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Oracle JD Edwards EnterpriseOne Object Usage Tracking

Performance Characterization Using JD Edwards EnterpriseOne Object Usage Tracking

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Executive Summary

Following the release of Object Usage Tracking in EnterpriseOne Tools 9.2.1.2, the Oracle JD Edwards EnterpriseOne development team initiated a project to characterize the performance of interactive applications and batch processes. The purpose of the performance characterization was to demonstrate that there is minimal impact to performance after enabling Object Usage Tracking.

The resulting performance characterization concluded that there was no significant impact to interactive applications or batch processes with Object Usage Tracking enabled. There was a consistent minimal impact of 130ms or less than 0.5% of the total end-to-end server processing time for both interactive and batch processes at all scaling levels of users tested (100/250/500). The Oracle development team recommends that Object Usage Tracking remain enabled at all times.

The recommendation is that customers follow the best practices for proper sizing of EnterpriseOne database tables that store the Object Usage Tracking information as well as initiate scheduled cleanup of the object tracking detail tables so as to avoid performance issues due to large table sizes.

Introduction

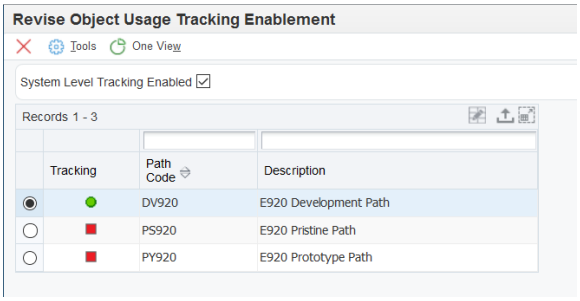
Oracle JD Edwards EnterpriseOne is an integrated applications suite of comprehensive enterprise resource planning (ERP) software that combines business value, standards-based technology, and deep industry experience into a business solution. The JD Edwards solution architecture can exist on multiple platforms and on multiple database architectures. This document describes performance characterization testing performed with JD Edwards EnterpriseOne Object Usage Tracking running on an Oracle Linux based virtual machine.

Object Usage Tracking Concepts

Object Usage Tracking provides enterprise-wide visibility on JD Edwards' interactive applications and batch jobs (UBEs) executed, customized, and patched in customer environments. Out of the box UX One analytics helps customers identify modules in use, usage patterns, as well as peak usage and load across environments to give greater insight for usage, performance, issue analysis, and managing compliance.

Object Usage Tracking allows the recording of batch and interactive applications (and forms) accessed by users. Object Usage Tracking stores tracking records in the Object Usage Tracking Detail table (F98911) on the EnterpriseOne Database Server.

Object Usage Tracking is disabled by default. You enable Object Usage Tracking through the Working with Object Usage Tracking Configuration (P980042T) application as illustrated in the figure below.



Object Tracking Configuration (P980042T)

Note: You must first enable Object Usage Tracking for the system before enabling the feature at the path code level.

For more information, see the JD Edwards EnterpriseOne Tools Software Updates guide at:
https://docs.oracle.com/cd/E53430_01/EOTSU/objectusage.htm#EOTSU275

An Object Usage Tracking record insert in the F98911 table occurs every time a user enters an interactive application or form and for every submission of a batch job.

Test Configuration

Below is the list of the EnterpriseOne component machines that made up the architecture for testing:

Machines and Platforms

Enterprise Server:

- Oracle Enterprise Linux 6
- Oracle Database12c (12.1.0.2) 32-bit Client
- 4 VCPUs x Intel(R) Xeon(R) CPU E5-2697 @ 2.90 GHz
- 12 GB RAM

Database Server:

- Oracle Enterprise Linux 6
- Oracle Database12c (12.1.0.2) Enterprise Edition 64 bit
- 8 VCPUs x Intel(R) Xeon(R) CPU E5-2697 @ 2.90GHz
- 30 GB RAM

WEB / HTML Server:

- Oracle Enterprise Linux 6
- 6 VCPUs x Intel(R) Xeon(R) CPU E5-2697 @ 2.90 GHz
- 16 GB RAM
- WebLogic Server 12c (12.1.3); Java JDK (1.8)
- Single Managed Instance (4GB Heap Size)

Deployment Server:

- Windows 2012 R2 Enterprise Edition
- 2 VCPUs x Intel(R) Xeon(R) CPU E5-2697 @ 2.90 GHz
- 8 GB RAM

Server Manager Console:

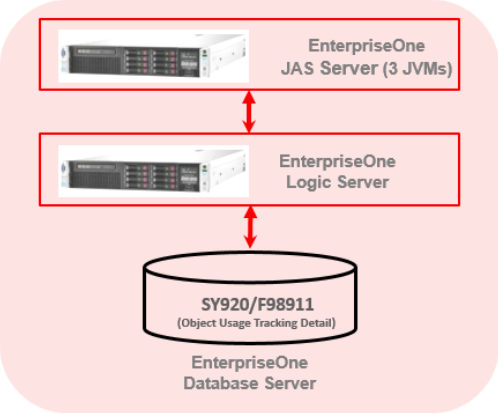
- Oracle Enterprise Linux 6
- 1 VCPUs x Intel(R) Xeon(R) CPU E5-2697 @ 2.90 GHz
- 132 GB RAM

OATS Test Controller:

- Windows 2012 R2 Enterprise Edition
- 8 VCPUs x Intel® Xeon® CPU E5-2697 2.90 GHz
- 32 GB RAM
- Oracle Application Testing Suite 12.3.0.1.0.376

Software

- JD Edwards EnterpriseOne Application 9.2 with Tools 9.2.1.2



EnterpriseOne Architecture

Data Collection Techniques

The items listed below are the metrics and data collection techniques used for testing Object Usage Tracking:

- CPU/Memory/Network operating system metric collection on the EnterpriseOne Logic and JAS / HTML servers was performed using scripts with the standard commands of 'ps', 'iostat', 'vmstat', 'netstat', and 'sar'. The LFRAME utility was used to collect all statistics on the EnterpriseOne Database server.

- JVM heap memory on the JAS / HTML server collected statistics using the verbose garbage collection (GC). The following arguments to the JVM collect all GC activity and heap size data over time:

  -Xloggc:<path to log directory>/gc.log -XX:-PrintGCDetails -XX:+PrintGCTimeStamps

  Verbose GC statistics are an excellent method of Java memory analysis and the impact of this utility on the EnterpriseOne JAS server is negligible, making it an ideal tool for ensuring stability of the EnterpriseOne application and identifying possible memory shortages and memory leaks.

- Call Object response times collection used the EnterpriseOne Server Manager Console facility included in the EnterpriseOne base product offering.

- Response times of all interactive transactions were collected using the Oracle Application Testing Suites (OATS) built-in analysis tools, which provided server end-to-end timing metrics.

Use Cases

The Oracle EnterpriseOne Day-in-the-Life (DIL) Kit was used for testing EnterpriseOne Object Usage Tracking. The DIL Kit is a set of Oracle internally automated load testing scripts for the purpose of generating various interactive loads in an EnterpriseOne architecture environment. The DIL Kit comprises 25 interactive applications across five functional modules, including Customer Service Management, Finance Management, Human Capital Management, Supplier Relationship Management, and Supply Chain Management. Another component of the DIL Kit is the 1.2 TB foundational database that application and batch processes use, designed to represent an average-sized JD Edwards EnterpriseOne customer.

Exercising the DIL Kit for 100, 250, and 500 interactive users included testing for concurrent batch processing and comparing the metrics with the Object Usage Tracking feature enabled. Metrics such as end-to-end response time and operating system metrics (processor, memory, and network) statistics comprised the bulk of the comparisons used for measuring the performance characterizations.

Results

Discussion

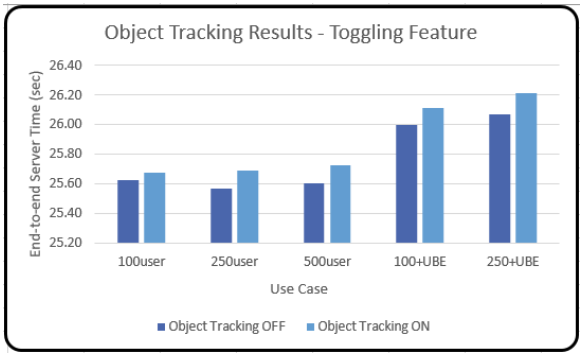
Object Usage Tracking recorded an entry for every instance an interactive application or form was instantiated by the DIL Kit tests. A tracking detail record was also recorded for every batch job process submitted.

The DIL Kit has 31 unique application/form entries that add records to the F98911 table. An individual DIL Kit script may record 1 to 4 records per iteration, which will continue for the testing period of an hour for each use case described above.

For example, during DIL Kit testing of one hour, the test recorded 3800 records for a 100 users' interactive load and 9700 records for a combined 100 users' interactive and batch load, assuming a rate of 10 UBE submissions per minute. Each batch (UBE) process entered a single record into the F98911 table. All of the batch processes tested were single-threaded and did not launch any child batch processes.

Server End-to-End Metrics

As mentioned in the summary section of this document, the impact of Object Usage Tracking is a delay of approximately 130ms. The below figure shows that this value is observed for each of the use cases tested.



Server end-to-end response times

Interactive User Characterization of Object Usage Tracking

In isolated interactive user testing (100/250/500 users), there was a consistent baseline measurement of the server end-to-end timing of approximately 25.60 seconds without Object Usage Tracking enabled. When Object Usage Tracking is enabled, the timing of the server end-to-end time rose to an average time of 26.73 seconds or 130ms difference. This baseline and time difference was independent of the scaling of interactive users.

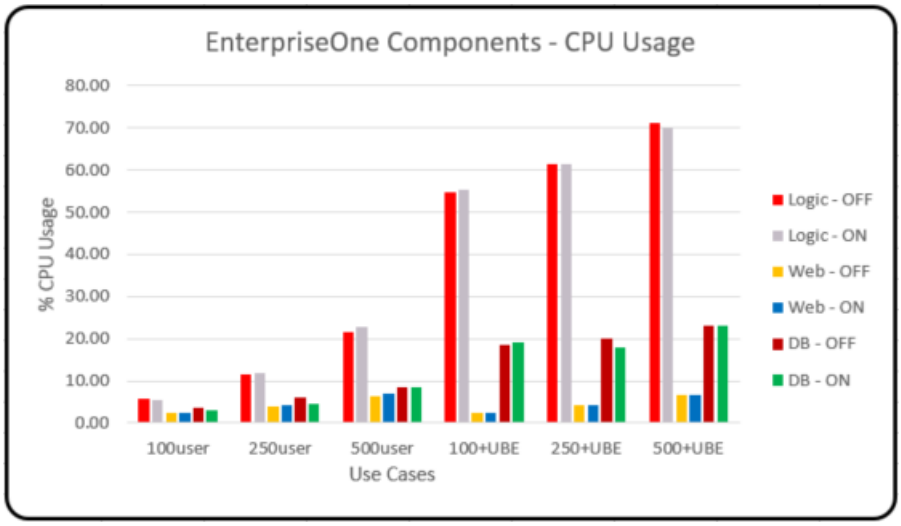
Interactive User and Batch Characterization of Object Usage Tracking

Similar to the interactive user testing, interactive and batch load testing results were predictable in the number of entries in the F98911 table and overhead to the end-to-end server response times. In the use cases of interactive and batch, a baseline (Object Usage Tracking disabled) of 26.00 seconds and 26.08 was observed for 100/batch and 250/batch, respectively. Enabling Object Usage Tracking yielded a similar 130ms differential. As before, scaling

both interactive users with batch yielded the same 130ms result, making the performance impact of the Object Usage Tracking feature independent of load.

Operating System Server CPU Profile

The illustration of the operating system processor (CPU) is in the figure below. The figure shows the CPU resource consumption for the EnterpriseOne architecture component servers.

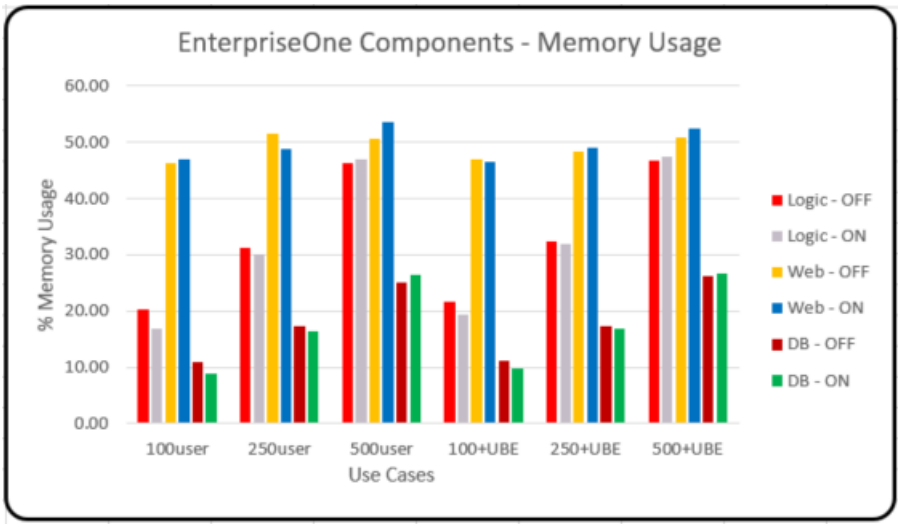


CPU Usage for EnterpriseOne Components

As anticipated for both interactive and interactive with batch testing, the CPU load increases on the Logic and Web Servers as the testing load increases and there was no significant impact to CPU performance between having Object Usage Tracking enabled or disabled. Although there is minor improvement to the CPU for the Logic and Web Server CPU statistics, this is a result of the EnterpriseOne application 'waiting' to write records and not consuming CPU resources. The observed CPU statistics are not an actual performance enhancement, but a downstream effect of the code 'wait' states resulting from the Object Tracking records inserted into the F98911 table.

Operating System Server Memory Profile

For the operating system memory profiles, illustrated below are the EnterpriseOne component servers. In the case of the JAS Server, the garbage collection (GC) metrics, described later in this document, is a better observational tool for observing memory consumption on the JAS server. The GC metrics measures the memory heap usage of the WebLogic managed instance memory pool.

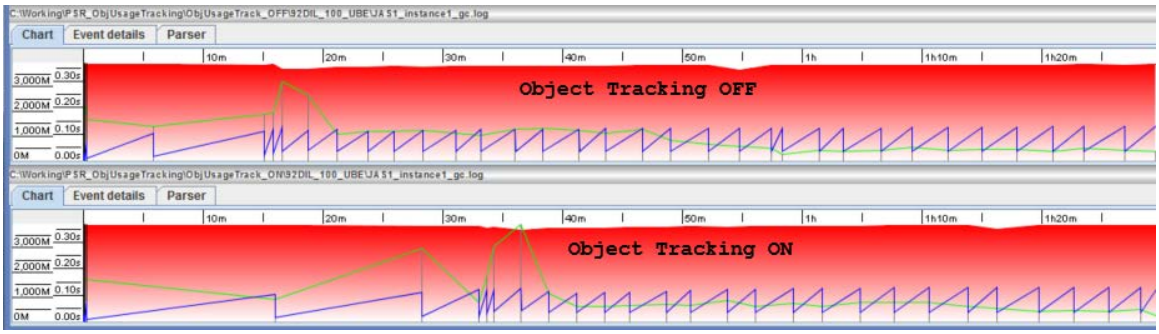


Memory Usage for the EnterpriseOne Component Servers

The illustration above is the memory profiles of the EnterpriseOne components. Similar to the CPU profiles, there is not a significant impact to memory consumption on the component servers with Object Usage Tracking enabled for interactive user scaling and interactive user scaling with batch processing. The EnterpriseOne architecture is based on the Linux operating system. This operating system uses a complex algorithm of memory buffers and cache with regard to memory consumption and reporting of available memory. Small variances in the reporting of memory consumption as was observed above is normal.

JAS Server Garbage Collection Profile

The garbage collection metrics shown in the figure below illustrate the memory profile of the WebLogic heap usage (shown in blue). The figure shows the memory profile of the WebLogic java managed instance heap usage. The test is 100 users with the inclusion of batch with Object Usage Tracking enabled.



Garbage Collection metrics

Without going into details about all aspects of this graph, the profiles demonstrate that no memory issues are observed through the garbage collection profile and a consistent memory usage and freeing of memory is seen that is identical to a similar profile.

Tuning Recommendations

With just a small impact (130ms) to the overall server end-to-end response time, the following is the recommended performance tuning for Object Usage Tracking:

EnterpriseOne Datasource System - 920

The F98911 table is located in the 'System – 920' EnterpriseOne data source. The EnterpriseOne 'System – 920' data source is used to mainly read information from the database for normal EnterpriseOne operations.

Object Usage Tracking changes the dynamics of this data source to be 'write' operation heavy. With this requirement comes the need for the database administrator to ensure that the default size of the database data source is large enough to handle the influx of records inserting in the F98911 table. The 'System – 920' data source must also be set to auto-extend if need be; otherwise tracking information and EnterpriseOne functionality in general might be compromised. There is a performance impact if the database must perform frequent auto-extension of the 'System – 920' data source and therefore it is recommended that a large tablespace size is chosen instead of auto-extension.

Purging the Object Usage Tracking Detail Table

Oracle recommends that the user follow the documentation for Object Usage Tracking with regard to purging and summarizing detail tracking information for future use. The F98911 table can accumulate a large number of records in a short time interval. Incorporating processes to ensure that this table's growth is 'checked' periodically is a concern of any performance analyst. A few key factors to this performance degradation include the size of F98911, frequency of 'inserts', the database's need to enforce indexes and constraints, and the database's need to maintain current table statistics. Of course, performance degradation will vary depending on the customer's use of Object Usage Tracking and the speed of the hardware on the EnterpriseOne Database Server component.

Analysis

Analysis of the cumulative metrics showed a minimal, less than 0.5%, or 130ms, performance impact to response time for the server end-to-end response time. Furthermore, CPU/Memory did not show any significant impact to warrant any architecture changes to the EnterpriseOne component servers.

Conclusion

When Object Usage Tracking is enabled, it has minimal impact to the end users, whether from the perspective of scaling interactive users or interactive users with batch. Testing with the Oracle DIL Kit demonstrated the feature impact was consistent throughout all the testing performed and was independent of the scaling of load.

The average CPU/Memory profile did not show an impact of this feature on the operating system metrics.

Enabling Object Usage Tracking resulted in a minimal (0.5%, 130ms) performance impact.

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