

**Oracle® Enterprise Manager**  
Monitoring Application Performance Guide  
Release 12.1.0.3  
**E41337-03**

July 2013

E41337-03

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# Contents

<b>Preface</b> .....	vii
Audience .....	vii
Documentation Accessibility .....	vii
Conventions .....	vii
 <b>1 How to Read this Guide</b>	
 <b>2 Monitoring Performance</b>	
2.1 Monitoring Views and Dimensions .....	2-1
2.2 Using ECIDs to Track Requests .....	2-4
2.3 Setting up End-to-end Monitoring .....	2-4
2.3.1 Set up Enterprise Manager .....	2-6
2.3.2 Set up Java Virtual Machine Diagnostics .....	2-6
2.3.3 Set up Real User Experience Insight .....	2-7
2.3.4 Set up Business Transaction Management .....	2-7
2.3.5 Create the Business Application .....	2-8
2.4 User Roles and Privileges .....	2-9
 <b>3 Understanding the User Experience</b>	
3.1 What Does RUEI Discover? .....	3-1
3.2 Viewing and Analyzing RUEI Data .....	3-3
3.2.1 Dashboards .....	3-3
3.2.2 Reports .....	3-4
3.2.3 Session Diagnostics .....	3-4
3.2.4 User Flows .....	3-5
3.2.5 KPIs and Service Level Agreements .....	3-7
3.3 What Questions Can RUEI Answer? .....	3-8
3.4 What Aspects of RUEI Can You Access from the EM Console? .....	3-8
3.5 How Does RUEI Work with BTM and JVM Diagnostics? .....	3-9
 <b>4 Discovering Services and Working with Transactions</b>	
4.1 What Does Business Transaction Management Discover? .....	4-1
4.2 Defining Transactions .....	4-2
4.3 Monitoring Transactions .....	4-4

4.4	What Questions Can Business Transaction Management Answer?.....	4-5
4.5	Accessing BTM from the Enterprise Manager Console .....	4-6
4.6	How Does Business Transaction Management Work with RUEI and JVM Diagnostics? .....	4-7

## 5 Getting Detailed Execution Information

5.1	Using JVM Diagnostics .....	5-2
5.2	Using Request Instance Diagnostics .....	5-3

## 6 Monitoring Business Applications

6.1	Introduction to Business Applications.....	6-1
6.1.1	Systems, Services, Business Applications, and Key Components.....	6-2
6.1.2	MyBank: An Example Business Application.....	6-2
6.2	Prerequisites and Considerations.....	6-3
6.2.1	Requirements for Using RUEI .....	6-3
6.2.2	Requirements for Using BTM .....	6-5
6.3	Registering RUEI/BTM Systems .....	6-6
6.4	Creating Business Applications .....	6-8
6.5	Monitoring Business Applications .....	6-10
6.6	Monitoring RUEI Options .....	6-12
6.6.1	Monitoring RUEI Data .....	6-12
6.6.1.1	RUEI Key Performance Indicators Tab .....	6-12
6.6.1.2	Usage Data Tab .....	6-13
6.6.1.3	Violations Data Tab .....	6-14
6.6.1.4	User Flows Tab .....	6-15
6.6.2	Working With Session Diagnostics.....	6-15
6.6.2.1	Getting Started .....	6-16
6.6.2.2	Customizing Session Diagnostics Reporting.....	6-19
6.6.2.3	Exporting Full Session Information .....	6-19
6.6.2.4	Exporting Session Pages to Microsoft Excel .....	6-20
6.6.3	Monitoring RUEI Metrics .....	6-21
6.7	Monitoring KPI and SLA Alert Reporting .....	6-22
6.8	Monitoring BTM Transactions in Enterprise Manager .....	6-25
6.9	Working Within Business Transaction Manager .....	6-27
6.9.1	Summary Information.....	6-28
6.9.2	Analyzing Transaction Information.....	6-28
6.9.3	Viewing Alerts .....	6-29
6.9.4	Viewing Transaction Instances .....	6-29
6.9.5	Viewing Message Logs .....	6-30
6.9.6	Viewing Service Level Agreement Compliance.....	6-31
6.9.7	Viewing Policies Applied to Transactions .....	6-32
6.9.8	Viewing Transaction Profile Information .....	6-32
6.9.9	Viewing Transaction Conditions.....	6-32
6.9.10	Viewing Transaction Properties .....	6-33

**7 Monitoring End-to-end Performance**

7.1	Troubleshooting: A Case Study .....	7-1
7.2	Finding Solutions .....	7-5

**Index**



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# Preface

*Oracle Enterprise Manager Monitoring Application Performance Guide* explains how you use a series of Oracle applications to obtain end-to-end application monitoring. Using these products you can evaluate the user experience, discover services, monitor specific operation flows (transactions), examine execution in detail, and assess the availability of supporting infrastructure.

## Audience

This document is intended for developers who are interested in the performance of their services, and for administrators who need to install and configure the components that provide monitoring services.

## Documentation Accessibility

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## Conventions

The following text conventions are used in this document:

Convention	Meaning
<b>boldface</b>	Boldface type indicates graphical user interface elements associated with an action, or terms defined in text or the glossary.
<i>italic</i>	Italic type indicates book titles, emphasis, or placeholder variables for which you supply particular values.
monospace	Monospace type indicates commands within a paragraph, URLs, code in examples, text that appears on the screen, or text that you enter.





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## How to Read this Guide

Monitoring distributed applications requires the use of several products, each of which examines a different aspect of application performance. This guide explains how you can use these products singly and together to monitor your application. It also provides a summary of the workflow required to install, configure, and work with these products. It includes the following chapters:

- [Chapter 2, "Monitoring Performance"](#) introduces the process of monitoring distributed applications. It describes RUEI, BTM, JVMD, and EM, which you use to monitor performance, it explains how you set up end-to-end monitoring, and it looks at how security schemes translate across different monitoring contexts.
- [Chapter 3, "Understanding the User Experience"](#) explains how you use Real User Experience Insight (RUEI) to understand how users are interacting with your product. Using the measurements that RUEI collects, you can assess the effectiveness of user interface design, the responsiveness of web servers and the internet, and the success of user operations.
- [Chapter 4, "Discovering Services and Working with Transactions"](#) describes how you use Business Transaction Management (BTM) to discover all the components that make up your application, and to select a subset of these for special attention. Monitoring this subset (transaction) allows you to identify and resolve issues related to performance, to profiling usage, and to finding the cause of failing components in a business process.
- [Chapter 5, "Getting Detailed Execution Information"](#) explains how you use Java Virtual Machine Diagnostics to look at the finest details of code execution and to identify problems like race conditions, blocked threads, and memory leaks.
- [Chapter 6, "Monitoring Business Applications"](#) describes how you create a Business Application, and how you use the Enterprise Manager (EM) console to get summary and detail information about the user experience and transaction performance related to that Business Application.
- [Chapter 7, "Monitoring End-to-end Performance"](#) provides an example that illustrates how you use RUEI, BTM, and JVMD together to troubleshoot an issue from the user experience to the finest machine-level details.

This guide is meant to be read sequentially, from beginning to end. If you are familiar with any of the individual components described, we still recommend that you read those subsections that describe how you navigate from one component to others.

This guide is not exhaustive. It is a map rather than a compendium. The bulk of material describing how monitoring components work, is found in other documents. Cross references to additional material are provided for your convenience.



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# Monitoring Performance

Service-oriented, distributed applications, which are characterized by modular development and dynamic binding, have a critical need for a single point of management from where one can monitor the behavior of the application as a whole, identify actual or potential problems, and take corrective action.

This chapter introduces the issues and tasks involved in monitoring the performance of distributed applications. It includes the following sections:

- [Monitoring Views and Dimensions](#)
- [Using ECIDs to Track Requests](#)
- [Setting up End-to-end Monitoring](#)
- [User Roles and Privileges](#)

To monitor the performance of distributed applications, you must be able to do the following.

- Examine the user experience to assess the quality of service rendered and to understand use patterns.
- Discover the components that make up the application, identify request flows of interest, and determine where performance issues or errors occur in the flow.
- Find the root cause of poor performance and failure by looking at the infrastructure supporting the logical application, or by obtaining more detailed information.

Used together, the products described in this guide offer the functionality described above. You do not need to use all these to learn about your application's performance. For example, you could start by monitoring the end-user experience and then later, add transaction monitoring. The next section describes the different monitoring options that are available to you.

## 2.1 Monitoring Views and Dimensions

End-to-end performance monitoring requires multiple views and dimensions:

- A complete view of the topology of the logical application, including routing schemes and database access
- A complete view of the underlying infrastructure
- Varying detail about the distributed application components used
- For web-based applications, the ability to access html source for the web pages visited by users

- Access to machine-level execution detail for application components running in a Java Virtual Machine
- The ability to go from the logical to the physical view of the application

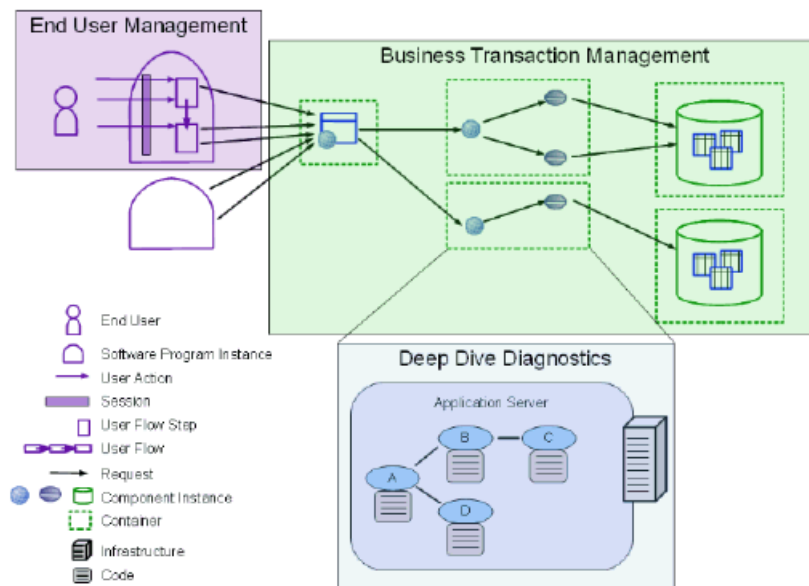
RUEI, BTM, JVMD, and Enterprise Manager provide the functionality required for end-to-end performance monitoring. As mentioned before, you do not need to install and configure all of these. You can use the piece that addresses your most immediate concerns and add more later.

- **Real User Experience Insight (RUEI)**  
Helps you identify problems with user interfaces, evaluate the quality of service offered, and understand and anticipate use patterns.
- **Business Transaction Management (BTM)**  
Discovers the components that make up your application and allows you to define transactions, which include operations that are of special interest. You can follow the work your application does as it crosses servers (tiers of execution) and also see the topology of your distributed application.
- **Java Virtual Machine Diagnostics (JVMD), Enterprise Manager**  
Provides a server-level view of the request flow and of the internal workings of the application execution environment for those services that execute in a Java Virtual Machine.
- **Request Instance Diagnostics (RID), Enterprise Manager**  
This JVMD view allows you to look at details of a single request, and query on things that touched a particular ECID.
- **Business Application Page, Enterprise Manager**  
Allows you to define Business Applications, in which context you can view and analyze RUEI and BTM information, and to access more detailed monitoring information.

[Figure 2–1](#) illustrates how these components work together, both in scope and in depth, to give you end-to-end performance monitoring.

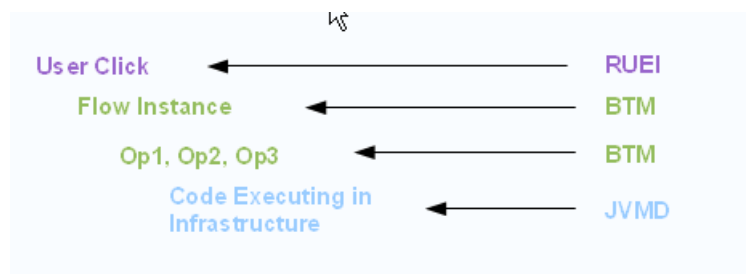
The End User Management pane illustrates RUEI monitoring. An end user completes a series of steps during a browsing session. RUEI monitors the actions of web users and can create reports, segmented in a variety of ways, that tell you who has requested a page, what pages were requested, which servers were affected, what the response time was, and what the throughput rate is for a given session or user flow.

By interacting with objects on web pages, users invoke request flows that are monitored by Business Transaction Management (BTM). BTM allows us to discover back-end application components and to define and monitor the request flows (transactions) that are critical to our understanding of application performance. For a given time period, we can determine the number of started and completed transactions, the throughput, and the average and maximum response times.

**Figure 2–1 Monitoring Application Performance**

Finally, in a request flow, for any given sequence of operations supported by a particular server, we can invoke deep dive diagnostics (shown in [Figure 2–1](#)) to determine whether slow or faulty service is due to low-level issues. Here we can view detailed information for the period within which a given operation executes. We can look at stack frames for executing threads, thread state information, aggregate information about the frequency and cost of method execution, information about database locks, and we can also look at objects in the Java heap.

Another way to break down the end-to-end picture is to look at the layers of execution underlying a user click and understand how RUEI, BTM, and JVMD correspond to each layer. In the figure below we see that RUEI tells us about user clicks; that BTM tells us about instances of request flows and also about individual requests (or operations), and that JVMD tells us about the code executing in the Java Virtual Machine.

**Figure 2–2 Components and Execution Layers**

In addition to using RUEI, BTM, and JVMD to monitor end-to-end application performance, you can also use the Enterprise Manager (EM) console to monitor Business Applications that include RUEI applications and BTM transactions. For more information see [Chapter 6, "Monitoring Business Applications."](#)

## 2.2 Using ECIDs to Track Requests

Because RUEI, BTM, and JVMD have a different focus and level of granularity, it helps to have some shared identifier to help us realize that we are looking at a shared process or element.

An Execution Context ID (ECID) is an identifier for tracking a request for components in the Oracle technology stack. An ECID is usually generated by the outer-most Oracle component handling the request and may be propagated to the Oracle components handling that request, potentially crossing server boundaries.

The creation and propagation of ECIDs enable the sharing of context and of diagnostic data between components. Although ECIDs are not universally used, where they are used, they provide good support for end-to-end diagnostic work.

Several technologies generate ECIDs for message traffic; these include RMI, JAX-RPC, JAX-WS, EJB, JMS, JDBC, Servlets, and SOA. (In some cases, ECIDs are supported only when communication occurs between WebLogic servers.)

Where ECIDs are used, they can help the user determine whether they are indeed looking at the same object across execution contexts. For example, you can correlate error messages from different target components if they share the same ECID.

The components used in end-to-end performance monitoring all support the use of ECIDs.

- RUEI displays ECIDs assigned to page objects in the history shown for a particular page.
- If BTM observes an incoming message to have an ECID, it assigns the ECID as an intrinsic property of the message. Users can then search for messages with a particular ECID and determine, when looking at table views of operations, which operations have the same ECID. (Request and response messages for the same operation can have different ECIDs.)
- ECIDs are also used at the lowest level to further identify threads running in the Java Virtual Machine.
- ECIDs can also be used in the correlation of log entries for Oracle Fusion Middleware components that use the Oracle Diagnostic Logging (ODL) framework.

To have ECIDs generated by default by an HTTP server or Web Logic server, follow the instructions given in My Oracle Support Knowledge Document 1527091.1.

## 2.3 Setting up End-to-end Monitoring

To obtain end-to-end monitoring, you must install, configure, and connect the products described in [Section 2.1](#). You might not need to deploy all these pieces at once. You can start with the piece that gives you the functionality you need and add other pieces later.

This section describes the steps required to set up end-to-end application performance monitoring for each dimension of performance monitoring. The purpose of each step is explained, and references are given to the relevant documentation. This section includes the following:

- [Set up Enterprise Manager](#)
- [Set up Java Virtual Machine Diagnostics](#)
- [Set up Real User Experience Insight](#)

- [Set up Business Transaction Management](#)
- [Create the Business Application](#)

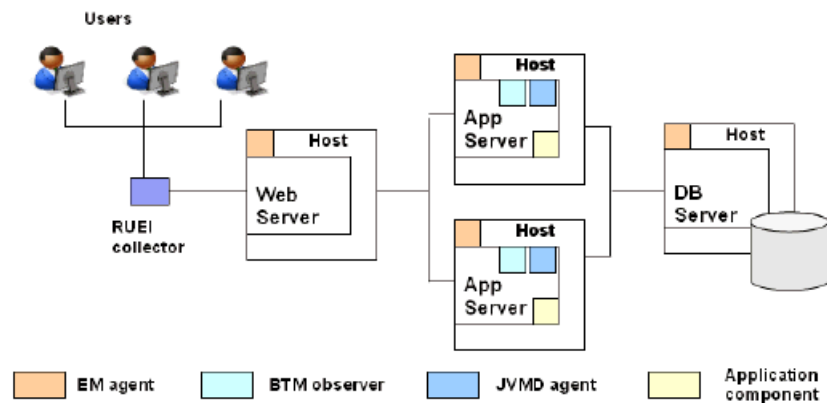
Before looking at the set-up instructions, take a moment to look over the following illustrations, which provide a topological view of the pieces that you can deploy to enable end-to-end monitoring.

[Figure 2–3](#) shows how the RUEI collector, EM agents, BTM observers, and JVMD agents are deployed in a monitored environment.

- The RUEI collector must be deployed in front of the web server.
- The EM agent must be deployed on the machine hosting the application servers and database servers used by the distributed application.
- The BTM and JVMD agents must be deployed in the application servers where application components are deployed.

Of course, which of these you deploy, depends on the views you need. For example, if you are not interested in machine-level runtime information, you do not need to deploy the JVMD agent.

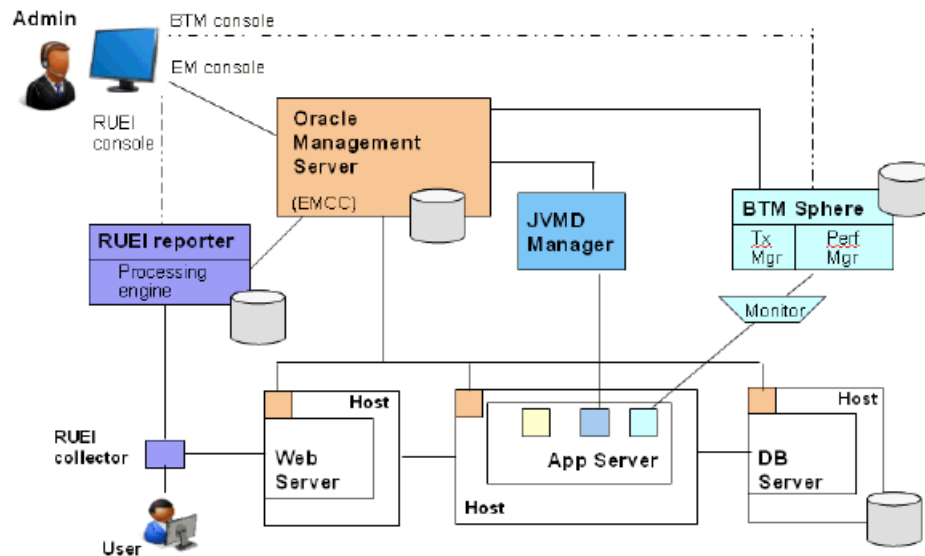
**Figure 2–3 Agents and Observers in the Monitored Environment**



[Figure 2–4](#) shows how RUEI, OMS, JVMD, and BTM are connected to one another and to their corresponding data collection points.

- It shows that each processing engine connects to its respective console, which allows the administrator to create and update monitored objects.
- It shows how RUEI, JVMD, and BTM are connected to the Oracle Management Server, which allows the sharing of data that enables the creation and monitoring of Business Applications.

A minimal user environment is shown below the administrative layer.

**Figure 2–4 Processing Engines in the Monitored Environment**

## 2.3.1 Set up Enterprise Manager

You need Enterprise Manager to create and monitor Business Applications. Enterprise Manager is also required if you want to do deep-dive diagnostics by looking at machine-level performance data. For more info on this option, see [Section 2.3.2, "Set up Java Virtual Machine Diagnostics."](#)

To set up Enterprise Manager:

1. **Install and configure Enterprise Manager.** See *Oracle Enterprise Manager Cloud Control Basic Installation Guide* at the following URL for more information.  
[http://docs.oracle.com/cd/E24628\\_01/install.121/e22624/toc.htm](http://docs.oracle.com/cd/E24628_01/install.121/e22624/toc.htm)
2. **Install an Oracle management agent** on the hosts where targets and application components monitored by RUEI or BTM are running. See "Installing Oracle Management Agent" in *Oracle Enterprise Manager Cloud Control Basic Installation Guide* at the following URL.  
[http://docs.oracle.com/cd/E24628\\_01/install.121/e22624/install\\_agent.htm](http://docs.oracle.com/cd/E24628_01/install.121/e22624/install_agent.htm)
3. **Launch Enterprise Manager** and use the **Enterprise Manager** console to create and monitor Business Applications. See "[Set up Business Transaction Management](#)" on page 2-7.

## 2.3.2 Set up Java Virtual Machine Diagnostics

To access machine-level performance data using the JVMMD or RID views, you must install the JVMMD manager and JVMMD agents. JVMMD is an integral part of Enterprise Manager, so the latter must be installed before you install JVMMD.

To set up Java Virtual Machine Diagnostics:

1. **Deploy the JVMMD Manager** (JVM Diagnostics Engine) in Enterprise Manager. You need this step to access JVM monitoring data. For information, see "Installing JVM Diagnostics" in *Oracle Enterprise Manager Cloud Control Basic Installation Guide*.  
[http://docs.oracle.com/cd/E24628\\_01/install.121/e22624/jvmd\\_installation.htm](http://docs.oracle.com/cd/E24628_01/install.121/e22624/jvmd_installation.htm)



2. **Install a JVM D agent** on all nodes where targets and services monitored by RUEI and BTM are running. You need this step to collect JVM data for a given server. For information, see "Installing JVM Diagnostics" in *Oracle Enterprise Manager Cloud Control Basic Installation Guide*.

### 2.3.3 Set up Real User Experience Insight

To obtain information about the user experience, you must install and configure RUEI, and then register it with Enterprise Manager.

To set up RUEI:

1. **Install and configure RUEI.** This step includes the following:
  - Install collectors, processor, and reporter in the monitored environment.
  - Install the reporter database.
  - Configure the RUEI reporter.

Configuration teaches RUEI to identify users, to specify the collection of pages that make up an application, to specify the scope of monitoring, to configure mail notification, and to provide security options. It is also at this time that you set up a connection to the Oracle Enterprise Manager. For information, see *Oracle Real User Experience Insight Installation Guide* at the following URL.

[http://docs.oracle.com/cd/E48389\\_01/index.htm](http://docs.oracle.com/cd/E48389_01/index.htm)

2. **Configure clickout functionality in RUEI.** You need this step to be able to click out to external tools. In this case, you will want to enable clickout to BTM and JVM D. For information, see "Configuring Clickouts to External Tools" in *Oracle Real User Experience Insight User's Guide* at the following URL.

[http://docs.oracle.com/cd/E48389\\_01/index.htm](http://docs.oracle.com/cd/E48389_01/index.htm)

3. **Register RUEI with Enterprise Manager.** Specify the port where the Reporter system can be accessed and provide access credentials. You need this step to establish communication between RUEI and EM. For information, see [Chapter 6, "Monitoring Business Applications."](#)

### 2.3.4 Set up Business Transaction Management

To discover your application components, to define transactions, and to define monitoring options for these, you must use Business Transaction Management. In the context of monitoring Business Applications, BTM is used to monitor cross-tier transactions; it is not needed for single-tier applications.

To set up Business Transaction Management:

1. **Install and configure BTM.** This step includes the following:
  - Installation and configuration of central servers. (At this time, you can also configure the connection to the Oracle Enterprise Manager server.)
  - Installation and configuration of monitors, which defines communication between monitors and observers.
  - Installation of observers on every server hosting the services to be monitored.

For information, see *Oracle Business Transaction Management Installation Guide* at the following URL:

[http://docs.oracle.com/cd/E24628\\_01/nav/assoproducts.htm](http://docs.oracle.com/cd/E24628_01/nav/assoproducts.htm)

2. **Enable access to JVMD.** You need this step to access JVMD and RID views from BTM. For information, see "Enabling Access to the JVMD and RID Views" in *Oracle Business Transaction Management Online Help*.  
[http://docs.oracle.com/cd/E24628\\_01/nav/assoproducts.htm](http://docs.oracle.com/cd/E24628_01/nav/assoproducts.htm)
3. **Wait for traffic, discover services, and define transactions in BTM.** Discovery in BTM is always dynamic. In a production environment, you must wait for traffic before you can discover application components. In a testing environment, you should run traffic to enable discovery. For more information, see *Oracle Business Transaction Management Online Help*.
4. **Register BTM with Enterprise Manager.** Specify the port where the Sphere can be accessed and provide access credentials. You need this step to establish communication between BTM and EM. For information, see [Chapter 6, "Monitoring Business Applications."](#)

### 2.3.5 Create the Business Application

For end-to-end monitoring, you want to create a Business Application that includes your RUEI applications, BTM transactions, and the system that supports these. You can build up your Business Application as you go along. You can start by including only the RUEI application, and then add any related transactions. You can even start by looking at the system that supports your distributed applications without including either a RUEI application or a BTM transaction.

To create a Business Application:

1. **Create a system in Enterprise Manager** that specifies the hosts and containers where monitored application components are running. These hosts and containers are the infrastructure of your distributed application. You need this step for Enterprise Manager to collect and return information about the health of the underlying infrastructure. For more information, see the online help for the Enterprise Manager Console.
2. **Create a Business Application** using the Enterprise Manager console. This step specifies the RUEI applications and BTM transactions to be included in a Business Application, and it specifies which system (Step 1) supports the Business Application. For information, see [Chapter 6, "Monitoring Business Applications."](#)
3. **Monitor the Business Application.** Use the Enterprise Manager Console to monitor the performance of your business application. For more information, see [Chapter 6, "Monitoring Business Applications."](#)
4. **Edit the RUEI application** if needed.

If you have defined a RUEI application and monitoring results in Enterprise Manager show that you need to change its definition to segment data differently or to re-set key performance indicators, you will need to use the RUEI console to change the application definition. For information, see *Oracle Real User Experience Insight User's Guide* at the following URL:

[http://docs.oracle.com/cd/E48389\\_01/index.htm](http://docs.oracle.com/cd/E48389_01/index.htm)

Enterprise Manager is automatically updated with the new definitions.

5. **Edit the BTM transaction** if needed.

If you have defined a transaction and monitoring results suggest that you need to change the transaction definition to collect more or less data, to add properties or conditions, or to re-set key performance indicators, you will need to use the BTM

console to change the transaction definition. For more information, see *Oracle Business Management Online Help* at the following URL.

[http://docs.oracle.com/cd/E24628\\_01/nav/assoproducts.htm](http://docs.oracle.com/cd/E24628_01/nav/assoproducts.htm)

EM is automatically updated with the new definitions.

## 2.4 User Roles and Privileges

User roles and privileges define accessibility to component functions. The following guidelines apply as you work with components to monitor application performance.

- Overall, higher privileges are required to create entities in RUEI and BTM than to monitor them in EM.
- Clicking through from one component to another exposes you to each console's native authentication system. Make sure that you have the privileges required for each component to perform your work.
- With the exception of the `admin` and `superAdmin` rules, in EM roles are always associated with targets. What is visible to you in the EM console depends on your role with regard to a particular target.
- You need the `super admin` role to register a BTM or RUEI system with EM. Once the RUEI or BTM system is registered with EM, you don't need the `super admin` role to create a business application.
- You need `Create Any Target` privilege and `View Target` privilege on the RUEI or BTM system target to access the credentials used by EM to talk to RUEI and BTM.
- You need `Manage Business Application` and `Business Application Menu Item` `Application Performance Management` resource privileges.
- To view JVM Diagnostics data, you must have `JVM Diagnostics User` privileges.
- To manage JVM Diagnostics operations such as creating and analyzing heap and thread snapshots, tracing threads, and so on, you must have `JVM Diagnostics Administrator` privileges.



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## Understanding the User Experience

This chapter introduces the Real User Experience Insight (RUEI) stand-alone product. For information on using RUEI monitoring functions from the Enterprise Manager console, see [Chapter 6, "Monitoring Business Applications."](#)

RUEI allows you to monitor application performance. In particular, RUEI monitors the user's interaction with a web browser, usually the first step (application component) in your distributed application. This first step is a crucial one because it identifies those problems that are most visible to users and because it discovers use patterns that can help you improve the design and effectiveness of your user-facing services.

This section introduces the concepts and tasks involved in working with RUEI to understand the user experience. It includes the following topics:

- [What Does RUEI Discover?](#)
- [Viewing and Analyzing RUEI Data](#)
- [What Questions Can RUEI Answer?](#)
- [What Aspects of RUEI Can You Access from the EM Console?](#)
- [How Does RUEI Work with BTM and JVM Diagnostics?](#)

RUEI offers a rich set of features that we cannot hope to describe in a single chapter. For complete information about its use, see *Oracle Real User Experience Insight User Guide*.

### 3.1 What Does RUEI Discover?

Users work with your application by interacting with a web page that contains one or more objects. Selecting an object and taking some kind of action, the user sets in train a sequence of calls that invoke the services that make up your distributed application. RUEI focuses on the initial interaction with one or more web pages; Business Transaction Management (described in the next chapter) monitors the sequence of calls that follow from that interaction.

Typically, RUEI is installed before the Web servers, behind a firewall in the DMZ. RUEI can monitor all users accessing a web page, and it does so without affecting server or network response time.

When you install and configure RUEI, you specify the following information:

- The ports that it should watch for traffic (scope of monitoring)
- How to identify users (using cookie information or log-in information)
- How to deal with security issues and how to monitor encrypted data

- How to identify pages that are associated with a RUEI application

A RUEI *application* is a collection of pages. In the configuration process, you teach RUEI which pages are associated with a given application.

Once RUEI begins to monitor traffic on the ports you have specified, it can identify and organize the information it discovers according to the scheme you have defined when you configured RUEI. Let's now look at the data that RUEI collects for each port it monitors.

Figure 3–1 shows how RUEI collects data associated with a page request.

1. When the user selects an object from a monitored page, RUEI sees the request and starts measuring the time it takes the Web Server to present the visitor with the requested object.

At this point, RUEI knows who requested the page (IP client), which object was requested, and from which server the object was requested (IP server).

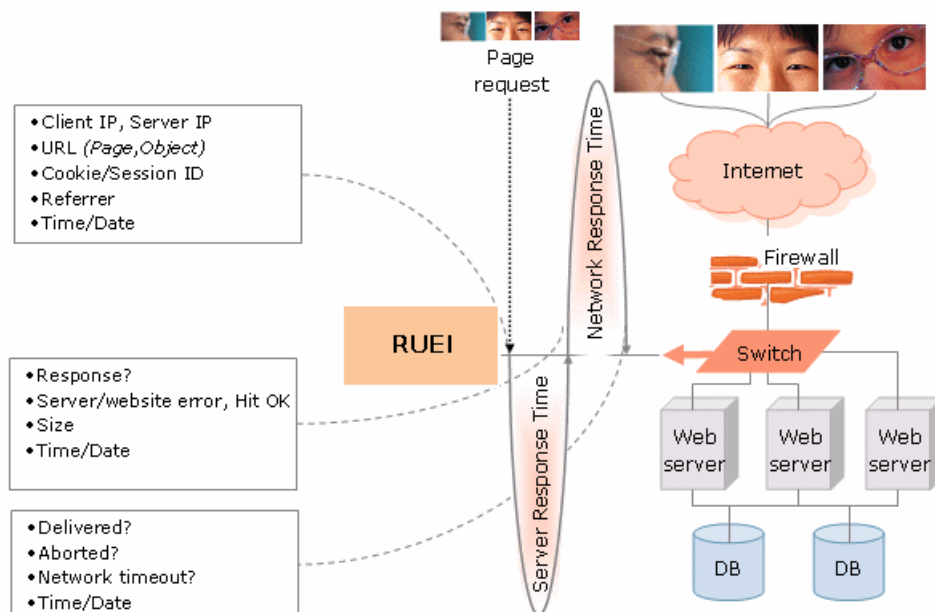
2. When the Web server responds and sends the object to the user, RUEI sees that response and stops timing the server response time.

At this point, RUEI can see whether there is a response from the server, whether this response is correct, how much time the Web server required to generate the requested object, and the size of the object.

RUEI can also see whether the object was completely received by the user or if the user aborted the download. Therefore RUEI can determine the time it took for the object to traverse the Internet to the visitor, and it can calculate the Internet throughput between the user and the server (connection speed).

The next figure illustrates this process.

**Figure 3–1 How RUEI Monitors User Requests**



In sum, every time an object on a page associated with a RUEI application is accessed, RUEI gathers the following information:

- Who requested the page and what object they requested

- Which server hosted the page
- The response time and the correctness of the response
- The size of the object
- Whether the object was completely received or aborted
- The internet throughput for this request/response sequence

The next section explains the various ways in which you can view and analyze this data using RUEI.

## 3.2 Viewing and Analyzing RUEI Data

Using the information it collects while the user is interacting with your application, RUEI can present a number of views to help you understand performance issues and use patterns relating to the user experience.

In addition to monitoring data on an ongoing basis, you have the option of creating Service Level Agreements that specify the expected level of service. This agreement is typically expressed in terms of a number of Key Performance Indicators (KPI) that define benchmark values. For more information, see ["KPIs and Service Level Agreements"](#) on page 3-7.

Another aspect of evaluating performance is the monitoring of use patterns. You can define a *user flow* as a sequence of pages, and monitor whether the steps of the flow are completed. For more information, see ["User Flows"](#) on page 5.

Data reported is scoped either to active sessions (5 minute duration) or closed sessions which might stretch for several days.

This section introduces some of the most commonly used RUEI views and also describes some additional ways of analyzing the information it gathers. It includes the following sections:

- [Dashboards](#)
- [Reports](#)
- [Session Diagnostics](#)
- [User Flows](#)
- [KPIs and Service Level Agreements](#)

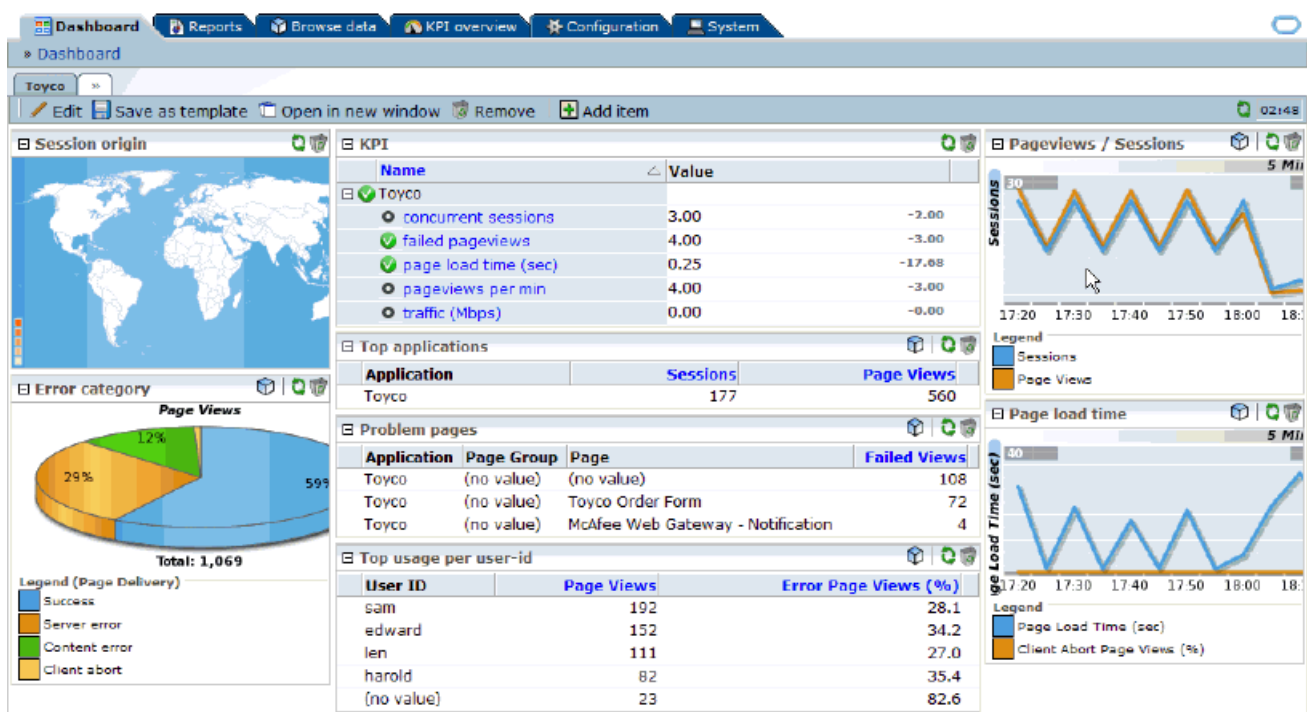
### 3.2.1 Dashboards

The RUEI Dashboard offers the most comprehensive view of user activity. It provides the following views of activity over the last twenty four hours:

- A regional, map-based view of the current session activity
- The five most active applications by page view
- The five top problem pages
- The most recent alerts across all monitored applications
- The status of defined KPIs across all monitored applications, showing how much they have changed from the previously recorded value
- A chart showing the proportion of errors due to network errors, client aborts, server errors, website errors, and content errors

- Charts showing average page-load time, and the relationship of page views to sessions

Figure 3–2 RUEI Dashboard Tab



## 3.2.2 Reports

RUEI provides an extensive library of pre-defined reports that allow you to display collected user information in a standard way. You use controls in the **Reports** tab to generate and view reports.

You begin by using controls in the **Reports** tab to specify a time period and to select the report you want to generate. Reports are grouped by category, for example **Applications** or **Clients**. Each category offers a variety of reporting options. For example, the **Clients** category allows you to generate reports for Performance per country, Sessions per browser, Sessions per language, Sessions per OS, and so on.

Reports are displayed in table or graphic form and they can be saved as PDF files or exported to other tools.

You can customize reports, you can create new reports, you can create shortcuts to your favorite reports, and you can define filters to constrain reported findings.

## 3.2.3 Session Diagnostics

The session diagnostics facility allows you to perform root cause analysis of operational problems that have occurred in a given time period.

Diagnostics information is available in a variety of categories; for example, All sessions, failed URLs, slow URLs, Failed pages, and so on. The specific search criteria varies with each group. For example, in the Failed pages category, you can narrow the search by application name, Client IP address, and User ID. You can also use additional filters to limit results.



For some diagnostics categories, you can also specify a search order. For example you can search the most active sessions first.

To use the facility you specify a time period, search criteria (including filters), and search order. RUEI returns all user records that match your search criteria in the order you specified. You can then search further within the currently displayed user records to isolate specific sessions.

The user record that is returned to you includes the complete session page history for a five minute period. You can inspect each page to see its loading satisfaction level, whether it is a key page, and whether it contains an error. You can also select a page to display full page content and the underlying html code received by the server and the client.

In some cases, you can click the **Replay** icon beside a viewed page to replay the complete user session. This allows you to review each page viewed by the visitor during a session, together with any reported error messages.

You can also click out to external tools from the Session diagnostics facility from selected functional areas. For more information, see ["How Does RUEI Work with BTM and JVM Diagnostics?"](#) on page 3-9.

You can export complete session contents to external utilities for further analysis, to integrate with other data, or to create the basis for generating test scripts.

### 3.2.4 User Flows

You create a user flow to define a logical task. A user flow is a collection of web pages and actions. It contains a number of steps that need to be performed to complete the task. For example, a Purchase user flow might have the following defined steps:

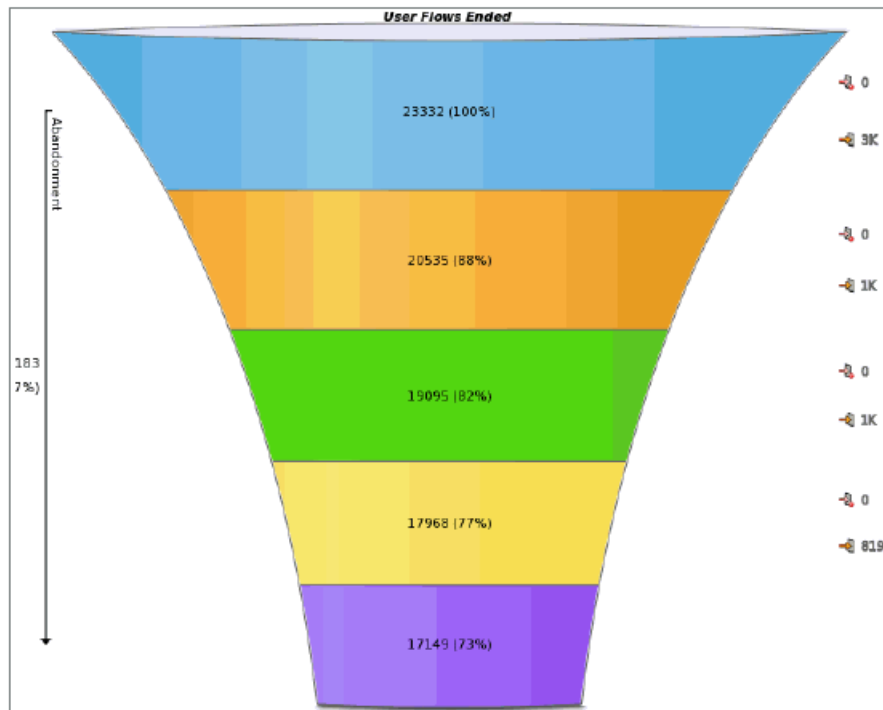
- Item selection
- Shipping information
- Billing information
- Confirmation

Each step can consist of multiple pages. For example, the Item selection step might include a number of pages from which items are selected.

User flow steps are defined in terms of conditions specifying the requirements that must be met for the step to be considered complete. For example, if the Billing information includes conditions relating to alternate methods of payment, only one of these conditions need be satisfied for the step to complete. Steps can be labeled as required or optional. Steps can also have an associated time period against which time-outs and the user experience can be evaluated.

User flows can be associated with a specific application or they can stand on their own.

User flow activity is reported at the most generic level using a funnel shape that illustrates the transition of the visitor through the flow steps for a given time period. The narrowing of the funnel represents visitors lost due to time-outs or visitor aborts. [Figure 3-3](#) shows a sample illustration of a user flow.

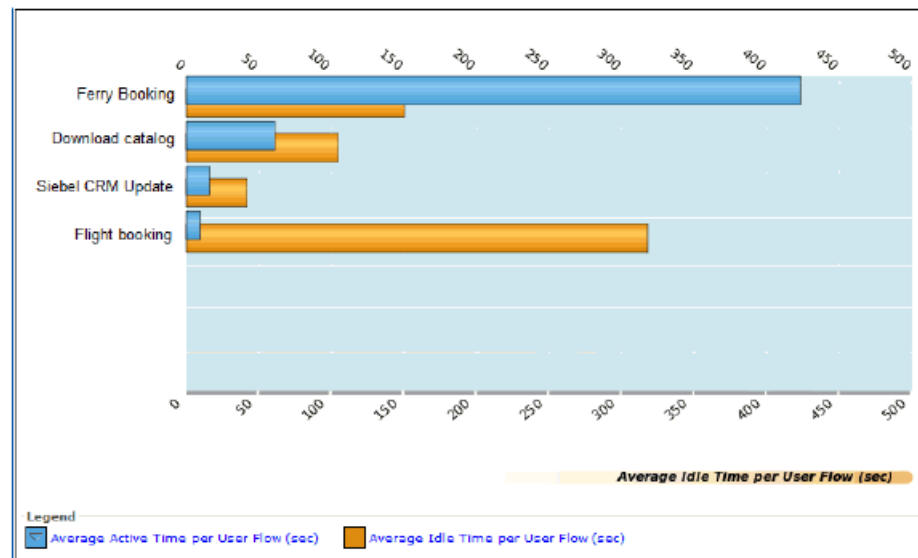
**Figure 3–3 User Flow Illustration**

The flow starts at the top and narrows as users drop off. Each step of the flow is shown in a different color. To the right of the figure are numbers showing how many users aborts and user time outs made up the loss of users for a given step. Following the funnel illustration is more detailed information (not shown in [Figure 3–3](#)) about the activity for each step.

RUEI provides further insight into user flow activity with a view that compares user active time with idle time for each flow. This kind of analysis might suggest which of your pages are most difficult for the user to complete. An example of this view is shown in [Figure 3–4](#):

Note the difference between the Ferry Booking and Flight Booking average idle time. Greater idle time might reflect poor web page design.

User flows provide an excellent means of finding trouble spots, identifying patterns of use, and improving the overall user experience.

**Figure 3–4 Active Time vs Idle Time in User Flow Steps**

### 3.2.5 KPIs and Service Level Agreements

In addition to the continuous, passive monitoring provided by RUEI, you can set up active monitoring using Key Performance Indicators (KPIs) to monitor specific aspects of performance, and you can define Service Level Agreements that alert you when the specified benchmarks are breached. You can review this data using dashboards and reports.

An SLA defines an expected level of service, typically expressed in terms of one or more Key Performance Indicators. For example a KPI might test whether a service is available 99% of the time, and an SLA might be defined to report when availability falls below this value.

KPIs are grouped into categories such as page load times, sessions, throughput, page availability, and so on. You can define your own category; for example, user flow completion or website availability.

When you define a KPI you specify the following information:

- whether to associate it with data from a specific application or whether it will be generic
- what metric to apply
- whether filters are needed to further define the scope of the KPI. For example, if you selected the user-flow-load-time metric, you need to specify the user flow to which it refers.
- whether the KPI has a minimum or maximum target range. Targets can be fixed or relative to historical performance.
- whether and how the KPI should be incorporated into an SLA
- whether an alert should be associated with the KPI

RUEI gives you very fine control over active monitoring. You can create service-level and alert schedules that are sensitive to normal periodic variation in target values, and you can define alert profiles and escalation procedures to specify who should be notified when an alert is triggered.

### 3.3 What Questions Can RUEI Answer?

RUEI can answer questions like the following about the user experience:

- *What time of the day are the greatest number of page hits?*  
Look at the chart that relates page views to sessions on the Dashboard tab.
- *What regions in Europe are experiencing the greatest user activity.*  
Look at the Session origin map for Europe, in the Dashboard tab.
- *What percentage of total errors is due to client aborts?*  
Look at the Functional errors chart in the Dashboard tab.
- *What are my most problematic pages?*  
Look at the Problem Pages listing in the Dashboard tab.
- *Which browser is most heavily used by clients in France?*  
Select the **Sessions per browser** report from the **Clients** category in the **Reports** tab, and filter by client-location/country.
- *Show me user records for the Bookings application that have a specific ECID.*  
Select the **Session diagnostics** group, and then specify the application name and the ECID of interest. For information about ECID, see [Section 2.2, "Using ECIDs to Track Requests."](#)
- *In what step of my Booking user flow am I losing the most customers?*  
Look at the user flow funnel and status details.
- *How many users returned to a previous step in my user flow?*  
Look at the Status Details for a user flow to see the number of users returning for each step. A high number of returning users might indicate the need to carry some status information forward into the following screen.
- *When has the availability of my creditCheck service fallen below 95%?*  
Define a KPI for that metric, and define a Service Level Agreement that alerts you when the desired value is breached.

### 3.4 What Aspects of RUEI Can You Access from the EM Console?

You can access monitoring information about the user experience from the Enterprise Manager console. However you cannot define or edit user flows, KPIs, SLAs, or custom Reports in the Enterprise Manager console. All that needs to be done using the RUEI console.

What information is provided in the Enterprise Manager console depends on how you have defined your application and monitoring features in RUEI. Should you find that you need different information, you can use the RUEI console to edit the appropriate elements. Enterprise Manager will be automatically updated with the new definition, and it will display the information you need after you have run additional traffic.

Overall, the information you can access from the Enterprise Manager console includes the following for each RUEI application associated with the current business application:

- On the **Business Application Home** page, you can view the Key Performance Indicators (KPIs) defined for your application, their status, and their defined

thresholds. You can also view an overview of incidents and problems associated with the business application. Some of these might have been generated by RUEI.

- The alerts generated by KPIs defined for RUEI applications are reported as events in **Incident Manager**. To view these events select **Monitoring** and then **Incident Manager** from the **Enterprise** menu. Then open the **Events Without Incidents** predefined view. Click the event of interest to view more information.

To reach more detailed monitoring information for RUEI applications, select **Real User Experience (RUEI)** and then **Real User Experience (RUEI) Data** from the **Business Application** drop down. You will be able to see the following regions:

- **RUEI Key Performance Indicators** region, which gives more detailed information for defined KPIs
- **Top User and Application Violations** region, which allows you to examine the application pages with the highest number of violations
- **Top executed User Requests** region, where you can view the most frequent user requests and actions, and assess their impact on the business application
- **Top Users** region, where you can monitor the most active users of the targets associated with the business application

To perform root cause analysis of operational problems, you can use the **RUEI Session Diagnostics** facility. You access this facility by selecting **Real User Experience (RUEI)** and then **RUEI Session Diagnostics** from the **Business Application** drop down.

To view the **RUEI Metrics** page, select **Real User Experience (RUEI)** and then **RUEI Metrics** from the **Business Application** drop down.

For complete information about working with RUEI in the Enterprise Manager Console, see ["Monitoring Business Applications"](#) on page 6-1.

### 3.5 How Does RUEI Work with BTM and JVM Diagnostics?

RUEI can work seamlessly with BTM and JVMMD if you install and configure these as described in ["Setting up End-to-end Monitoring"](#) on page 2-4. Options include the following:

- You can click out to JVMMD to get activity information for the selected request based on its ECID. You can access the Request Instance Diagnostics page by a right-click on a record in a RUEI Session Diagnostics view.
- You can click out to Business Transaction Management to display information about a business transaction from the Session Diagnostics facility.
- You can click out the Business Transaction Management to provide aggregated information about the specific flow of work associated with the selected request. This option is available through the BTM service/operation dimension within the URL diagnostics group.
- You can click out to Business Transaction Management to provide aggregated information about the service deployed within your application environment associated with the selected request. This option is available through the BTM service dimension within the URL diagnostics group.

For additional information about how RUEI works with external tools, see ["Configuring Clickouts to External Tools"](#) in *Oracle RUEI User's Guide*.



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## Discovering Services and Working with Transactions

This chapter introduces the Business Transaction Management (BTM) stand-alone product. For information on using BTM monitoring functions from the Enterprise Manager console, see [Chapter 6, "Monitoring Business Applications."](#)

Monitoring the user experience treats the sequence of operations that follows a page hit as a black box. A user action triggers a request: the request goes out, a response is returned, and if the tardiness or absence of the reply is not directly related to the web page, it is impossible to determine its cause. (This series of actions is illustrated in [Figure 2–1.](#)) Business Transaction Management (BTM), another aspect of monitoring application performance, allows you to examine the sequence of operations that ensue from the original request. BTM focuses on the monitoring of transactions, a subset of these operations, to help you locate which operations in the sequence have performance issues and errors.

This section introduces the basic concepts and tasks involved in working with BTM. It includes the following topics:

- [What Does Business Transaction Management Discover?](#)
- [Defining Transactions](#)
- [Monitoring Transactions](#)
- [What Questions Can Business Transaction Management Answer?](#)
- [Accessing BTM from the Enterprise Manager Console](#)
- [How Does Business Transaction Management Work with RUEI and JVM Diagnostics?](#)

BTM offers a rich set of features that we cannot hope to describe in a single chapter. For complete information about its use, see *Oracle Business Transaction Manager Online Help*.

### 4.1 What Does Business Transaction Management Discover?

Business Transaction Management uses dynamic discovery, based on traffic flow, to discover the essential characteristics of a running application. These include the following elements:

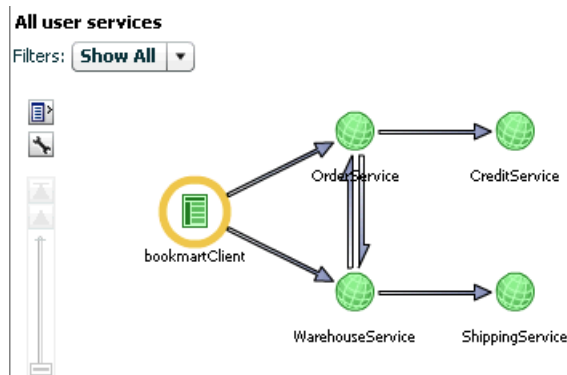
- Application components: the logical service that designates a deployed component type, the endpoints (instances of that service), and the operations that can be invoked on an endpoint
- The dependencies among components

- The containers (application servers) where application components are running

After you run traffic, BTM can display the services and dependencies found in a dependency graph, like the one shown in [Figure 4–1](#).

Although BTM can discover a wide variety of components, it uses a web-service model to represent these components and their dependencies, no matter what their actual type. According to this model, services interact by sending request and response XML messages. For example, if you have a composite application consisting of a web service that calls an EJB that accesses a database via JDBC, it will be modeled as three services that communicate using XML messages. When you use the Business Transaction Management console to view discovered components, these are listed as services, and the messages they exchange are listed as operations belonging to these services. A message corresponds to either the request or response phase of an operation. The figure below shows how BTM represents related discovered services.

**Figure 4–1 Service Dependency Graph**



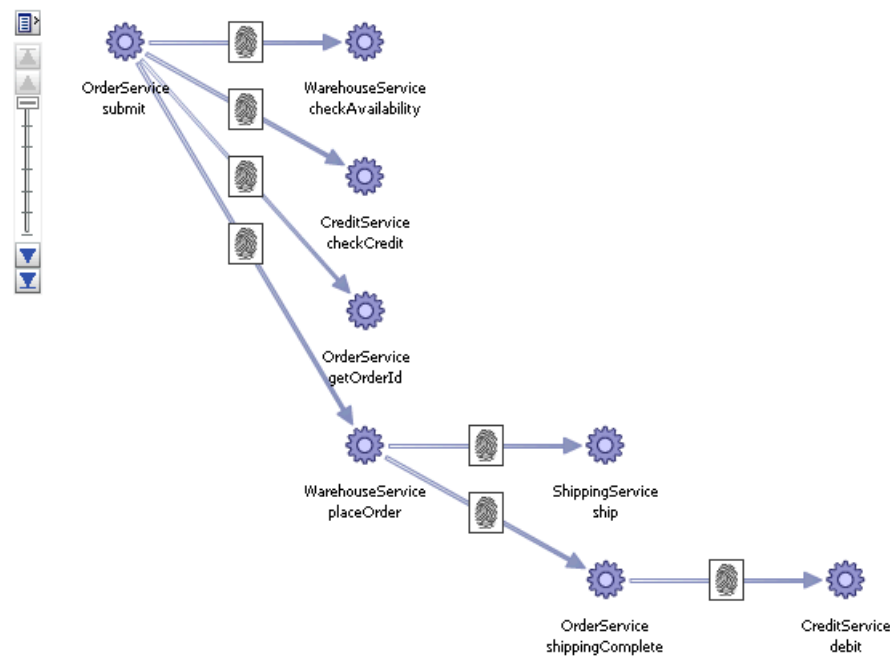
The figure shows five inter-related services and the flow of traffic between them. The circled service is the service initiating traffic. You can drill down further to show service operation dependencies, this view is the starting point for a transaction definition, which is described next.

## 4.2 Defining Transactions

Once you have run traffic and discovered the services that make up your application, you can define a transaction that includes some or all of those services in a flow. Normally, a transaction will be comprised of a subset of the flow of services that make up your application. You will use transactions to focus on an area of interest in order to get a better understanding of performance or to troubleshoot problems.

By default, a transaction begins with the operation you select as a starting operation and it ends with the response message of that operation. You can customize the definition by changing the operations that are included in the transaction definition and by including flows whose relevance cannot be automatically discovered. The figure below shows a graphical representation of a transaction definition based on the dependency graph shown in [Figure 4–1](#).



**Figure 4–2 Transaction Graph**

The figure shows the sequence of operations that follows the starting operation of the transaction, `OrderService:submit`. (The fingerprint icon shown on the arrows linking the operations means that these operations were automatically correlated using message fingerprints. If they had been manually correlated, a key icon would have been used instead.)

By default, monitoring is enabled for a transaction. BTM will capture basic measurements of transaction performance: average response time, started transactions, completed transactions, and maximum response time. You can increase the depth and extent of monitoring by specifying the following additional features:

- You can choose to segment transaction measurements based on host address and by individual consumer.
- You can enable instance logging to see a list of transaction instances recorded in a given time period. You can then assemble and inspect a given instance, view any property values for that instance, and create conditions based on these property values.
- You can enable message logging, which allows you to view message content for the operations you specify. You can also search for an operation based on the content of its request or response message.

Each of these features exact some cost on BTM performance and resources. For example, for applications that process large volumes of data, instance logging can take up a lot of database space. To help balance monitoring needs with performance, BTM allows you to define *properties* for a given operation to capture partial content of a message without having to log message content. You can also use properties to manually correlate messages, to search for specific transaction instances, and to define conditions.

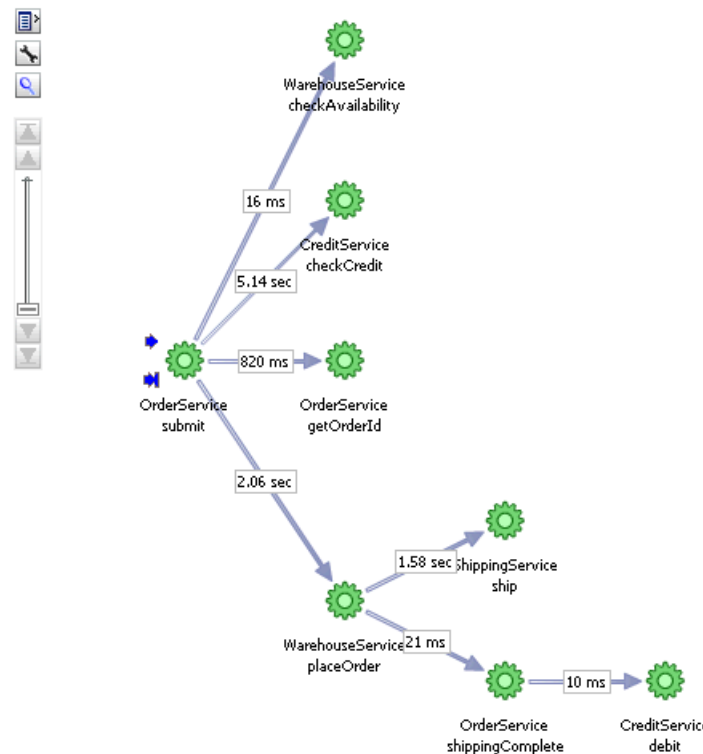
The features you choose when you define a transaction govern the kind and extent of monitoring that follows. In addition to this type of monitoring, you can also configure

BTM to alert you about special situations by using conditions and service level agreements:

- Service level agreements (SLA) define standards of performance for your transactions based on aggregate measurements. Business Transaction Management then monitors deviations from those standards, and when deviations occur, an alert is issued and displayed in the Management Console. (When you view BTM-related information in the Enterprise Manager console, events corresponding to these SLAs are shown in the **Events Without Incidents** view of the Incident Manager.)
- Conditions can alert you when an expected message does not arrive, when a specified message property value is encountered, or when a fault occurs. They are tools to help you detect issues in specific transaction instances. When the condition is triggered and satisfied, Business Transaction Management assembles the corresponding transaction instance, allowing you to view its content and perform whatever analysis is needed for troubleshooting or other performance evaluation. Note that evaluating conditions on each transaction instance requires instance logging to be enabled and can affect BTM performance.

## 4.3 Monitoring Transactions

How much information Business Transaction Management gathers for a given transaction depends on the transaction definition as explained above. At a minimum, if you have not enabled any features, BTM displays core measurements for the selected transaction in the Main area of the BTM console. This includes the number of started and completed transactions, the throughput, the average response time, the maximum response time, and the number of violation alerts. The figure below shows graphic monitoring information for the transaction whose definition is illustrated in [Figure 4-2](#). The numbers shown represent the average response time for a link. If you right-click on the link, a popup window displays the link throughput. In addition to the figure, BTM displays a grid view that lists the core measurements described above.

**Figure 4–3 Transaction Monitoring**

In the Tabs area of the display, BTM shows information about performance data segmented by consumer or client address, alerts, assembled transaction instances, logged message content, SLA compliance, and the transaction definition. How much of this data is available depends on the transaction definition. For example, if you have not enabled message logging, you will not be able to view message content.

In addition to the core instruments, you can enable additional instrumentation and monitoring both for transactions and for services and operations. For more information, see "About Instruments" in *Oracle Business Transaction Management Online Help*.

## 4.4 What Questions Can Business Transaction Management Answer?

Using transactions, properties, service level agreements, and conditions, Business Transaction Management can answer questions like the following about your application:

- *What is the logical structure of my application? What are the operations that make up my application components, and what are their call dependencies?*

Open the **Service Map** view to display currently active services and their dependencies.

- *Where can I look at my environment infrastructure and the dependencies between the elements of that infrastructure?*

Select the **Containers** view. From here you can see the application components hosted in a given container, and you can also see the operations that make up each component.

- *How can I get a quick overall sense of operational status?*  
Select **Operational Health Summary** from the **Dashboards** view. This gives you current failure and warning counts, alerts, and admin status.
- *How are my transaction flows performing, and what is the volume of traffic?*  
Select a transaction in the **Transaction** view and check monitoring data for a transaction for throughput and average response time numbers.
- *What parts of my application are most heavily used?*  
Check the **Most Load** items in the **Top 10 Services** dashboard.
- *Which services are most error prone?*  
Check the **Most Faults** items in the **Top 10 Services** dashboard.
- *Which are my slowest transactions?*  
Check Slowest **Avg Response Time** table in the **Top 10 Transactions** dashboard.
- *How does current performance compare with historical norms?*  
Define a baseline for the performance metric of interest and define warning and alert levels for an SLA on selected operations. Once the baseline is defined, it's displayed as a reference on the **Transaction Summary** page and **Analysis** tab. You can also receive alerts if you configure SLAs. View results in the **SLA Compliance** tab.
- *Which of my customers is getting the slowest service?*  
Define consumer segmentation and view results in the **Analysis** tab.
- *Are there any bottlenecks in traffic flow? Do I need to add a load balancer.*  
Look for unusually high throughput numbers and slow average response time on services.
- *How many orders exceeded \$10,000 in the last week?*  
Define a property for the message element that specifies the invoice total. Then, define a condition that uses this property to alert you for the occurrence of any order that exceeds that amount. The count of the condition is tracked as an instrument that is displayed on the **Analysis** tab for the transaction.

## 4.5 Accessing BTM from the Enterprise Manager Console

You can access monitoring and definitional information about transactions from the Enterprise Manager Console. You cannot edit transactions, create properties, define conditions or set Service Level Agreements in the Enterprise Manager console. All that needs to be done in the Business Transaction Manager console.

Of course, as we explained in "[Defining Transactions](#)" on page 4-2, what information is provided depends on what features you have enabled when you defined the transaction. For example, if you don't enable instance logging, you will not be able to view information about individual transaction instances. Should you find that you need a different amount of information, you can use the Business Transaction Management console to edit the transaction definition. Enterprise Manager will be automatically updated with the new definition, and it will display the information you need after you have run additional traffic.

Overall, the information you can access from the Enterprise Manager console includes the following for each transaction associated with the current business application:

- On the Business Application page, you can view the list of all associated transactions, along with the selected transaction's current compliance status, the number of transaction instances started and completed during a given period, the average completion time, and the maximum completion time.
- On the Transaction Home page, which you can reach by clicking a transaction on the Business Application page, you can view SLA compliance and a tree table list of the transaction service operations with core measurements, with the breakdown of the performance measurements across service instances (endpoints) for cases where the service has replicates.
- Right clicking on an endpoint in the Transaction Home page gives you the option of launching the BTM UI to see the details for that operation or to launch JVMMD.

You can access more extensive and detailed information for a given transaction by clicking Launch BTM from the Transaction Home Page. This will open a new window which allows you to view Tab information from the Business Transaction Management console.

For complete information about working with BTM in the Enterprise Manager Console, see ["Monitoring Business Applications"](#) on page 6-1.

## 4.6 How Does Business Transaction Management Work with RUEI and JVM Diagnostics?

Business Transaction Management can work seamlessly with RUEI and JVMMD if you install and configure these as described in ["Setting up End-to-end Monitoring"](#) on page 2-4. Options include the following:

- You can access the Business Transaction Management from RUEI. For information, see ["Configuring Clickouts to External Tools"](#) in *Oracle Real User Experience Insight User's Guide*.
- You can access Java Virtual Machine Diagnostics (JVMD) and the Request Instance Diagnostics (RID) view from the Business Transaction Management console.

You can access the JVMD view by selecting an operation and selecting **Drilldown to JVMD** from its drop list. You can then view details about an executing JVM process for the period within which the operation executes. You can see stack frames for executing threads, thread state information, aggregate information about the frequency and cost of method execution, and so on.

For a message that has been assigned an ECID, you can view information in the Request Instance Diagnostic view, which displays a list of the JVMs through which request steps with the specified ECID executed. You can access the RID view by selecting an operation and selecting **Request Instance Diagnostics** from its drop list.

For more information, see ["Accessing Other Diagnostic Tools"](#) in *Oracle Business Transaction Management Online Help*.



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## Getting Detailed Execution Information

There are times when the views offered by RUEI or BTM are not sufficient to understand performance issues. If the suspect services are executing in a Java Virtual Machine, it is possible to go deeper and get detailed execution information that helps you diagnose the root cause of such problems.

JVM Diagnostics is a tool that allows you to view the details of an executing JVM process. These details include the stack frames for executing threads, thread state information, aggregate information about the frequency and cost of method execution, information regarding the holding of Java and database locks, and details about the objects in the Java heap. Using this tool you can also access historical data for each JVM monitored.

This section explains how you use two Enterprise Manager JVM views to get detailed execution information about failing or problematic operations. It includes the following sections:

- [Using JVM Diagnostics](#)
- [Using Request Instance Diagnostics](#)

When you invoke one of these views from RUEI or BTM to further analyze performance, Enterprise Manager selects and displays data generated in the time interval for the selected RUEI page object or BTM operation instance. One additional piece of information that might be shown for the data displayed is its execution context ID (ECID).

An ECID is an identifier used to track a request, for components in the Oracle technology stack. The creation and propagation of ECIDs enable the sharing of context and of diagnostic data between components. ECIDs are also used to identify threads running in the Java Virtual Machine. Where ECIDs are available, they can help you correlate data shown in RUEI or BTM with data shown in the JVM Diagnostics view or Request Instance Diagnostics view. For additional information, see ["Using ECIDs to Track Requests"](#) on page 2-4.

To access JVM views from RUEI and Business Transaction Management, you must do some preliminary set-up work. For more information, see ["Setting up End-to-end Monitoring"](#) on page 2-4.

JVMD offers a rich set of features that we cannot hope to describe in a single chapter. For complete information about its use, see the chapters describing JVMD in *Getting Started with Oracle Fusion Middleware*.

## 5.1 Using JVM Diagnostics

Java Virtual Machine Diagnostics (JVMD) information is accessed from the Business Transaction Management console in one of the following ways:

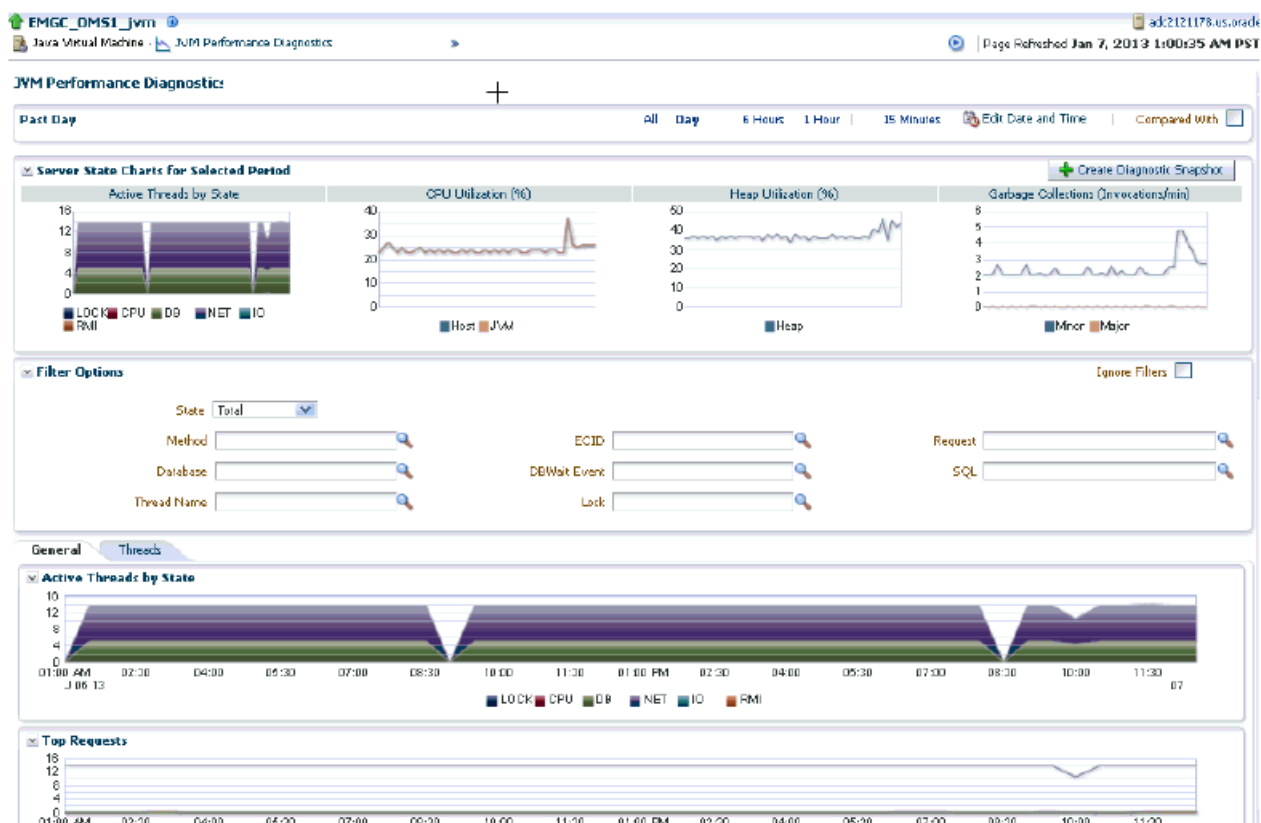
- In the **Message Log** tab for a service, endpoint, logical operation, physical operation, or transaction. Right-click on a row and select **Drilldown to JVMD** from the context menu.
- In the **Transaction Instance Inspector**, right click on an operation (in either the graph or grid view), and select **Drilldown to JVMD** from the context menu.
- In the **Message Search Log** tool, right click on a message row, and select **Drilldown to JVMD** from the context menu.

In Enterprise Manager, you can access JVMD information for a transaction operation by selecting a transaction in the Business Application and opening the transaction summary page. Then do one of the following:

- Right click one of the operation nodes in the topology diagram and select JVMD diagnostics from the context menu.
- Right click one of the operation rows in the operations table and select JVMD diagnostics from the context menu.

In each case, a new window is displayed showing the JVM Performance Diagnostic view. In the multi-VM case, JVMD shows a VM group target and aggregate information for the group. [Figure 5-1](#) shows the JVM Performance Diagnostic view.

**Figure 5-1 JVM Performance Diagnostic View**





This view shows the summary details of the JVM in which the selected operation is running. It shows Server state charts, Active Threads by State, Top Methods, Top Requests, Top DBWait Events, TopSQLs, and Top Databases. You can filter the data that is displayed by specifying various criteria.

Click on the Threads tab to view the Thread State transition chart. This chart shows how the threads have transitioned from one state to another in the selected period. Click on a bar graph in the Thread State Transition chart to view the Sample Analyzer, which provides a detailed analysis on the thread of the thread.

Click the Live Thread Analysis control to see all threads running in the JVM. Click on a thread to view additional information about that thread.

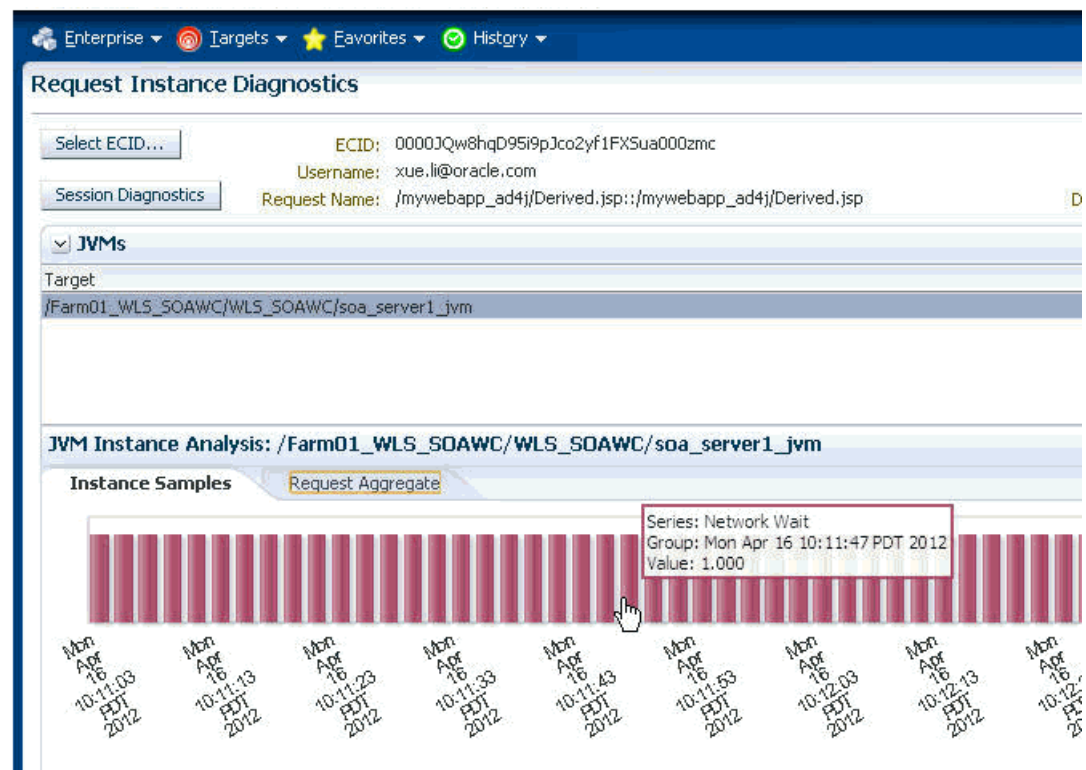
## 5.2 Using Request Instance Diagnostics

You can access the Request Instance Diagnostics (RID) view either from RUEI or from Business Transaction Management.

- From the RUEI stand-alone application, the ECID is used to correlate the data shown. You can access RID by a right-click on a record in a RUEI session diagnostics view.
- From a RUEI Session Diagnostics, object view in EM, you can access RID by a right-click on the Oracle logo icon. (The icon is displayed only if there's an ECID)
- If an operation in Business Transaction Management has an associated ECID, you can access the RID view in the same way you access the JVMD view except that you select RID from the context menu.

Figure 5–2 shows part of the Request Instance Diagnostic view for a given ECID.

**Figure 5–2 The Request Instance Diagnostics View**



The JVMs panel lists all the JVMs through which the request was executed. Select a JVM to display the following information:

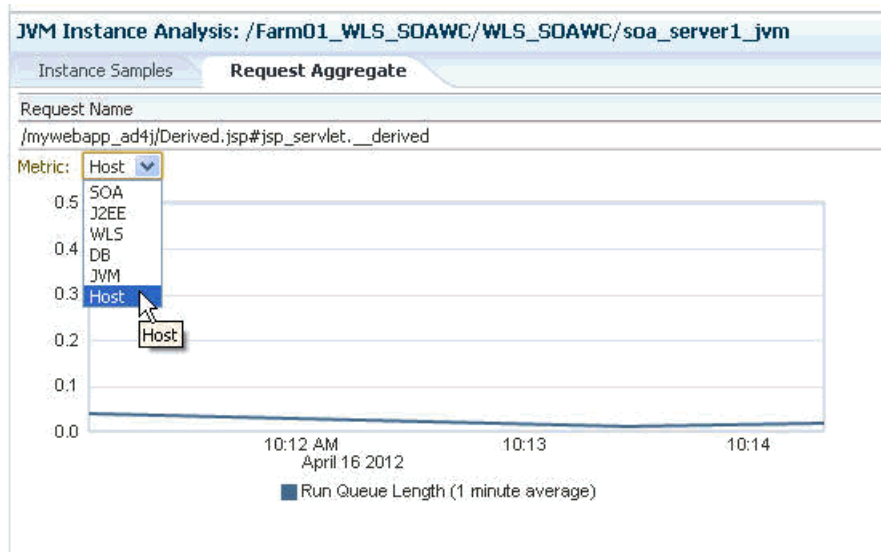
- RID: The Relationship ID, an ordered set of numbers describing the location of each task in the tree of tasks.
- The start time and the duration of the request.
- Step Name: The individual steps in the request. For example, the first step could be jsp, the second could be EJB, and the third could be DB.
- CPU utilization by the JVM
- GC Major/Minor indicates the number of objects added to the major and minor garbage collections.

If you select a JVM from the list, a bar graph is displayed in the **Instance Samples** tab of the JVM Instance Analysis panel. This graph shows the thread state in each JVM snapshot taken within the duration of the request. A color key, to the right of the display, indicates a different thread state; Runnable, Lock, IO wait, DB Wait, NW wait, and RMI Wait. Hover over the graph to get an in-depth view of the thread.

To view aggregate metrics collected for the selected JVM during the specified period, click on the **Request Aggregate** tab. [Figure 5-3](#) shows a sample tab.

To view measurements for a given metric type, select the desired type from the drop down Metric menu, as shown in the figure.

**Figure 5-3 RID: Request Aggregate Tab.**



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## Monitoring Business Applications

This chapter describes how you use Oracle Enterprise Manager to monitor Business Application performance.

A *Business Application* is an Enterprise Manager target that represents a logical application; for the user, it defines a unit of management. A Business Application is composed of RUEI applications and BTM transactions. Using the Enterprise Manager Console, you view a Business Application to access RUEI and BTM performance data as well as information about the application's supporting infrastructure: the hosts and servers where the application services are executing.

You cannot use Enterprise Manager to create RUEI applications and BTM transactions. That work must be done using the RUEI and BTM stand-alone products, which were introduced in previous chapters. You must complete the steps described in ["Setting up End-to-end Monitoring"](#) on page 2-4, to be able to set up Business Application monitoring. You must also complete the tasks described in [Section 6.2, "Prerequisites and Considerations."](#)

This chapter covers the following:

- [Introduction to Business Applications](#)
- [Prerequisites and Considerations](#)
- [Registering RUEI/BTM Systems](#)
- [Creating Business Applications](#)
- [Monitoring Business Applications](#)
- [Requirements for Using RUEI](#)
- [Monitoring KPI and SLA Alert Reporting](#)
- [Monitoring BTM Transactions in Enterprise Manager](#)
- [Working Within Business Transaction Manager](#)

### 6.1 Introduction to Business Applications

By using Oracle Enterprise Manager to monitor your Business Applications, you can make sure that your applications are performing at their peak and that end users are satisfied with their performance.

The use of Business Applications offers a number of significant advantages over traditional IT-centric approaches that only focus on system health issues. In particular, Business Applications:

- Allow you to manage your applications in their business context, measuring, and alerting on the basis of the end-users' experience.
- Provide customizable dashboards with complete visibility across multi-tier composite applications.
- Provide a visualization of all target relationships within a business service.

### 6.1.1 Systems, Services, Business Applications, and Key Components

Within Oracle Enterprise Manager, there are two types of targets: systems and services. A service target represents some functionality provided or supported by a system. A Business Application is a service target. Hence, when you create a business application, you must associate it with a system that represents the infrastructure that supports the service functionality.

Consider an example business application that contains an order entry application implemented by a collection of physical (system) resources. The application is deployed in a Web Logic domain modeled as a system target whose members are the individual managed servers. The Business Application could include transactions deployed in containers. Each of these containers is an application server, possibly within a single Web Logic domain. In this case, the Web Logic domain is the system target. (In the case that the transaction spans multiple domains, it is recommended that you create a composite application within Oracle Enterprise Manager.)

You specify which key components within the system target should be monitored to determine the business application's availability. For instance, for a transaction, the key components will be the servers where the services that comprise the transaction are running.

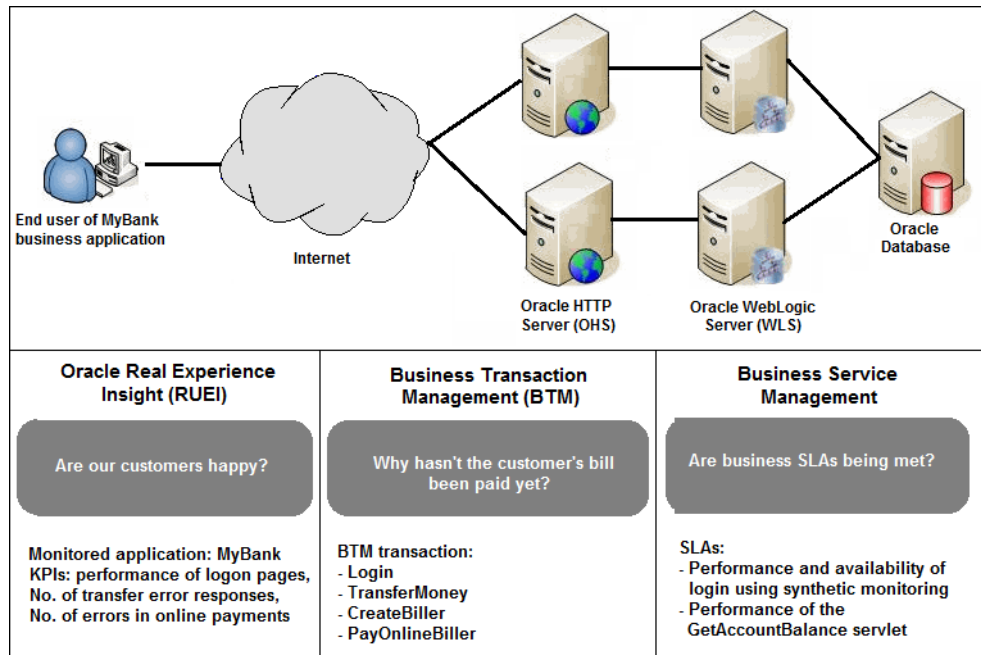
System monitoring provides insights into the behavior of the monitored application infrastructure. It collects metrics and reports on the health of all components from the hosts to the application servers and the deployed Java EE applications. It also provides deep-dive diagnostics tools for the application servers and the databases.

### 6.1.2 MyBank: An Example Business Application

To illustrate the nature of a Business Application, consider the situation in which end users access a banking application (MyBank) that allows them to perform such tasks as the payment of bills. This business application is delivered through the infrastructure shown in [Figure 6-1](#).

The end-user experience of the MyBank business application is monitored through RUEI, while Key Performance Indicators (KPIs) are used to monitor its key aspects, such as the availability and performance of the logon page, and the number of errors in transfer responses and online payments.

BTM monitors the performance of the services and transactions deployed within the application environment used to deliver the business application. This is done by tracking each transaction as its execution progresses through the different tiers of the application. This is complemented by the ability to perform root-cause analysis to locate bottlenecks, errors, and incomplete transaction instances.

**Figure 6–1 The MyBank Business Application**

Proactive application monitoring is achieved by defining business objectives that set acceptable levels of performance and availability. Within Oracle Enterprise Manager, these business objectives are referred to as *Service Level Agreements* (SLAs) and are composed of *Service Level Objectives* (SLOs) that measure specific metrics.

Insight into each of these key aspects of a business application's operation and delivery is available through a number of dedicated regions of the Oracle Enterprise Manager console.

## 6.2 Prerequisites and Considerations

This section describes the requirements that must be met and the issues that should be considered to use the Business Applications facility. It is strongly recommended that you carefully review this information before proceeding with the creation of business applications.

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**Important:** It is recommended that you review the My Oracle Support website to obtain up-to-date information about the supported RUEI and BTM products, as well as patches, configurations, known issues, and workarounds.

---

This section covers the following:

- [Requirements for Using RUEI](#)
- [Requirements for Using BTM](#)

### 6.2.1 Requirements for Using RUEI

To use RUEI to monitor the performance of your Business Applications, you must ensure that the following requirements have been met:

- RUEI version 12.1.0.4 (or higher) has been installed and configured to monitor the required applications, suites, and services. Information about deployment options and requirements is available from the *Oracle Real User Experience Insight Installation Guide*.

- The Enterprise Manager for Oracle Fusion Middleware plug-in version 12.1.0.4 must be deployed to both Oracle Management Service (OMS) and to each Management Agent monitoring the business application targets.

For details on deploying the plug-in to OMS, see the "Deploying Plug-Ins to Oracle Management Service" chapter in the *Enterprise Manager Cloud Control Administrator's Guide*:

[http://docs.oracle.com/cd/E24628\\_01/doc.121/e24473/plugin\\_mgr.htm#CJGCDHFG](http://docs.oracle.com/cd/E24628_01/doc.121/e24473/plugin_mgr.htm#CJGCDHFG)

For details on deploying the plug-in to a Management Agent, see the "Deploying Plug-Ins on Oracle Management Agent" chapter in the *Enterprise Manager Cloud Control Administrator's Guide*:

[http://docs.oracle.com/cd/E24628\\_01/doc.121/e24473/plugin\\_mgr.htm#CJGBIAGJ](http://docs.oracle.com/cd/E24628_01/doc.121/e24473/plugin_mgr.htm#CJGBIAGJ)

- The Reporter system must be accessible to Oracle Enterprise Manager via an HTTPS connection on port 443. Other component host systems (such as Collector, Processing Engine, and database servers) do not need to be accessible to Oracle Enterprise Manager unless you intend to make them managed targets (see [Section 6.3, "Registering RUEI/BTM Systems"](#)).
- The statistics data retention setting (which governs the availability of statistical information such as violation counters) has been configured to be consistent with your business application reporting requirements. The procedure to do this is described in the *Oracle Real User Experience Insight User's Guide*.
- If you intend to export session information from the Session Diagnostics facility, you should ensure that the exported session is not older than the period specified for the Full Session Replay (FSR) data retention setting. In addition, the URL prefix masking setting should be specified as "Complete logging". For more information, see the *Oracle Real User Experience Insight User's Guide*.

### Registering RUEI Installations with Self-Signed Certificates

A RUEI installation can use a self-signed certificate. This is explained in the *Oracle Real User Experience Insight Installation Guide*. However, Oracle Enterprise Manager only accepts SSL certificates issued by a trusted Certificate Authority (CA), and that contain a valid Common Name (CN). Therefore, in order to be able to register a RUEI installation with Oracle Enterprise Manager, you need to do the following:

---

---

**Note:** All instructions on the Oracle Enterprise Manager system need to be carried out as the user running the oms and agent.

---

---

1. Verify that the certificate is valid. One way to do this is to attempt to access the Oracle Real User Experience Insight system through a browser via HTTPS and view the certificate details. You should ensure the certificate's date validity. If the certificate's date range does not include the period your Oracle Real User Experience system is running, you will not be able to use it.
2. Download the certificate to your Oracle Enterprise Manager system. Many browsers provide an option when creating a security exception for a self-signed

certificate to also save the certificate to a file. If you have already approved the security exception in your browser, the following example works in Mozilla Firefox:

- a. Click the security icon to the left of the hostname
- b. Click **More information**, then click **View certificate**
- c. Select the **Details** tab and click **Export**

The exported file should be copied to your system running Enterprise Manager. The examples below assume that you stored the file containing the certificate in ~/ruei.cert.

A more direct way to download the certificate to your Oracle Enterprise Manager system can be carried out on the system itself. Issue the following commands on the Oracle Enterprise Manager system:

```
openssl s_client -showcerts -connect <RUEI_REPORTER_HOST>:443 </dev/null \
| openssl x509 -inform PEM > ~/ruei.cert
```

3. Add the certificate to the keystore. Within Oracle Enterprise Manager, two components are used to communicate with a RUEI system via SSL: one for polling the status of RUEI, and one for the communication with RUEI. Both keystores need to contain the same certificate. Issue the following commands on the Oracle Enterprise Manager system:

Agent:

```
cd <agent instance home>/bin
./emctl secure add_trust_cert_to_jks \
[-password <keystore password, default "welcome">] \
-trust_certs_loc ~/ruei.cert -alias <unique alias>
```

OMS

```
<path_to_Oracle_WT>/jdk/bin/keytool -import \
-keystore <path_to_wlserver_10.3>/server/lib/DemoTrust.jks \
-file ~/ruei.cert -alias <unique alias> -storepass DemoTrustKeyStorePassPhrase
```

4. In order for Oracle Enterprise Manager to work with the new certificate, perform a bounce of the OMS and the AGENT. Issue the following commands:

```
<OMS oracle home>/bin/emctl stop oms -all
<OMS oracle home>/bin/emctl start oms
<AGENT oracle home>/bin/emctl stop agent
<AGENT oracle home>/bin/emctl start agent
```

## 6.2.2 Requirements for Using BTM

To use BTM to monitor the performance of your business applications, you must ensure that the following requirements have been met:

- BTM version 12.1.0.4 (or higher) has been installed and configured. Installation and configuration instructions are provided in the *Oracle Business Transaction Management Installation Guide*.
- The server where the central BTM server is deployed must be accessible to the Oracle Management Server (OMS) on the port where the BTM system's managed server is listening.

- The business transactions you intend to monitor via the Business Application facility have been defined using the BTM user interface. The procedure for doing this is described in the *Business Transaction Management Online Help*.

## 6.3 Registering RUEI/BTM Systems

Before you can create Business Applications based on RUEI-monitored applications and services, or BTM-monitored transactions, you must first register the appropriate RUEI or BTM system with Oracle Enterprise Manager.

---

**Note:** You must have Super Administrator privileges in order to access the Application Performance Management page.

---

Do the following:

1. From the **Setup** menu, select **Middleware Management**, then select **Application Performance Management**. The **Application Performance Management** page shown in [Figure 6–2](#) appears. The currently registered systems are listed.

**Figure 6–2 Application Performance Management Agents**

The screenshot shows the 'Application Performance Management Agents' page. At the top, it displays 'JVM Agents Count: 0' and 'ADP Agents Count: 0'. Below this is a section titled 'Application Performance Management Engines' with buttons for 'View', 'Add', 'Remove', and 'Configure'. A table lists the engines:

Name	Host	Port	SSL Port	Status	Availability (%)	Server	Version
▼ RUEI Systems (0)							
BTM Systems (0)							
JVM Diagnostics Engines (0)							
ADP Engines (0)							

2. Select **Real User Experience Insight System** or **Business Transaction Management System** from the **Add** drop down. A page similar to the one shown in [Figure 6–3](#) appears.

**Figure 6–3 Discover RUEI System Page**

The screenshot shows the 'Discover RUEI System: Find Targets' page. It includes a 'Test Connection' button, a 'Discover' button, and a 'Cancel' button. Below these are radio buttons for 'Use standard location' (selected) and 'Use custom location'. The form fields are:

- \* Host: myshop.us.com
- \* Port: 443
- SSL: ☒
- \* Username: admin
- \* Password: ••••••
- Unique Identifier:

3. Specify whether the RUEI or BTM system is running in a standard or custom location.
4. Specify the host system where the Reporter system or BTM Sphere is located. Click **Select Target**. A new window opens that allows you to view the available systems. You can use the **Target Type** menu to search for specific target types.
5. Specify the port number used to communicate with the RUEI Reporter or BTM Sphere.



6. Specify whether a secure connection should be used to the RUEI Reporter or BTM Sphere. If so, the necessary SSL certificates must be registered with Oracle Enterprise Manager. This is described in the *Oracle Enterprise Manager Cloud Control Advanced Installation and Configuration Guide* available at the following location:

[http://docs.oracle.com/cd/E24628\\_01/install.121/e24089/appdx\\_troubleshooting.htm#CEGBIGBH](http://docs.oracle.com/cd/E24628_01/install.121/e24089/appdx_troubleshooting.htm#CEGBIGBH)

7. Specify a valid user name and password combination. For a RUEI system, the specified user must have Oracle Enterprise Manager access permissions. Note that Oracle SSO authentication for this user is not supported. The Security Officer privilege is also recommended to allow downloading of sessions and the showing of replay details in the Enterprise Manager UI. With this in place, Enterprise Manager will be able to retrieve this data. Moreover, additional (per-end-user) Enterprise Manager roles will be applied to reveal session-zip download and content-download buttons.
8. Optionally, specify a string to be attached to the RUEI/BTM system name. For example, if "SanitySite" is specified, then each of the system's component names will be prefixed with "SanitySite\_", creating system names such as "SanitySite\_BTM\_System".
9. In the case of a custom location, specify the full URL of the WSDL RUEI/BTM discovery service. In the case of a BTM system, this should be in the following form:

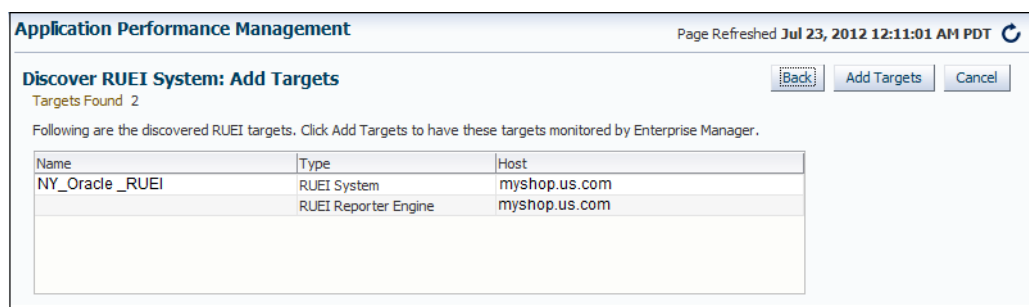
`http://host:port/btmcentral/sphere/discoveryService/?wsdl`

In the case of a RUEI instance, this should be in the following form:

`http://host:port/ruei/service.php?endPoint=uxDiscoveryService&wsdl`

10. Specify the URL of the Management Agent to be used to collect metric information about the system. If it is managed by Oracle Enterprise Manager, you can click **Select** to specify it.
11. Click **Test Connection** to verify whether a working connection to the RUEI/BTM system can be made.
12. Click **Discover**. An overview of the components associated with the selected system is displayed. An example is shown in [Figure 6-4](#).

**Figure 6-4 Discover RUEI Instance: View Targets Page**



13. Click **Add Targets** to have each of the system's components become a managed target within Oracle Enterprise Manager. Note that if you do so, each system must be accessible to a Management Agent. Further information about managed targets is available from the *Oracle Enterprise Manager Cloud Control Administrator's Guide*.

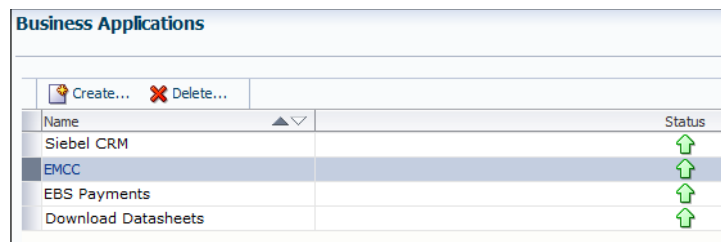
## 6.4 Creating Business Applications

To create a Business Application, you need to specify the RUEI-monitored applications, suites, and services, and the BTM-monitored transactions upon which it is based. You are not required to include both RUEI applications and BTM transactions in a Business Application.

Do the following:

1. From the **Targets** menu, select **Business Applications**. The currently defined Business Applications are displayed. The page (partially) shown in [Figure 6–5](#) appears.

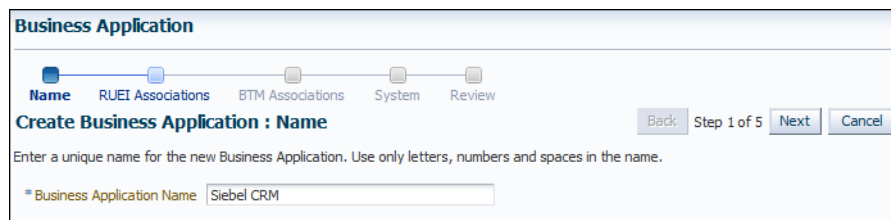
**Figure 6–5 Business Application Page**



Name	Status
Siebel CRM	↑
EMCC	↑
EBS Payments	↑
Download Datasheets	↑

2. Click **Create**. The page shown in [Figure 6–6](#) appears.

**Figure 6–6 Create Business Application (Name) Page**



**Business Application**

Progress bar: Name (active), RUEI Associations, BTM Associations, System, Review

**Create Business Application : Name**

Enter a unique name for the new Business Application. Use only letters, numbers and spaces in the name.

\* Business Application Name:

Buttons: Back, Step 1 of 5, Next, Cancel

3. Specify a unique name for the new business application. It is recommended that you include an indication of the purpose and scope of the business application as part of the name. Note that business applications cannot be renamed later. When ready, click **Next**. The page shown in [Figure 6–7](#) appears.

**Figure 6–7 Create Business Application (RUEI Associations) Page**



**Business Application**

Progress bar: Name, RUEI Associations (active), BTM Associations, System, Review

**Create Business Application : RUEI Associations**

Use Add to associate one or more RUEI Applications, Suites and Services with the Business Application. Associating with RUEI Applications, Suites and Services is optional.

Buttons: + Add, - Remove

Name	Type
Cleaner	app
Shop	app

4. Click **Add**. A new window opens that allows you to select the RUEI-monitored applications, suites, and services upon which the business application should be based. You can use the **Type** menu to restrict the listing to specific types. When ready, click **Next**. The page shown in [Figure 6–8](#) appears.

**Figure 6–8 Create Business Application (BTM Associations) Page**

- Click **Add**. A new window opens that allows you to select the BTM-monitored transactions upon which the business application should be based. When ready, click **Next**. The page shown in [Figure 6–9](#) appears.

**Figure 6–9 Create Business Application (System) Page**

Component	Type	Key Component
myshop_NY_reporter	RUEI Reporter Engine	<input checked="" type="checkbox"/>
MYSHOP/EMCC_DOMAIN	Application Deployment	<input checked="" type="checkbox"/>
MYSHOP_Database_sys41	Database System	<input checked="" type="checkbox"/>
MYSHOP/EMCC_DOMAIN	Oracle WebLogic Domain	<input checked="" type="checkbox"/>
myshop_ny_collector	RUEI Collector	<input checked="" type="checkbox"/>

- Click **Select System** and select the system that hosts the business application. This should be a system that encompasses the infrastructure that the business application runs on.

Use the **Key Component** check boxes to select the system members used in the calculation of the business application's availability. Two rules are available: either *all* specified key components for a business application must be up, or *at least one* of them must be up (the default). When ready, click **Next**. The page shown in [Figure 6–10](#) appears.

**Figure 6–10 Create Business Application (Review) Page**

**Business Application**

Progress: Name RUEI Associations BTM Associations System **Review**

**Create Business Application : Review** [Back] Step 5 of 5 [Next] [Create Business Application] [Cancel]

This step shows the summary of all the previous steps. Clicking the Create Business Application button will create a business application with the data shown here.

**Name**  
Business Application Name: Siebel CRM

**RUEI Associations**

Name	Type
Cleaner	app
Shop	app

**BTM Associations**

Name	Type
Payment	

**System**

System: myshop\_server23\_data\_center  
 System Time Zone: (UTC-08:00) US Pacific Time  
 Business Application Time Zone: Use System Time Zone  
 Business Application Availability: ☐ Available when all selected Key Components are up  
☒ Available when at least one selected Key Component is up

Component	Type	Key Component
myshop_NY_reporter	RUEI Reporter Engine	<input checked="" type="checkbox"/>
MYSHOP/EMCC_DOMAIN	Application Deployment	<input checked="" type="checkbox"/>
MYSHOP_Database_sys41	Database System	<input checked="" type="checkbox"/>
MYSHOP/EMCC_DOMAIN	Oracle WebLogic Domain	<input checked="" type="checkbox"/>
myshop_ny_collector	RUEI Collector	<input checked="" type="checkbox"/>

- Review the new business application's properties before creating it. If necessary, use the **Back** and **Next** buttons to amend its properties. When ready, click **Create Business Application**. The newly created Business Application appears on the Business Application page (Figure 6–5).

## 6.5 Monitoring Business Applications

Once a Business Application has been created, you can use the **Business Application** home page to monitor its performance and availability, as well as the status of the systems (hosts, databases, and middleware components) that support it.

It is also from the **Business Application** home page that you can access more detailed information about RUEI components and Business Transactions:

- To get more information about RUEI components, select one of the RUEI related views from the **Business Application** drop down menu. See "[Monitoring RUEI Options](#)" on page 6-12.
- To get more information about Business Transactions, select one of the transactions listed in the **Business Transaction** region.

To view the **Business Application** home page, do the following:

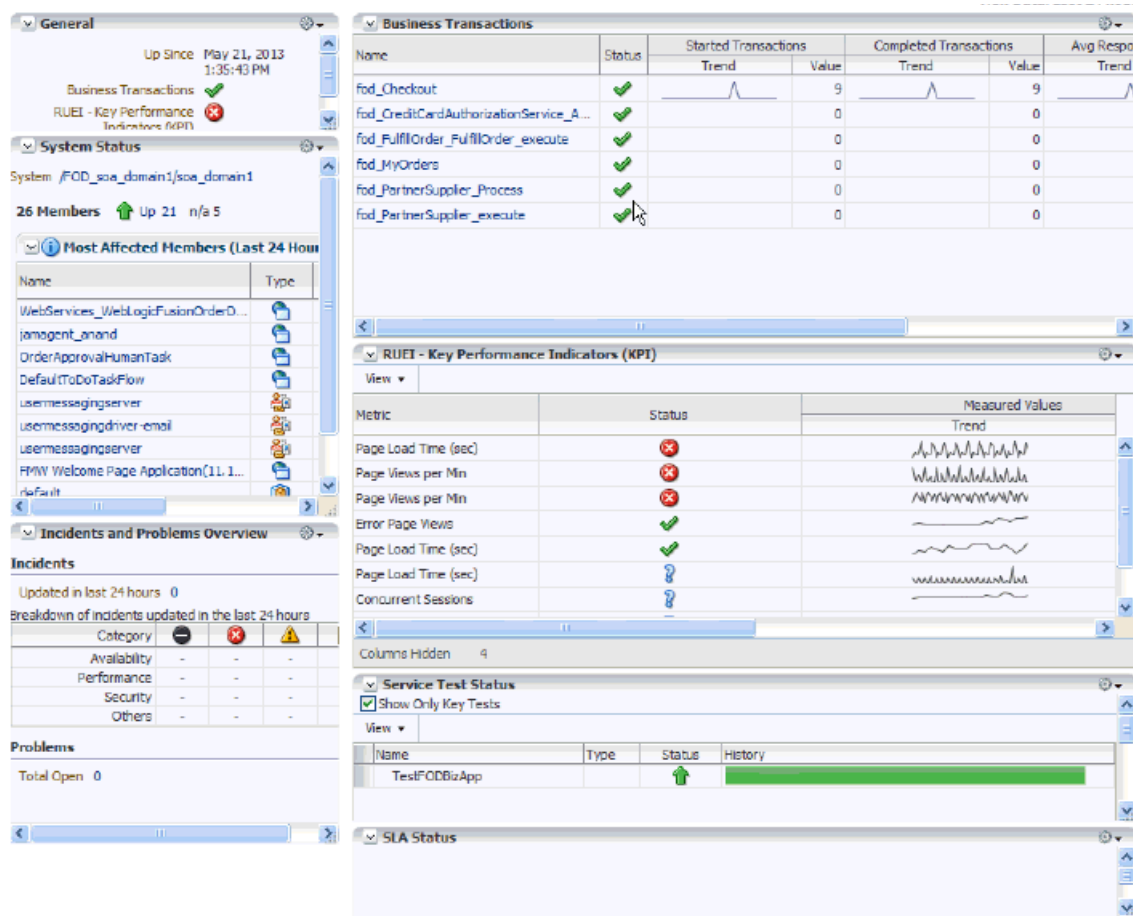
- From the **Targets** menu, select **Business Applications**. The currently defined business applications are listed. An example is shown in Figure 6–5.

In addition to the names of existing Business Applications, this page also provides summary information about status, system, RUEI metrics, and RUEI KPIs. Use the **View > Columns** menu option to add or delete columns to this display.

You can also click across to view information about system targets by clicking on one of the names listed in the System pane.

- Click the Business Application of interest. The home page for the selected Business Application is displayed. An example is shown in [Figure 6–11](#).

**Figure 6–11 Business Application Home Page**



Each region provides specific information on the various operational aspects of the selected business application. By default, the following regions are available:

- **General:** indicates the business application's status and availability. Click the **Availability (%)** item to view a history of its status for the selected time period.
- **System Status:** indicates the system's availability over the last 24 hours. The **Most Affected Members** are shown next, with an indication whether the member has been defined as a key variable in determining availability.
- **Incidents and Problems Overview:** indicates the number of outstanding critical, warning, and error alerts associated with various aspects of the selected business application.
- **Business Transactions:** lists the business transactions included in the Business Application. The use of this region is explained in [Section 6.8, "Monitoring BTM Transactions in Enterprise Manager"](#).
- **RUEI - Key Performance Indicators (KPI):** indicates the status of the KPIs associated with the business application's targets.
- **Service Test Status:** indicates the status and history of Service Tests.

- **SLA Status:** indicates the Service Level Agreements defined for this Business Application. For more information about defining Service Level Agreements, see *Oracle® Enterprise Manager Cloud Control Administrator's Guide*.

## 6.6 Monitoring RUEI Options

The **Business Application** drop down menu, accessible from the Business Application home page, includes three options for the Real User Experience (RUEI) item:

- **Real User Experience (RUEI) data**, whose contents are described in ["Monitoring RUEI Data"](#) on page 6-12.
- **RUEI Session Diagnostics**, whose contents are described in ["Working With Session Diagnostics"](#) on page 6-15.
- **RUEI Metrics**, whose contents are described in ["Monitoring RUEI Metrics"](#) on page 6-21.

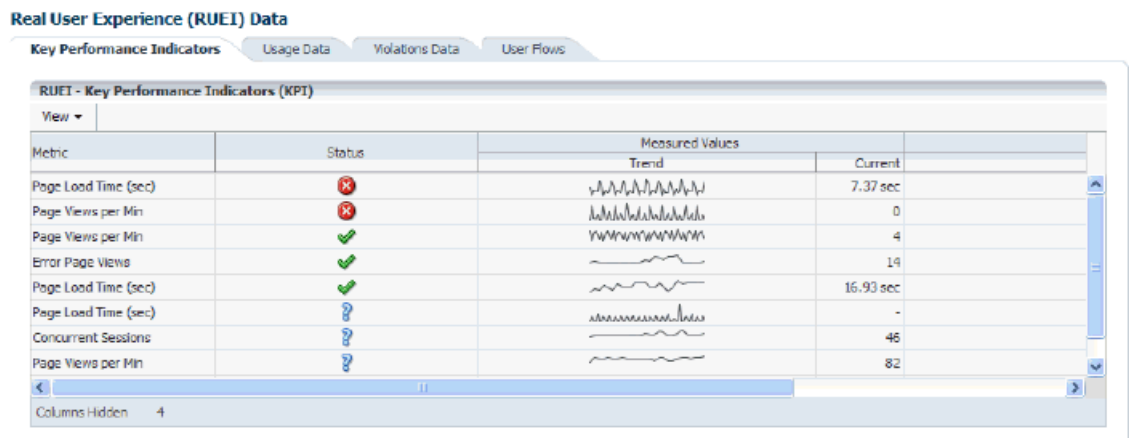
### 6.6.1 Monitoring RUEI Data

Selecting the RUEI Data option from the **Business Application > Real User Experience** menu, displays a region that includes four tabs. This section describes the contents of each tab.

#### 6.6.1.1 RUEI Key Performance Indicators Tab

The **RUEI Key Performance Indicators** tab displays information about key aspects of the RUEI application, suite, or service upon which the business application is based. For example, you could have KPIs defined for such things as availability, performance, and visitor traffic. An example is shown in [Figure 6-12](#).

**Figure 6-12 Key Performance Indicators Data**



#### Understanding Report Metric Values

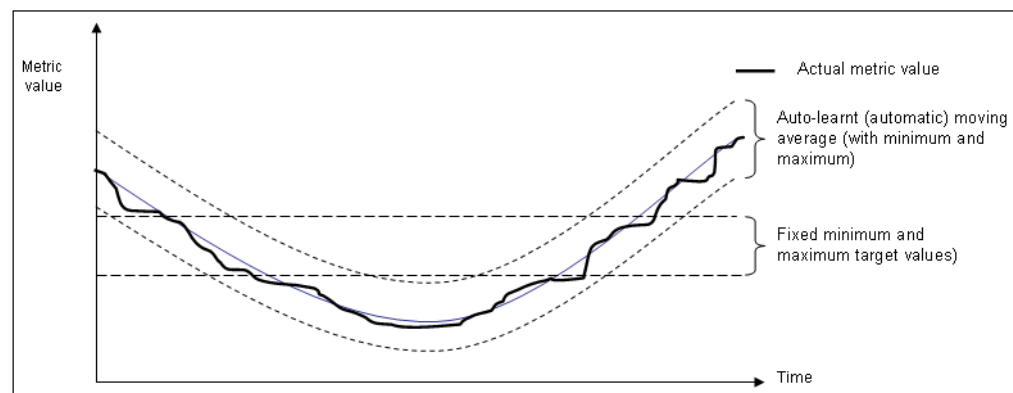
A KPI's metric value is always calculated over a 1-minute interval. That is, the metric's value is derived from its average value over that 1-minute period. Within the RUEI instance's configuration, The KPI calculation range specifies how many of these 1-minute period averages should be used when calculating the metric's reported value. By default, the calculation range is one minute. However, a longer calculation range can be specified if you want extreme values to be averaged out over a longer period. For example, if a calculation range of 10 minutes is specified, the metric's value over each reported 1-minute period is calculated based on the averages for the

previous 10 1-minute periods. Similarly, a calculation range of 15 minutes would specify that the reported value should be derived from the averages for the last 15 1-minute periods.

### Automatic and Fixed Targets

In addition to fixed targets, KPIs can be based on automatic (or auto-learnt) targets. Because visitor traffic and usage patterns can differ widely during the course of a day, these auto-learnt minimum and maximum targets are calculated as moving averages for the current 1-minute period, based on the measured metric value for that 1-minute period over the last 30 days. For example, when a KPI metric is measured at 10.45 AM, the average against which it is compared is calculated from the last 30 days of measurements at 10.45 AM. The minimum and maximum targets can be defined in terms of small, medium, or large deviations from these moving averages. In contrast, a fixed KPI target essentially represents a straight line, as either a minimum or maximum. This is shown in [Figure 6–13](#).

**Figure 6–13 Automatic and Fixed KPI Targets Contrasted**



### Alert Handling

Optionally, KPIs can be configured within RUEI to generate alerts when they move outside their defined boundaries. If enabled, the configuration defines the duration the KPI must be down before an alert is generated, the severity of the reported incident, and whether an additional notification should be generated when the KPI has returned to its defined boundaries. The reporting of these alerts is described in [Section 6.7, "Monitoring KPI and SLA Alert Reporting"](#).

#### 6.6.1.2 Usage Data Tab

The **Usage Data** tab displays information about the top executed user requests and about the top users.

The **Top Executed User Requests** display, is shown in the next figure. This region enables you to view the most frequent user requests and actions, and their impact on the business application. These actions can be specific page names, or combinations of suite-specific dimensions (such as Siebel screen, module, and view names).

**Figure 6–14 Top Executed User Requests**

Actions		Page Views	Violations Percentage		
			Total (%)	User (%)	Application (%)
Toyco Order Form	Toyco	2216	49.00	0.00	49.00
Logistics Manage Cycle Counts	CountWorkArea no componentDisplayName in UserActivityInfo	968	100.00	0.00	100.00
crmCommon	mktImportWorkArea				

Columns Hidden: 4

The **Top Users** region enables you to monitor the most active users of the targets associated with the business application. This includes session and page view information, as well as user and application violation indicators. An example is shown in [Figure 6–15](#).

Use this region to verify the performance of the most popular user requests associated with a business application (such as downloads or payment handlings).

**Figure 6–15 Top Users**

User ID	Sessions	Page		Violations Percentage		
		Views	Avg Load Time (sec)	Total (%)	User (%)	Application (%)
Elaine	25	3846	2.79	21.27	0.00	21.27
sam	758	3434	8.79	12.58	0.00	12.58
edward	758	2282	4.48	35.10	0.00	35.10
BANDERS	49	2157	2.24	30.09	0.00	30.09
ien	376	1687	12.17	22.64	0.00	22.64

Columns Hidden: 3

Selecting a user opens the RUEI Session Diagnostics facility and displays detailed information about the selected user. For more information, see [Section 6.6.2, "Working With Session Diagnostics"](#).

### 6.6.1.3 Violations Data Tab

The **Violations Data** tab enables you to examine the suite and application pages, as well as service functions, with the highest number of associated violations. An example is shown in [Figure 6–16](#).

**Figure 6–16 Violations Data**

Name	Trend	Violations		Page Views
		Total Count	Total (%)	
▽ Fusion Component (FusionReply)				
▷ no componentDisplayName in UserActivityInfo		145	100.00%	145
▷ Cancel		6	100.00%	6
▷ Next		6	100.00%	6
▷ Save and Close		6	100.00%	6
▷ 2055502 Receipts		4	100.00%	4
▽ Fusion Component Type (FusionReply)				
▷ Table		54	100.00%	54
▷ Query		44	100.00%	44
▷ Command Link		26	100.00%	26
▷ Command Button		22	100.00%	22
▷ Command Image Link		8	100.00%	8



The application violation counter reports the number of website, network, server and content errors, while the user violation counter reports the number of content notifications and client aborts. A *content notification* is the detection of a predefined string within a page (such as "Order processed successfully"); a *client abort* refers to a page view that was aborted by the client, possibly because the client closed the browser, or clicked reload, or clicked away, while the page was loading.

For each suite instance, total counters are also reported for each of its associated suite-specific data items (such as Oracle Fusion view ID). See the *Oracle Real User Experience Insight User's Guide* for further information on these items.

Note that the number of items (such as page names or suite-specific data items) listed for a category can be controlled via the **Show** menu. For example, list only the 5 or 10 items with the most violations. The **Minimum Violations** menu allows you to specify the threshold of violation incidents that needs to be met for a page before being reported.

### Violation Reporting

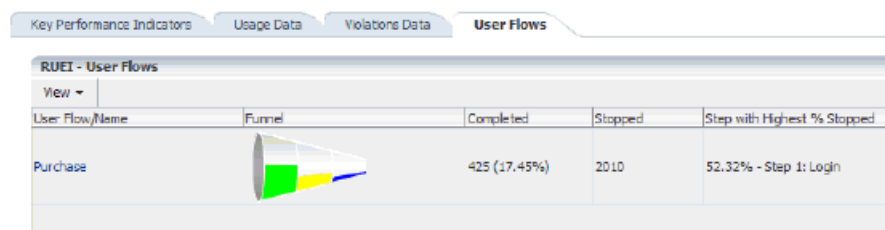
If a page or object experiences several types of errors (for example, both a network and a web service error), the page or object error is not recorded multiple times. Instead, it is reported according to the following order: website, server, network, and content. For example, if an object experiences both a website and a network error, the error is recorded as a website error.

The application violation counter reports the total number of website, network, server, and content errors. The user violation counter reports the total number of content notifications and client aborts. An example of the possible use of these counters would be the creation of dashboards to track the general health of specific applications. These counters are also available for use as KPI metrics.

#### 6.6.1.4 User Flows Tab

The **User Flows** tab displays information about the user flows associated with the current Business Application. An example of the data displayed in this tab is shown in [Figure 6–17](#). The information shown includes a graphic representation of the loss of users through the defined steps, the number of steps completed and the number of steps stopped.

**Figure 6–17 User Flows**



### 6.6.2 Working With Session Diagnostics

The Session Diagnostics facility allows you to perform root-cause analysis of operational problems. It supports session performance breakdown, including the impact of failing pages and hits on sessions, the full content of each failed page, and the relationship between objects, page views, and sessions. Moreover, it offers the opportunity to track exactly what error messages visitors to the monitored website receive, and when. With this ability to recreate application failures, you can identify and eliminate annoying or problematic parts of your web pages.

This section explains the use of the Sessions Diagnostics facility. It covers the following topics:

- [Getting Started](#)
- [Customizing Session Diagnostics Reporting](#)
- [Exporting Full Session Information](#)
- [Exporting Session Pages to Microsoft Excel](#)

#### 6.6.2.1 Getting Started

To locate the diagnostics information you require, do the following:

1. On the Business Application home page, from the **Business Application** drop down, select **Real User Experience (RUEI)** and then **RUEI Session Diagnostics**.
2. Use the **View Data** menu to select the required period. Note that the availability of session diagnostics information is determined by the Statistics and Session Diagnostics data retention policy settings specified for the associated RUEI instance. For more information, see the *Oracle Real User Experience Insight User's Guide*.
3. Specify the appropriate search criteria to locate the required user record(s). The available default search criteria are controlled by the RUEI instance configuration (described in [Section 6.6.2.2, "Customizing Session Diagnostics Reporting"](#)). You can click **Add Fields** to make additional search criteria available. Be aware that while the use of wildcard characters (\*) is supported, all other search characters are treated as literals. Also, *all* criteria specified for the search must be met for matched user records to be reported.

You can specify multiple values for a single dimension by clicking **Add Fields**, and selecting the required dimension. In this case, only *one* of the specified values needs to be found in order for a match to be made.

After updating the appropriate search filters, you can save the search combination by clicking **Save**. Note that changes to saved searches can influence the available fields within the **Add Fields** facility. In addition, the predefined list of available dimensions is based on the business application definition. For example, only oracle Fusion-specific dimensions are available if the business application is defined as a Oracle Fusion suite.

When ready, click **Search**. The results of the search are shown in the lower part of the area. An example is shown in [Figure 6-18](#).

**Figure 6–18 Session Diagnostics Search Results**

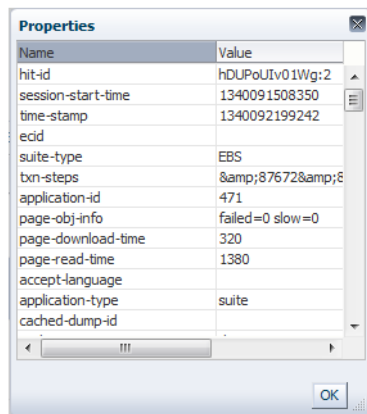
Period/Hour	User ID/ID	Client Location	Info
06/11 14:35 - 06/11 15:13	anonymous	Location/Country: Client Location/City: Beijing Client Location/IP: 122.119.90.108	Application Violation Page Views: 2 Frustrated Page Views: 2 Content Errors: 0 Network Errors: 0 Server Errors: 0 Website Errors: 0 User Violation Page Views: 0 Client Aborts: 0 Content Notifications: 0 Page Load Time (s): 3.85 Page Views: 20
06/11 15:00 - 06/11 15:09	anonymous	Location/Country: Client Location/City: Beijing Client Location/IP: 122.119.90.108	Application Violation Page Views: 2 Frustrated Page Views: 2 Content Errors: 0 Network Errors: 0 Server Errors: 0 Website Errors: 0 User Violation Page Views: 0 Client Aborts: 0 Content Notifications: 0 Page Load Time (s): 33.4 Page Views: 6
06/11 14:47 - 06/11 15:06	anonymous	Location/Country: Client Location/City: Beijing Client Location/IP: 122.119.90.108	Application Violation Page Views: 5 Frustrated Page Views: 3 Content Errors: 2 Network Errors: 0 Server Errors: 0 Website Errors: 0 User Violation Page Views: 0 Client Aborts: 0 Content Notifications: 0 Page Load Time (s): 14.8 Page Views: 8
06/11 15:02 - 06/11 15:03	anonymous	Location/Country: Client Location/City: Beijing Client Location/IP: 122.119.90.108	Application Violation Page Views: 0 Frustrated Page Views: 0 Content Errors: 0 Network Errors: 0 Server Errors: 0 Website Errors: 0 User Violation Page Views: 0 Client Aborts: 0 Content Notifications: 0 Page Load Time (s): 7.07 Page Views: 2
			Application Violation Page Views: 0 User Violation Page Views: 0

- Click the user record of interest from the displayed list. Information like the one shown in [Figure 6–19](#) is displayed.

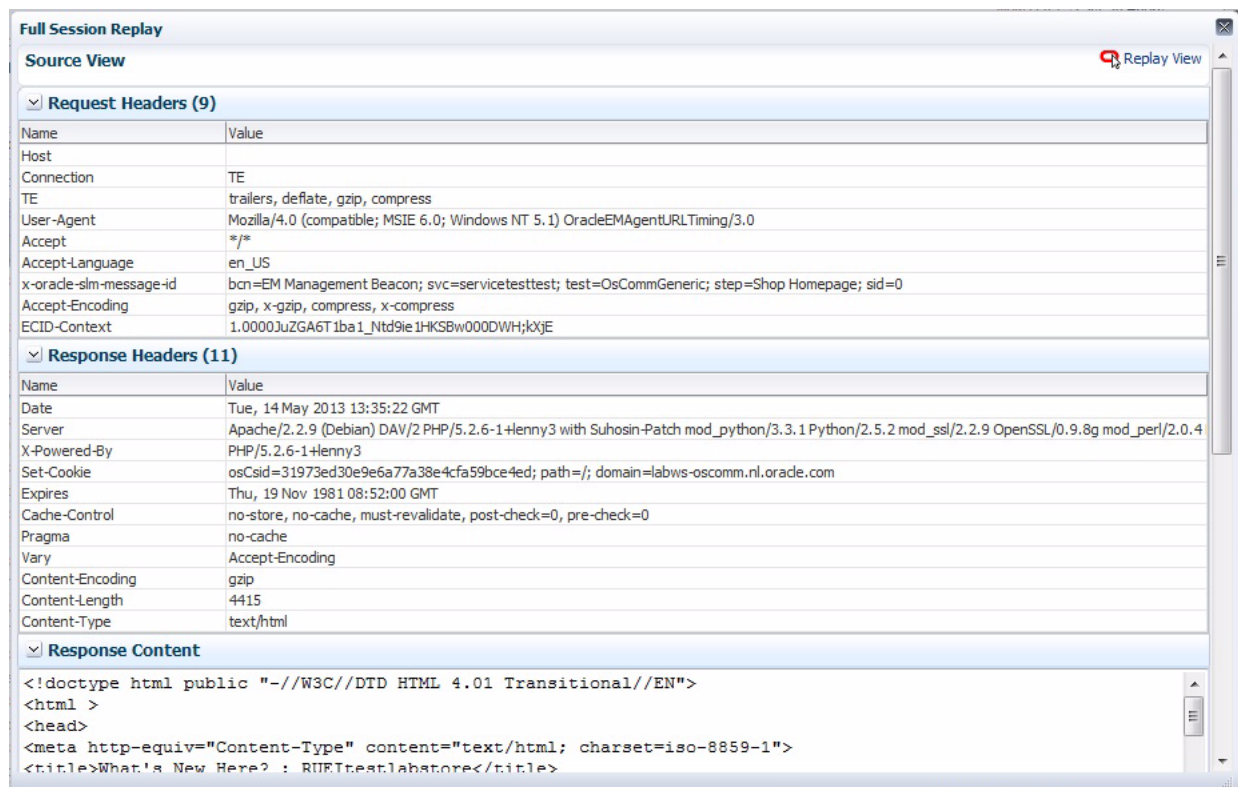
**Figure 6–19 Example Session Activity Listing**

<div> <div>Search In</div> <div>Issue Type</div> <div>Value</div> <div>Search</div> <div>Previous (0)</div> <div>Next (0)</div> <div>Export as Zip</div> <div>Export as XLS</div> </div>				
Session Activity	Page Load Time (s)	Info	Object End-to-end Time (ms)	Time
<div> <div>full page refresh</div> <div>155.66.103.236</div> </div>	0.0	<div> <div></div> <div></div> <div></div> </div>		06/24 23:58
<div> <div>/receivables/faces/index</div> <div></div> </div>		<div> <div></div> <div></div> <div></div> </div>	126	06/24 23:58
<div> <div>/receivables/faces/index?_afLoop=36197175452000&amp;_afWindowMode...</div> <div></div> </div>		<div> <div></div> <div></div> <div></div> </div>	12	06/24 23:58
<div> <div>/receivables/faces/index?_afLoop=36198070542000&amp;_afWindowMode...</div> <div></div> </div>		<div> <div></div> <div></div> <div></div> </div>	138	06/24 23:58
<div> <div>full page refresh</div> <div>155.66.103.236</div> </div>	0.0	<div> <div></div> <div></div> <div></div> </div>		06/24 23:59
<div> <div>ManageFCPaymentMethods</div> <div>155.66.103.236</div> </div>	0.891	<div> <div></div> <div></div> <div></div> </div>		06/24 23:59
<div> <div>ManageFCPaymentMethods</div> <div>155.66.103.236</div> </div>	0.0	<div> <div></div> <div></div> <div></div> </div>		06/24 23:59
<div> <div>06/24 23:35</div> <div>0</div> <div>15</div> <div>20</div> <div>25</div> <div>06/25 00:00</div> </div>				
<div> <div>User ID anonymous</div> <div>Client IP 155.66.103.236</div> </div>				

- The overview shows the pages and actions recorded within the selected user record. Icons indicate slow or failed objects, the page-loading satisfaction, whether replay content is available, and whether clickout is available to JVM Diagnostics to provide activity information. (Clickout capability is shown by the Oracle icon.) The camera replay can show a pop-up with full contents of the hit. This allows access to the original html in full detail.
- You can click a page or object within the selected user session to open a window with detailed technical information about it. An example is shown in [Figure 6–20](#).

**Figure 6–20 Page Properties Window**

When replay content is available an icon is displayed in the Session Activity Listing as shown in [Figure 6–19](#). You can click on the icon to open a pop up showing the Replay Content that was recorded. An example is shown [Figure 6–21](#).

**Figure 6–21 Full Session Replay**

Click the **Replay View** link in the upper right corner of the screen to be redirected to the RUEI server, where you see the browser view of the Session Replay Content. You might be required to log in to the RUEI server.

- The list of matched user sessions shown in [Figure 6–18](#) is based upon the period selected in the **View** menu. For example, if the period "Last hour" is selected, the list of matched user sessions is based on sessions that were active during that period. However, they may have started or finished outside this period. For this

reason, you can use the slider at the bottom of [Figure 6–19](#) to restrict the displayed page views and actions to a more specific period.

8. Optionally, click **Export as Zip** to export the session's complete contents to external utilities for further analysis (described in [Section 6.6.2.3, "Exporting Full Session Information"](#)) or **Export as XLS** to export a summary of the pages within the session (described in [Section 6.6.2.4, "Exporting Session Pages to Microsoft Excel"](#)).

### 6.6.2.2 Customizing Session Diagnostics Reporting

You can control the specific dimensions reported in Session Activity part of the Session Diagnostics for applications, suites and services. To do so:

1. From the **Setup** menu, select **Middleware Management**, then select **Application Performance Management**. The currently registered RUEI instance is shown in the **RUEI Systems** row of the Application Performance Management page shown in [Figure 6–2](#).
2. Select the required RUEI system. Click **Configure**. The **Edit Dimension Listing** page shown in [Figure 6–22](#) is displayed.

**Figure 6–22 Edit Dimension Listing Page**

3. Use the **Application Type** menu to select whether you want to modify the dimension listings for generic applications (that is, applications that are not suite-based), services, or suites. If the latter, you will need to specify the suite type.
4. Use **Move** and **Remove** to select the dimensions that should be listed. Once selected, you can control the order in which the item appears in the list. When ready, click **Save**.

### 6.6.2.3 Exporting Full Session Information

In addition to viewing session information, you can also export complete session contents to external utilities for further analysis or integration with other data. For example, you could use complete real-user sessions as the basis for test script generation. Test platforms, such as Oracle Application Testing Suite (ATS), can easily be configured to generate automated test scripts for an application's most common usage scenarios.

In addition, this facility can also be used to support root-cause analysis. Complete user session information can be provided to application or operations specialists to help identify unusual or difficult to isolate issues. Sensitive information within the exported data is masked according to the actions defined in the HTTP protocol item masking facility. This is described in the *Oracle Real User Experience Insight User's Guide*.

To export session information:

1. Locate the required session, and click **Export as Zip**.
2. Depending on how your browser is configured, you are either prompted to specify the location to which the zip file should be saved, or the session is immediately saved to the defined default location.

### Important

In order for the session export files to be created correctly, you should do the following:

- Ensure that the requirements for exporting session information described in [Section 6.2, "Prerequisites and Considerations"](#) have been met.
- Verify the exported content files (described in the following section) are present before attempting to import an exported RUEI session into an external utility.

### Understanding the Structure of the Exported Data

The exported session zip file contains the following files:

- `data.tab`: contains the direct (raw) hit information for the selected session extracted from the Collector log file.
- `page.tab`: contains the direct (raw) page information for the selected session extracted from the Collector log file.
- `content_hitno.tab`: contains the complete (raw) content information for the indicated hit. There is a file for each hit within the `data.tab` file that has content. For example, if the third and sixth hits had content available for them, two files would be created: `content_3.tab` and `content_6.tab`.

Viewable versions of the files cited in the hit file are also available under the `content_viewer` directory. This means that data transferred with chunked encoding can be immediately viewed. Note that the same *hitno* as in the `data.tab` file is used in their file naming.

- `index.html`: allows developers and other interested parties outside RUEI to view and analyze session details as they would appear within the Session Diagnostics facility, with access to source, page and object details, and element identification.

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**Note:** The log files used as the basis for creating exported session files are also used internally by RUEI. The format and contents of these files is subject to change without notice.

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#### 6.6.2.4 Exporting Session Pages to Microsoft Excel

You can export a summary of the pages within the currently selected session to Microsoft Excel.

1. Locate the required session, and click **Export as XLS**. Depending on how your browser is configured, you are either prompted to specify the tool with which to

open the file directly (by default, Microsoft Excel), or the session is immediately saved to the defined default location.

2. Within Microsoft Excel, you can view and edit the generated file. The exported page view history and session summary can be used to compile sets of real-user sessions that could be used as the basis for testing or performance analysis.

### Controlling Row Creation and Ordering

Be aware that the rows that appear in the Microsoft Excel export are based on the currently specified RUEI configuration. This is described in [Section 6.6.2.2, "Customizing Session Diagnostics Reporting"](#).

## 6.6.3 Monitoring RUEI Metrics

As part of Business Application monitoring, the RUEI Metrics page presents a useful overview of user-selectable metrics within a given timespan. These metrics can be counts (for example, page views) or aggregate values (such as, median page load time).

To view the RUEI Metrics page, select **Real User Experience (RUEI)** and then **RUEI Metrics** from the **Business Application** drop down, as shown in [Figure 6-23](#).

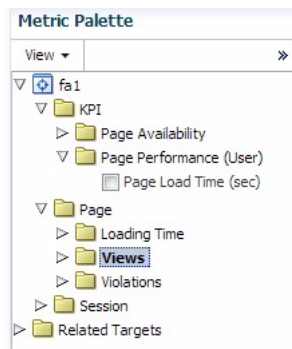
**Figure 6-23 RUEI Metrics**



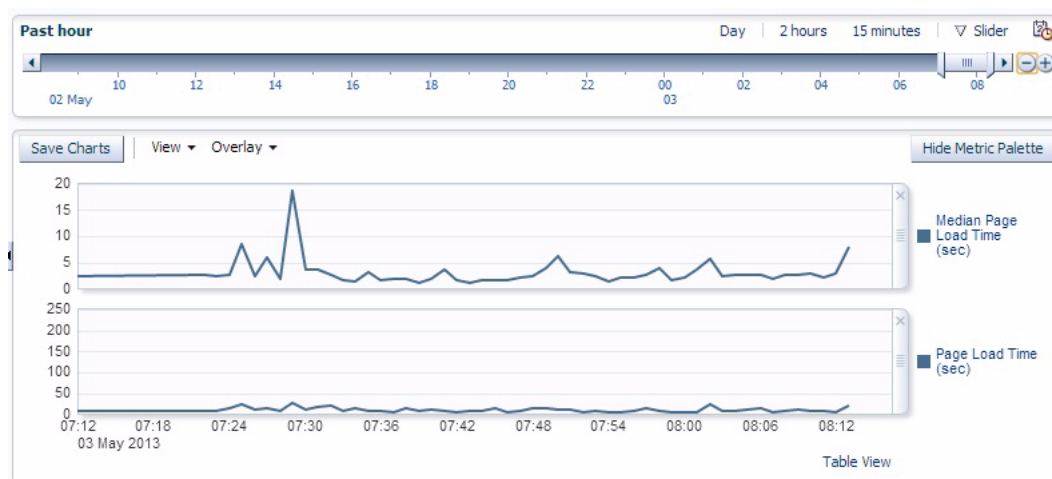
This page allows you to select performance metrics and view their associated average and median data graphically.

The time-period for the data can be set and search filters similar to those on the RUEI Session Diagnostics Page allow you to further refine the data returned. Filter settings can be saved for subsequent use. The selectable metrics are arranged in an hierarchical tree palette. The list displays a set of items that is appropriate for the configured business application type. This set can expand to include system metrics. For example, if the application associates to a WebLogic server, JVM metrics become available in addition to RUEI metrics. An example of a metrics palette is shown in [Figure 6-24](#).



**Figure 6–24 Metric Palette**

Note that the individual metrics graphs can be combined into one chart using the graph toolbar. Figure 6–25 shows a sample graph for performance metrics collected over a 60 minute period.

**Figure 6–25 Sample Metrics Graph**

Incident Manager allows you to navigate directly from a KPI event to the RUEI Metrics page. In this case, the RUEI Metrics page is populated with time and filter settings relevant to the context of the KPI event. Therefore, you can inspect relevant metrics around the offending event, be it in time-period or in filters broader than those that correspond to the original KPI event.

From the **RUEI Metrics** page there is a direct link to the session diagnostics facility. When you click this link, the search properties and time-span will be re-used to find sessions that match the active criteria.

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**Note:** Selecting median values over a large timespan can impact performance.

---

## 6.7 Monitoring KPI and SLA Alert Reporting

This section explains the KPI-related information that is available for both RUEI applications and BTM Transactions.



The alerts generated by KPIs defined for the applications, suites, and services, as well as for the SLAs for the transactions that comprise your business applications are reported as events in **Incident Manager**. To view these events:

1. From the **Enterprise** menu, select **Monitoring**, and then **Incident Manager**.
2. Open the **Events Without Incidents** predefined view.
3. Click the event of interest to view more information about it.

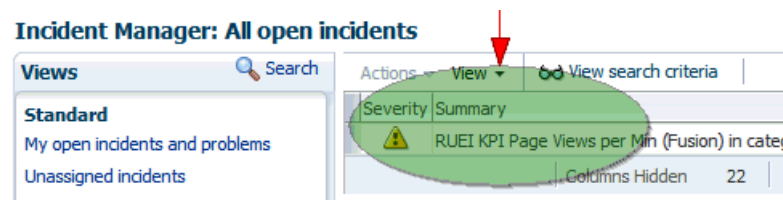
Event detail information varies depending on whether the event is based on a RUEI KPI or BTM SLA. Each is described in the following sections.

You can also access the **Events Without Incidents** view from the home page of a business application using the **Business Application** menu. Select **Monitoring**, then **Incident Manager**, and **Events without Incident**. This option shows events in the context of the selected Business Application.

### RUEI Event Detail

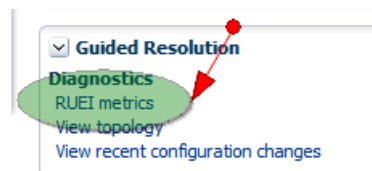
After accessing the **Events Without Incidents** view, you will see events listed as shown in [Figure 6–26](#).

**Figure 6–26 Incident Manager**



When you click on the RUEI event, you'll see event details at the bottom of the screen in the **Guided Resolution** region (as shown in [Figure 6–27](#)).

**Figure 6–27 Accessing RUEI Metrics from Incident Manager**



Select RUEI metrics to drill down to the **RUEI Metrics** page in context of the filters that were set up for the KPI as well as in the time frame of the KPI violation. The **RUEI Metrics** page will also show the metric that is the basis for the KPI definition.

The status of the KPIs defined for the applications, suites, and services that comprise your business applications are reported in the RUEI - Key Performance Indicators (KPIs) tab (explained in [Section 6.6.1.1, "RUEI Key Performance Indicators Tab"](#)).

This provides information about the Business Application associated with the KPI, as well as the metric upon which the KPI is based. Note that for ease of management, KPIs within RUEI are grouped into categories that can be customized to contain related performance indicators. For example, separate categories could be defined for business and IT-related issues, such as user flow completion, visitor traffic, website availability, and so on.

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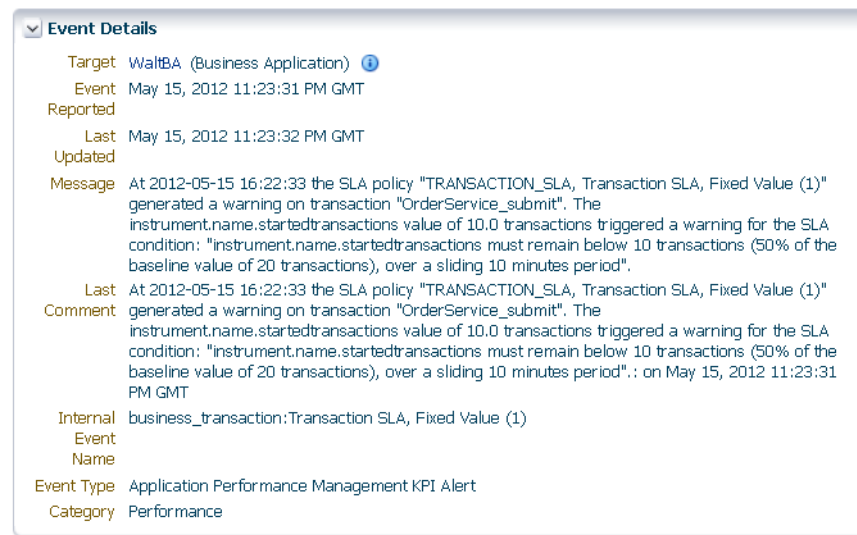
**Important:** In order to view KPI alerts within Incident Manager, you will need to set up a connection between RUEI and the Oracle Enterprise Manager Repository. The procedure to do this is described in the *Oracle Real User Experience Insight Installation Guide*.

---

### BTM Event Detail

Information about BTM SLA alerts is shown on the **Alerts** tab and on the **SLA Compliance** tab for BTM. Events corresponding to these alerts are also shown in the **Events Without Incidents** view of the Incident Manager. When you click the event of interest, information similar to that shown in [Figure 6-28](#) is displayed.

**Figure 6-28 BTM SLA Alert Event Details**



Information is provided about the following:

- **Target:** the business application containing the service or transaction for which the event was reported.
- **Event Reported:** the date and time when the event was reported.
- **Last Updated:** if the severity of the event has changed, this indicates the date and time when it has changed.
- **Message:** details about the event and the condition that triggered it.
- **Last Comment:** indicates comments manually added to events via the "Comments..." link in Incident Manager. If none have been added, then the original message is reported.
- **Internal Event Name:** a combination of the managed object type whose threshold was breached (business\_transaction, service, or service\_endpoint) and the original SLA policy name.
- **Event Type:** this is always "Application Performance Management KPI Alert" for BTM SLA alerts.
- **Category:** this is always "Performance" for BTM SLA alerts.

---

**Important:** In order for BTM Service Level Agreement alerts to be reported as events in Oracle Enterprise Manager, you must set up a connection between BTM and the EM repository. Please consult the *Business Transaction Management Installation Guide* for instructions on how to configure this connection.

---

## 6.8 Monitoring BTM Transactions in Enterprise Manager

The **Business Transactions** region shown on the Business Application home page (Figure 6–11) provides a high-level overview of each transaction within the selected business application. An example is shown in Figure 6–29.

**Figure 6–29 Business Transactions Region**

Name	Status	Completed Transactions		Started Transactions		Avg Response Time (ms)		Max Response Time (ms)	
		Trend	Value	Trend	Value	Trend	Value	Trend	Value
tc_Submit Order	✓		1014		1066		23629		122184

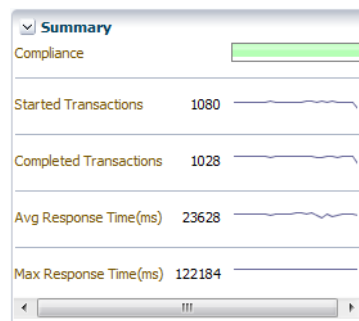
For each transaction, it indicates:

- The transaction's current compliance status.
- The number of transaction instances started during the period. A transaction instance starts when an instance of the primary operation flow is started.
- The number of transaction instances that completed during the period. An instance is considered to have completed when both its start and end messages have been observed, regardless of whether condition alerts occurred.
- The average amount of time a transaction requires to complete. For each transaction instance, this is calculated as the time from when the instance's start message is observed until its end message is observed.
- The maximum amount of time a transaction requires to complete. This is the single highest response time from all transaction instances observed during the period.

You can click a transaction to view more information about it. This opens the Transaction Home page, where you can view the following regions:

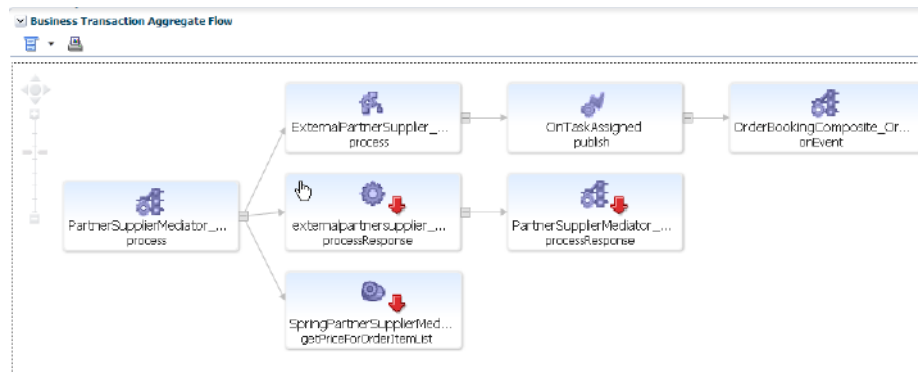
- **Summary:** provides a graphic rendering of the transactions' overall compliance and core metrics. An example is shown in Figure 6–30.

**Figure 6–30 Summary Region**



- **Business Transaction Aggregate Flow:** provides a graphical rendering of the operations that make up the selected transaction and their status. An example is shown in [Figure 6–31](#).





























**Figure 6–31 Business Transaction Aggregate Flow Region**



The aggregate flow region provides you with a complete picture of the transaction and helps you understand the flow of work through it. You can use it to identify and resolve issues related to performance, and to isolate the cause of failing components in a business process. Based on the dependencies revealed by discovery, the services that interact within the transaction are also revealed. Additional information is usually available if you move the cursor over the links that connect operations or the operation itself. This should allow you to identify bottlenecks, faulty components, slow components, and unusually light or heavy traffic.

- **Operations:** indicates all the logical operations associated with the transaction. An example is shown in [Figure 6–32](#).

**Figure 6–32 Operations Region**

Operations											
Name	Compliance	Uptime (%)	Violation Alerts	Avg Response Time (ms)		Max Response Time (ms)		Throughput (count)		Faults (count)	
				Trend	Value	Trend	Value	Trend	Value	Trend	Value
> CatalogService.getAllProducts	✓	100 ⇄	0		3		225		2591		0
> CatalogSessionService.retrieveCatalog	✓	100 ⇄	0						0		0
> ProductEntityService.getProduct	✓	100 ⇄	0						0		0
> PurchasingDB.executePrepStmt	✓	100 ⇄	0		1		182		6529		0
> PurchasingService.createNewOrder	✓	100 ⇄	0		10926		45633		590		486
> SubmitOrderQSService.submitOrder	✓	100 ⇄	0		10453		21281		590		486
> purchasingClient.orderApplication.jsp_action_Submit_Order	✓	100 ⇄	0		23680		122184		1024		52

You can expand an operation to view its corresponding endpoints. An operation might have several corresponding endpoints if it has been replicated or if different endpoints are used for secure/unsecure communication. For each endpoint, the host name and port for the container where the endpoint resides are also displayed, together with its status and performance data. If you right click an endpoint in the **Operations** or **Business Transaction Aggregate Flow** region, you can choose to display the tabs associated with the physical operation. The context menu that is displayed when you right-click an operation also provides the option to access the JVM view or the Request Instance Diagnostics view:

- The **JVM Diagnostics** view allows you to view the details of an executing Java Virtual Machine (JVM) process for the period within which a given operation executes. You can see stack frames for executing threads, thread state information, aggregate information about the frequency and cost of method

execution, information regarding the holding of Java and DB locks, and details about the objects in the Java heap. JVMD also stores historical data for each JVM it monitors so that you can view data relating to things that have happened in the past and get a sense for historical trends.

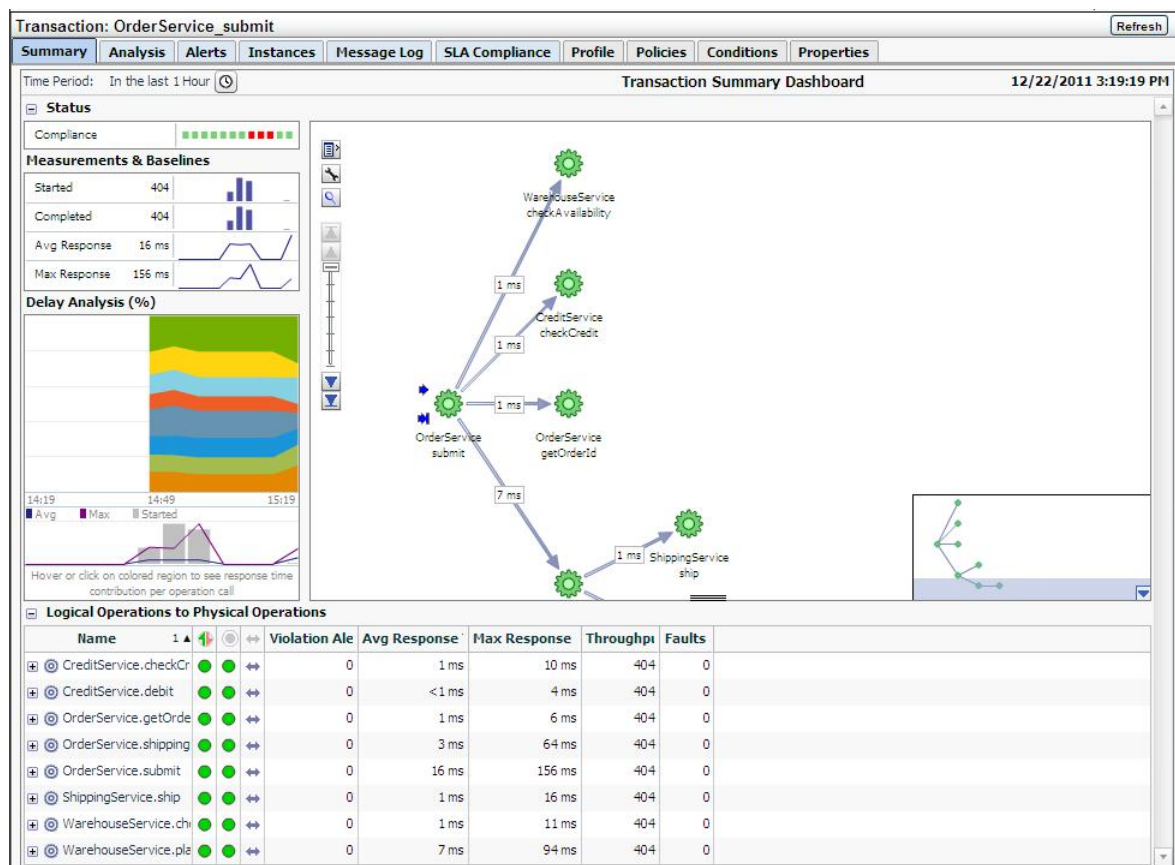
- The **Request Instance Diagnostics** view allows you to trace the path of a request in a WebLogic domain and to generate a report of all the metrics associated with a particular instance of the request.

Please see [Chapter 5, "Getting Detailed Execution Information,"](#) for additional information about these views.

## 6.9 Working Within Business Transaction Manager

Additional information about a selected transaction is available by clicking **Launch BTM** at the top-right hand of the Transaction Home page. This will open a new window with the Business Transaction Management console providing extended information about the selected transaction. The first time you open this window you will need to provide a valid BTM user name and password. An example is shown in [Figure 6–33](#).

**Figure 6–33 Business Transaction Management Console**



The following sections describe the Tabs display as they apply to a given transaction; similar information is displayed if you look at tabs for a physical operation. Additional information is available from the *Oracle Business Transaction Management Online Help*.

## 6.9.1 Summary Information

The **Summary** tab uses four panes and a grid view to present performance information in a **Transaction Summary Dashboard**. It contains the following elements:

- A **Status** pane indicating the overall compliance for the transaction.
- A **Measurement and Baselines** pane detailing the number of started and completed transactions, average response times, and maximum response times. If baselines have been defined for the transaction, these are shown as gray lines.
- A map of the transaction detailing average response times for each transaction link. Place the cursor over each service icon to obtain detailed performance information for that service. The thickness of the arrows indicates throughput.
- The **Delay analysis** pane, which you can use in conjunction with the map pane, provides a graphical rendering of the proportion of the overall response time that is spent in each hop (link) of the transaction.

Each colored area of the grid corresponds to a transaction link. Clicking within a colored region highlights its corresponding link in the map and displays the percentage of the response time taken up by that hop.

At the bottom of this pane, a graph shows the average and maximum response times, and the number of started transactions. Clicking within the pane displays a vertical red line that shows how the colored proportions correspond to message traffic flows.

- A grid view showing the logical and physical operations that make up the transaction, and the following instruments for each: violation alerts, average response time, maximum response time, throughput, and faults.

## 6.9.2 Analyzing Transaction Information

The **Analysis** tab displays detailed current performance and usage information for the selected transaction. It contains the panes described in [Table 6–1](#).

**Table 6–1 Panes Within Analysis Tab**

Pane	Description
Performance	Provides data about started transactions, completed transactions, condition alerts, average response time, and maximum response time. The data is displayed in graphic form as well as using a grid view.
Conditions	Provides information about condition alerts that have been triggered in a given time period: the name of the condition that was met, the endpoint where the condition alert was triggered, and the number of condition alerts triggered. Conditions must have been defined for this information to be collected and displayed.
Consumer Usage	Displays performance information segmented by consumer for the given time period: started transactions, completed transactions, average response time, and maximum response time. Consumers must have been defined and consumer segmentation enabled for this information to be collected and displayed.
Breakdown by Client Address	Displays performance information segmented by client IP address: started transactions, completed transactions, average response time, and maximum response time. The client address is the machine host name from which the request was sent. The table lists all client addresses that sent requests, and displays the aggregated performance measurements associated with each client address. Segmentation by client IP address must be enabled for this data to be collected and displayed.

**Table 6–1 (Cont.) Panes Within Analysis Tab**

Pane	Description
Violation Alerts	Displays information about service level agreement (SLA) violations. The display distinguishes between warning alerts and failure alerts. The graph shows aggregate measurements for violation alerts. The grid view lists more detailed information: showing alerts for each SLA policy. SLAs must have been created for this information to be collected and displayed.
Custom Charting	Lets you set up a customized chart and table similar to the Performance pane, but with instruments of your choosing. Click <b>Choose Instruments</b> , and select the instruments you want displayed in the chart and table. You can select multiple instruments. When you set up a custom chart/table for a transaction, it is available for any selected transaction.
Custom Breakdown	You can set up a custom table of numeric instruments segmented in various ways. Click <b>Choose Instruments</b> and select the instruments that you want displayed in the table. Click <b>Choose Segments</b> and select how you want to segment the measurements. You can select multiple segments.

### 6.9.3 Viewing Alerts

The **Alerts** tab shows information about all alerts occurring in the given time period. Business Transaction Management issues the following types of alerts:

- Service level agreement alerts issued when a deviation occurs from the standards of performance you have defined for a transaction.
- Condition alerts issued when a condition is satisfied. Conditions can test for faults, specific property values, or a missing message.
- System alerts issued to provide information about the health of the monitoring infrastructure.

The grid view shows the following information for each alert: time of occurrence, an icon denoting the severity of the alert, the source of the alert, the instrument measured, and for SLA alerts, the enforcement value. To obtain more information about a given alert, click the **Inspector** icon to open an inspector window.

Service level agreement alerts are also reported as events in Incident Manager. For more information on accessing these events, see [Section 6.7, "Monitoring KPI and SLA Alert Reporting"](#).

### 6.9.4 Viewing Transaction Instances

The **Instances** tab allows you to view captured transaction instances.

A transaction usually executes many times in a given period. If you have enabled transaction instance logging or if you have enabled fault monitoring, Business Transaction Management tracks the flow of messages included in the transaction and maps these to particular *transaction instances*. It assembles the messages for a transaction instance in the following cases:

- When an alert is generated as a result of a fault, or a condition being met.
- When you explicitly ask for assembly.

Once a transaction instance is assembled, you can use the **Instances** tab to access detailed performance information for that instance. You can also use the **Message Log** tab to search for messages containing particular property values.

#### Viewing Aggregate Information

In the **Instances** tab, The ID column of the table lists both instances that have been assembled (these have an ID value assigned) and instances that have not been



assembled (these are blank). Information for each instance shows when it was captured, what the overall response time for the transaction instance was, and values for properties if you have created these.

The **Show instances** filtering control allows you to list instances that have occurred in a set time period or to show only assembled instances.

Which instances you choose to assemble depends on what interests you. For example, you might want to assemble an instance with an unusually slow response time; or you might want to assemble an instance with an unexpected property value.

If you are capturing a very large set of messages, you might want to use the **Message Log** tab to search for a smaller set of messages, based on property values, and then assemble one or more of these.

### Inspecting an Assembled Instance

You can assemble an instance by clicking the **Inspector** (magnifying glass icon) for the instance. This opens a **Transaction Instance Inspector**. It consists of three parts:

- The top part of the inspector shows the name of the transaction, the time the assembled instance started executing, its ID, the number of message exchanges, the total messages exchanged, and the response time between the starting and ending messages. Any warnings or faults are also shown.
- The instance map shows the entire transaction instance, with the response time given for each request/response link. Move the cursor over the operation name to view the service type, endpoint name, host name, and port. Right clicking an operation allows you to view JVM diagnostics.
- A grid view shows detailed information for each message included in the transaction instance. The view includes property values if these have been defined. Right clicking a row allows you to view JVM diagnostics.

Clicking the magnifying glass (tear-off control) for any operation, opens a **Message Content** inspector window, and displays the contents of the selected message if you have enabled message content logging for that operation.

## 6.9.5 Viewing Message Logs

You can use the **Message Log** tab to view the following information:

- If instance logging is enabled, you can view information about each message logged in a specified time period, as well as the value of any property associated with a message. You can also use the **Message Log Search** tool to search for a message or messages that contain property values of interest.
- If message content logging is enabled, you can view information about each message logged in a specified time period, as well as its content. In this case, in addition to searching for messages based on property values, you can also search based on the content of any message element (free text search).

Business Transaction Management logs message content or instance and property values only if you have done the following:

- Enabled monitoring for the transaction.
- Enabled the appropriate type of logging for the transaction (instance or message).
- Selected one or more operations for message logging.

Logged information is stored according to storage settings that you define when you create the transaction.



## Viewing Message Content

The **Message Log** tab uses a grid view to display a list of messages, showing the arrival time of the request message, the service that includes the selected operation, the location of the endpoint that implements the service, the operation (message), and the type of operation. If there are any properties associated with the operation, their values are shown in additional columns whose title is the property name.

If you have message content logging enabled, double clicking on any message shows you the contents of the message. The set of messages shown in the grid varies depending on the setting of the filters shown at the top of the tab. These allow you to see the following:

- All operations or specific operations chosen from a drop down list.
- Any response, only successful operations, only failures.
- Messages that arrived within a time interval denoted by the last specified time period, since a certain time, or between two given times.

You can use these controls to narrow the selection of messages shown in the grid. After you change filter settings, click **Search** again to repopulate the grid. You can further restrict your search by using the **Message Search tool** accessed from the **Choose Content...** link. This allows you to search for messages based on their property values or, if message content is enabled, based on message content. This tool is described in the next section.

## Searching for Messages

You can find messages belonging to the current transaction, by clicking the **Choose Content...** link from the **Message Log** tab. This brings up a dialog that includes three areas to use for specifying search criteria: an area labeled **Message property** search, an area labeled **ECID**, and one labeled **Free text** search. You use controls in these areas to search for a set of messages based on a property value, an ECID value, and/or on text content. As you enter property, ECID, and free-text values, a search expression is constructed in the text box at the top of the dialog. To clear the text box and start over, press **Clear**.

Additional information about using Oracle query language to construct your query is available at the following location:

[http://download.oracle.com/docs/cd/B28359\\_01/text.111/b28304/cqoper.htm#BABBJGfJ](http://download.oracle.com/docs/cd/B28359_01/text.111/b28304/cqoper.htm#BABBJGfJ)

When you are done defining the expression to be used in the search, click **OK**. Then click **Search** to repopulate the grid according to your newly defined search criteria. For more information about the Message Log Search tool for searching for messages with a specific ECID, see the *Business Transaction Management Online Help*.

## 6.9.6 Viewing Service Level Agreement Compliance

The **SLA Compliance** tab displays the current state of Service Level Agreement (SLA) compliance for the selected transaction. These are specified during transaction creation. You use such agreements to set standards of performance for a business application. You can then monitor deviations from those standards. To view both condition alerts and SLA alerts, use the **Alerts** tab. The SLA Compliance tab has the following subtabs:

- The **Threshold Compliance** subtab provides real-time monitoring of the selected transaction. It uses a grid view. Each row represents one performance objective. The columns provide various types of static information that identify and define

the objectives. Also provided are the following dynamic columns with real-time monitoring values:

- The **Current Status** column can have three possible values: a green circle indicates that the transaction is in SLA compliance, a yellow triangle indicates that the warning threshold for the transaction is currently in violation, and a red diamond indicates that the failure threshold for the objective is currently in violation.
- The **Value** column displays the current value of the instrument on which the objective is based. Click the magnifying glass next to a value to pop up a chart showing the instrument's recent history.
- The **Baselines** subtab displays historical baseline values for the transaction that you can use as a reference point. Data is shown only if baselines for the selected object have been defined.

### 6.9.7 Viewing Policies Applied to Transactions

Use the **Policies** tab to view information about policies associated with a transaction. By default, the tab shows information about applied policies. You can use the filter control to view changed policies, disabled policies, pending policies, rejected policies, and unapplied policies. The name of the applied policy is shown in a tree view in the **Name** column. Expanding the policy node shows the following information:

- **Policy Status Details** lists any issues arising from the application of the policy.
- **Monitored Object Type** specifies the targets to which the policy is applied.
- **Location** specifies the address of a target endpoint.
- **Management Intermediary** specifies the Business Transaction Management agent that is applying the policy.

Double clicking the policy name in the **Policy** tab, opens a new window that you can use to view alert, profile, and target information for the selected policy.

### 6.9.8 Viewing Transaction Profile Information

Use the **Profile** tab to see a map of the transaction and to see its definition. It also provides the following information:

- The date the transaction definition was last modified.
- Any user attributes defined for the transaction.
- The transaction identifier, which is sometimes needed to identify the transaction in CLI commands.

### 6.9.9 Viewing Transaction Conditions

When you define a transaction, you can associate one or more conditions with the transaction. A *condition* is an expression that Business Transaction Management evaluates against each instance of the transaction. Conditions can test for faults, specific property values, or missing messages. Use the **Condition** tab to display the conditions defined for a transaction. This tab allows you to do the following:

- View the status of fault monitoring: enabled or disabled.
- View condition definitions and status.

Use the **Alerts** tab to see whether any of the conditions have been violated. You cannot change fault monitoring status or condition definitions from the Enterprise Management console.

### 6.9.10 Viewing Transaction Properties

Properties are variables that hold values associated with the request or response phase of an operation. Properties are commonly used to facilitate searches, to surface message elements without having to log message content, to define conditions, and to enable consumer segmentation. Use the **Properties** tab to display a list of all the properties defined for messages included in a transaction. In addition to listing the properties, the tab shows information about the following:

- The service and operation for which the property is defined.
- The phase (request/response) of the operation.
- The data type of the property value.
- Whether the value is deemed sensitive.
- Whether it is mapped to a consumer (denoted by a human icon on the left) and what consumer-mapped attribute it is associated with.
- A description if you have supplied one when you created the property.

You cannot modify a property value from the Enterprise Management console.



---

## Monitoring End-to-end Performance

This chapter walks you through a demonstration of how you can use the application monitoring components described in the previous chapters to identify the underlying cause of poor user experience. It then poses a series of questions to test your understanding of end-to-end monitoring.

This chapter includes the following sections:

- [Troubleshooting: A Case Study](#)
- [Finding Solutions](#)

The demonstration uses the stand-alone versions of RUEI and BTM.

You can view a live demonstration of the case study described in this chapter by navigating to the following site:

[http://apex.oracle.com/pls/apex/f?p=44785:24:0::NO:24:P24\\_CONTENT\\_ID,P24\\_PREV\\_PAGE:5781,1#prettyPhoto/0/](http://apex.oracle.com/pls/apex/f?p=44785:24:0::NO:24:P24_CONTENT_ID,P24_PREV_PAGE:5781,1#prettyPhoto/0/)

### 7.1 Troubleshooting: A Case Study

This demonstration aims to traverse all the functional layers of a distributed application. Only partial views of screens are shown.

#### Looking at the User Experience

Our investigation begins with the RUEI dashboard, the first place to review the overall user experience.

Looking at the **Top usage by User ID** panel, we note a very high percentage of Error page views for the users Harold and Edward:



User ID/ ID	Page views	Error page views (%)
harold	18	33.3
edward	15	33.3
sam	8	0.0

To get more details about this situation, we select to display browser data by clicking on the cube icon in the upper-right hand corner.

From the **Browser data** display, we select a user and select user diagnostics to get session diagnostics for the user, filtering on a specific application, in this case the Toyco application.

Filter on	Value
User ID/ID	harold
Application/Name	Toyco

### Session diagnostics

*Search user records for the specified period using the available criteria. All strings are regarded as literals.*

**Search**

**Search filters**

Application/Name: « Select »

User ID/ID: [text box]

Client location/IP: [text box]

**Add more filters**

Dimension level: « Select »

Value: « Select » **Add**

Dimension level	Value
No filters	

**Search result order**

- ☒ Session start time
- ☐ Most active sessions
- ☐ Fastest sessions
- ☐ Slowest sessions
- ☐ Shortest sessions
- ☐ Longest sessions
- ☐ Most failure sessions

Next, we retrieve session information for the user for a given time period. The results are displayed in the **Session diagnostics** pane:

### Session diagnostics

*Search user records for the specified period using the available criteria. All strings are regarded as literals.*

Order: Session start time ▾ Dimension level: « Select » ▾ Value: « Select »

Period/Hour	User ID/ID	Client network/IP
15:00 - 16:00	harold	144.25.146.189
15:00 - 16:00	harold	144.25.146.189
15:00 - 16:00	harold	144.25.146.189
15:00 - 16:00	harold	144.25.146.189
15:00 - 16:00	harold	144.25.146.189
15:00 - 16:00	harold	144.25.146.189
16:00 - 17:00	harold	144.25.146.189
16:00 - 17:00	harold	144.25.146.189
16:00 - 17:00	harold	144.25.146.189

We select one of the session listed in the grid view to find out more about the session. Information is displayed in the **Session activity** pane.

Session activity		Page load time (s)	Info
	Toyco » Toyco - Purchasing Client	2.7	
	Toyco » Toyco Order Form	120.2	
	Content error » error string: Purchase Failed	1.0	
	Toyco » Toyco - Purchasing Client		

We see that one of the load times is excessive and that there's an error listed as well.

We click on the page icon in the **Info** column to view the page as the user saw it. It is shown next. Indeed, at the bottom of the page is the error message "Purchase failed."

Customer: Hardware Hotel	
Address: 11 Houston St.	
City: Honolulu	State: HI
Country: USA	

ID	Product	Item Price	Quantity
1001	Call of Duty: Black Ops for Xbox 360	59.99	
1002	Star Wars: The Force Unleashed II for Xbox 360	58.50	
1003	Kinect Adventures for Xbox 360	69.99	
1004	FIFA Soccer 11 for PlayStation 3	59.95	
1005	Rubix Cube 2011	9.99	

Ship Using:		
Select	Carrier	JMS API Used
<input checked="" type="radio"/>	FedEx	TextMessage (SOAP)
<input type="radio"/>	UPS	TextMessage (non-SOAP)
<input type="radio"/>	DHL	ObjectMessage
<input type="radio"/>	USPS	MapMessage
<input type="radio"/>	SpeedPost	ByteMessage
<input type="radio"/>	Cargo	StreamMessage
<input type="radio"/>	Air	Message

**Purchase Failed**

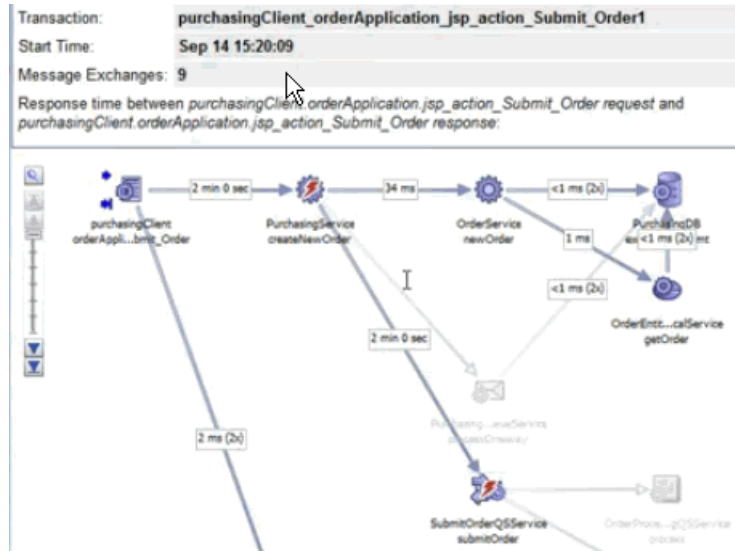
The error message in the user view suggests that this is a functional error.

### Looking at Business Transactions

We return to the **Sessions diagnostics** page from which we can drill down to Business Transaction Management to see the flow of operations in the back-end that failed to fulfill this order.



Selecting the problematic application and selecting **Diagnose transaction** from the context menu displays the **Instance inspector** view in BTM.



The red thunderbolt icons identify the failing services.

Suspecting that the call to the database is the culprit, we take a look at the message content, which suggests that the trouble is in the message response.



Choosing to view the XML, we find ourselves in a Java stack trace, and we see a fault string:

```
<soap:Envelope>
  <soap:Body>
    <soap:Fault>
      <faultcode>tns:BEA-382515</faultcode>
      <faultstring>
        Callout to java method "public static void com.oracle.callouts.CustomSocket.commitSocketOpen
        java.net.SocketTimeoutException: Read timed out at java.net.SocketInputStream.socketRead0(
        java.net.SocketInputStream.read(SocketInputStream.java:182) at com.oracle.callouts.CustomS
        com.oracle.callouts.CustomSocket.callSocket(CustomSocket.java:42) at com.oracle.callouts.Cu
        sun.reflect.GeneratedMethodAccessor1185.invoke(Unknown Source) at sun.reflect.DelegatingV
        java.lang.reflect.Method.invoke(Method.java:597) at stages.transform.runtime.JavaCalloutRuntin
        weblogic.security.acl.internal.AuthenticatedSubject.doAs(AuthenticatedSubject.java:363) at web
        weblogic.security.Security.runAs(Security.java:61) at stages.transform.runtime.JavaCalloutRuntin
        com.bea.wli.sb.pipeline.StatisticUpdaterRuntimeStep.processMessage(StatisticUpdaterRuntimeS
        com.bea.wli.sb.pipeline.debug.DebuggerRuntimeStep.processMessage(DebuggerRuntimeStep.ja
        com.bea.wli.sb.stages.StageMetadataImpl$WrapperRuntimeStep.processMessage(StageMetadi
```

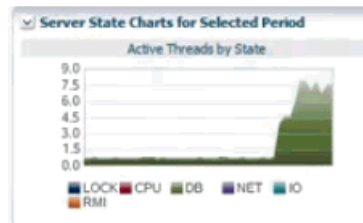
We'll need to drill down to the **Java Virtual Machine Diagnostics** page.

We return to the transaction graph and right-click on the offending operation to get the JVMD view.

### Looking at Machine-Level Information

Indeed, Looking at the **Active Threads by State** graph in the JVMD view, it looks like we have a database problem.





Looking at the **Threads State Transition** display on the same page, we note that a number of threads are stuck.

Thread Name
[STUOK] ExecuteThread: '0' for queue: 'weblogic.kernel.Default (self-tuning)'
[STUOK] ExecuteThread: '2' for queue: 'weblogic.kernel.Default (self-tuning)'
[STUOK] ExecuteThread: '4' for queue: 'weblogic.kernel.Default (self-tuning)'
[STUOK] ExecuteThread: '8' for queue: 'weblogic.kernel.Default (self-tuning)'
[STUOK] ExecuteThread: '5' for queue: 'weblogic.kernel.Default (self-tuning)'
[STUOK] ExecuteThread: '7' for queue: 'weblogic.kernel.Default (self-tuning)'
[STUOK] ExecuteThread: '3' for queue: 'weblogic.kernel.Default (self-tuning)'
[STUOK] ExecuteThread: '6' for queue: 'weblogic.kernel.Default (self-tuning)'
[STUOK] ExecuteThread: '1' for queue: 'weblogic.kernel.Default (self-tuning)'
[STUOK] ExecuteThread: '9' for queue: 'weblogic.kernel.Default (self-tuning)'

Noting that this is a current problem, we select the **Live Thread Analysis** button to get more information.

In the **Live Thread Analysis** display, we see ten threads waiting for the database, with three of them locked.

CPU(%)	JVM CPU Usage(%)	OSR	Memory(%)	Runnable	DB Wait	Lock	Network Wait	IO Wait	RMI Wait	Object Wait	Sleep
0	0	1	34	1	1	3	0	0	0	26	2

We can drill down to the database by selecting the **State (DB Wait)** link. This shows us the SQL details.



The display confirms our suspicion that the trouble lies with database access.

This ends our troubleshooting session, which traversed all the layers of distributed application performance: from the user layer, to back-end supporting services, to the underlying infrastructure.

## 7.2 Finding Solutions

See if you can guess the answer to the following questions, which test your understanding of end-to-end performance monitoring.

**Is the problem with my application?**

The following problems relate either to the user experience or to back-end services.

- *Are some services especially slow?*  
Look at the **Analysis** tab in BTM. Look at high values for average response time on individual links.
- *Are users unable to complete a task?*  
Look at statistics for user flows in RUEI.
- *Are services failing?*  
Look at the **Operational Health Summary** from the **Dashboards** view in BTM?
- *Do I have a memory leak?*  
Look at heap analysis information in JVMD for a given time period.
- *Am I getting out-of-bounds values?*  
Check SLA-based alerts defined for RUEI and BTM.
- *Are services miscommunicating? (missing messages)*  
Check alerts related to missing message conditions in BTM.

**Is the problem with deployment architecture?**

- *Do I need to replicate and load-balance services?*  
Check high throughput values for transaction links. These might indicate bottlenecks.
- *Do I need a failover scheme?*  
Use the Enterprise Manager **Business Applications** page or the **Business Application** home page to check for servers that are often unavailable.

**Is the problem with supporting infrastructure?**

- *Is a server down or slow?*  
Use the Enterprise Manager **Business Applications** page or the **Business Application** home page to check for servers that are often unavailable.  
  
In BTM, check the **Uptime Issues** table in the **Top 10 Services** dashboard. Then check the **Services to Endpoints** view to find the address of the server associated with the service.
- *Is thread-lock causing services to fail?*  
Use the JVM Diagnostics page in Enterprise Manager to get information about executing threads.
- *Is the network slow?*  
Look at NetworkWait information in the JVM Diagnostics page in Enterprise Manager.
- *Are any of my routers down?*  
If you have included your routers in the definition of your System for Enterprise Manager, you can get information about these in Enterprise Manager.

## B

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### Business Application

- creating, 6-8
- home page, 6-10
- introduced, 6-1
- key components, 6-2
- KPIs, 6-24
- monitoring, 6-10
- sample, 6-2
- setting up, 2-8
- SLA alerts, 6-24
- target type, 6-2

### Business Transaction Management

- accessing from EM console, 4-6
- accessing from RUEI, 4-7
- agent deployment, 2-5
- alerts information, 6-29
- analysis information, 6-28
- compliance tab, 6-31
- conditions, 4-4
- data collection, 4-1
- defining transactions, 4-2
- ECID, use of, 2-4
- introduced, 4-1
- JVMD, accessing from, 4-7
- launching from EM, 6-27
- message logs, 6-30
- messages and operations, 4-2
- monitoring in EM, 6-25
- monitoring transactions, 4-4
- properties, 6-30, 6-33
- registering with EM, 6-6
- requirements for using in EM, 6-5
- service level agreements, 4-4, 6-31
- setting up, 2-7
- SLA compliance, 6-31
- summary information, 6-28
- transaction graph, 4-3
- transaction instance, viewing, 6-29
- use of, 4-5

## C

---

- conditions (BTM), 4-4

## E

---

### ECID

- JVMD displays, use of, 5-1
- request instance diagnostics, 5-3
- tracking requests, 2-4

### Enterprise Manager

- agent deployment, 2-5
- JVMD, accessing from console, 5-2
- launching BTM from, 6-27
- monitoring transactions in, 6-25
- registering BTM with, 6-6
- registering RUEI with, 6-6
- services, 6-2
- setting up, 2-6
- systems, 6-2
- targets, 6-2

- execution context, 2-4

## J

---

### Java Virtual Machine Diagnostics

- accessing, 5-2
- agent deployment, 2-5
- introduced, 5-1
- live thread analysis, 5-3
- request instance diagnostics, 5-3
- sample analyzer, 5-3
- setting up, 2-6
- Thread Stat transition chart, 5-3
- view, initial, 5-2

## K

---

- key components, 6-2, 6-9

### KPIs

- calculation range, 6-12
- introduced, 6-11
- monitoring, 6-22
- RUEI, 3-7

## P

---

### performance monitoring

- data collection, 2-5
- dimensions of, 2-3
- example of end-to-end, 7-1

- processing engines, 2-6
- setting up, 2-4
- troubleshooting, 7-5
- user roles, 2-9

## R

---

Real User Experience Insight

- accessing BTM from, 3-9
- accessing from EM console, 3-8
- accessing JVMD from, 3-9
- application, 3-2
- collector, 2-5
- dashboards, 3-3
- data analysis, 3-3
- data collection, 3-1
- ECID, use of, 2-4
- exporting sessions, 6-19
- introduced, 3-1
- KPI target types, 6-13
- KPIs, 3-7
- metric values, 6-13
- monitoring data, 6-12
- monitoring metrics, 6-21
- registering with EM, 6-6
- reports, 3-4
- requirements for using in EM, 6-3
- service level agreements, 3-3, 3-7
- session diagnostics, 3-4, 6-16
- session replay, 6-18
- setting up, 2-7
- top users, 6-14
- use of, 3-8
- user flows, 3-3, 3-5, 6-15
- violations, 6-14

reports (RUEI), 3-4

## S

---

service level agreements (BTM), 4-4

service level agreements (RUEI), 3-7

session diagnostics (RUEI), 3-4, 6-16

## T

---

transactions

- conditions, 6-33
- defining, 4-2
- graph of, 4-3
- instance inspector, 6-30
- instance, assembling, 6-30
- instance, viewing, 6-29
- logged messages, viewing, 6-30
- monitoring, 4-4
- monitoring in EM, 6-25
- policies applied to, 6-32
- profile of, 6-32
- properties, 6-33

## U

---

user flows, 3-5, 6-15

user privileges, 2-9

user roles, 2-9