ORACLE
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.
Session #S317066
Diving Deep Into the Root Cause of Problems with JVM Diagnostics In Enterprise Manager
Glen Hawkins, Director of Product Management
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Agenda

• Oracle Enterprise Manager Overview
• JVM Diagnostics Challenges
  • Gaps in existing tools for production use
• Key Use Cases
• JVM Diagnostics Key Advantages
• Customer Success Story
• Demonstration
• Q&A
Oracle Enterprise Manager Overview
Business-Driven IT Management

Business Users and Customers

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

Services Cloud

Oracle Support

Integrated Application-to-Disk and Cloud Management
JVM Diagnostics
Challenges
Production Application Problems

- Key business app is slow
  - Java/DB? Which Java method or SQL?
  - Is it long running I/O or network calls or locks?
- Mid-tier CPU utilization is high
  - Don’t know which Java classes or methods burning CPU
- User requests are hanging
  - Which Java method call is causing the hang? What is the reason?
- Garbage Collector is running often, consuming resources & slowing application
  - Is this a memory leak? Which objects are leaking?
- Database is slow because of a bad SQL
  - Which application request is associated with the DB session? What is the associated Java code?
Production Diagnostic Visibility
A must have for viable problem resolution

• Large number of problems occur ONLY in production and cannot be reproduced elsewhere

• Typically they occur at the WORST possible time and hence need to be resolved rapidly
  • Retailers facing crushing loads on Black Friday or Tax processing servers on 15th April

• Must accelerate problem resolution times

• Reduce costs by saving time spent by IT operations teams, developers, architects & DBAs

• Empowers IT teams to diagnose Java application problems
Diagnostic Challenges

- Limited production visibility
- Not enough depth to diagnose production issues
- Diagnostic tools not suited for production
- Inability to reproduce problems on other environments
- Hard to isolate culprit tier and component
- Impacts time to resolution

Java is a black box
Key Use Cases
The Four Primary Use Cases

• Performance and resource use over time
  • “Why does my application feel so slow?”
• Immediate/live resource consumption
  • “Why is my system hung?”
• Momentary problem behavior
  • “It only happens when I click here…”
• Memory/heap consumption between points
  • “What ate up all my memory?”
Performance & Resource Usage
“Why does my application feel so slow?”

• Symptoms
  • General reports of slowdowns from users
  • Greater than expected server resources
  • Feeling that there are “low-hanging fruit” opportunities for optimization

• Solution Approach
  • Trend resource consumption
    • By type: DB vs. IO vs. Net vs. CPU
    • By class/method
Thread-based Resource Consumption

Immediate visibility into the state of threads for a JVM or JVM Pool

Examine CPU and memory heap utilization by JVM

Filter and analyze your JVMs by requests in addition to restricting the cross-tier analysis to the database

Top methods can easily be filtered on and drilled into to identify referenced objects
Live Resource Consumption

“Why is my system hung?”

• Symptoms
  • System not responding
  • Application server process not crashed
  • Server accepting new requests
    • But not responding to them

• Solution Approach
  • Live thread visibility
  • Thread lock analysis
Live Thread and Stack View/Browse

Live threads with status, request entry point, Java file and line number in addition to state information.

Method stack details and information related to which thread holds the current lock.
Momentary Problem Behavior

“It only happens when I click here…”

- Symptoms
  - Reproducible test case
  - Short lived (seconds to minutes) behavior that requires isolation

- Solution Approach
  - Fine grained data capture during known duration
  - Analysis of a defined snapshot period
High Resolution Thread Trace

Critical details of your persisted thread trace tie resource utilization with top states and methods.

Within thread traces, persist the thread state over time to identify the top states.
Memory/Heap Consumption

“What ate up all my memory?”

• Symptoms
  • Out of memory errors
  • Intermittent whole-system sluggishness
  • High process resident memory usage

• Solution Approach
  • Quickly take heap snapshots
  • Browse and compare heap contents
Heap Object Analysis

Quickly determine the cause of performance degradations that occur over time with heap comparisons.

Deep contextual drill-downs allow identify the objects in the heap stack that are consuming memory on the heap.
JVM Diagnostics Key
Advantages
Difference: HOT Deployment
Dynamic deployment on running applications

• No parameter changes needed
• Deploys dynamically as a web application
• Does not need app configuration changes
• Does not need profiling support
• Does not alter the class loader
Cross-tier Trace With Database

- Trace Java thread to DB session
  - Identify in-flight Java threads waiting for database resource
  - Drill to SQL

- Trace DB session to Java thread
  - View database sessions waiting for or holding locks
  - Identify Java thread holding database session
### Challenges
- Large number of Java EE applications running on shared infrastructure
- Must quickly determine the root cause of performance problems and deliver actionable information at the Java class/method level to customers and partners
- Java developers must assure software quality before production deployment

### Solution
- Diagnostics Pack for Oracle Middleware

### Business Results
- Java EE application performance problems tracked more quickly and with less effort
- Faster cycle time for fixing core production application code
- New Java EE applications can be tested with less effort and more detail
- Low overhead means no extra hardware cost
Packaging and Future Direction
WebLogic Server Management Pack EE
Complete management for all WebLogic Servers

- **Business Transaction Management**
  - Discovery of transaction flows across the enterprise
  - Leverages transaction content/payload for business visibility
  - Exception Management

- **Performance & Diagnostics**
  - Enterprise scale multi-domain management
  - Deep JVM diagnostics pinpoints application issues in production
  - Improve performance and availability of Java EE and SOA applications

- **Lifecycle Management**
  - Manage configuration changes
  - Automated deployment procedures to clone and scale-up applications
### WLS Management Pack EE

#### High-level Roadmap

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<th>Future Releases</th>
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<td><strong>Agent/Manager update</strong></td>
<td><strong>EM / E2E Integration</strong></td>
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<td>WebLogic Server Virtual Edition</td>
<td>Consolidate agent deployment</td>
<td>BTM Integration</td>
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<tr>
<td>Additional 64-bit IBM JREs</td>
<td>Bi-directional impact analysis with Database diagnostics</td>
<td>Consolidated end-to-end agent (ADP/JVM/BTM)</td>
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<td>Exalogic Management</td>
<td>Full Configuration Management (ACC/CCC) Integration</td>
<td>Consolidated automated installation</td>
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<td>JVM Diagnostics</td>
<td>JVM as a target</td>
<td>User Experience data integration for dimensional analysis of transactions</td>
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<td>JRockit Virtual Edition</td>
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<td>Continued new JRE support</td>
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<td>SQL Hash look-up</td>
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<td><strong>Request Monitoring</strong></td>
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<td>Single request instance transaction tracing</td>
<td>WLS Patching</td>
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<td>WLS Gold Image Provisioning</td>
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<td>Java EE application provisioning</td>
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<td><strong>EM / RUEI Integration</strong></td>
<td><strong>Application Performance Management</strong></td>
<td><strong>Support Integration</strong></td>
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<td>Enhance contextual drill-down</td>
<td>Middleware Diagnostics Advisor (MDA)</td>
<td>Offline Diagnostics expansion framework</td>
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<td><strong>Provisioning/Cloning</strong></td>
<td><strong>Support Integration</strong></td>
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<tr>
<td>Expand platform support (Solaris, AIX, Windows)</td>
<td>Offline Diagnostics</td>
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Oracle Enterprise Manager 11g Resource Center
Access Videos, Webcasts, White Papers, and More

Oracle.com/enterprisemanager11g
## Additional Sessions / Demos / Hands-On Labs

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<tr>
<td>S317067</td>
<td>WebLogic Server Management for Oracle DBAs</td>
<td>Thursday 9:00 am</td>
<td>Marriott Hotel, Salon 9</td>
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<tr>
<td>S316996</td>
<td>Oracle Enterprise Manager Grid Control Deployment Best Practices</td>
<td>Thursday 10:30 am</td>
<td>Moscone South, Room 102</td>
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<tr>
<td>S317066</td>
<td>Deep Java Diagnostics and Performance Tuning: Expert Tips and Techniques</td>
<td>Thursday 1:30 pm</td>
<td>Marriott Hotel, Salon 9</td>
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<tr>
<td>S317060</td>
<td>Managing User Experience in the Cloud: Lessons from eBay</td>
<td>Thursday 1:30 pm</td>
<td>Marriott Hotel, Golden Gate A</td>
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Enterprise Manager DEMOgrounds in Moscone West

Fusion Middleware Management Hands-On Lab on Tuesday 2:00-3:00 pm and Thursday 10:30 – 11:30 am in Marriott Hotel, Salon 12/13, YB Level
Questions and Answers
SOFTWARE. HARDWARE. COMPLETE.