J2EE: Black Box in the Oracle World

December 2005
DBA Hot Seat:  Have these things ever happened to you?

DBA

Application Owner

IT Manager

Software Vendor
Hotseat comes from Unclear Ownership

It’s an Application issue!

It’s a Database issue!

Need evidence to show where the problem exists, avoid “Finger Pointing” to the database

SQL*Net message to client/dblink

The server (foreground process) is sending a message to the client. Typically indicates a network problem if times are abnormally excessive.

Resolved by:
Network Administrators

Additional Research
Unclear where to add capacity investment?

Where do we put the hardware investment - Database or App Server?

I need it...

DBA

I need it...

J2EE Owner

Need to identify what improvement will occur before expenditures or tuning projects...

00:08:29  Time waiting for 'db file scattered read'
25%    Percent of Time Period wait time
Problems must occur multiple times

Why did we have poor performance this morning?

Not sure, we need to wait for it to happen again

Need to watch production transactions, not just synthetic/test transactions
Typical Multi-Tier System

- Web page request
- App Layer
  - Oracle eBusiness
  - Peoplesoft
  - Siebel
  - SAP
  - Custom apps
- J2EE layer
- Oracle database

Service Levels Measured Here...

...Blame assigned Here

OS Independent
Typical Java tools

- Focus on system measurement, not Wait Time/Service Time
- Java details, no database visibility – but most Java delays are due to database
- No real time/constant monitoring
Typical Oracle Database Tools

- Focus on database in isolation – no connection to the J2EE application
- Look system wide, not at individual SQLs
- Count executions, not Wait Time
- Traces for special sessions, no continuous monitoring
System Centric Monitoring: How Can You Manage Performance this Way?

- Focus on system operation
- No correlation to transaction performance

![Graph showing system monitoring data]

- Idle threads
- Number of requests
- Waiting Requests
- Memory Usage

This page allows you to monitor performance information about this server.

- Idle Threads: 15
  The number of idle threads assigned to the queue.

- Oldest Pending Request: Tue Dec 06 10:22:40 MST 2005
  The date and time that the longest waiting request was placed in the queue.

- Throughput
  The number of requests that have been processed by the queue.

- Queue Length
  The number of waiting requests in the queue.

- Memory Usage
  The current amount of memory (in bytes) that is available in the JVM heap.

[Options: Force garbage collection, Modify graphing preferences]
Emerging best-practice for database tuning

- “You can’t tell how long something took by counting how many times it happened. ... If you’re only measuring event counts, then you’re not measuring what the users care about.”
  — Optimizing Oracle Performance, O’Reilly Press

Oracle is starting to build wait-based tuning tools into the database particularly in 10g

Tune by determining where processing time is spent
Track Wait Time, Not System Counters

- Watching Counters leads to wrong conclusions: Time is more relevant
- Total System Counters hide information: Need breakdown to individual steps in your transaction

<table>
<thead>
<tr>
<th>Total System Counter</th>
<th>Resources</th>
<th>I/O</th>
<th>Network</th>
<th>Locks</th>
<th>Redo</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>SQL 1</td>
<td>5 R</td>
<td>4 M</td>
<td>6 M</td>
<td>4 M</td>
</tr>
<tr>
<td></td>
<td>SQL 2</td>
<td>25 R</td>
<td>200 M</td>
<td>10 M</td>
<td>35 A</td>
</tr>
<tr>
<td></td>
<td>SQL 3</td>
<td>50 Reads</td>
<td>5M</td>
<td>100 Minutes</td>
<td>5M</td>
</tr>
<tr>
<td></td>
<td></td>
<td>80K Reads</td>
<td>5K Packets</td>
<td>125 Attempts</td>
<td>216K Writes</td>
</tr>
</tbody>
</table>
1st Step: Course Grained Measure of Time Between Systems
Many Tools Never See Inside Your Multi-Tier Application

Web – J2EE - Oracle

- Standard approach: Treat each system as a Black Box
- No detail inside the system
- Where are the bottlenecks, and who is responsible?
3 Requirements for J2EE to Oracle Visibility

- Every Transaction
- Every Step inside each layer
- Measure Time – That’s what users care about
Performance Monitoring where it Matters Most

Web page request

App Layer
Oracle eBusiness
PeopleSoft
Siebel
SAP
Custom apps

This is where the wait time accumulates

Web Server
J2EE layer
Oracle database

OS Independent
OS Independent
OS Independent
Desired Correlation Between Java and Oracle

Key Questions to Answer

Where are the transaction bottlenecks?

Why is Java waiting on the database?

What in the App server is driving my Oracle load?
Essential Step: Correlate Application Wait Time to SQL Waits

Question: Which SQL statements are causing Wait Time for my application?
Correlate URL Requests to Specific SQLs

Question: Which User Requests are responsible for driving SQL Wait Times?
Result: Identify Where the Bottlenecks Occur

App Server

Oracle Database

OfficeSupplies.com
Request Wait Times
Thursday - September 15, 2005 (3:00 PM to 4:00 PM)

Requests

Seconds of waiting

BIGFOOT (App Server)

PRODHOST_TESTBOX (Oracle)

Double-click to show more details
Get down to Details

- Recall 3 requirements:
  1. Individual request
  2. Every step
  3. Wait time
**Typical J2EE Performance Test Setup – Trial and Error to Find Bottleneck**

**Typical Cycle**

1. Functional Test/Memory Leaks
2. Build Test Environment
3. Simulate Load
4. Single session Profile – time measure
5. Measure system parameters
6. Try some changes

**Desired Cycle**

1. Functional Test/Memory Leaks
2. Validate in Test Environment
3. Measure Real Transactions
4. Identify bottleneck steps
5. Monitor Service Time Compliance
Java Measurement Techniques

- JMX – Heavy Load
- Profiler – Test transactions only
- Byte code instrumentation – Production Monitoring
  - Insert monitor byte into selected Java methods
  - Jar file pre-processor = No runtime intrusion
  - Test/validate instrumented jars on integration system
  - Download to production environment
- Method execution correlates with JDBC/SQL
Identify Execution Paths

- SQL – Method Call – URL Request
- Allocate Wait Time to each

<table>
<thead>
<tr>
<th>Execution Paths</th>
<th>Execution Time Attributed to Node</th>
<th>Number of Executions</th>
</tr>
</thead>
<tbody>
<tr>
<td>SQL Update Order Total</td>
<td>768.000 s</td>
<td>1439</td>
</tr>
<tr>
<td>DailyData.loadSQLs</td>
<td>768.000 s</td>
<td>3448</td>
</tr>
<tr>
<td>DailyData.getSQLMap</td>
<td>768.000 s</td>
<td>3448</td>
</tr>
<tr>
<td>DailyData.getSql</td>
<td>0.000 s</td>
<td>1724</td>
</tr>
<tr>
<td>Repository.getSQL</td>
<td>0.000 s</td>
<td>1724</td>
</tr>
<tr>
<td>Repository.getWaitEvents</td>
<td>0.000 s</td>
<td>1724</td>
</tr>
<tr>
<td>WaitEventAction.execute</td>
<td>0.000 s</td>
<td>1724</td>
</tr>
<tr>
<td>LoginFilter.doFilter</td>
<td>0.000 s</td>
<td>1724</td>
</tr>
<tr>
<td>OfficeSupplies.com//PlaceOrder.jsp</td>
<td>0.000 s</td>
<td>1724</td>
</tr>
<tr>
<td>DailyData.getSqls</td>
<td>0.000 s</td>
<td>1724</td>
</tr>
</tbody>
</table>
Conclusions

- DBA does not have to take the blame
- Solve database problems by understanding the other systems
- Look for Wait Time – that’s where the action is
- Connect SQL Waits with J2EE application time
- Watch production data, not synthetic transactions
About the Author

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