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Introduction

The intended audience for this solution document is the client or client technical professional that needs the ability to monitor the end-user experience for management of the performance and availability of their applications. In addition, this solution provides a phased approach on how to configure real user monitoring (agent-less), active monitoring (robotic transaction playback), and resource monitoring. In summary, the end-user experience monitoring solution provides the following:

- Availability and performance metrics for the client, transaction, server, and application.
- Set-up on a single computer system
- Agent-less monitoring of a server and applications by utilizing port spanning technology

End-user experience monitoring is a critical element of the overall IBM® Tivoli® Application Performance Management (APM) implementation. For additional information on APM, please refer to the Best Practices for Application Performance Management link in Appendix C.

This IBM® Tivoli® solution also demonstrates an easy to use graphical user interface with out of box, fast-response dashboards for managing performance and availability of business applications. The user interface let’s your end users quickly create highly customized dashboards for a business application quickly by using templates.

This solution and use case scenarios, which are described in the next section, were tested and proven in our IBM lab.
Application Performance Management 101 Usage Scenarios

In this section we describe two use cases that use this solution’s capabilities to enable the user to quickly find the root cause of slow performance of a composite application. This solution including both use cases were tested and proven in our IBM test labs.

**Determining the reason for slow WebSphere performance**

In this use case, the application owner has an overview of the performance and availability of his applications in the application overview dashboard. This dashboard provides an at a glance view of the health of his applications. The application owner sees that the WebSphere-based Tivoli Trader business application has a critical alert indicating slow performance.

![Application Overview showing Tivoli Trader](image)

Figure 1: Application Overview showing Tivoli Trader

The application owner “follows the red” and clicks on the resource indicator to launch the resource dashboard.
He then notices a critical alert for one of the WebSphere status widgets corresponding to one of the application's WAS instances where the connection pool is over 90%:

Figure 2: Tivoli Trader- Resource Dashboard
The application owner drills down on the WAS status widget to launch the WAS summary dashboard for that particular instance.

Figure 3: WAS Summary Dashboard
He isolates the problematic thread pool and clicks on “Issue Advisor” for a description of the issue and advice on a possible solution.

The advice that the thread-pool is the cause of the critical performance issue. In a matter four clicks, the application owner was able to identify the root cause for the slow performance.
Finding root cause for slow SAP® transactions

In this next scenario, the application owner receives notification that the SAP® J2EE-based Net Banking application has a performance issue. She uses the business view to verify the issue and drill down to the application view for diagnosis, and isolating the root cause in a minimum amount of clicks.

For more information on end user experience monitoring for SAP, please refer to the Best Practices for Application Performance Management link in Appendix C. In the section APM 101 - Get started with monitoring end user response time of your applications click on the link “Monitoring End User Response Time for SAP® Transactions using IBM Tivoli Composite Application Manager Video.”

In the application overview dashboard the operator sees the Net Banking application in red. The transaction link appears to have a violated threshold and the user clicks the link.
Figure 5: Application Overview showing Net Banking (SAP) application
The link brings her to the SAP Transaction Performance Dashboard, which shows a client status summary, transaction status summary, transaction volumes, end-user response time historical trend metrics, and server topology. She notices one of the servers in the server topology is red:

Figure 6: SAP Transaction Performance dashboard
The operator clicks on the server in the topology with the critical visual indicator. This displays a context dialog box containing response time metrics:

![Figure 7: SAP server properties](image)
Clicking anywhere in this server properties box will drill-down into the SAP summary dashboard which contains SAP instance resource metrics.

Figure 8: SAP Summary Dashboard
The operator sees that the buffer hit ratio is in the red at 1%. To get more information about this error, the operator clicks on the Issue Adviser button.

![Figure 9: Issue Advisor for Buffer Hit Ratio for SAP](image)

The issue advisor summarizes the top issues on the current dashboard. It also shows a description and advice for each issue. In this case, the low buffer hit ratio indicates low memory on the server machine. Upon further investigation, it was found that the server had an out-of-control process, which was using up system memory. After correcting the issue, the application performance was restored back to normal.
Solution environment overview

This section provides an overview of the software components, architectural overview, and deployment procedure overview to describe how to deploy the solution to achieve the results in the use scenarios.

Software Components Overview
To monitor end user response time, the following components are used:

- IBM Tivoli Monitoring (ITM) server infrastructure
- ITCAM for Transactions (Response Time and Transaction Tracking components)
- ITM agent-less OS monitoring (bundled with ITM)
- ITCAM for Applications: DB2 database agent or Oracle database agent
- ITCAM for Applications: SAP agent

Architectural Overview
The figures below provide an architectural overview of the foundation software components for monitoring end-user experience. These software components are used to monitor the end-user response time for an application and server components as well the supporting IT resources.

The figure below shows an agent-less set-up for the Web Response Time (WRT) agent which is installed on a remote system to monitor TCP and HTTP traffic. For agent-less monitoring, the WRT agent should be on the same network switch as the SAP server. The switch needs to be configured with port mirroring. The agent-less data collected by this agent is retrieved by the ITCAM Transaction. Agent-less configuration is recommended since the WRT agent can be resource intensive.
In the following figure, an ITCAM for Transactions Robotic agent is installed for recording and playing back robotic transactions. The playback scripts are uploaded to the ITCAM for Transactions Application Management Console Agent (AMC), which is deployed on the same server as the ITM server in this solution example. AMC can then deploy that script for playback by the remote playback agents.

In this solution example, robotic transactions are recorded and played back from a single server. In a production environment, a single server could be used for recording, and the lightweight robotic agent could be deployed to multiple geographic locations for playback.
Resource monitoring is introduced as shown in the figure below. A single OS agent is installed on a remote system for agent-less monitoring of each of the application and database servers. A database (Oracle or DB2) agent is installed remotely to collect key performance metrics from the data instance. For SAP, a single SAP agent can be installed on a remote system for agent-less monitoring of each SAP instance.

![Diagram of Tivoli software components](image)

Figure 10c: Including resource monitoring capability

**Deployment Procedure Overview**

The flow charts below provide an overview of the steps required to deploy the Tivoli software components needed to manage the end user response time and IT infrastructure for your environment. The deployment for this solution can be split into two phases. The first phase shown in the figure below shows the minimal deployment components that immediately provide insight to end-user experience of your business applications and servers. The Web Response Time agent will generate metrics from the web traffic from the user transactions and users accessing the application.
The figure below introduces the robotic playback capability with the Robotic Response Time agent that allows you to record and play back key transactions of your application. Robotic Response Time agents can be deployed to different geographic locations in order to distinguish client and server issues.
Finally, the resource monitoring can be phased as shown in Figure 11c. It is important to note that the resource monitoring can be added at any stage after the central monitoring is installed and configured. Resource agents can include OS agents to monitor the underlying operating system where the application server resides, database agents to monitor the application server data repository, and other agents that monitor the server infrastructure like an SAP or PeopleSoft agent.
In the next section, the deployment steps are described in detail.
Component Deployment
In this section, the installation and configuration for each of the components is described.

ITM – Central Monitoring Server
For this solution, the ITM TEPS and Warehouse DB2 9.7 server and ITM 6.2.3 Fix Pack 1 server were installed and configured on a single Linux server using the documentation at the following link.


For agent-less monitoring of the operating systems for the application server and database servers, the ITM agents were installed and configured on a separate Linux server.

For database resource monitoring, refer to the ITCAM for Applications InfoCenter:


IBM Tivoli Composite Application Manager for Transactions – End User Experience monitoring
Rational Function Tester V8.2 and components from the Tivoli Composite Application Manager for Transactions Version 7.3 were installed into the ITM environment for transaction tracking of application servers (e.g. SAP). The following web address is the Installation and Configuration section for ITCAM for Transactions. Please refer to this section for more details on installing and configuring all ITCAM for Transaction components discussed below:

Rational Function Tester – Recording Robotic Transactions

Rational Function Tester (RFT) provides the ability to record HTTP and SAP-GUI transactions that will be played back by the Robotic Response Time agent. After installing RFT, ITCAM for Transactions support for RFT was installed which provides a Rational license and the upload capability to the Application Management Console (AMC). For more details on installing and configuring RFT navigate to the direct link address to the IBM Rational Function Test documentation in the IBM Infocenter:


After installing the ITCAM for Transaction support, ensure that the ITCAM views are in RFT and that you can upload scripts to the AMC.

Application Management Console Agent – Managing End User Experience monitoring

The AMC agent manages and distributes profiles, maintenance windows, client information, and user information for all the other Response Time and Transaction Tracking monitoring agents. For this solution, the agent was installed and configured into the ITM environment. The AMC support was also installed on the Tivoli Enterprise Server (TEMS), Tivoli Enterprise Portal Server (TEPS), and Tivoli Enterprise Portal (TEP) desktop consoles. For more details on installing and configuring the AMC agent, please refer to the Installation and Configuration section at the web address at the top of this section.

Once the agent is configured and started, verify that the AMC workspaces contain data. Click on the Application Management Configuration Editor icon as shown in the figure below.
Ensure that the Application Management Configuration editor panel appears. This editor will be used in a later section to configure and distribute response time playback of the transaction recordings to the robotic response time agent.

**Robotic Response Time Agent – Robotic Transactions**

The Robotic Response Time (RRT) agent will play back web and other transactions, such as SAP GUI, using Rational Function Tester. These transactions represent a set of steps typically performed by an end user to complete a business objective, such as logging into the application, creating a bank statement for an account, and reading the balance of the account.

In this solution, the RRT agent was installed and configured in the ITM environment. In the agent configuration, you can configure key parameters for data analysis and Rational Functional Tester as shown below.
For more details on installing and configuring the RRT agent, please refer to the Installation and Configuration section at the web address at the top of this section.

**Web Response Time Agent – End User Response Monitoring**

The Web Response Time (WRT) agent provides the end-user experience and uses server-side monitoring to capture HTTP and HTTPS transaction data such as response time and status codes. In this solution, the WRT agent was installed on a dedicated system; this is recommended as best practice since the agent can potentially process large amounts of TCP data.

For more details on installing and configuring the AMC agent, please refer to the Installation and Configuration section at the web address at the top of this section.

In the next section, we’ll go into detail on configuring the WRT agent for agent-less tracking.
Configuring Web Response Time monitoring

In this section, you configure the ITCAM for Transaction components to enable agent-less transaction tracking of your applications. For additional details on agent-less transaction tracking, click on the source link “Agent-less Transaction Tracking in ITCAM for Transactions” in Appendix C.

Configuring for agent-based WRT monitoring

For agent-based, you will need to install the WRT agent on each machine containing a server component such as an application server, DB server, and/or web server.

Configure the WRT agent to monitor all TCP traffic and all HTTP transactions as shown below:

![Figure 14: TCP settings for WRT](image-url)
In the advanced monitoring configuration of the agent, enable monitoring network traffic as shown in the figure below. You can also use network and server masks to filter out other unnecessary traffic that may clutter the data in the TEPS workspaces as shown below:

![Figure 15: Advanced settings for WRT](image)

Consequently, the configuration settings above also apply to agent-less configuration of WRT. The next section describes additional configuration required for agent-less monitoring using WRT.

**Configuring for agent-less WRT monitoring**

For agent-less monitoring using WRT, you will need a single dedicated machine for the WRT agent. It is highly recommended to use the agent-less configuration since the WRT agent can be resource intensive which may negatively affect the server.
The following sections describe some of the prerequisite steps that need to be done in order to enable agent-less tracking.

**Prerequisite Steps to Enable Agent-less Tracking:**

**Port mirroring**

The WRT agent must be installed on the same switch as the application server that needs to be monitored. The switch must be configured for port mirroring. In Appendix C, click on the link “What is Port Mirroring” for more details.

The TCP traffic generated by the robotic response time agent hitting the application server will be analyzed by the WRT agent as shown in the figure below:

![Port Mirroring Diagram](image)

*Figure 26: Port Mirroring showing WRT and SAP Server as an example*
Enabling network monitoring protocol on the WRT machine with Windows OS

For WRT agents running on Windows, install the network-monitoring driver. To do this, go to Control Panel->Add or Remove Programs, and select Add/Remove Windows Components. Choose Network Monitoring Protocol. This is only necessary for WRT agents running on Windows OS.

**Verifying WRT is capturing data in the TEPS console**

To verify that WRT is capturing data, log into the TEPS console, and navigate to the Network view in the WRT workspaces. The following figure shows a workspace containing WRT data:
Recording and Playing Back Transactions

In this section, record the transactions and configure the Robotic Response time agent playback to generate TCP traffic for agent-less transaction tracking. For a thorough example that outlines in detail how to record transactions and distribute the transactions to the playback agents, navigate to the link “Monitoring Applications with Rational Performance Tester and ITCAM for Response Time” in Appendix C.

This document

Recording the transactions

Obviously, you will need to target important enterprise transactions that capture key performance and availability for your enterprise. To record, use Rational Function Tester. Ensure you’re able to log into your web application before recording. Choose a key transaction when you record in RFT. In our solution, we recorded a transaction made up of 15 transaction steps.

Setting up the playback agent
Using the Application Management Configuration editor in the TEPS console, create a RRT profile for each script. Configure each sub transaction’s number of retries or response time thresholds if necessary as shown in the figure below. Assign the playback to agents in the Distribution tab.

In this view, you can edit some of the transaction defaults like minimum and maximum response time for the overall and sub-transactions.

Once the transactions are distributed to the agents, each will begin to play back the transaction. In the next section, we look at defining clients, applications, and servers using the AMC.
Using the Application Management Console to manage your user response time monitoring

In this section, we will define server components, applications, and clients. The Application Management Console agent support provides many out of the box server components and applications. However, in this section we discuss how to create these definitions to help us easily monitor the enterprise using the APM UI.

Please refer to this direct link to the ITCAM User’s Guide for more information on configuring the Application Management Console:

Define server components

In order to identify the server components containing your business applications, you can define them in the AMC under the components menu. For example, define the protocol for the server using IP address and port. In this example, we’ve defined a Tivoli Service Request Manager server as shown in the figure below:
Figure 19: Defining a HTTP protocol in the AMC
Define clients

In order to easily identify remote playback agents in different regions and networks, define them as client filter in the AMC. In the example below, a playback agent in Austin is defined by the IP address:

![Diagram showing how to define a client for RRT agent in Austin](image)

Figure 20: Defining a client for RRT agent in Austin
**Configure the Applications**

The AMC contains some out-of-the-box default definitions for applications such as Siebel and SAP. Also, when you create a RRT playback profile, it will also automatically create an application based on your profile as shown in the example below:

![Applications in the AMC](image)

Figure 21: Applications in the AMC
Using the Application Performance Management User Interface

In this section, we'll cover using the Application Performance Management (APM) UI to manage performance and availability of our business applications. Next, we'll install, configure, and customize the APM UI to utilize the ITM and ITCAM monitoring infrastructure and business application definitions covered in the previous sections.

Currently, the APM UI is under transparent development. The release for general availability will be in 2Q 2012. For additional details on installation, configuration, and product roadmap, please refer to “Application Performance Management User Interface on Developer Works” link in Appendix C.

Installing and configuring the APM UI

In this solution, the APM UI was installed into a Tivoli Integrated Portal server v2.2 Fixpack 3 as described in the APM UI installation README file. The APM UI war file was installed into the server server1 in the TIP profile.

The provider configuration file was configured to use the rest provider service on the ITM server. After restarting the TIP server, ensure you are able to reach the APM UI main page by navigating to this URL:

Example: Creating a new WebSphere-based business application

In this example, create an application using the Simple J2EE template and save it:

![Figure 22: Creating new dashboard]
Within the resource dashboard for the new application, edit one of the existing DB widgets, select a DB instance, and save it:

![DB Status widget](image)

**Figure 23: DB status widget**

Data from your DB2 agent instance should be displayed in the widget. Click on the widget to launch the DB resource dashboard to verify that you have live data in there as well. You can also add new widgets that can be configured as well.
Conclusion

This end user experience monitoring is easy to deploy and will allow you to quickly realize significant value towards your overall application performance management strategy. You will be able to proactively detect performance and availability issues that impact the end-user experience through real user and robotic monitoring. This lays the foundation for adopting more advanced IBM® Tivoli® application performance management of your runtime application architecture. The following figure illustrates how your application performance value improves as you adopt more application performance management capabilities:

Figure 24: Adopting capabilities improves value
Beyond this solution, the next step is adding the transaction tracking capability to enable true end-to-end monitoring which can provide the following:

- Transaction Path snapshots
- Service dependency mappings
- Network topologies interactions
- Alert or event correlation

Along with end-user experience monitoring described in this solution, transaction tracking will maximize value and provide solid end-to-end management for your enterprise applications. For additional information on how to get started with end to end monitoring, navigate to the “Application Performance Management User Interface on DeveloperWorks” link in Appendix C.
### Appendix A: Architecture

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## Appendix B: Information Centers

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## Appendix C: Additional Documents

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