End-to-End Application Management: 10 tricks you wish you knew

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Software Engineer
Cornell University
BlackBoard, Inc.

Marc Rix
Founder
Bridgescape, Inc.
The following is intended to outline our general product direction. It is intended for information purposes only, and may not be incorporated into any contract. It is not a commitment to deliver any material, code, or functionality, and should not be relied upon in making purchasing decisions. The development, release, and timing of any features or functionality described for Oracle’s products remains at the sole discretion of Oracle.
Program Agenda

• Business-Driven Application Management using Oracle Enterprise Manager
• 10 tricks for end-to-end Application Management
• Bridgescape, Inc. Case Study
• Cornell University Case Study
• Q&A
Business-Driven IT Management

User Experience

Business Transactions
- WEB PORTAL
- PRODUCT CATALOG
- ORDER ENTRY
- OTHER SERVICES

Business Services

Business-Driven Application Management
- Understand business needs
- Manage from business perspective

Integrated Application-to-Disk & Cloud Management
- Eliminate management silos
- Create agile IT for dynamic business

Integrated Systems Management & Support
- Proactively identify and fix problems
- Maximize business productivity

Integrated Application-to-Disk and Cloud Management

Services Cloud

Oracle Support

Integrated Systems Management and Support
Business - IT Disconnect

**Business Demand**
- How satisfied are my users?
- How many orders did we complete?
- My order is stuck, what’s going on?

**Traditional IT Response**
- The application was up 90% of time.
- We had 200 database transactions.
- Our servers are up. We will look into it.
Oracle Business-Driven Application Management

Business Demand

- How satisfied are my users?
- How many orders did we complete?
- My order is stuck, what’s going on?

New IT Response

- 99% of users were satisfied.
- We completed 250 orders.
- There is an issue with a supplier’s app. It has been escalated.

User Experience Management

Business Transaction Management

Business Service Management
User Experience Management Approaches

Synthetic Test Monitoring

- Ensure the performance of a specific business process or user
- Proactive monitoring – be alerted to issues from locations with no users or traffic
- Ensure the performance of applications based on many different protocols

Real User Monitoring

- Monitor experience for all users
- Monitor performance, errors, and business KPI’s
- Diagnose problems quickly with “replay” of user session
- Determine exact usage of applications
Business Transaction Management

- Real-time tracking of each transaction
- Follows transactions across all infrastructure and applications
  - App Servers, Applications, ESB's, BPM's, Etc.
- Leverages message content – the business value flowing through the application
- Exception Management – Business and Technical exceptions
Business Service Management

- Comprehensive service dashboards
- Service discovery, topology, and monitoring
- Service implementation visibility for deep diagnostics
- Service configuration and provisioning automation
10 tricks for end-to-end Application Management
10 Tips & Tricks

User Experience Management
1. Developing realistic synthetic service tests
2. Adjusting monitoring for peak load

Business Transaction Management
3. Alerts for business issues affecting transaction execution
4. How to monitor unsupported endpoints

Business Service Management
5. Monitoring of custom metrics exposed by the application developer
6. Alerting on cluster or enterprise-level metrics
7. Supporting App & Server admin roles
8. Expanding the OOB policies provided for configuration
9. JVM resource utilization overwhelmed with idle threads
10. POJO performance monitoring

1. Using real user sessions for recording service tests
2. Setting automatic thresholds
3. Monitoring based on business exceptions
4. Leverage the Oracle SB as a proxy
5. Using JMX extensions for application monitoring
6. Monitoring aggregate system-level metrics
7. Application as a target for monitoring
8. Setting User defined configuration policies
9. Idle thread exclusion for more effective JVM diagnostics
10. Custom application metric monitoring
1. Use Real User Sessions for Recording Synthetic Tests

- Export user session from RUEI
- Import RUEI session into Oracle Application Testing Suite 9.1+
- Parameterize session as required
- Verify recording using playback
- Export script for monitoring (File→Export Script)
1. Use Real User Sessions for Recording Synthetic Tests (cont…)

- Set up Beacon to use the ATS Web Transaction
  - Create a ATS_Test directory under `ORACLE_HOME/sysman/emd`
  - Copy and extract the Load Test script archive under `ORACLE_HOME/sysman/emd/ATS_Test` directory
  - Extract the downloaded beacon custom test script under `ORACLE_HOME/sysman/emd/ATS_Test` and make sure `runTest.bat` and `ats_play.pl` files are copied.

- Create a Generic Service in Enterprise Manager Grid Control

- In “Service Test” page select “Custom Script” and enter the following attributes
  - OpenScript agent location - directory which contains `runScript.bat` / `runScript.sh`
  - Directory under which load test script is extracted
  - If the beacon needs proxy to connect to internet, then provide Proxy host name and port number
2. Setting Automatic (auto-learned) Thresholds

- Eliminates the effort required to determine good fixed thresholds
- Recommended for systems with variability in performance (small, medium, large thresholds available)
- Key things to consider:
  - Assumes that a KPI has approximately the same value at the same time of day during each of the last 30 days
  - It requires a full day before the auto-learnt targets become available
  - If problems persist over a long period, these abnormal values will become part of the automatic target
  - Automatic targets can drop dramatically if the KPI value is unavailable every day at about the same time. For example, in the case of no network traffic after 18:00.
Marc Rix
Founder, Bridgescape
RUEI Case Study

Marc Rix
Founder, Bridgescape, Inc.
Oracle Open World 2010
About Bridgescape

• Systems Integrator
• Based in Southern California
• Oracle Partner with Expertise in
  – Enterprise Management / SAM
  – Service-Oriented Architecture
  – Cloud Computing
• 2010 Oracle SOA Innovation Award Recipient
• More at www.bridgescapeinc.com
RUEI Case Study: Overview

- The Environment
  - Fortune 500 Company, IT Division
- The Problem
  - Severe Performance Degradation of Custom A/P Application
- The Impact
  - Productivity Nosedive
  - Delayed Invoice Processing
  - Delayed Closing Risk
  - Missed Vendor Payments
  - Night / Weekend Catch-Up
  - IT Recovery Effort @ $30K/week
  - IT / Business Rift
- The Objective
  - Diagnose, Resolve, Avoid, Harmonize
RUEI Case Study: Approach

- **Challenges**
  - Small Group of Affected Users
  - Distributed Application Architecture
  - Inability to Replicate Problem
  - Inability to Relate to User Testimonies
  - Insufficient Monitoring Tools

- **Evolution of a Strategy**
  - Escalation > Task Force > Data Mining > Assumptions > Ineffective Changes > Escalation > Panic > Desperation
RUEI Case Study: Solution

- **The Epiphany**
  - Must Understand Users’ POV!

- **RUEI Pilot**
  - 30 Minutes to Enlightenment
  - Session Diagnostics
  - Server vs. Network Latency
  - Transaction Correlation

- **Resolution Achieved**
  - WAN Acceleration
  - Web Service Optimization
  - Application Optimization
  - Proactive Monitoring / Reporting
  - Renewed Confidence in IT
RUEI Best Practices

- **Prime Business Cases**
  - Mission Critical Web Apps & Suites
  - Distributed Systems (SOA, SaaS)
  - IT Service Governance (ITIL, COBIT)

- **Installation & Configuration**
  - Know Your Network
  - Size for Critical Systems
  - Mask Sensitive Data
  - Integrate with OEM for Max Value

- **Usage & Data Analysis**
  - Establish SLAs & KPIs
  - Involve Stakeholders & Power Users
  - Use Transactions to Manage Bus. Processes
  - USE the Data (Involve BI Teams)
Thank You!

www.bridgescapeinc.com
10 Tips & Tricks

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10. Custom application metric monitoring
3. Monitoring based on Business Exceptions

- User-defined BTM Policies: Can leverage message content
- Correlate faults & errors to individual transaction instances
- Monitor Business & Technical exceptions
  - Stalled transactions, missing steps, error messages
  - Incorrect data values, boundary conditions, etc.
  - Business conditions, such as credit denied, orders over $1M, shipment longer than 7 days
- Take Action – notify, open trouble tickets, invoke other exception handlers, etc.
4. Leverage Oracle Service Bus (OSB) as Proxy Agent

Assuming you have some endpoints to manage, that are available to the OSB project's object definition tools

1. Deploy OSB
2. Deploy a BTM observer into OSB
3. Configure a BTM communication policy to monitor OSB
4. Create an OSB project
5. Configure Business Service(s) using your endpoints
6. Define Proxy Endpoint(s) in OSB to perform necessary routing
7. Modify your clients to talk to the OSB's proxy services
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5. Monitoring JMX Applications Deployed on WebLogic Server

- The JMX fetchlet, supplied with 11.1 Management Agents, enables you to monitor key metrics in your JMX-instrumented applications.

- Monitoring JMX-instrumented applications with Enterprise Manager entails defining a new target type that Enterprise Manager can monitor via Management Plug-ins.

- JMX command-line tool (emjmxcli) simplifies creating the requisite target definition files: metadata and the default collection file.
  - The tool is an offline configuration utility that connects you to an MBeanServer and enables you to browse available MBeans.

- To start the JMX command-line tool:
  - Go to the $AGENT_HOME/bin directory.
  - Run the following command: `emjmxcli -t WebLogic [OPTIONS]` or `emjmxcli -t JVM [OPTIONS]`
  - Once invoked, the command-line interface automatically prompts you for the requisite information.
6. Monitoring Aggregate System Level Metrics

- Define a system which includes the relevant targets
- Create a service on the system
- Select performance metrics to be based on system metrics
- Choose an aggregation function – Max, Min, Average, or Sum
  - Use Sum metric for parallel execution systems where totals such as throughput or queue depth are important
  - Use Max/Min for linear systems where largest number represents the critical bottleneck
  - Use average for metrics like response time, where outlier numbers can be excluded
7. Application as a Target for Monitoring

- Application Deployments as targets
- Application Availability (not server availability) metrics, including blackout
- Easily accessible metrics for request processing time, throughput, & active sessions
- “Service” creation that automatically includes all application resources.
- Application deployment as a target in
  - Topology
  - Availability root cause
  - Performance analysis
- Application specific metric templates
8. Creating User-defined Configuration Policies

- Accessible via ‘Compliance’ tab > ‘Library’ property page > ‘Create…’ button
- Wizard prompts you for requisite information including:
  - SQL query to be run against Management Repository Views that returns data to be verified (views documented in Extensibility Guide)
  - Violation condition test to be evaluated - either threshold or SQL based
  - Evaluation schedule
- Receive alert notification when non-compliant
8. Creating User-defined Configuration Policies

Use Application Configuration Console

<table>
<thead>
<tr>
<th>Application Stack View</th>
<th>Lifecycle Environments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dev_CA</td>
<td>QA_NC</td>
</tr>
<tr>
<td>WebLogic Cluster</td>
<td>WebLogic Cluster</td>
</tr>
<tr>
<td>Web Server</td>
<td>Web Server</td>
</tr>
<tr>
<td>Tuxedo</td>
<td>Tuxedo</td>
</tr>
<tr>
<td>Oracle</td>
<td>Oracle</td>
</tr>
<tr>
<td>Netegrity</td>
<td>Netegrity</td>
</tr>
</tbody>
</table>
9. Idle Thread Exclusion in JVM diagnostics

- Some method calls sampled in JVM diagnostics may be idle waiters, not doing any work. For example:
  - Socket listeners for adapters/drivers
  - Thread/queue monitors that use locks
- The contribution of these methods to resource utilization may be over-represented.
- Mark them as idle:
10. Custom Metric Monitoring with Application Dependency & Performance

- Custom applications contain POJOs which are not monitored out of the box
- Custom Metrics can be used to add monitoring coverage to custom Java classes
  - Name the class you want and restart the JVM

![Middleware Home > Application Dependency and Performance](image)
OEM for Applications

HEATHER DAMIANI
CORNELL UNIVERSITY
ORACLE OPEN WORLD 2010
Agenda

- Application Challenges / OEM Solutions
- Best Practices at Cornell
- Bang for Your Buck Monitoring Tests
- Management of Applications
- Delivery of Information
Application Challenges / OEM Solutions

- Diverse Portfolio of Applications from Vendor to Custom to Open Source
- Distributed Support, OS Sys Admins, DBAs, Network, App Devs, App Sys Admins
- Distributed Functional Users, Colleges, Units, Audit, Finance etc.
- Mission Critical Applications – 24x7x365, no downtime
<table>
<thead>
<tr>
<th>Application Challenge</th>
<th>OEM Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disparate, Limited Monitoring Tools</td>
<td>Robust Comprehensive Mgmt Tool</td>
</tr>
<tr>
<td>Horizontal Monitoring Only</td>
<td>Horizontal and Vertical Stack Monitoring</td>
</tr>
<tr>
<td>React and Scramble to Issues</td>
<td>Proactive and Expedited Troubleshooting</td>
</tr>
<tr>
<td>No Access to Quantitative User Experience</td>
<td>Access to End User Experience</td>
</tr>
<tr>
<td>Cumbersome Processes for Presenting Information, if it Exists</td>
<td>Presenting Metric and Availability Information to Management and Audit</td>
</tr>
<tr>
<td>Application Specific Custom Scripts for Environment Checking</td>
<td>Ensuring that our Environments are In Sync</td>
</tr>
<tr>
<td>No ability to quickly look at the Contents of Logs</td>
<td>Quickly Ascertain the Contents of Logs</td>
</tr>
<tr>
<td>No single console for Service Control</td>
<td>Single Console for Service Control</td>
</tr>
</tbody>
</table>
OEM for Applications at Cornell:

- Blackboard
- Kronos
- Pinnacle
- PeopleSoft
- Common Spot
- Cold Fusion Environment
- Remedy
- Directory Server
- Custom Authentication system
Define a **GROUP** Nomenclature
- Security
- Separation of Duties
- Extensible
- Scalable

**Group Deployment – Next Slide**
- Application Group > Environment > Group Tiers
- Rollup like components into respective tiers, easing scalability and swaps
- Databases, Listeners < **Database Tier**
- Mid Tier OEM Agents < **Middle Tier Agents** < **Middle Tier**
- Mid Tier Servers < **Middle Tier Hosts** < **Middle Tier**
Group Nomenclature Example
Define **ROLES** for Users
- Security
- Scalability
- Administration Ease

**Application System Admin**: read access to all of the groups and write access to the Middle Tier Hosts and Systems and Services Tiers
- read-only access to the groups, such as audit and front end support specialists
Best Practices at Cornell

Define Alerting Strategy

- ID to define the **RULES** for **ALERTS**
- The rule defines an ID to notify and what metrics to use
- The notified ID contains the email and texting information
  - Facilitates maintenance for staff changes
  - The alerting rules and ids are not tied to a person

Read Only DB IDs for SQL Tests
Bang for Your Buck Monitoring Tests

- Transparency, User Experience, System Metrics, Presentation
  - HTTP
  - SQLNET/JDBC
  - LDAP
  - JMX
  - System Level Metrics
HTTP Test

- End User Experience – Next Slide
- Measure total and discrete timings – Next Slide
- Performance Troubleshooting – Next Slide
- Custom Authentication
- Test from Any Location
Blackboard User Performance Metrics

- Quickly Identify Application Layers in Distress
- Quantify ‘Slow’
- Correlate User Response Times and System Metrics
- Trend Analysis
- Identify Lost Services in Real Time
- Real World Scenarios
HTTP Test

- End User Experience
- Measure total and discrete timings
- Performance Troubleshooting
- Custom Authentication
- Test from Any Location
Example of Parameter Substitution to Accommodate Custom Auth

- Allow for changing session identifiers for each login
- Secure sensitive identifiers (id/pword)
- Define success strings
HTTP Test

- End User Experience
- Measure total and discrete timings
- Performance Troubleshooting
- Custom Authentication
- Test from Any Location
Use Read Only accounts when possible
Compare SQLNET and JDBC SQL Performance
Chart Performance Changes with a Known Query
Troubleshooting for Poorly Running Queries
Critical Limits and Transparency
Alert when a Job is complete
Aggregate Tests
Blackboard Query Response Time Test

PerformanceValue: MetricName Total Time (ms): Last 24 hours

<table>
<thead>
<tr>
<th>MetricName</th>
<th>Total Time (ms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Last Known Value</td>
<td>5</td>
</tr>
<tr>
<td>Average Value</td>
<td>6.22</td>
</tr>
<tr>
<td>High Value</td>
<td>13</td>
</tr>
<tr>
<td>Low Value</td>
<td>4</td>
</tr>
<tr>
<td>Warning Threshold</td>
<td>Not Defined</td>
</tr>
<tr>
<td>Critical Threshold</td>
<td>Not Defined</td>
</tr>
<tr>
<td>Occurrences Before Alert</td>
<td>1</td>
</tr>
<tr>
<td>Corrective Action</td>
<td>None</td>
</tr>
</tbody>
</table>

Response metrics vary by test type. The following response metrics are collected for this test type:

<table>
<thead>
<tr>
<th>Status</th>
<th>Fetch Time (ms)</th>
<th>Status Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Time (ms)</td>
<td>Close Time (ms)</td>
<td></td>
</tr>
<tr>
<td>Connect Time (ms)</td>
<td>Number of Rows Fetched</td>
<td></td>
</tr>
<tr>
<td>Prepare Time (ms)</td>
<td>Total Time per Row (ms)</td>
<td></td>
</tr>
<tr>
<td>Execute Time (ms)</td>
<td>Fetch Time per Row (ms)</td>
<td></td>
</tr>
</tbody>
</table>
Management of Applications

- Out of the Box Management
  - Service Control Scripts
    - Marshalling ids
    - No direct logon to hardware
    - Multiple servers simultaneously
    - Avoid dual factor authentication, such as keyfobs
    - Scheduling
  - Environment Compares
    - Ex: OEM identified a PeopleSoft mis-configuration on one of our servers
# Delivery of Information

## Help Desk Integration
- Customize email
- SMTP calls

## Reports
- Metrics
- Application Reports

## Dashboards
- SLA views
- Audit views
- Support views

## Alerts
Example of an On Demand Blackboard Report for Front End Support

### Blackboard Report

**Time Period:** Last 24 Hours EDT

#### Last 180 days

<table>
<thead>
<tr>
<th>PK1</th>
<th>USER_ID</th>
<th>FIRSTNAME</th>
<th>LASTNAME</th>
<th>EMAIL</th>
<th>ENROLLMENT_DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>59,373</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Aug 26, 2010 11:06:55 PM</td>
</tr>
<tr>
<td>67,577</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Aug 26, 2010 2:38:04 PM</td>
</tr>
<tr>
<td>73,160</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Aug 27, 2010 12:52:17 AM</td>
</tr>
<tr>
<td>81,994</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Aug 26, 2010 9:16:04 AM</td>
</tr>
<tr>
<td>92,815</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Aug 26, 2010 3:45:02 PM</td>
</tr>
<tr>
<td>94,739</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Aug 26, 2010 3:07:19 PM</td>
</tr>
<tr>
<td>98,035</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Aug 26, 2010 12:35:58 PM</td>
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<tr>
<td>108,825</td>
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<td></td>
<td></td>
<td></td>
<td>Aug 26, 2010 2:37:38 PM</td>
</tr>
<tr>
<td>120,391</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Aug 27, 2010 12:16:53 AM</td>
</tr>
<tr>
<td>120,876</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Aug 27, 2010 8:52:13 AM</td>
</tr>
</tbody>
</table>
Choosing the Time Period for Reports

Set Time Period
Select the range representing the dates that you want such that the duration is not greater than 99 years.
Note: All Dates/Times are mentioned in EST timezone

- **Time Zone:** (UTC-05:00) Canada Eastern Time (EST)

- **From Current Time**
  - Last 24 Hours

- **Previous Time Period**
  - Days
  - Selecting "7 Days" and viewing the report now will display data from midnight on Aug 19, 2010 to midnight on Aug 26, 2010.

- **Calendar Time Period**
  - This Week
  - Selecting "This Week" and viewing the report now will display data from midnight on Aug 21, 2010 to 9:14:13 AM on Aug 27, 2010.

- **Custom Date Range**
  - The dates can be in the past or future. For eg: Start Date is Aug 20, 2010 and End Date is Aug 27, 2010, then data will be displayed from 00:00:00 of Aug 20, 2010 to 24:00:00 on Aug 27, 2010
  - **Start Date**
  - **End Date**
  - (Format: MMM d, yyyy)
Delivery of Information

In the end, it is the information that matters!

- Integrate with your Help Desk
- Reports
- Dashboards
- Alerts
Blackboard Dashboard Showing the High Level Results of Service Tests

PeopleSoft Dashboard for Developers
Thanks to:

- Kevin Leonard, DBA Manager
- Atul Deshpande, DBA
- Donivan Patwell, Application Administrator
- Tony Damiani, Assistant Director – DBA and BI

Contact Information

- Heather Damiani  heather.damiani@blackboard.com
- Tony Damiani  ard1@cornell.edu
Oracle Enterprise Manager 11g Resource Center
Access Videos, Webcasts, White Papers, and More
Oracle.com/enterprisemanager11g
Not to be Missed Enterprise Manager Sessions!

**Enterprise IT and Cloud Computing**
- Richard Sarwal, SVP, Monday, Sept. 20^{th}, 3:30 pm, Moscone South 102

**Business-Driven Application Management and End-to-End Performance Diagnostic**
- Ali Siddiqui, VP, Monday, Sept 20^{th}, 3:30pm in Moscone West Room 3024
- MW Management Overview, Product Roadmap, Cool Demos

**What Lies Beneath: Oracle Ops Center for OS and Hardware Management**
- Steve Wilson, VP, Tuesday, Sept 21^{st}, 5:00pm in Moscone South Room 270

**Business-Driven IT Management with Oracle Enterprise Manager 11g**
- Leng Tan, VP, Tuesday, Sept 21^{st}, 11 am, Moscone South 102
- EM Overview, Product Roadmap, Cool Demos!
# Additional Oracle Enterprise Manager Sessions

<table>
<thead>
<tr>
<th>Monday, Sept. 20</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Mon 3:30 p.m - Business-Driven Application Management and End-to-End Performance Diagnostics</td>
<td>• Moscone W L3, Rm 3024</td>
</tr>
<tr>
<td>• Mon 5:00 p.m.- Managing Oracle WebLogic Server: New Features and Best Practices</td>
<td>Moscone W L3, Rm 3024</td>
</tr>
<tr>
<td>• Tu 11:00 a.m.- General Session: Business-Driven IT with Oracle Enterprise Manager 11g</td>
<td>Moscone S Rm102</td>
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<tr>
<td>• Tu 11:00a.m. - Managing the Oracle Ecosystem on a Cloud Platform: Oracle Enterprise Manager</td>
<td>Moscone S Rm 309</td>
</tr>
<tr>
<td>• Tu 3:30 p.m.- Oracle Identity Management Administration Best Practices</td>
<td>Moscone S Rm 309</td>
</tr>
<tr>
<td>• Wed 4:45 p.m.- Oracle SOA Management Best Practices, Tips, and Techniques</td>
<td>Moscone W L3, Rm 3018</td>
</tr>
<tr>
<td>• Thu 9:00 a.m. - Oracle WebLogic Server Management for Oracle DBAs</td>
<td>Marriott Marquis, Salon 9</td>
</tr>
<tr>
<td>• 12:00 p.m. - Spot Problems Before Your Users Call: User Experience Monitoring for Oracle Apps</td>
<td>Marriott Hotel, Golden Gate A</td>
</tr>
<tr>
<td>• 1:30 p.m. - Deep Java Diagnostics and Performance Tuning: Expert Tips and Techniques</td>
<td>Marriott Marquis, Salon 9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tuesday September 21, 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>2:00 p.m. - 3:00 p.m.</td>
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</table>

<table>
<thead>
<tr>
<th>Thursday September 23, 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:30 a.m. - 11:30 a.m.</td>
</tr>
</tbody>
</table>
Appendix
ORACLE