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Who Should Read This Paper?

This paper is intended for system administrators or others interested in performance test results for Micro Focus® Solutions Business Manager 10.1.5.1. This paper discusses the performance tests results of 200 virtual users in the on-premise version of Micro Focus Work Center using Windows 2008 R2 and Oracle 11gR2.

Test Methodology

Testing was conducted in a private enterprise performance testing lab using HP’s LoadRunner 12.00. Tests measured application response time, throughput, and system resource usage under a load of 200 virtual users against a large enterprise data set with a think time pause of 10 seconds between transactions. This test involved making Load Runner generate load by creating virtual users (one unique virtual user is added every five seconds until the desired load level is reached) to model user activity. Each virtual user then performs scripted tasks and sends crafted HTTP requests. LoadRunner then uses a threading execution model to create multiple instances of unique virtual users to create load and concurrency on the SBM application. During this test, the 200 virtual users iterate 600 times through each use case (transaction) in the performance suite. The scripts and the data sets used in this testing can be provided for reference upon request.

Runtime Test Architecture

The performance test was performed in a distributed SBM installation using five separate 64-bit servers. The environment included a dedicated Micro Focus License Manager installation with 80,000 seat licenses:

- **Server 1**—SBM Application Engine Web Server (Win2008R2-IIS 7 or Win2012R2-IIS 8.5) with 8GB memory
- **Server 2**—SBM JBoss1: Single Sign-On (SSO), SBM Mail Services, SBM Orchestration Engine with 8GB total and 4GB memory allocated to JBoss
- **Server 3**—SBM JBoss2: SBM Common Services (Smart Search, Resource Management, Relationship Service, SSF Services) with 8GB total and 4GB memory allocated to JBoss
- **Server 4**—SBM Logging Services (Mongod64) with 8GB of total memory
- **Server 5**—Oracle 11gR2 database with 16GB of total memory

---

**Note:** In 10.1.5.1, SBM Configurator enables you to install SBM Logging Services (MongoDB) on a separate server. As part of the performance tests, SBM Logging Services was installed on a separate server to measure its full out-of-the-box impact at 200vu load. This configuration is typically recommended only if you plan to set the logging level to TRACE for debugging purposes.
Load Test Scenario

Load tests simulated scaling the number of common tasks that are performed by 200 virtual users. Using a standard defect tracking application that enables a team to track product defects, the tests replicated the life cycle of defects from submittal, approval, and assignment. Notes and attachments are added to each item as it moves through the process. The Notification Server sent e-mails via SMTP to a test SMTP Mail Server repository. Shared views of activity, backlog, calendar feeds, and shared dashboard views of multiview reports were run against the system.

Tests were performed by a set number of 200 unique virtual users over a 20 minute baseline. Think time between each use case (LoadRunner “Transaction”) was 10 seconds (with exceptions for transactions from Micro Focus Work Center: 60 second think time before indexer transactions; 90 second think-time before notification transactions). The performance workflow consist of the following actions:

- LoadRunner virtual users run in multiple threads of execution
- 200 unique virtual users log in via SSO to Work Center in vuser_init
- Repeat iterate (defect tracking application) use cases
- 200 unique virtual users log off via SSO from Work Center in vuser_end

Work Center (SBM Application Engine) Use Cases

Work Center use cases run during virtual user initialization against large enterprise data set:

- Web SSO Login
- VUser Init Notification Remove All
- Settings Save Preferred Project
- Settings Save Items Per Page 40 And Notification Poll Interval 90 Second
- SWC Home Add Report Widget (use Multi-View Report #1)
- SWC Home Add Activity Widget (use My Activity)

Work Center use cases run during virtual user exit against large enterprise data set:

- SWC Home Delete Report Widget (use Multi View Report #1)
- SWC Home Delete Activity Widget (use My Activity)
- VUser End Notification Remove All
- Web SSO Logout
Work Center use cases iterated by each virtual user against large enterprise data set:

- Submit-Form
- Submit-Form OK (submit item)
- Transition Owner In
- Defect Tracking Activities Tab
- Defect Tracking My Activity After Owner IN
- Defect Tracking Shared Activity Feed View After Owner IN
- Defect Tracking Calendars Tab
- Defect Tracking My Calendar
- Defect Tracking Shared Calendar Feed View After Owner IN
- Transition Owner Out
- Transition Owner Out Ok
- Transition Secondary Owner In
- My Activity After Secondary Owner In
- Shared Activity View All Items I Own Primary and Secondary
- Transition Secondary Owner Out
- Transition Secondary Owner Out Ok
- Transition-SyncTest (makes synchronous AE Web services call)
- AddNote
- Add Attachment In Note (27KB JPEG file attached from disk)
- AddNote-Ok (text with HTML5 tags includes 27KB JPG + 2KB note)
- AddAttachment
- AddAttachment-OK (11KB .txt file attached from disk)
- Email_Link • Email_Link SearchUser
- Email_Link-OK (message with HTML5 tags)
- Transition Assign To CCB
- Transition Assign To CCB OK
- Transition Assign To Area Owner
- Transition Assign To Area Owner OK
- Social View Of BUG
- BUGID Lucene Text Search
- BUGStar Lucene Text Search
- BUGIDStar Lucene Text Search
- Attachment Lucene Text Search
- TitleDescription Lucene Text Search
- TitleDescriptionStar Lucene Text Search
- Submitter Lucene Text Search
- User Profile Card
- Contact Card AD Client Logging
- Add then Delete From Favorites
- PinUp Defect Tracking (Application)
- Select Defect Tracking PinUp
- Defect Tracking Manage Views
- Defect Tracking My Dashboard
- Defect Tracking Shared Dashboard View (use Multi-View Report #1)
- Defect Tracking Backlogs Tab
- Defect Tracking Shared Backlog Feed View
- Report Center
- CTOSDS Elapsed Time Duration
- CTOSDS Time in State Duration
- CTOSDS Average Time To State Duration
- CTOSDS Open And Completed Trend
- CTOSDS Entering A State Trend
- CTOSDS State Activity Trend
- Multi-View Report 1
- Static Listing For Performance EG
- Static Listing For Multi-View Performance
- All Issues By Project and State
- All Issues by Issue Type
- Listing Report
About the Data Set

The large enterprise data set that was used for testing is summarized below:

<table>
<thead>
<tr>
<th>SBM Entity</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workflows (define the process that items follow)</td>
<td>31</td>
</tr>
<tr>
<td>Projects (store process items, such as issues and incidents)</td>
<td>5,302</td>
</tr>
<tr>
<td>Users</td>
<td>21,100</td>
</tr>
<tr>
<td>SBM groups</td>
<td>138</td>
</tr>
<tr>
<td>Folders (store personal and group favorites)</td>
<td>147,570</td>
</tr>
<tr>
<td>Issues (process items that follow a workflow)</td>
<td>1,130,000</td>
</tr>
<tr>
<td>Contacts (similar to address book entries)</td>
<td>20,053</td>
</tr>
<tr>
<td>Resources</td>
<td>24,249</td>
</tr>
</tbody>
</table>

**Note:** In addition, the database included the following configuration settings:

- processes = 300 (Newer versions of Application Engine require more sessions per user to power Work Center)
- READ_COMMITTED_SNAPSHOT = OFF
Performance Test Results

The following graphs summarize the results from the performance tests.

Average Transaction Response Time

The response time for individual transactions are summarized below:

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Minimum Time</th>
<th>Average Time</th>
<th>Maximum Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>ContactCard AD Client Logging</td>
<td>0.009</td>
<td>0.017</td>
<td>0.052</td>
</tr>
<tr>
<td>SWC Home Delete Activity Widget</td>
<td>0.035</td>
<td>0.04</td>
<td>0.046</td>
</tr>
<tr>
<td>BUGIDStar Lucene Text Search</td>
<td>0.031</td>
<td>0.041</td>
<td>0.052</td>
</tr>
<tr>
<td>SWC Home Delete Report Widget</td>
<td>0.037</td>
<td>0.042</td>
<td>0.052</td>
</tr>
<tr>
<td>Add Attachment</td>
<td>0.031</td>
<td>0.053</td>
<td>0.096</td>
</tr>
<tr>
<td>User Profile Card</td>
<td>0.036</td>
<td>0.058</td>
<td>0.086</td>
</tr>
<tr>
<td>User End Notification Remove All</td>
<td>0.043</td>
<td>0.059</td>
<td>0.079</td>
</tr>
<tr>
<td>Defect Tracking Backlogs Tab</td>
<td>0.057</td>
<td>0.07</td>
<td>0.092</td>
</tr>
<tr>
<td>Defect Tracking My Calendar</td>
<td>0.051</td>
<td>0.083</td>
<td>0.11</td>
</tr>
<tr>
<td>Defect Tracking Calendars Tab</td>
<td>0.083</td>
<td>0.096</td>
<td>0.114</td>
</tr>
<tr>
<td>Add Note</td>
<td>0.075</td>
<td>0.097</td>
<td>0.133</td>
</tr>
<tr>
<td>Email Link Search User</td>
<td>0.058</td>
<td>0.098</td>
<td>0.131</td>
</tr>
<tr>
<td>All Open Issues</td>
<td>0.067</td>
<td>0.101</td>
<td>0.146</td>
</tr>
<tr>
<td>Listing Report</td>
<td>0.065</td>
<td>0.103</td>
<td>0.173</td>
</tr>
<tr>
<td>Notification UI View All</td>
<td>0.09</td>
<td>0.103</td>
<td>0.122</td>
</tr>
<tr>
<td>Defect Tracking Activities Tab</td>
<td>0.09</td>
<td>0.105</td>
<td>0.143</td>
</tr>
<tr>
<td>TitleDescription Lucene Text Search</td>
<td>0.083</td>
<td>0.11</td>
<td>0.19</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Measurement</th>
<th>Minimum Time</th>
<th>Average Time</th>
<th>Maximum Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>My Open Issues</td>
<td>0.084</td>
<td>0.113</td>
<td>0.148</td>
</tr>
<tr>
<td>Notification UI MarkRead and Remove 10</td>
<td>0.092</td>
<td>0.117</td>
<td>0.144</td>
</tr>
<tr>
<td>Notification UI MarkRead and Remove 3</td>
<td>0.104</td>
<td>0.117</td>
<td>0.134</td>
</tr>
<tr>
<td>Notification UI MarkRead and Remove 6</td>
<td>0.105</td>
<td>0.117</td>
<td>0.131</td>
</tr>
<tr>
<td>Notification UI MarkRead and Remove 7</td>
<td>0.106</td>
<td>0.117</td>
<td>0.139</td>
</tr>
<tr>
<td>Notification UI MarkRead and Remove 9</td>
<td>0.1</td>
<td>0.117</td>
<td>0.146</td>
</tr>
<tr>
<td>Notification UI MarkRead and Remove 2</td>
<td>0.1</td>
<td>0.118</td>
<td>0.145</td>
</tr>
<tr>
<td>Notification UI MarkRead and Remove 4</td>
<td>0.102</td>
<td>0.118</td>
<td>0.134</td>
</tr>
<tr>
<td>Notification UI MarkRead and Remove 1</td>
<td>0.102</td>
<td>0.12</td>
<td>0.137</td>
</tr>
<tr>
<td>Notification UI MarkRead and Remove 5</td>
<td>0.106</td>
<td>0.12</td>
<td>0.145</td>
</tr>
<tr>
<td>Notification UI MarkRead and Remove 8</td>
<td>0.105</td>
<td>0.12</td>
<td>0.151</td>
</tr>
<tr>
<td>Email Link</td>
<td>0.097</td>
<td>0.121</td>
<td>0.149</td>
</tr>
<tr>
<td>CTOSDS Time in State Duration</td>
<td>0.08</td>
<td>0.125</td>
<td>0.188</td>
</tr>
<tr>
<td>Add then Delete From Favorites</td>
<td>0.119</td>
<td>0.136</td>
<td>0.159</td>
</tr>
<tr>
<td>TitleDescriptionStar Lucene Text Search</td>
<td>0.112</td>
<td>0.152</td>
<td>0.214</td>
</tr>
<tr>
<td>CTOSDS Entering A State Trend</td>
<td>0.113</td>
<td>0.193</td>
<td>0.272</td>
</tr>
<tr>
<td>Settings Save Items Per Page 40 And Notification Poll</td>
<td>0.169</td>
<td>0.209</td>
<td>0.248</td>
</tr>
<tr>
<td>Interval 90 Second</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Defect Tracking Manage Views</td>
<td>0.191</td>
<td>0.217</td>
<td>0.257</td>
</tr>
<tr>
<td>BUGID Lucene Text Search</td>
<td>0.036</td>
<td>0.223</td>
<td>0.758</td>
</tr>
<tr>
<td>Static Listing For Multi-View Performance</td>
<td>0.152</td>
<td>0.244</td>
<td>0.321</td>
</tr>
<tr>
<td>Email Link OK</td>
<td>0.159</td>
<td>0.246</td>
<td>0.297</td>
</tr>
<tr>
<td>Defect Tracking My Activity After Owner IN</td>
<td>0.203</td>
<td>0.282</td>
<td>0.335</td>
</tr>
<tr>
<td>My Activity After Secondary Owner IN</td>
<td>0.184</td>
<td>0.282</td>
<td>0.356</td>
</tr>
<tr>
<td>Social View Of BUG</td>
<td>0.241</td>
<td>0.286</td>
<td>0.35</td>
</tr>
<tr>
<td>Submit Form</td>
<td>0.206</td>
<td>0.323</td>
<td>0.46</td>
</tr>
<tr>
<td>Transition Secondary Owner OUT</td>
<td>0.288</td>
<td>0.357</td>
<td>0.425</td>
</tr>
<tr>
<td>Add Attachment In Note</td>
<td>0.29</td>
<td>0.358</td>
<td>0.432</td>
</tr>
<tr>
<td>Transition Owner OUT</td>
<td>0.266</td>
<td>0.373</td>
<td>0.441</td>
</tr>
<tr>
<td>Add Note OK</td>
<td>0.295</td>
<td>0.378</td>
<td>0.47</td>
</tr>
<tr>
<td>Transition Assign To Area Owner</td>
<td>0.301</td>
<td>0.409</td>
<td>0.485</td>
</tr>
<tr>
<td>Defect Tracking Shared Calendar Feed View After Owner IN</td>
<td>0.323</td>
<td>0.415</td>
<td>0.469</td>
</tr>
<tr>
<td>Transition Assign To CCB</td>
<td>0.289</td>
<td>0.415</td>
<td>0.488</td>
</tr>
<tr>
<td>Issues by Issue Type</td>
<td>0.34</td>
<td>0.421</td>
<td>0.497</td>
</tr>
<tr>
<td>All Issues by Project and Issue Type</td>
<td>0.314</td>
<td>0.421</td>
<td>20.053</td>
</tr>
<tr>
<td>All Issues by Owner</td>
<td>0.338</td>
<td>0.426</td>
<td>20.053</td>
</tr>
<tr>
<td>All Issues by State</td>
<td>0.336</td>
<td>0.428</td>
<td>20.053</td>
</tr>
<tr>
<td>Transition Owner OUT</td>
<td>0.354</td>
<td>0.434</td>
<td>0.526</td>
</tr>
<tr>
<td>Transition Secondary Owner OUT OK</td>
<td>0.365</td>
<td>0.435</td>
<td>0.523</td>
</tr>
<tr>
<td>WebSSO Logout</td>
<td>0.377</td>
<td>0.448</td>
<td>0.551</td>
</tr>
<tr>
<td>All Issues By Project and State</td>
<td>0.354</td>
<td>0.449</td>
<td>0.534</td>
</tr>
<tr>
<td>PinUp Defect Tracking</td>
<td>0.425</td>
<td>0.469</td>
<td>0.513</td>
</tr>
<tr>
<td>Transition Owner IN</td>
<td>0.441</td>
<td>0.513</td>
<td>0.621</td>
</tr>
<tr>
<td>Transition Secondary Owner IN</td>
<td>0.419</td>
<td>0.55</td>
<td>0.662</td>
</tr>
</tbody>
</table>

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A higher average response time was recorded for Open and Completed Trend report and SBM Search by Submitter with an Oracle database; for all other transactions, the average response time was 2.49 seconds or less.

No significant performance impact was observed when the Rich Text Editor was enabled for Memo/Note Fields in submit and transition forms.
Transaction Hits Per Second
Hits per second for HTTP transactions that were executed concurrently in SBM are summarized below:

![Graph of Hits Per Second]

Transaction Bytes Per Second
Bytes per second for HTTP transactions that were executed concurrently in SBM are summarized below:

![Graph of Bytes Per Second]
Number of Transactions Executed Concurrently By 200 Virtual User Load
The number of HTTP transactions that were executed concurrently in SBM are summarized below:

Web Server CPU Usage
Web server CPU usage is summarized below:
**Web Server Memory Usage**

Web server memory usage is summarized below:

![Graph showing Web Server Memory Usage](image)

- **Win2008R2-Oracle11GR2 Default-W3WP Working Set Up To 790 MB**
- **Win2008R2-Oracle11GR2 GSOAP-W3WP Working Set Up To 470 MB**

**Web Server Thread Count**

Web server thread count is summarized below:

![Graph showing Web Server Thread Count](image)

- **Win2008R2-Oracle11GR2 Default-W3WP Thread Count up to 92**
- **Win2008R2-Oracle11GR2 GSOAP-W3WP Thread Count up to 72**
Web Server Handle Count

Web server handle count is summarized below:

Web Server Virtual Bytes

Web server virtual bytes are summarized below:
Common Services CPU Usage

Common Services CPU usage is summarized below:

Common Services Memory Usage

Common Services memory usage is summarized below:
Notification Server CPU Usage
Notification Server CPU usage is summarized below:

![Notification Server CPU Usage Graph](image)

Notification Server Memory Usage
Notification Server memory usage is summarized below:

![Notification Server Memory Usage Graph](image)
**Database Server CPU Usage**

Database Server CPU usage is summarized below:

![Database Server CPU Usage Graph](image)

**Database Server Memory Usage**

Database Server memory usage is summarized below:

![Database Server Memory Usage Graph](image)
SBM Logging Services CPU Usage

SBM Logging Services (mongod64) CPU usage is summarized below. Note that Active Diagnostics logging level was set to `INFO`:

![SBM Logging Services CPU Usage Graph]

SBM Logging Services Memory Usage SBM

Logging Services memory usage is summarized below. Note that Active Diagnostics logging level was set to `INFO`:

![SBM Logging Services Memory Usage Graph]
Relationship Service Performance

Results for one Neo4J instance (not clustered), JBoss 3GB Heap + Neo4J 1GB Heap, default 10 worker threads are summarized below:

- Neo4J Java CPU% peak was 25% during the initial load (most CPU intensive period).
- Initial load totaled 1.2 million records (ExportToCSV + ImportToGraphDB), which took 108 minutes to finish.
- Replicating/synchronization of new records in TS_CHANGEACTIONS table was processed at a rate of 2,400 records per minute.
- For 1,137,446 records (and 14,118,424 relationships), Neo4J database disk usage was 3.9GB.

Smart Search Indexer Performance

Results of the Smart Search indexer (Lucene), 4 GB Common Services Java Heap are summarized below:

- Initial index or re-index operations are now multi-threaded. 6 worker threads of execution quickly processed all primary tables sequentially.
- After the initial index or re-index finished, the indexer periodically polled the database every 30 seconds (by default) to update the index with new records from the TS_CHANGEACTIONS table, which was then searchable via Work Center.
- Initial index of 1,102,276 items in the TTT_ISSUES table took 2 hours and 6 Minutes to complete (indexdir folder size was 230MB).
- Impact of initial index of 1,102,276 items in TTT_ISSUES: Common Services Java CPU increased to 18%, Common Services Java Working Set increased to 720MB.
- The indexer finished the update of 46,357 change items in 17 minutes and 45 seconds.
- Impact of update index with new records from TS_CHANGEACTIONS table: Common Services Java CPU increased to 2%, Common Services Java Working Set increased to 457MB.

Additional Information

Note the following performance testing information:

Configuration Notes

- If TRACE level logging in Active Diagnostics is enabled for debugging SBM components on a 64-bit system with 8GB RAM, the mongod64 process will compete for memory with SBM Common Services and prevent JBoss from using the 4GB Heap that is allocated to it.
The default performance settings in SBM Configurator are used for load tests:

- Notification Server ForceSend = OFF
- Throttling of Orchestrations = OFF

On the server that hosts SBM Common Services, the indexer settings are changed for load tests in SBM Configurator:

- Expected Search Usage = High
- Database Polling Interval = 30 seconds

Oracle ODBC client connection to Oracle server configuration tips:

- Another variable for number of sessions used depends on what type of ODBC connection Application Engine is making as a client to the Oracle 11gR2 server. ODBC connection as Client10 (SSL) or via Oracle Advanced Security requires an increase in processes/sessions on the Oracle 11gR2 server.

- To avoid server refused the connection errors in the Application Engine Event Viewer and JDBC connection exceptions in the JBoss server.log in the performance lab at 200vu load against Work Center, increasing the number of processes to 300 and sessions to 400 in Oracle is sufficient:

\[
\text{sqlplus system/testauto@hpq5} \\
> \text{alter system set processes=300 scope=spfile;}
\]

Verify change:

\[
\text{sqlplus system/testaut0@hpq5} \\
> \text{show parameters processes;} \\
> \text{show parameters sessions;}
\]

SBM 10.1.5.1 Reported Defects

The following defects have been submitted against the GA build of SBM 10.1.5.1:

- **DEF261371**—SWC PERF 200vu Default W3WP Process Handle Count Leak
- **DEF267809**—SWC PERF 200vu Add Activity Widget—Higher Response with Oracle 11gR2 as compared to SQL Server 2008R2 (not a regression)
- **DEF267213**—SWC PERF: Editable Grid Listing Report Executed Twice. This issue causes higher response time and higher database CPU, though it is not a regression. The report is executed twice in the following areas:
  - When used a home page report
  - When you select an application that is pinned as a favorite in Work Center
  - When the report is used on My Dashboard
  - When the report is used in a shared backlog feed view
Performance Test Exclusions

The following items were excluded from performance testing:

- System report transactions are not included in 200vu load test.