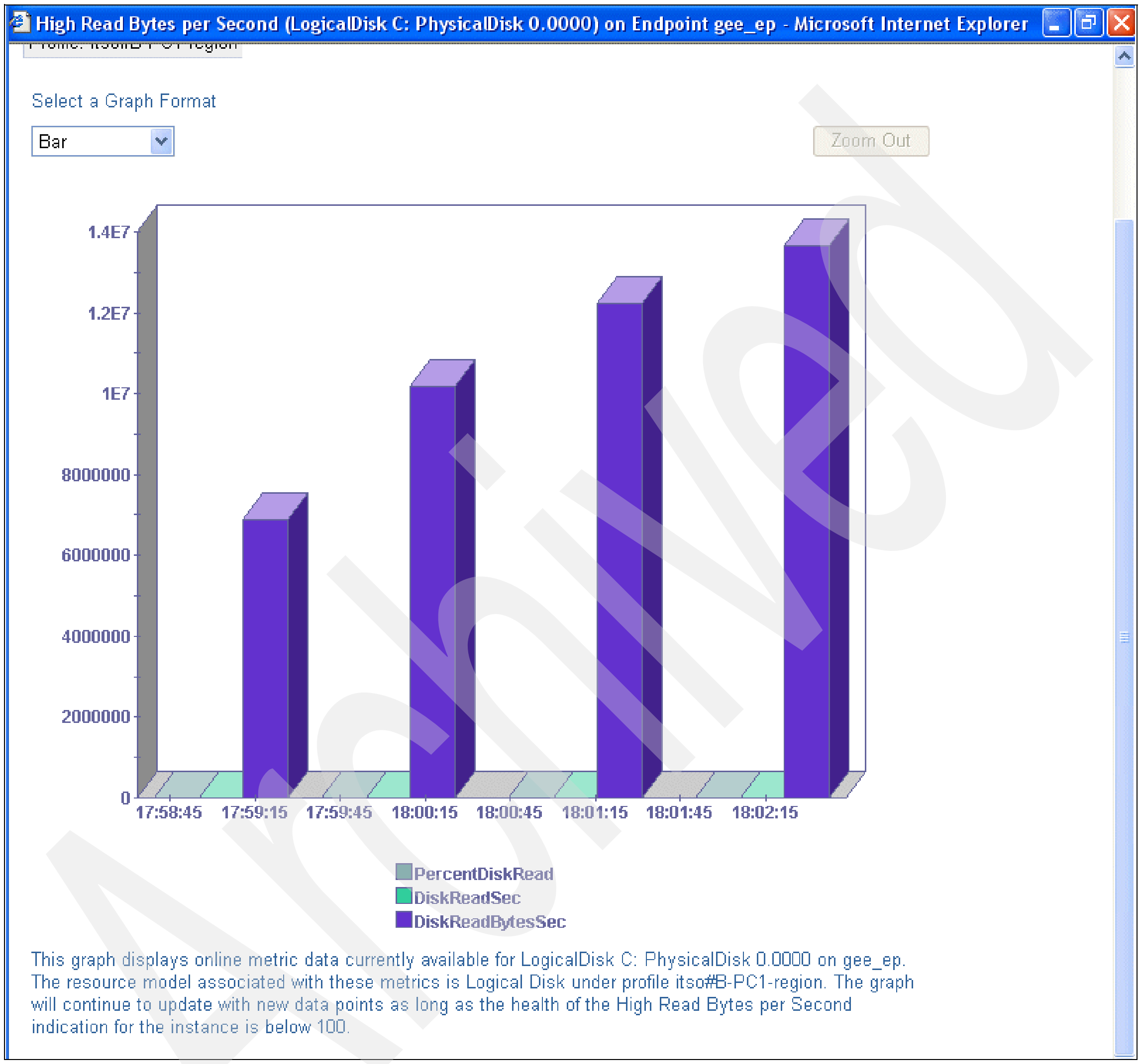
Graph

Select	Name	Instance	Health
[✓ ●]	High Read Bytes per Second	LogicalDisk C: PhysicalDisk 0.0000	90 🟩
○	High Percentage Disk Time		100 🟩
○	High Transfer Rate		100 🟩

Done | Local intranet

Figure 7-12 Viewing online data for an indication

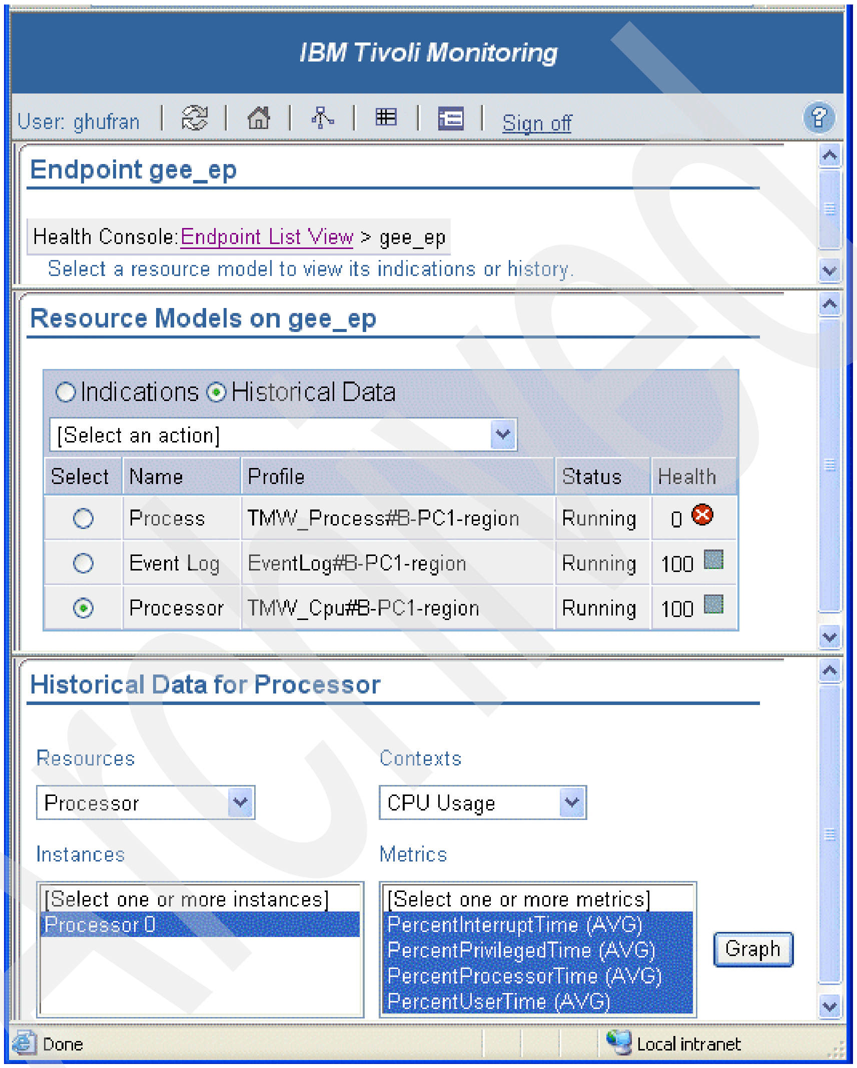
When you click the Graph button, you see the results shown in Figure 7-13. This graph is continuously updated.



This graph displays online metric data currently available for LogicalDisk C: PhysicalDisk 0.0000 on gee_ep. The resource model associated with these metrics is Logical Disk under profile itso#B-PC1-region. The graph will continue to update with new data points as long as the health of the High Read Bytes per Second indication for the instance is below 100.

Figure 7-13 Online data for indications generated by a resource model

When you click the Historical Data radio button in the Resource Models frame (Figure 7-12), you can view the historical data generated by this resource model on the endpoint. The bottom portion of the page changes, allowing you to choose the data in which you are interested, as shown in Figure 7-14.


IBM Tivoli Monitoring

User: ghufran | Sign off

Endpoint gee_ep

Health Console: Endpoint List View > gee_ep

Select a resource model to view its indications or history.

Resource Models on gee_ep

Indications [✓ Historical Data]

[Select an action]

Select	Name	Profile	Status	Health
○	Process	TMW_Process#B-PC1-region	Running	0 ⊗
○	Event Log	EventLog#B-PC1-region	Running	100 ▨
●	Processor	TMW_Cpu#B-PC1-region	Running	100 ▨

Historical Data for Processor

Resources: Processor

Contexts: CPU Usage

Instances:
[Select one or more instances]
Processor 0

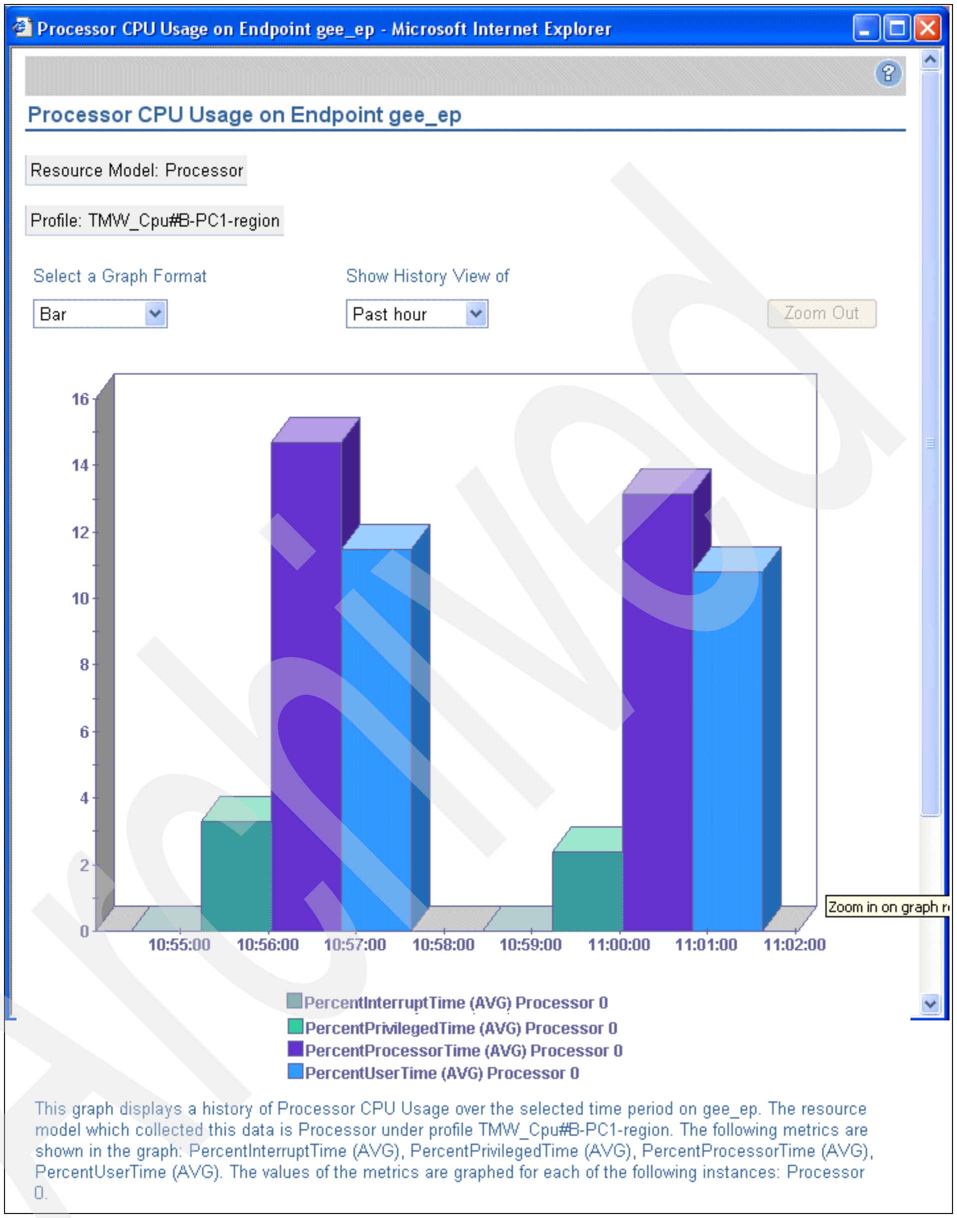
Metrics:
[Select one or more metrics]
PercentInterruptTime (AVG)
PercentPrivilegedTime (AVG)
PercentProcessorTime (AVG)
PercentUserTime (AVG)

Figure 7-14 Historical data options

Using the historical data selection controls, you select instances and metrics from the selected resource model to create a chart of recent historical data from the endpoint. To create historical data, logging must be enabled for the resource model. With logged data, you can use the historical data graph to identify specific instances of resource problems over the past 1, 6, 12, or 24 hours.

To create a historical data graph as shown in Figure 7-15, follow these steps:

1. Select a resource model from the Resource Model list in the upper frame and click the **Historical Data** radio button (see Figure 7-14).
2. The Historical Data information for your selection appears in the lower frame.
   a. The Resource list is the only option that is active when the frame opens. From the Resources list, select a resource.
   b. From the Contexts list, select a context. Each context identifies a logical grouping of problems related to the specified resource.
   c. From the Instances list, select one or more instances. These identify specific instances of the selected indication.
   d. From the Metrics list, select one or more metrics. These metrics are used to measure the selected indication.
   e. Click **Graph**.



Processor CPU Usage on Endpoint gee_ep - Microsoft Internet Explorer

Processor CPU Usage on Endpoint gee_ep

Resource Model: Processor

Profile: TMW_Cpu#B-PC1-region

Select a Graph Format: Bar

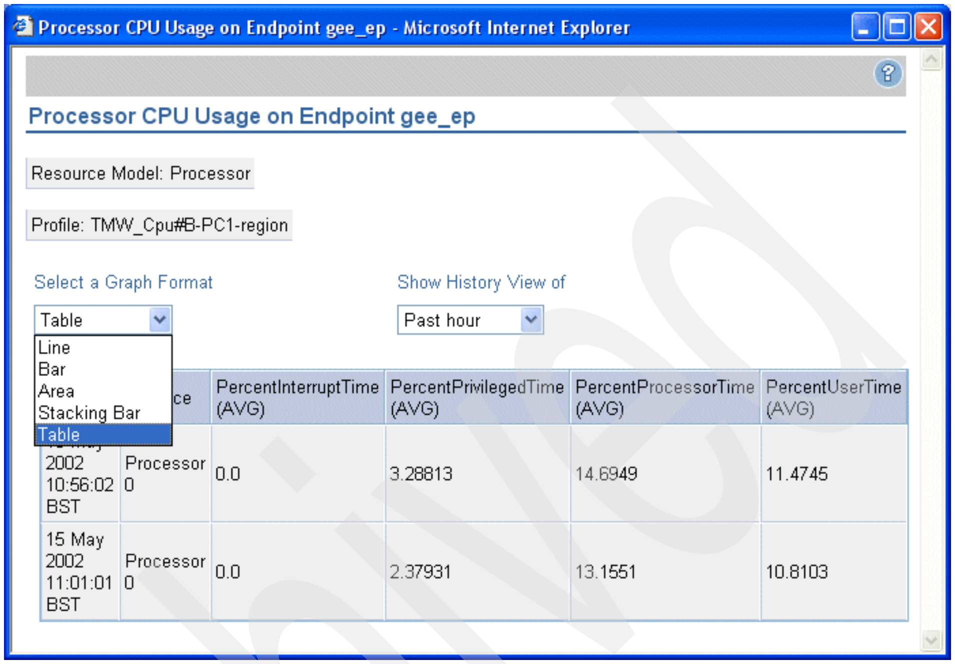
Show History View of: Past hour

PercentInterruptTime (AVG) Processor 0
PercentPrivilegedTime (AVG) Processor 0
PercentProcessorTime (AVG) Processor 0
PercentUserTime (AVG) Processor 0

This graph displays a history of Processor CPU Usage over the selected time period on gee_ep. The resource model which collected this data is Processor under profile TMW_Cpu#B-PC1-region. The following metrics are shown in the graph: PercentInterruptTime (AVG), PercentPrivilegedTime (AVG), PercentProcessorTime (AVG), PercentUserTime (AVG). The values of the metrics are graphed for each of the following instances: Processor 0.

Figure 7-15 Sample historical data graph

You can display the historical data graphs in various formats, as shown in Figure 7-16.


Processor CPU Usage on Endpoint gee_ep - Microsoft Internet Explorer

Processor CPU Usage on Endpoint gee_ep

Resource Model: Processor

Profile: TMW_Cpu#B-PC1-region

	ce	PercentInterruptTime (AVG)	PercentPrivilegedTime (AVG)	PercentProcessorTime (AVG)	PercentUserTime (AVG)
2002 10:56:02 BST	Processor 0	0.0	3.28813	14.6949	11.4745
15 May 2002 11:01:01 BST	Processor 0	0.0	2.37931	13.1551	10.8103

Figure 7-16 Available graph layouts

8

IBM Tivoli Monitoring Workbench

This chapter explains how to use IBM Tivoli Monitoring Workbench to create and customize resource model and migrating classic Distributed Monitoring monitors.

8.1 Using the Workbench

We begin by exploring one of the simpler resource models shipped with IBM Tivoli Monitoring, the PhysicalDiskModel. We use this model later in our examples to illustrate some of the advanced features of the Workbench. To begin, follow these steps:

Figure 8-1 IBM Tivoli Monitoring Workbench icon

1. Double-click the IBM Tivoli Monitoring Workbench icon (Figure 8-1).
2. Open the sample project file for the PhysicalDiskModel (shipped with the product). From the menu, select **File →Open**.
3. Go to the samples/Windows directory in the install location of IBM Tivoli Monitoring. The samples directory consists of four subdirectories with sample resource models source.

This sample use the Windows PhsicalDiskModel to demonstrate the basics of using the Workbench. The source for this model is in the TMW_PhysicalDiskModel.dmws project file. This project file is a non-editable file that contains all of the element definitions for the PhysicalDisk resource model. It is sometimes referred to as a *project file*. You can open this file and explore each of its elements. For a UNIX resource model, you can also browse this information by importing the associated Managed Object Format (MOF) file using the **`mofcomp`** command line interface (CLI) command.

The Workbench is made of three panes as shown in Figure 8-2:

- Pane 1

  The first pane contains most of the resource model elements that make up a particular model. These elements are ordered in a tree-like hierarchy. The root node of the tree is the name of the resource model and describes the model's general settings. In this case, it is TMW_PhysicalDiskModel.

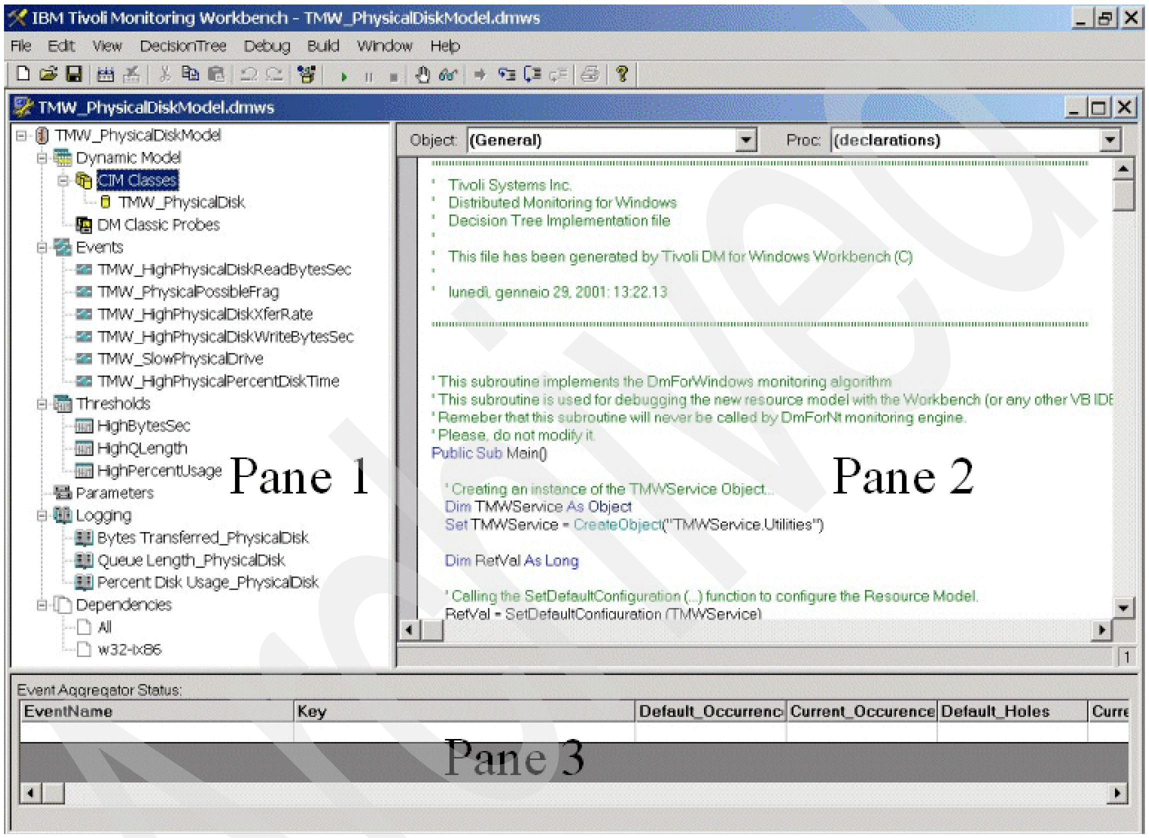
  In most cases, you can open any element in the tree by double-clicking the mouse. Some elements in the tree have multiple options associated with it. Right-clicking the mouse on any element in the tree lists the associated options for that element. For example, right-clicking the TMW_PhysicalDisk element, under Dynamic Model/CIM Classes, display three options: Modify, Remove, and Collection Test. We illustrate the use of many of these options later in the examples.

- Pane 2

  This pane contains the Java or Visual Basic script code used in the resource model. The functions in this code are used to initialize, set the configuration options, and run the decision tree logic.

- Pane 3

  The third pane is used only for models that interact with the Windows platforms (that is, Common Information Model (CIM) or Windows Management Instrumentation (WMI)-based). This pane is used when debugging a resource model and to display the aggregate status of event indications.


IBM Tivoli Monitoring Workbench - TMW_PhysicalDiskModel.dmws
File Edit View DecisionTree Debug Build Window Help
TMW_PhysicalDiskModel.dmws
Pane 1
Pane 2
Pane 3
Object: (General)
Proc: (declarations)
Event Aggregator Status:

```
TMW_PhysicalDiskModel
  Dynamic Model
    CIM Classes
      TMW_PhysicalDisk
    DM Classic Probes
  Events
    TMW_HighPhysicalDiskReadBytesSec
    TMW_PhysicalPossibleFrag
    TMW_HighPhysicalDiskXferRate
    TMW_HighPhysicalDiskWriteBytesSec
    TMW_SlowPhysicalDrive
    TMW_HighPhysicalPercentDiskTime
  Thresholds
    HighBytesSec
    HighQLength
    HighPercentUsage
  Parameters
  Logging
    Bytes Transferred_PhysicalDisk
    Queue Length_PhysicalDisk
    Percent Disk Usage_PhysicalDisk
  Dependencies
    All
    w32-ix86
```

```
'''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''
'  Tivoli Systems Inc.
'  Distributed Monitoring for Windows
'  Decision Tree Implementation file
'
'  This file has been generated by Tivoli DM for Windows Workbench (C)
'
'  lunedì, gennaio 29, 2001: 13:22.13
'
'''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''


'This subroutine implements the DmForWindows monitoring algorithm
'This subroutine is used for debugging the new resource model with the Workbench (or any other VB IDE
'Remeber that this subroutine will never be called by DmForNt monitoring engine.
'Please, do not modify it.
Public Sub Main()

  'Creating an instance of the TMWService Object...
  Dim TMWService As Object
  Set TMWService = CreateObject("TMWService.Utilities")

  Dim RetVal As Long

  'Calling the SetDefaultConfiguration (...) function to configure the Resource Model.
  RetVal = SetDefaultConfiguration (TMWService)
```

EventName	Key	Default_Occurrenc	Current_Occurence	Default_Holes	Curre

Figure 8-2   *PhysicalDiskModel opened in Workbench*

8.2 Elements of a resource model

All resource models are made up of seven basic elements.

- Dynamic model

  In this element, you define all of the CIM classes and properties for the resource model. Under the dynamic model element are two sub-elements:

  – CIM classes: This is where you define all resource model class definitions. To define and modify the CIM classes, you invoke the Workbench CIM browser. Figure 8-7 on page 134 shows an example of this.

  – DM classic probes: This is where you define the Tivoli Distributed Monitoring (Classic Edition) 3.7 compatibility mode monitors. These definitions are imported from dumped MCSL files or source CSL files.

- Events

  The event element is where all of the resource model *indications* are defined. It is where you define the default attributes that make up an event, along with the aggregation defaults (holes and occurrences). For greater discussion about this topic, see 8.3.3, "Event element of PhysicalDiskModel" on page 137.

  Note: An event element in a resource model is an indication definition (as seen in an IBM Tivoli Monitoring V5.1.1 Profile). The event element is not the same thing as a TEC or Tivoli Business Systems Manager (TBSM) event. The IBM Tivoli Monitoring event aggregator processes all indications using event element (holes and occurrences) definitions. After it passes through the event aggregation, based on the number of holes and occurrences and the profile definitions, it can then become a TEC or TBSM event.

- Thresholds

  The threshold element is where you define the different resource model class property thresholds. For example, in TMW_PhysicalDiskModel, there are three threshold properties: HighBytesSec,HighQLength, and HighPercentUsage. These thresholds are set when the resource model is initialized on the endpoint and retrieved on each *cycle time* by the decision tree logic. The decision tree logic uses the threshold elements to determine if an indication should be sent.

- Parameters

  The parameters element is used for parametric resource models. Parametric resource models are designed to allow the user to customize the resource model definitions from the IBM Tivoli Monitoring V5.1.1 profile. Some examples of parametric-based resource models are TMW_ParamPort, TMW_ParamEventLog, and the TMW_ParamServices resource models. For example, the TMW_ParamServices resource model allows a user to customize the Windows NT or Windows 2000 monitored services defined in the profile from the Tivoli Desktop. The types of parameters are boolean list, choice list, numeric list, or string list.

- Logging

  You use the logging element to define the properties of the resource model that are to be logged. All of the examples discussed in this chapter include logging elements.

- Dependencies

  You use the dependencies element to define file dependencies that are to be pushed with the resource model when the profile is distributed to the endpoint. Examples of dependency files are dynamic linked libraries (DLLs), MOF files, and executable script files. We demonstrate the use of dependencies in some examples later in this chapter.

- Decision tree script

  The decision tree script is made up of a set of function routines that provide the heart of the logic of the resource model. These functions set the default configuration definitions and thresholds, and process them by generating indications and logging events. Three primary functions are used by the IBM Tivoli Monitoring 5.1 engine at runtime, and one is used for debugging.

  – SetDefaultConfiguration: This function sets runtime definitions based on resource model element settings. This routine is run once when the IBM Tivoli Monitoring 5.1 profile is pushed to the endpoint. The code in the function should not be modified because it is generated automatically by the Workbench. For example, if we use the Workbench to change the event element definitions, it automatically changes the corresponding definition in this function.

  – Init: This function is called after the SetDefaultConfiguration function. you can use it to create user settings or change default settings. Remember that some of the values defined in the resource model elements can be overridden in the IBM Tivoli Monitoring profile. This routine runs after the profile settings are initialized.

  – VisitTree: This routine runs every *cycle time* after the IBM Tivoli Monitoring profile is pushed. This function contains all of the decision tree logic. The VisitTree function retrieves threshold values defined in the SetDefaultConfiguration function and processes the decision tree logic through a series of “if” statements. When a *threshold exceeded* is detected, the VisitTree generates indications, logging events, or both. All of our examples demonstrate customizing the VisitTree code.

– Main: This routine is used only for debugging. The Windows-only-based (Visual Basic script) models display this routine in the Workbench as the first function. The JavaScript-based resource models do not display this function in the Workbench. The Workbench generates an output file that contains all four routines, including Main, when debugging JavaScript-based resource models. In this case, the output JavaScript source file is created in the IBM Tivoli Monitoring install directory under the subdirectory named *scripts*. This file is passed to the MicroSoft Script Debugger.

Figure 8-3 shows the flow between the IBM Tivoli Monitoring V5.1.1 engine and the decision tree functions.

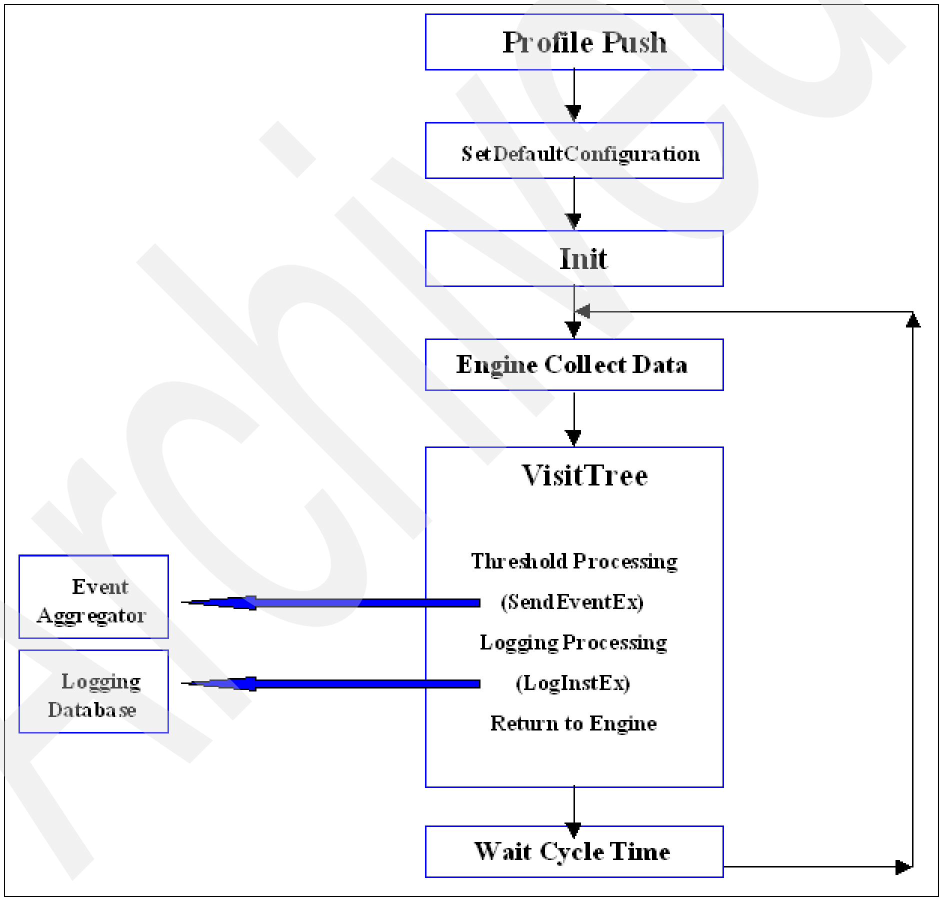


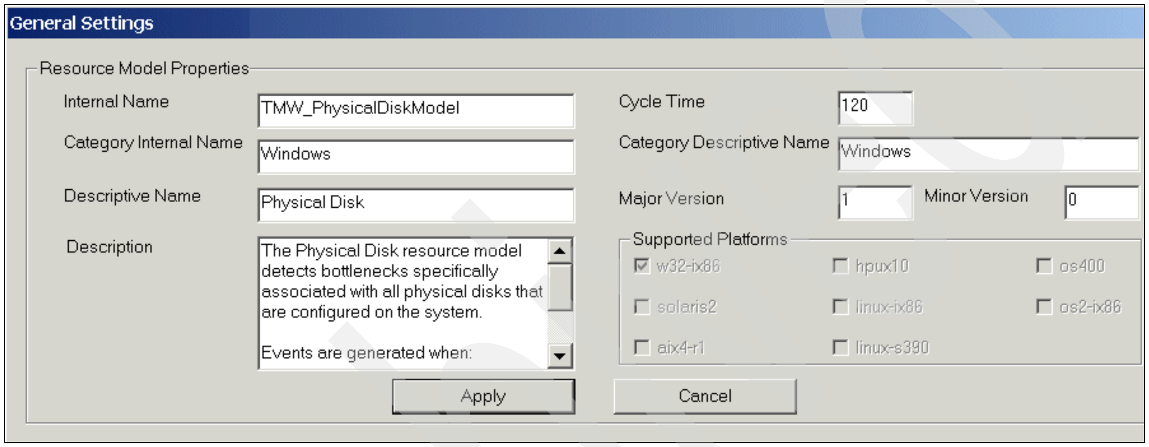
Figure 8-3 Decision tree script logic

8.3 Looking at PhysicalDiskModel

The following sections discuss PhysicalDiskModel.

8.3.1 Properties of PhysicalDiskModel

To open the properties of a resource model, double-click the root node object or right-click the object and select to open it. In this case, we open the TMW_PhysicalDisk object and see the General Settings window (Figure 8-4).



General Settings

Resource Model Properties

Internal Name	TMW_PhysicalDiskModel	Cycle Time	120
Category Internal Name	Windows	Category Descriptive Name	Windows
Descriptive Name	Physical Disk	Major Version	1
		Minor Version	0

Description: The Physical Disk resource model detects bottlenecks specifically associated with all physical disks that are configured on the system.

Events are generated when:

Supported Platforms: [✓ w32-ix86] hpux10 os400 solaris2 linux-ix86 os2-ix86 aix4-r1 linux-s390

Figure 8-4 TMW_PhsyicalDiskModel general settings

The properties of the General Settings window are:

- **Internal name**: This is the internal name of the resource model. Changes to this setting update automatically the SetDefaultConfiguration function Svc.SetModelName method call. Example 8-1 on page 133 shows these settings in the SetDefaultConfiguration function. The internal name can be retrieved in the VisitTree function by calling the `Svc.GetModelName` method. This name must be alphanumeric, starting with an alphabetic letter, and not contain any blanks. This name identifies the resource model in the TMR.

- **Descriptive name**: This is the name that appears in the IBM Tivoli Monitoring V5.1.1 profile list of resource models. Figure 8-5 shows an example of the descriptive name in the profile, which in this example is *Physical Disk*.

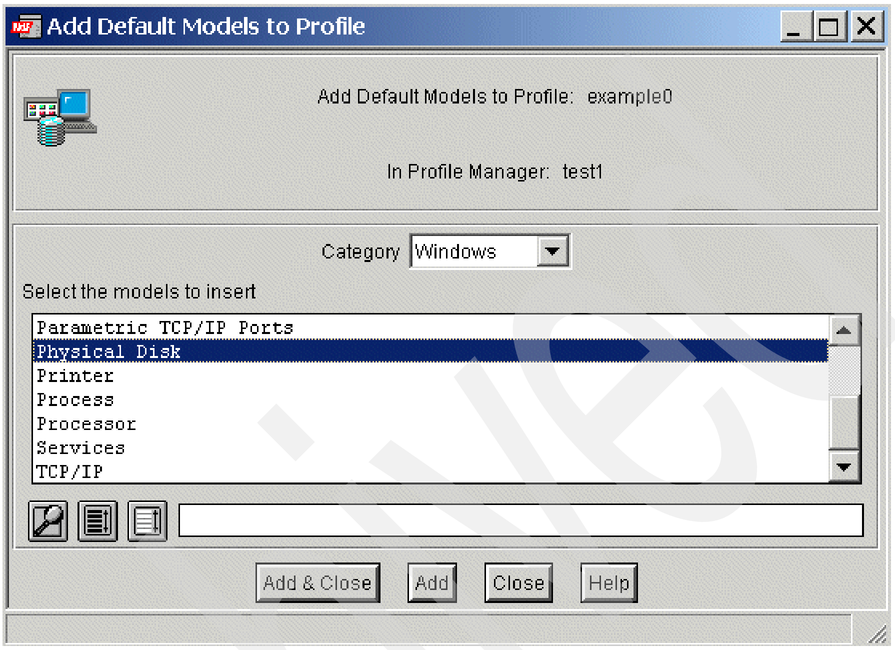
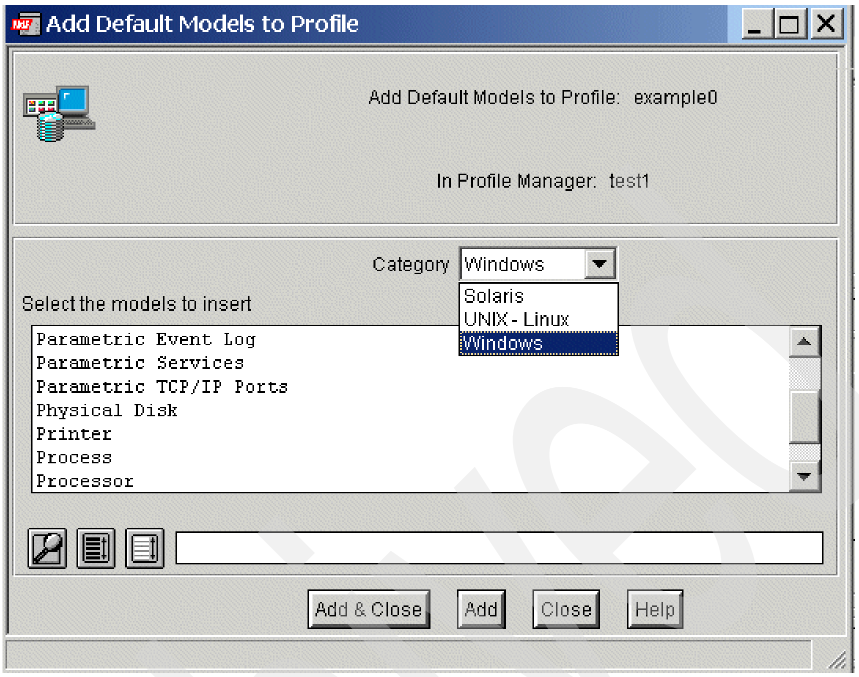

Add Default Models to Profile
Add Default Models to Profile: example0
In Profile Manager: test1
Category Windows
Select the models to insert
Parametric TCP/IP Ports
Physical Disk
Printer
Process
Processor
Services
TCP/IP
Add & Close
Add
Close
Help

Figure 8-5 Example of descriptive name in a profile

- **Description**: This is the text that describes the resource model. It is used to document the resource model. You can use these settings to document the decision tree logic and to explain the threshold settings.
- **Category internal name**: This name is the internal name for grouping resource models on the profile category display. All resource models that have the same category internal name are displayed under the same category option, as shown in Figure 8-6.
- **Category descriptive name**: This name is displayed in the profile category display. Figure 8-6 shows an example of this in the Category list.


Add Default Models to Profile
Add Default Models to Profile: example0
In Profile Manager: test1
Category
Windows
Solaris
UNIX - Linux
Windows
Select the models to insert
Add & Close
Add
Close
Help

Parametric Event Log
Parametric Services
Parametric TCP/IP Ports
Physical Disk
Printer
Process
Processor

Figure 8-6 Category profile pull-down option

- **Cycle time**: This is the default cycle time for the resource model. You can change this value in the profile before profile distribution. This setting changes the Svc.SetCycleTime in the SetDefaultConfiguration function. Example 8-1 shows the SetDefaultConfiguration function for the PhysicalDiskModel. You can also retrieve this setting in the VisitTree function using the `Svc.GetCycleTime` method.
- **Major and minor version**: This is the internal version of the resource model.
- **Supported platforms**: These platforms are supported by the resource model and defined when the resource model is created.

The created or modified properties in the General Settings window update the code automatically in the SetDefaultConfiguration function (Example 8-1).

Example 8-1 PhysicalDiskModel general settings

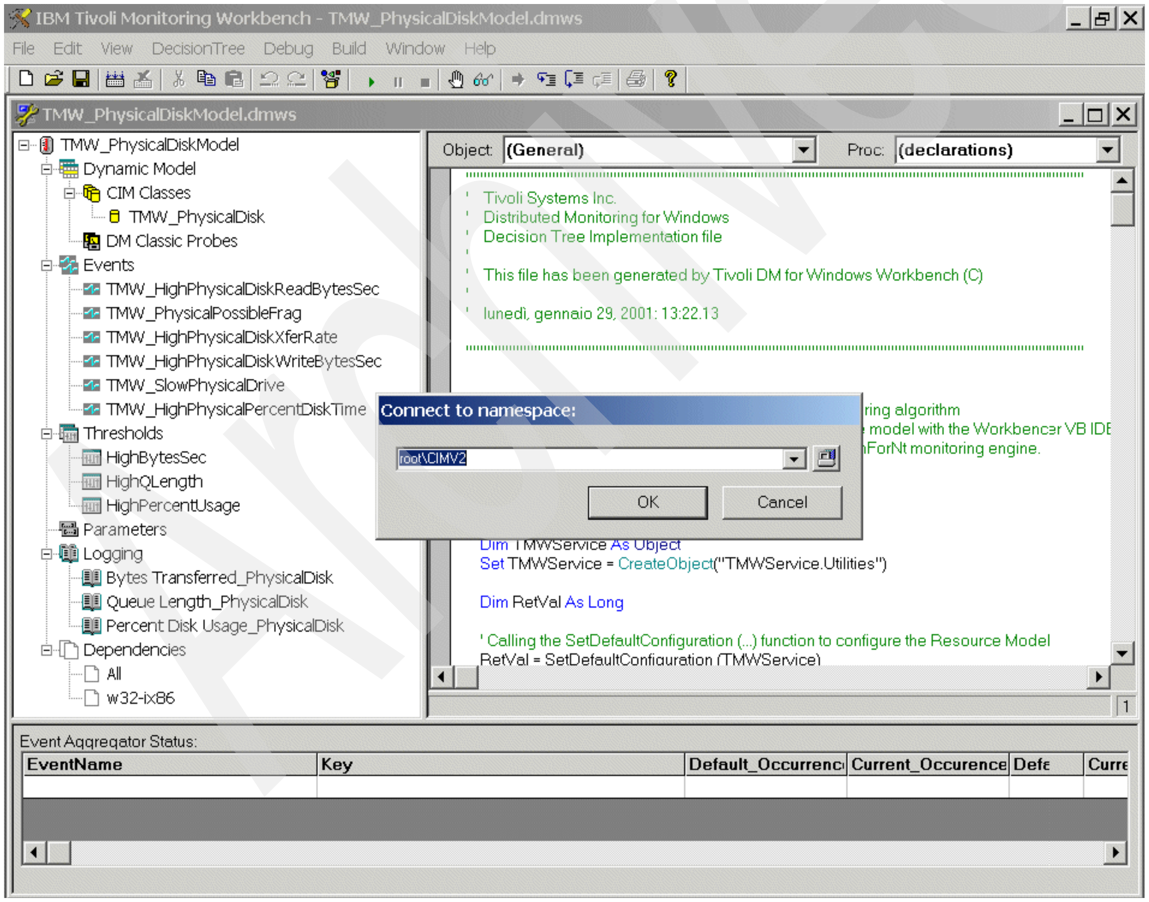
```
' General info section
   '<<GENERAL_INFO>>
   Svc.SetModelName “TMW_PhysicalDiskModel”
   Svc.SetProfileName “157999030”
   Svc.SetCycleTime 120
   '<<\GENERAL_INFO>>
```

8.3.2 Dynamic model element of PhysicalDiskModel

The PhysicalDiskModel resource model uses only one resource class, the TMW_PhysicalDisk class. You can examine this class further by opening the CIM browser supplied with the Workbench.

To open the CIM browser, as shown in Figure 8-7, select the TMW_PhysicalDisk resource class under the dynamic model/CIM classes hierarchy. When you open the CIM browser from the Workbench, you use the first window to designate the CIM name space that you want to open. For Windows CIM or WMI-based models, always use root/CIMV2. However, later when we start working with the UNIX and Linux-based models, we open the root/default name space.

Next you see a login window. This window always defaults to the signed-on user. Simply click **OK**.

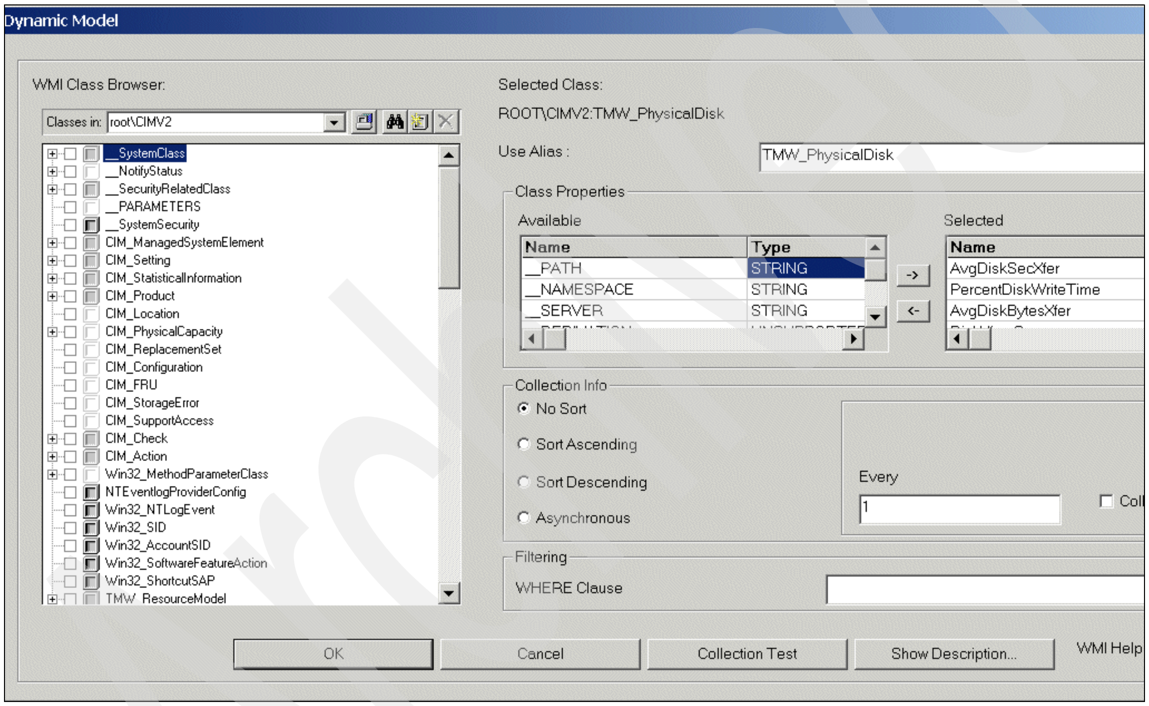


```
'''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''
'  Tivoli Systems Inc.
'  Distributed Monitoring for Windows
'  Decision Tree Implementation file
'
'  This file has been generated by Tivoli DM for Windows Workbench (C)
'
'  lunedì, gennaio 29, 2001: 13:22.13
'''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''

                                         ring algorithm
                                         model with the Workbencer VB IDE
                                         ForNt monitoring engine.

Dim TMWService As Object
Set TMWService = CreateObject("TMWService.Utilities")

Dim RetVal As Long

' Calling the SetDefaultConfiguration (...) function to configure the Resource Model
RetVal = SetDefaultConfiguration (TMWService)
```

Figure 8-7 Opening the CIM browser

The CIM browser now displays all of the properties of the PhysicalDisk resource class defined in PhysicalDiskModel as shown in Figure 8-8.

Note: The Workbench CIM browser displays all of the correct properties for the selected class. But, it doesn't automatically position the browser to the correct CIM class in the Classes window (left pane). If another class is selected, all properties are erased from the selected properties window. It is important to cancel out of the browser in this scenario. However, if you create a new resource class, as demonstrated later, you must select a new class.



Classes in: root\CIMV2

Selected Class:
ROOT\CIMV2:TMW_PhysicalDisk

Use Alias : TMW_PhysicalDisk

Name	Type
__PATH	STRING
__NAMESPACE	STRING
__SERVER	STRING

Name
AvgDiskSecXfer
PercentDiskWriteTime
AvgDiskBytesXfer

[✓ No Sort] Sort Ascending Sort Descending Asynchronous

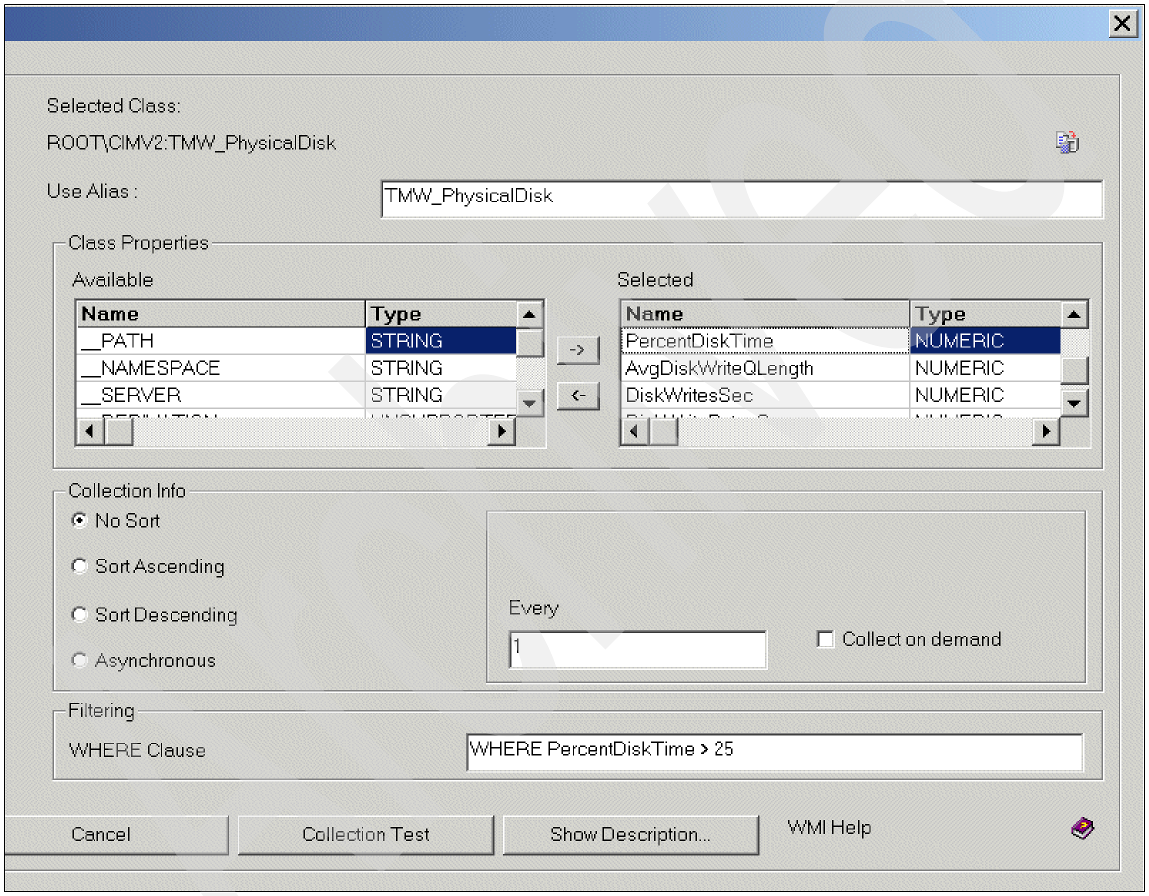
Every: 1

Figure 8-8 PhysicalDisk resource class definitions

The PhysicalDisk resource class settings are made up of the following of property fields:

- **Class properties**: These are the attribute values (in CIM terminology, the *properties*) that are selected for processing. SetDefaultConfiguration has a `Svc.DefineClass` method call with all of the properties selected from this class. See Example 8-2 on page 137 for the SetDefaultConfiguration function for the PhysicalDiskModel. The IBM Tivoli Monitoring analyzer collects all of the properties that are in the selected list each *cycle time*.

- **Collection info**: This field enables you to optionally set sort options for data that may need to be in sorted order.
- **Filtering**: This field lets you place optional filters on the collection process before the VisitTree function is called. For example, if you do not want to process any physical disks, where the PercentDiskTime property was less than 25%, you can add a WQL filter, as shown in Figure 8-9. The WHERE Clause field is passed to WMI as WQL code by the engine to filter data that is to be returned.


Selected Class:
ROOT\CIMV2:TMW_PhysicalDisk
Use Alias : TMW_PhysicalDisk

Class Properties

Available

Name	Type
__PATH	STRING
__NAMESPACE	STRING
__SERVER	STRING

Selected

Name	Type
PercentDiskTime	NUMERIC
AvgDiskWriteQLength	NUMERIC
DiskWritesSec	NUMERIC

Collection Info
[✓ No Sort]
Sort Ascending
Sort Descending
Asynchronous
Every: 1
Collect on demand

Filtering
WHERE Clause: WHERE PercentDiskTime > 25

Figure 8-9 Using WMI WQL

The properties created or modified from the dynamic model element automatically update the code in the SetDefaultConfiguration function, as shown in Example 8-2.

Example 8-2 PhysicalDiskModel dynamic model properties

```
' Dynamic model section
   '<<DATA_INFO>>
   Svc.DefineClass "CIM", "TMW_PhysicalDisk", "ROOT\CIMV2:TMW_PhysicalDisk",
"","AvgDiskSecXfer,PercentDiskWriteTime,AvgDiskBytesXfer,DiskXfersSec,PercentDi
skReadTime,AvgDiskReadQLength,DiskReadBytesSec,DiskReadsSec,DiskBytesSec,Curren
tDiskQLength,AvgDiskQLength,PercentDiskTime,AvgDiskWriteQLength,DiskWritesSec,D
iskWriteBytesSec", "PhysicalDisk", "None", "", 0, 1
   '<<\DATA_INFO>>
```

8.3.3 Event element of PhysicalDiskModel

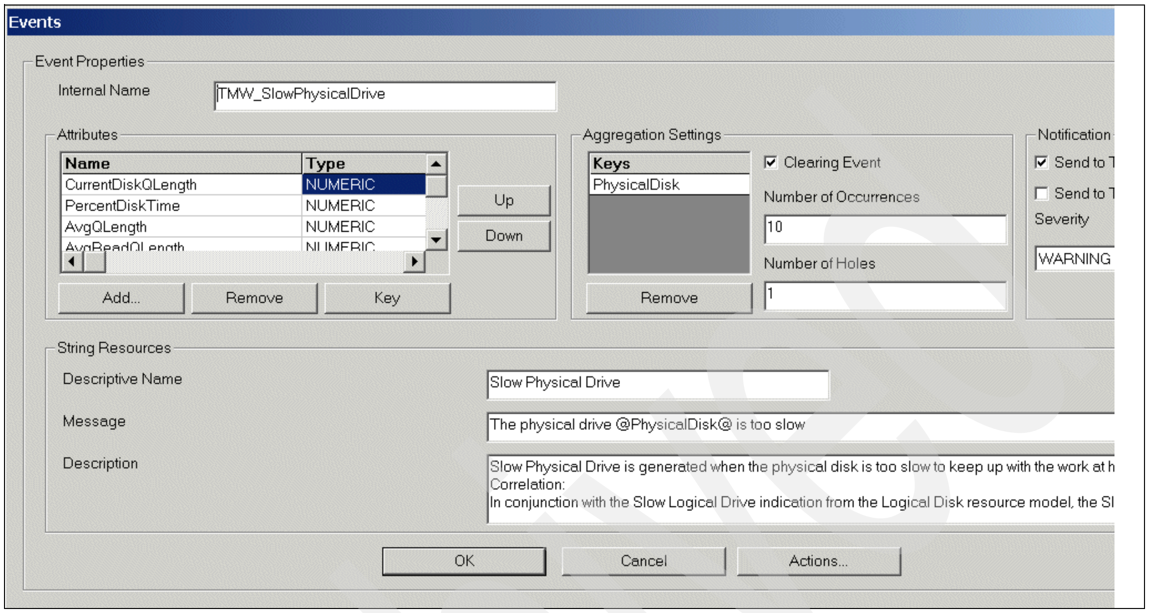
PhysicalDiskModel has six event elements that are used by the decision tree, VisitTree, to send indications. These elements are defined in the resource model and define the event name along with all of the attributes of the event and the aggregation settings. When the resource model is added to the Tivoli environment, the aggregation settings can be updated from an IBM Tivoli Monitoring profile.

Let's look at one of the event elements in this example. In the PhysicalDiskModel, the TMW_SlowPhysicalDrive indication is generated by the VisitTree function when the following property conditions are true:

- The CurrentDiskQLength property is greater than the threshold setting.
- The DiskBytesSec property is greater than the threshold setting.

None of this logic can be found in the event element settings. This can only be derived from analyzing the VisitTree code, which we do later in Example 8-6 on page 145. The threshold values can be seen in the threshold elements discussed in the next section. The event element defines the properties that make up the event as well as the aggregation settings (holes and occurrences) that are used by the event aggregator.

Figure 8-10 shows an example of the TMW_SlowPhysicalDrive event element in the Workbench.


Events

Event Properties

Internal Name: TMW_SlowPhysicalDrive

Attributes

Name	Type
CurrentDiskQLength	NUMERIC
PercentDiskTime	NUMERIC
AvgQLength	NUMERIC
AvgReadQLength	NUMERIC

Aggregation Settings

Keys: PhysicalDisk

☑ Clearing Event

Number of Occurrences: 10

Number of Holes: 1

Notification

☑ Send to T

☐ Send to T

Severity: WARNING

String Resources

Descriptive Name: Slow Physical Drive

Message: The physical drive @PhysicalDisk@ is too slow

Description: Slow Physical Drive is generated when the physical disk is too slow to keep up with the work at h
Correlation:
In conjunction with the Slow Logical Drive indication from the Logical Disk resource model, the Sl

Figure 8-10 TMW_SlowPhysicalDrive event element settings

The TMW_SlowPhysicalDrive properties include:

- **Internal name**: This is the internal name used for this indication. It is defined in the SetDefaultConfiguration function with the `Svc.DefineEvent` method.

  See Example 8-3 for the SetDefaultConfiguration function for the PhysicalDiskModel. The internal name is referenced in the VisitTree function by the `SvcSendEvent` and `Svc.SendEventEx` methods. The `SendEvent` and `SendEventEx` methods pass indications to the event aggregator to determine the action to take. The internal name is also used as a prefix to variables passed to shell scripts. For example, if a Perl script is invoked as a response from the TMW_SlowPhysicalDrive, one variable that is set in the Perl script at runtime is TMW_SlowPhysicalDrive_PercentDiskTime.
- **Attributes**: These attributes are of the event. If the event aggregator generates a TEC or TBSM event (based on holes and occurrences), these properties are passed into the slots of the TEC event and attributes of the TBSM event. These attributes are set in the VisitTree code before the `SendEvent` or `SendEventEx` methods are invoked.
- **Aggregation settings**: This is where you define the aggregation keys, along with the number of occurrences and holes for this indication.

- **Notification**: These are the definitions for event notification. If the indication becomes an event based on the output of the event aggregator, these settings will be used to set the severity.
- **String resources**: These settings are used for the attributes of the event to be sent. The descriptive name is the display name. The message is used to set the msg slot for TEC events and attributes for TBSM events. In this example, the message text is: `The physical drive` *`@PhysicalDisk@`* `is too slow`. *@PhysicalDisk@* is replaced with the PhysicalDisk variable set in the VisitTree routine.
- **Actions**: This button is used to define response actions for the event. You can define CIM Methods, shell programs, or both as response actions to the event element. If you define a response action, it runs after event aggregation has determined that an event should be generated.

  For example, if TMW_SlowPhysicalDrive is set to 3 occurrences and 0 holes and has a send_email.pl script defined as an action, then send_email.pl runs locally on the monitored machine after the third consecutive indication has occurred. Unlike compatibility mode scripts and scripts invoked by the Svc.Shell method, response actions do not have a time-out value.

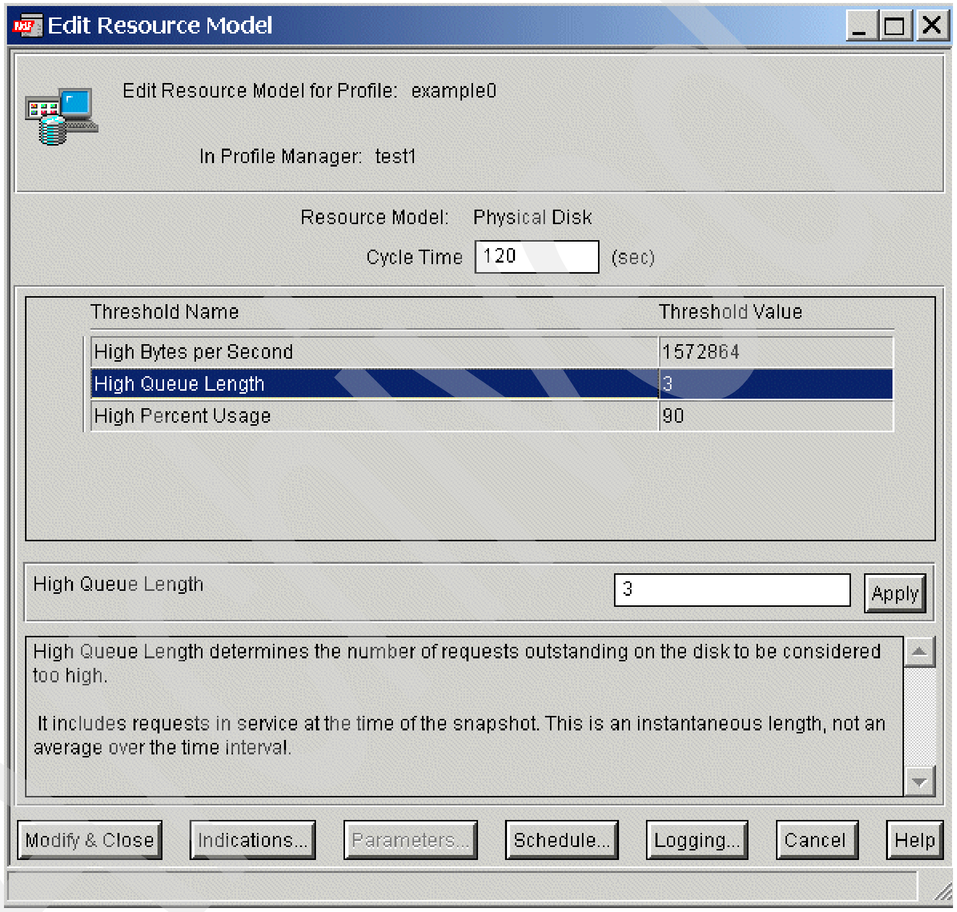
The properties created or modified from the event element automatically update the SetDefaultConfiguration function, as shown in Example 8-3.

Example 8-3 PhysicalDiskModel event element properties

```
' Event definition section
   '<<EVENTS_INFO>>
   Svc.DefineEvent "TMW_HighPhysicalDiskReadBytesSec",
"DiskReadBytesSec,DiskReadSec,PercentDiskRead", "PhysicalDisk"
   Svc.DefineEvent "TMW_PhysicalPossibleFrag", "PercentDiskTime,DiskBytesSec",
"PhysicalDisk"
   Svc.DefineEvent "TMW_HighPhysicalDiskXferRate",
"DiskXfersSec,DiskReadsSec,DiskWritesSec,PercentDiskReadTime,PercentDiskWriteTi
me", "PhysicalDisk"
   Svc.DefineEvent "TMW_HighPhysicalDiskWriteBytesSec",
"DiskWriteBytesSec,DiskWriteSec,PercentDiskWrite", "PhysicalDisk"
   Svc.DefineEvent "TMW_SlowPhysicalDrive",
"CurrentDiskQLength,PercentDiskTime,AvgQLength,AvgReadQLength,AvgWriteQLength,D
iskReadBytesSec,DiskWriteBytesSec", "PhysicalDisk"
   Svc.DefineEvent "TMW_HighPhysicalPercentDiskTime",
"PercentDiskTime,PercentReadTime,PercentWriteTime", "PhysicalDisk"
   '<<\EVENTS_INFO>>
```

8.3.4 Threshold element of PhysicalDiskModel

PhysicalDiskModel has three threshold elements that are used by the decision tree logic (that is, VisitTree) to determine if an indication should be sent. These elements are defined in the resource model and become part of the resource model tar file. After they are added to the Tivoli environment, they can be updated from an IBM Tivoli Monitoring profile, as shown in Figure 8-11.



Edit Resource Model for Profile: example0

In Profile Manager: test1

Resource Model: Physical Disk

Cycle Time 120 (sec)

Threshold Name	Threshold Value
High Bytes per Second	1572864
High Queue Length	3
High Percent Usage	90

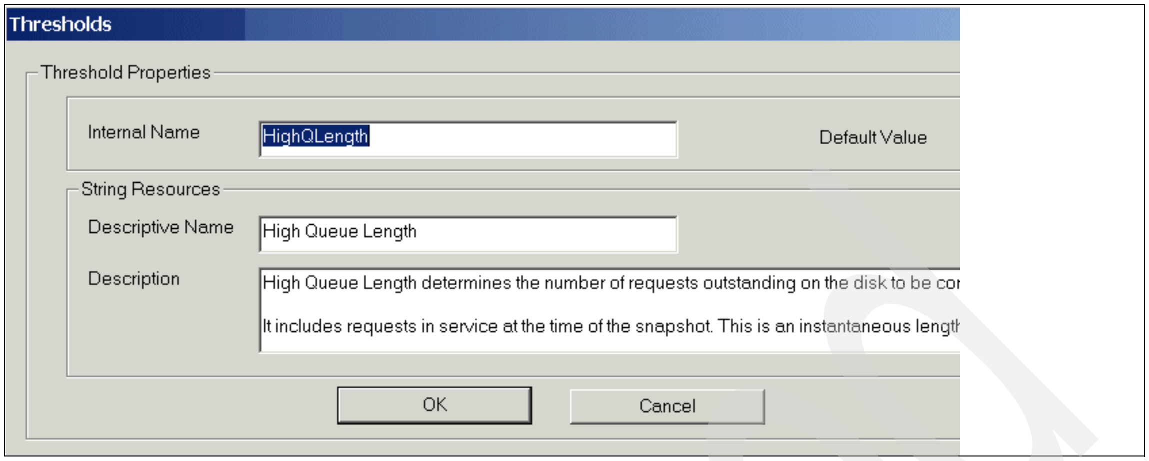
High Queue Length 3

High Queue Length determines the number of requests outstanding on the disk to be considered too high.

It includes requests in service at the time of the snapshot. This is an instantaneous length, not an average over the time interval.

Figure 8-11 PhysicalDiskModel thresholds in a profile

Figure 8-12 shows an example of the TMW_HighPercentUsage threshold element in the Workbench.


Thresholds

Threshold Properties

Internal Name: HighQLength

Default Value

String Resources

Descriptive Name: High Queue Length

Description: High Queue Length determines the number of requests outstanding on the disk to be cor

It includes requests in service at the time of the snapshot. This is an instantaneous lengtl

Figure 8-12 PhysicalDiskModel HighPercentUsage threshold profile display

The HighPercentUsage properties include:

- **Internal name**: This is the internal name that is used by the VisitTree function to determine if a property has exceeded a threshold value. In the VisitTree function, the `Svc.GetThreshold` method is invoked to retrieve and compare this value. The threshold is defined in the SetDefaultConfiguration function by the `Svc.DefineThreshold` method. Remember the SetDefaultConfiguration definitions are updated automatically by the Workbench when you update the element in the elements pane (pane 1).
- **Default value**: This is the default value associated with the internal name. The HighQLength is 3 by default.
- **Descriptive name**: This name is used for the IBM Tivoli Monitoring profile display, as shown in Figure 8-11.
- **Description**: This is used for documentation purposes.

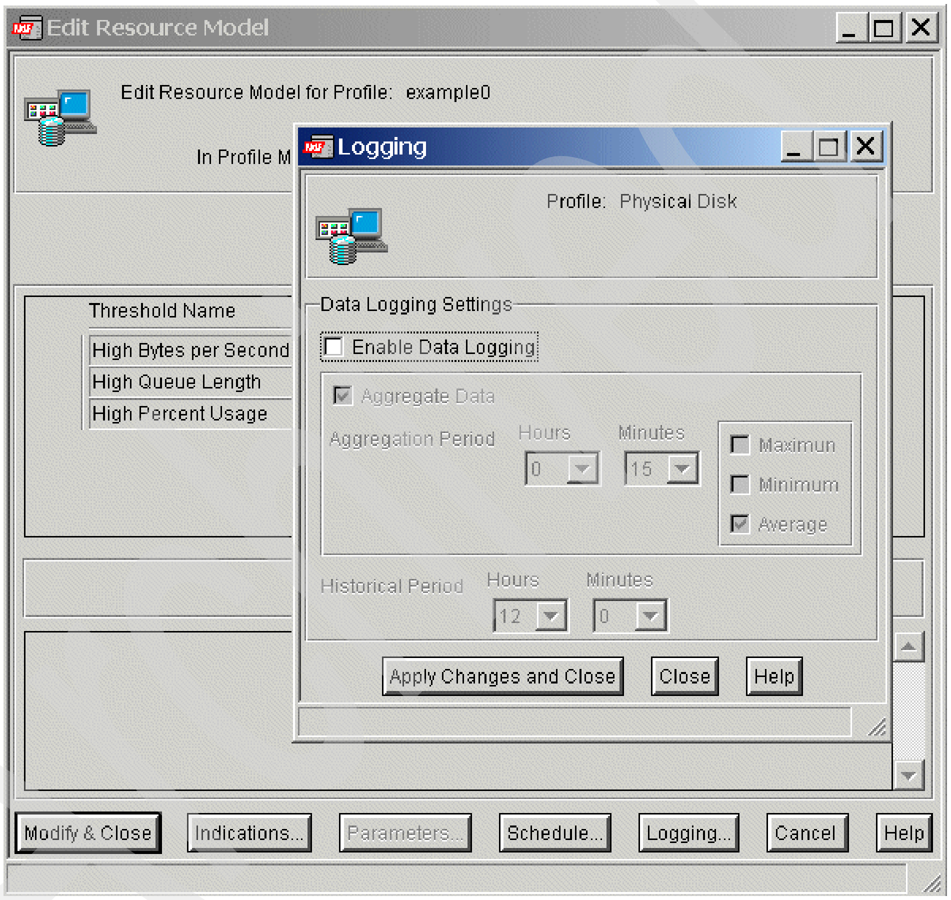
The properties created or modified from the threshold element automatically update the SetDefaultConfiguration function, as shown in Example 8-4.

Example 8-4 PhysicalDiskModel threshold element properties

```
' Thresholds section
   '<<THRESHOLDS_INFO>>
   Svc.DefineThreshold “HighBytesSec”, 1572864
   Svc.DefineThreshold “HighQLength”, 3
   Svc.DefineThreshold “HighPercentUsage”, 90
   '<<\THRESHOLDS_INFO>>
```

8.3.5 Logging element of PhysicalDiskModel

PhysicalDiskModel has three logging elements that are used by the decision tree logic (VisitTree) to determine whether to log an indication. These elements are defined in the resource model and become part of the resource model tar file. After they are added to the Tivoli environment, they can be updated from an IBM Tivoli Monitoring V5.1.1 profile, as shown in Figure 8-13.



Edit Resource Model for Profile: example0

In Profile M

High Bytes per Second
High Queue Length
High Percent Usage

Profile: Physical Disk

Data Logging Settings

- [ ] Enable Data Logging
- [✓] Aggregate Data

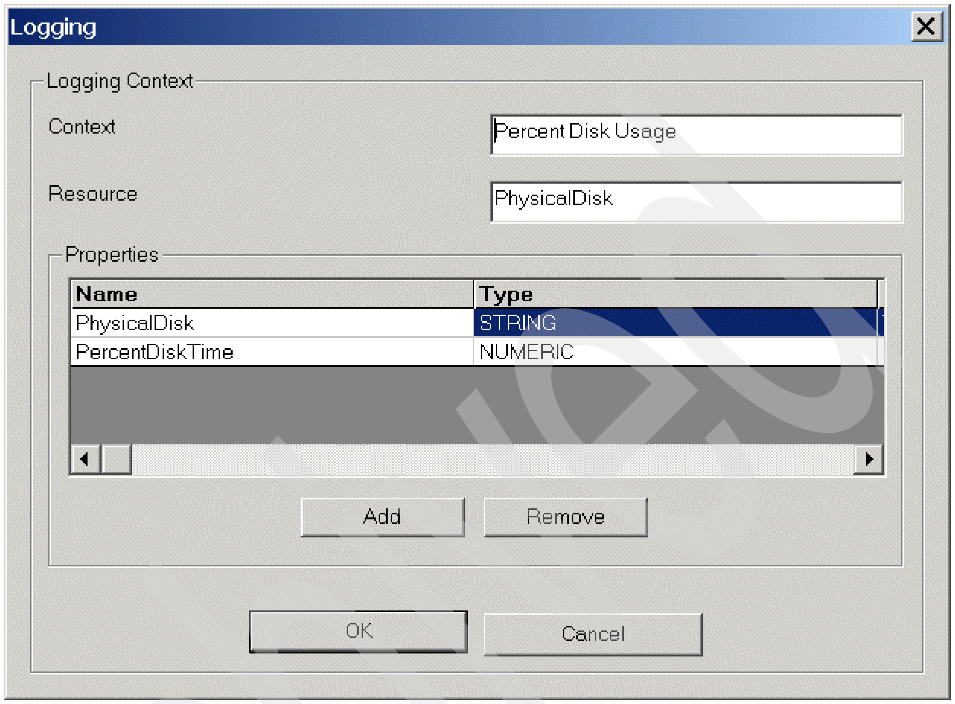
Aggregation Period Hours 0 Minutes 15

- [ ] Maximun
- [ ] Minimum
- [✓] Average

Historical Period Hours 12 Minutes 0

Figure 8-13 PhysicalDiskModel logging element profile display

Figure 8-14 shows an example of the percent disk usage logging element in the Workbench.


Logging

Logging Context

Context: Percent Disk Usage

Resource: PhysicalDisk

Properties

Name	Type
PhysicalDisk	STRING
PercentDiskTime	NUMERIC

Figure 8-14 PhysicalDiskModel percent disk usage element profile display

The HighPercentUsage properties include:

- **Context**: This name is passed as the first parameter of the `Svc.LogInst` or `Svc.LogInstEx` methods. It is also the display name in the IBM Tivoli Monitoring Web Health Console.
- **Resource**: This name is used as the second argument of the `Svc.LogInst` and `Svc.LogInstEx` methods. This name is also what is displayed in the IBM Tivoli Monitoring Web Health Console historical data.
- **Properties**: These properties are to be logged under the context/resource. The PhysicalDiskModel HighPercentUsage logging element has a key of PhysicalDisk.

The properties created or modified from the logging element automatically update the SetDefaultConfiguration function, as shown in Example 8-5.

Example 8-5 Physicaldiskmodel logging element properties

```
' Logging definition section
   '<<LOGGING_INFO>>
   Svc.DefineLogInst “Bytes Transferred”, “PhysicalDisk”, “PhysicalDisk”,
“DiskBytesSec”, “PhysicalDisk”
   Svc.DefineLogInst “Queue Length”, “PhysicalDisk”, “PhysicalDisk”,
“AvgQLength”, “PhysicalDisk”
   Svc.DefineLogInst “Percent Disk Usage”, “PhysicalDisk”, “PhysicalDisk”,
“PercentDiskTime”, “PhysicalDisk”
   '<<\LOGGING_INFO>>
```

8.3.6 Decision tree script of PhysicalDiskModel

As you have seen so far, PhysicalDiskModel is made up of four key components: dynamic model elements, event elements, threshold elements, and logging elements. We have been focusing on the three specific elements:

- The TMW_SlowPhysicalDrive event element
- The HighQueueLength threshold element
- The Percent Disk Usage_PhysicalDisk logging element

The PhysicalDiskModel decision tree script code ties these three elements together. This is a Visual Basic script-based model that uses Microsoft’s WMI to retrieve CIM data. WMI is Microsoft’s implementation of the CIM architecture on Windows machines.

VisitTree in PhysicalDiskModel only generates indications and logs data. First let’s look at how the TMW_SlowPhysicalDrive indication is sent to the event aggregator.

Note: The event aggregator is not in the decision tree code. It is part of the IBM Tivoli Monitoring engine.

PhysicalDiskModel collects data from the WMI Performance Monitoring Provider (PerfProv). Most of the Windows-based resource models collect data from PerfProv as well. In the dynamic model element of PhysicalDiskModel, all of the properties that are defined are collected each cycle time before the VisitTree function is called.

The TMW_SlowPhysicalDrive indication is generated from the VisitTree function when the CurrentDiskQLength and the DiskBytesSec exceed their threshold values. The Percent Disk Usage_PhysicalDisk logging element is processed on every cycle regardless of whether the threshold is met. Example 8-6 shows the code for TMW_SlowPysicalDrive and the logging elements. It is an example of the PhysicalDiskModel code and has been modified for the purposes of this discussion.

Example 8-6 PhysicalDiskModel example VisitTree

```
Public Function VisitTree(Svc As Object) As Long
Dim numAvgQLength As Long, numCurrentDiskQLength As Long, numAvgReadQLength As Long
Dim numAvgWriteQLength As Long, bytDiskReadBytesSec As Long, bytDiskWriteBytesSec As Long
Dim numDiskReadsSec As Long, numDiskWritesSec As Long, numDiskXfersSec As Long
Dim numDiskBytesSec As Long, numPercentDiskTime As Long, numPercentDiskReadTime As Long
Dim numPercentDiskWriteTime As Long, numTotalDisks As Long, flagHighPhysicalQLength As Long
Dim flagHighPhysicalXferRate As Long, flagHighPhysicalReadRate As Long,
      flagHighPhysicalWriteRate As Long
Dim flagHighPhysicalPercentTime As Long, i As Long
Dim strPhysicalDisk As String

 i = 0

 numTotalDisks = Svc.GETNUMOFINST("TMW_PhysicalDisk")

 Do While i < numTotalDisks
   flagHighPhysicalQLength = 0
   flagHighPhysicalXferRate = 0
   flagHighPhysicalReadRate = 0
   flagHighPhysicalWriteRate = 0
   flagHighPhysicalPercentTime = 0

   strPhysicalDisk = Svc.GetStrProperty("TMW_PhysicalDisk", i, "PhysicalDisk")

    If strPhysicalDisk <> "_Total" Then
      strPhysicalDisk = Mid$(strPhysicalDisk, 1, 1)
      bytDiskReadBytesSec = Svc.GetNumProperty("TMW_PhysicalDisk", i, "DiskReadBytesSec")
      bytDiskWriteBytesSec = Svc.GetNumProperty("TMW_PhysicalDisk", i,
                                                  "DiskWriteBytesSec")
      numDiskReadsSec = Svc.GetNumProperty("TMW_PhysicalDisk", i, "DiskReadsSec")
      numDiskWritesSec = Svc.GetNumProperty("TMW_PhysicalDisk", i, "DiskWritesSec")
      numCurrentDiskQLength = Svc.GetNumProperty("TMW_PhysicalDisk", i,
                                               "CurrentDiskQLength")
      numAvgQLength = Svc.GetNumProperty("TMW_PhysicalDisk", i, "AvgDiskQLength")
      numAvgReadQLength = Svc.GetNumProperty("TMW_PhysicalDisk", i, "AvgDiskReadQLength")
      numAvgWriteQLength = Svc.GetNumProperty("TMW_PhysicalDisk", i,
                                          "AvgDiskWriteQLength")
      numDiskBytesSec = Svc.GetNumProperty("TMW_PhysicalDisk", i, "DiskBytesSec")
      bytDiskReadBytesSec = Svc.GetNumProperty("TMW_PhysicalDisk", i, "DiskReadBytesSec")
      bytDiskWriteBytesSec = Svc.GetNumProperty(“TMW_PhysicalDisk”, i,
                                               “DiskWriteBytesSec”)
      numPercentDiskTime = Svc.GetNumProperty(“TMW_PhysicalDisk”, i, “PercentDiskTime”)
      numPercentDiskReadTime = Svc.GetNumProperty(“TMW_PhysicalDisk”, i,
                                               “PercentDiskReadTime”)
      numPercentDiskWriteTime = Svc.GetNumProperty(“TMW_PhysicalDisk”, i,
                                                  “PercentDiskWriteTime”)

   'Log instance data stuff
      Svc.LogInst “Percent Disk Usage”, “PhysicalDisk”, numPercentDiskReadTime,
                      strPhysicalDisk
      Svc.LogInst “Bytes Transferred”, “PhysicalDisk”, numDiskBytesSec, strPhysicalDisk
      Svc.LogInst “Queue Length”, “PhysicalDisk”, numAvgQLength, strPhysicalDisk

      If numCurrentDiskQLength > Svc.GetThreshold(“HighQLength”) Then
            flagHighPhysicalQLength = 1
      End If

      If numDiskBytesSec > Svc.GetThreshold(“HighBytesSec”) Then
            flagHighPhysicalXferRate = 1
      End If

      If bytDiskReadBytesSec > Svc.GetThreshold(“HighBytesSec”) Then
            flagHighPhysicalReadRate = 1
      End If

      If bytDiskWriteBytesSec > Svc.GetThreshold(“HighBytesSec”) Then
            flagHighPhysicalWriteRate = 1
      End If

      If numPercentDiskTime > Svc.GetThreshold(“HighPercentUsage”) Then
            flagHighPhysicalPercentTime = 1
      End If

      If flagHighPhysicalQLength = 1 Then
         If flagHighPhysicalXferRate = 1 Then
            Svc.SENDEVENT “TMW_SlowPhysicalDrive”, _
             numCurrentDiskQLength, _
             numPercentDiskTime, _
             numAvgQLength, _
             numAvgReadQLength, _
             numAvgWriteQLength, _
             bytDiskReadBytesSec, _
             bytDiskWriteBytesSec, _
             strPhysicalDisk
         Else

               Some code deleted

```

```
89 i = i + 1
90 Loop
91 VisitTree = 0
92 End Function
```

Tip: A thread exists for each resource model that is running on the engine. Each thread runs a simplified pseudo code loop:

```
While (Engine Running) {
CollectCIMData();
Call VisitTree();
Sleep(cycle time);
}
```

Let's examine the code in Example 8-6.

- Line 1

  This is the VisitTree function definition.

- Lines 2 through 10

  These lines are the variable definitions. The variables that we are concerned with for TMW_SlowPyhsicalDrive are numCurrentQLength, numDiskBytesSec, and numPercentDiskTime.

- Line 14

  This is the method call that returns the number of instances that have been collected by the IBM Tivoli Monitoring V5.1.1 engine. In our environment, there were two physical disks on our W2K machine. However, the Svc.GETNUMOFINST returned three instances (disk0, disk1, and _Total). Some of the Perfmon-provided properties return a _Total instance where it is appropriate. In line 25, we skip this instance.

- Line 23

  When the VisitTree function is called, all of the data that was collected by the IBM Tivoli Monitoring V5.1.1 analyzer is available to the VisitTree function via method calls. Individual properties can be retrieved using the `Svc.GetStrProperty` or the `Svc.GetNumProperty` methods as shown in lines 26 through 45. In this example, we retrieve the physical disk name on each instance (that is, disk0, disk1, and _Total).

- Line 25

  In the shipped PhysicalDiskModel code, _Total instances is discarded. A customized model can use this instance. _Total is the total of all instances.

- Line 27

  This is a call to the `Svc.GetNumProperty` method to retrieve the DiskReadBytesSec property.
- Line 32

  This is a call to the `Svc.GetNumProperty` method to retrieve the CurrentDiskQLength.
- Line 42

  This is a call to the `Svc.GetNumProperty` method to retrieve the PercentDiskTime.
- Line 48 through 52

  These lines are unconditional calls to the Svc.LogInst methods for the three logging elements defined in Figure 8-13 on page 142.
- Line 54 through 56

  This code checks the CurrentQLength value retrieved from CIM or WMI against the static threshold definition defined in the SetDefaulConfiguration function and sets a flag. The `Svc.GetThreshold` method returns values stored by the `Svc.DefineThreshold` in the SetDefaultConfiguration function. See Figure 8-4 on page 141.
- Line 58 through 60

  This code checks the DiskBytesSec value retrieved from CIM or WMI against the static threshold definition defined in the SetDefaulConfiguration function and sets a flag. The `Svc.GetThreshold` method returns values stored by the Svc.DefineThreshold in the SetDefaultConfiguration function. See Figure 8-4 on page 141.
- Line 74 through 84

  If the HighPhysicalQLength and HighPhysicalXfreRate flags are set, then the Svc.SENDEVENT method is invoked, passing all the TMW_PhysicalDisk class properties retrieved in lines 27 through 46.
- Line 89 through 90

  This line increments and loops back to get the next instance.
- Line 91 through 92

  These lines return back to the IBM Tivoli Monitoring V5.1.1 engine.

8.4 Working with a resource model in Workbench

When you start IBM Tivoli Monitoring V5.1.1 Workbench, there are several options to start working with resource models.

- Create an empty resource model and build the resource model from scratch. With this method, you need to:
  - Define the resource model property
  - Define a dynamic model
  - Define events
  - Define thresholds
  - Define parameters
  - Define data to log
  - Define the decision tree script
  - Add dependencies
  - Build a resource model
- Import a monitoring source. You can import a monitoring source (or a whole monitoring collection) also in a resource model that already exists, by opening the resource model tree structure. This is typically performed for importing the DM classic module. Under the Dynamic Model element, right-click **DM Classic Probes**, and select the file format of `mcsl` or `csl` output.
- Generate resource models using the Resource Model wizard. This allows you to build the resource model without the need of coding. The wizard allows you to create a resource model from:
  - A selected CIM class taken from the WMI repository
  - A monitoring collection extracted using the `mcsl` command from Tivoli Distributed Monitoring
  - A custom script that sent as a dependency and invoked using the ServiceShell method from VisitTree function

After you define your resource model, you can start building components of your resource models. Run the following options under the build option:

- Building the Package

  To build your resource model into a complete tar package that you can later install on the IBM Tivoli Monitoring V5.1.1 server, install the resource model. From the command line, type the following command:

  ```
  wdmrrm -add filename.tar
  ```

- Building the TEC BAROC

  To see your resource model events on the Tivoli Enterprise Console, you have to build and export a TEC BAROC file. This file contains all the event definitions specified in the BAROC language. You can install this file on a TEC Rule base. It allows the Tivoli Enterprise Console to display the events of your resource model.

- Exporting the Message Catalog

  Optionally, you can build a message file containing all the information that will be displayed in IBM Tivoli Monitoring dialogs. This can be useful if you want to translate your text information into other languages. The workbench is designed to generate resource model packages that contain all the strings for the English Locale. Therefore, double-byte character set (DBCS) characters are not supported. All localized strings should be handled separately from the workbench.

- Building an HTML file

  You can build an HTML document that contains all the information that is related to your resource model and included in the descriptive sections of the resource model components.

A

Sample test questions

This appendix contains a collection of sample test questions and their answers to help you prepare for Certification Test 593: *IBM Tivoli Monitoring V5.1.1 Implementation*.

Sample test questions

Answer the following questions. To check your answers, see “Answers to sample test questions” on page 156.

1. What documentation contains information about the Framework patches that are required before you install IBM Tivoli Monitoring V5.1.1?
    a. IBM Tivoli Monitoring Release Notes 5.1.1
    b. IBM Tivoli Monitoring User Guide 5.1.1
    c. IBM Tivoli Monitoring Workbench Release Notes 5.1.1
    d. IBM Tivoli Monitoring Resource Model User Guide 5.1.1
2. Which three platforms are supported by IBM Tivoli Monitoring V5.1.1? (Choose three.)
    a. Windows XP
    b. NetWare
    c. HP-UX
    d. OS/400
    e. OS/2®
    f. SCO UNIX
3. What is the minimum memory requirement for the IBM Tivoli Monitoring Web Health Console?
    a. 256 MB
    b. 512 MB
    c. 384 MB
    d. 1024 MB
4. Which two statements are true about the “supported” database creation for the Tivoli Enterprise Data Warehouse Support Component? (Choose two.)
    a. cr_itm_db.sh must be executed from the DB server for DB2.
    b. cr_itm_db.sh must be executed from the DB server for Informix.
    c. cr_itm_db.sh must be executed from the DB server for MS SQL.
    d. cr_itm_db.sh must be executed from the DB server for Sybase.
    e. cr_itm_db.sh must be executed from the DB server for Oracle.
5. Which language is supported in the IBM Tivoli Monitoring Workbench’s Decision Tree script? (Choose two.)
    a. Perl
    b. Visual Basic
    c. JavaScript
    d. C++
    e. XML

6. Which command do you use to enable the physical and logical disk counters on Windows-based platforms?

   a. Perfmon
   b. Diskperf
   c. WMI
   d. Diskmon

7. What is the recommended amount of memory for the IBM Tivoli Monitoring V5.1.1 Web Health Console?

   a. 256 MB
   b. 384 MB
   c. 512 MB
   d. 1 GB

8. Which product can coexist with IBM Tivoli Monitoring 5.1.1?

   a. Tivoli Distributed Monitoring (Classic Edition) 3.7
   b. Tivoli Distributed Monitoring (Advanced Edition) 4.1
   c. Tivoli Distributed Monitoring for Windows 3.7
   d. Tivoli Manager for Windows NT

9. IBM Tivoli Monitoring 5.1.1 requires a Java Runtime Environment (JRE) to be installed on the endpoint. What command should you use to deploy the compressed version of the JRE shipped with IBM Tivoli Monitoring 5.1.1 to the endpoint?

   a. `wdmdeploy -J`
   b. `wdmjredeploy -J`
   c. `wdmdeployjre -J`
   d. `wdmdistrib -J`

10. Assuming a Windows-based TEC server with default configuration, what port should you use when configuring an IBM Tivoli Monitoring Monitoring Profile for sending non-TME events to TEC?

    a. 0
    b. 5529
    c. 9494
    d. 9495

11. You have a Tmw2kProfile that contains three resource models which support logging. Where is the Data Logging feature enabled to ensure that the models collect data for the Web Health Console?

    a. Web Health Console Preferences view
    b. Tmw2kProfile GUI window
    c. Resource Model GUI window
    d. Workbench must be used to rebuild the models.

12. Which database requires you to change the password for the IBM Tivoli Monitoring RIM object from the Tivoli default?

    a. Microsoft SQL Server
    b. Oracle
    c. Sybase
    d. DB2

13. What command do you use to configure the heartbeat options other than the heartbeat frequency?

    a. `wdmheartbeat`
    b. `wdmeng`
    c. `wdmmn`
    d. `wdmconfig`

14. What do the individual resource model BAROC files depend on being loaded into TEC first?

    a. Itm511.baroc
    b. Tmw2k.baroc
    c. dmae.baroc
    d. dm.baroc

15. The client wants to monitor the activity of distributed resource models on UNIX endpoints and to log errors that occur to /tmp/MyTrace.log. Which CLI command should the client use to achieve this?

    a. `wdmtrceng -e MyEndpoint "" /tmp/MyTrace.log`
    b. `wdmtrceng -e MyEndpoint /tmp/MyTrace.log 3`
    c. `wdmtrceng -e MyEndpoint /tmp/MyTrace.log 0`
    d. This capability is not possible.

16. Which command is most useful when troubleshooting the error message `"Failed to enumerate instances"` when it appears in theTmw2k.log on a Windows-based endpoint?

    a. `wmitest.exe`
    b. `wmiinst -debug`
    c. `java`
    d. `wbemtest.exe`

17. You have distributed a profile that contains five resource models. One resource model is not sending Tivoli Business Systems Manager (TBSM) events, although the others are doing successfully. What should you verify?

    a. The Send TBSM box is selected for this profile.
    b. The Send TBSM Events button is clicked for the appropriate indication.
    c. Severity is set to `FATAL` for the appropriate indication.
    d. The Send TEC Event button is clicked for the appropriate indication.

18. Tivoli Monitoring provides three serviceability tasks to collect, in tar format, logs and trace information. Which task is not one of the provided three serviceability tasks?

   a. DMCollectMnEnv
   b. DMCollectEpEnv
   c. DMCollectMnLog
   d. DMCollectEpLog

19. Which CLI command is used to monitor the distribution of a Tmw2KProfile?

   a. `wdmdistrib`
   b. `wmdist`
   c. `wrpt`
   d. `wdepot`

20. What are two valid resource model status messages returned by **`wdmlseng`**? (Choose two.)

   a. Scheduled
   b. Distributed
   c. Compiled
   d. Restarted
   e. Not compiled

21. What information can you view using the **`wdmmngcache -m all -l –v`** command? (Choose two.)

   a. A list of endpoints in the Tivoli Name Registry that have not yet been discovered
   b. The list of resource models cached on the managed node and gateways
   c. The TEC events cached from endpoints running IBM Tivoli Monitoring resource models
   d. The TBSM status for discovered endpoints
   e. The heartbeat status for discovered endpoints

22. Which statement is true?

   a. Using the command line operation, it is possible to create an IBM Tivoli Monitoring 5.1.1 profile using an XML file on a Windows-based platform.
   b. Using the command line operation, it is possible to create an IBM Tivoli Monitoring 5.1.1 profile using an XML file on a UNIX-based platform.
   c. Using the command line operation, it is possible to create an IBM Tivoli Monitoring 5.1.1 profile using an XML file on any platform.
   d. Using the command line operation, it is possible to create an IBM Tivoli Monitoring 5.1.1 profile using an XML file on Linux-based platform.

23. In which two scripting languages can resource models be written? (Choose two.)

   a. Visual Basic
   b. Shell
   c. Perl
   d. JavaScript
   e. Bash

24. Which command allows the user to browse details of Classic Distributed Monitoring probes and collections as well as to dump the internal source?

   a. `wdmcol`
   b. `dmtf`
   c. `mcsl`
   d. `wdmrm`

Answers to sample test questions

The answers are highted in bold.

1. What documentation contains information about the Framework patches that are required before you install IBM Tivoli Monitoring V5.1.1?

   a. IBM Tivoli Monitoring Release Notes 5.1.1
   b. IBM Tivoli Monitoring User Guide 5.1.1
   c. IBM Tivoli Monitoring Workbench Release Notes 5.1.1
   d. IBM Tivoli Monitoring Resource Model User Guide 5.1.1

2. Which three platforms are supported by IBM Tivoli Monitoring V5.1.1? (Choose three.)

   a. Windows XP
   b. NetWare
   c. HP-UX
   d. OS/400
   e. OS/2
   f. SCO UNIX

3. What is the minimum memory requirement for the IBM Tivoli Monitoring Web Health Console?

   a. 256 MB
   b. 512 MB
   c. 384 MB
   d. 1024 MB

4. Which two statements are true about the “supported” database creation for the Tivoli Enterprise Data Warehouse Support Component? (Choose two.)

   a. cr_itm_db.sh must be executed from the DB server for DB2.
   b. cr_itm_db.sh must be executed from the DB server for Informix.
   c. cr_itm_db.sh must be executed from the DB server for MS SQL.
   d. cr_itm_db.sh must be executed from the DB server for Sybase.
   e. cr_itm_db.sh must be executed from the DB server for Oracle.

5. Which language is supported in the IBM Tivoli Monitoring Workbench’s Decision Tree script? (Choose two.)

   a. Perl
   b. Visual Basic
   c. JavaScript
   d. C++
   e. XML

6. Which command do you use to enable the physical and logical disk counters on Windows-based platforms?

   a. Perfmon
   b. Diskperf
   c. WMI
   d. Diskmon

7. What is the recommended amount of memory for the IBM Tivoli Monitoring V5.1.1 Web Health Console?

   a. 256 MB
   b. 384 MB
   c. 512 MB
   d. 1 GB

8. Which product can coexist with IBM Tivoli Monitoring 5.1.1?

   a. Tivoli Distributed Monitoring (Classic Edition) 3.7
   b. Tivoli Distributed Monitoring (Advanced Edition) 4.1
   c. Tivoli Distributed Monitoring for Windows 3.7
   d. Tivoli Manager for Windows NT

9. IBM Tivoli Monitoring 5.1.1 requires a Java Runtime Environment (JRE) to be installed on the endpoint. What command should you use to deploy the compressed version of the JRE shipped with IBM Tivoli Monitoring 5.1.1 to the endpoint?

   a. `wdmdeploy -J`
   b. `wdmjredeploy -J`
   c. `wdmdeployjre -J`
   d. `wdmdistrib -J`

10. Assuming a Windows-based TEC server with default configuration, what port should you use when configuring an IBM Tivoli Monitoring Monitoring Profile for sending non-TME events to TEC?

    a. 0
    b. 5529
    c. 9494
    d. 9495

11. You have a Tmw2kProfile that contains three resource models which support logging. Where is the Data Logging feature enabled to ensure that the models collect data for the Web Health Console?

    a. Web Health Console Preferences view
    b. Tmw2kProfile GUI window
    c. Resource Model GUI window
    d. Workbench must be used to rebuild the models.

12. Which database requires you to change the password for the IBM Tivoli Monitoring RIM object from the Tivoli default?

    a. Microsoft SQL Server
    b. Oracle
    c. Sybase
    d. DB2

13. What command do you use to configure the heartbeat options other than the heartbeat frequency?

    a. `wdmheartbeat`
    b. `wdmeng`
    c. `wdmmn`
    d. `wdmconfig`

14. What do the individual resource model BAROC files depend on being loaded into TEC first?

    a. Itm511.baroc
    b. Tmw2k.baroc
    c. dmae.baroc
    d. dm.baroc

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   b. `dmtf`
   c. `mcsl`
   d. `wdmrm`

Related publications

The publications listed in this section are considered particularly suitable for a more detailed discussion of the topics covered in this redbook.

IBM Redbooks

For information about ordering these publications, see “How to get IBM Redbooks” on page 162. Note that some of the documents referenced here may be available in softcopy only.

- *Maintaining Your Tivoli Environment,* SG24-5013
- *IBM Tivoli Monitoring Version 5.1: Advanced Resource Monitoring*, SG24-5519
- *IBM WebSphere Version 4.0 Advanced Edition Handbook,* SG24-6176
- *Tivoli Business Systems Manager V2.1 End-to-end Business Impact Management*, SG24-6610
- *IBM Tivoli Monitoring Version 5.1.1 Creating Resource Models and Providers*, SG24-6900
- *Implementing Tivoli Data Warehouse V 1.2*, SG24-7100

Other publications

These publications are also relevant as further information sources:

- *Tivoli Framework Version 3.7.1 Installation Guide,* GC32-0395
- *IBM Tivoli Monitoring Release Notes Version 5.1.1,* GI10-5797
- *IBM Tivoli Monitoring User’s Guide Version 5.1.1*, SH19-4569
- *IBM Tivoli Monitoring Resource Model Reference Version 5.1,* SH19-4570
- *IBM Tivoli Monitoring Workbench User’s Guide Version 5.1.1*, SH19-4571
- *IBM Tivoli Monitoring: Resource Model Builder User's Guide*
- *IBM Tivoli Monitoring: Resource Model Builder Problem Determination Guide*
- *IBM Tivoli Monitoring: Deployment Supplement*
- *IBM Tivoli Monitoring: Road Map for a Typical Installation*

Online resources

These Web sites and URLs are also relevant as further information sources:

- Professional Certification Program from IBM

  `http://ibm.com/certify`
- IBM Publications Center

  `http://www.ibm.com/shop/publications/order`
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  `http://ibm.com/training`

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IBM Redbooks

IBM Tivoli Monitoring V5.1.1 Implementation Certification Study Guide

(0.2"spine)
0.17"<->0.473"
90<->249 pages

IBM Tivoli Monitoring V5.1.1 Implementation

Certification Study Guide

Redbooks

Explains how to prepare for, install, configure and operate IBM Tivoli Monitoring V5.1.1

Prepares you to take Certification Test 593

Includes sample test questions and answers

This IBM Redbook prepares you with the necessary knowledge to help you complete Certification Test 593: *IBM Tivoli Monitoring V5.1.1 Implementation*. This test leads to certification for Tivoli Certified Deployment Professional for IBM Tivoli Monitoring.

The scope of the certification tests your ability to demonstrate the following areas of expertise required for IBM Tivoli Monitoring V5.1.1:

- Prerequisite knowledge for IBM Tivoli Monitoring
- Planning the implementation
- Installation prerequisites
- The installation process
- Configuration of the IBM Tivoli Monitoring server
- Problem determination
- General operations
- IBM Tivoli Monitoring Workbench

You can find the information that you need about these topics all in this IBM Redbook. Plus, you have a chance to test your knowledge using the sample questions at the back of the book.

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