

ORACLE E-BUSINESS SUITE R12 (12.2.7) LARGE PAYROLL (BATCH) BENCHMARK - USING ORACLE12c (12.1.0.2) ON ORACLE’S CLOUD INFRASTRUCTURE (1-NODE VM DB SYSTEM)

As a global leader in e-business applications, Oracle is committed to delivering high performance solutions that meet our customers’ expectations. Business software must deliver rich functionality with robust performance. This performance must be maintained at volumes that are representative of customer environments.

Oracle benchmarks demonstrate our software’s performance characteristics for a range of processing volumes in a specific configuration. Customers and prospects can use this information to determine the software, hardware, and network configurations necessary to support their processing volumes.

The primary objective of our benchmarking effort is to provide as many data points as possible to support this important decision.

SUMMARY OF RESULTS

This batch benchmark test was run on a 16-core server.

Batch Workload			
250,000 Employees	Threads	Time (Min)	Hourly Employee Throughput
Payroll Processing	30	9.83	1,525,423
PrePayments	30	2.75	5,454,545
External Archive	30	28.88	519,330
NACHA	30	0.83	18,000,000
Checkwriter	30	1.78	8,411,214
Costing	30	2.80	5,357,142
Totals:		46.88	319,943
Parent Proc. Total:		66.40	225,903

Table 1: Payroll Batch Performance

Note that the hourly throughput numbers mentioned above are linear extrapolations. Many factors can influence performance and your results may differ.

BENCHMARK PROFILE

In April 2019, Oracle conducted a benchmark initiated from Pleasanton California using cloud resources located in Ashburn Virginia, to measure the batch performance of Oracle E-Business Suite Standard Benchmark processes in an environment running Oracle E-Business Suite Payroll R12 (12.2.7). The database server used Oracle12c™ (12.1.0.2.0) running on Oracle’s Cloud Infrastructure (OCI) VM Cloud 16.2.2 Database Cloud Service – Virtual Machines, with Oracle® Linux® 6.9 (64-bit) OS. Moreover, the instance of 16 OCPU, 32 threads, 240 GB used the attached 12.8 TB NVMe SSD for data storage and redo log storage.

The benchmark measured the Payroll batch business process hourly throughputs for an extra-large database model. Testing was conducted in a controlled environment with no other applications running. **The goal of this Benchmark was to obtain reference batch throughputs for Oracle E-Business Suite R12 Benchmark on an Oracle’s Database Cloud Infrastructure (1-Node VM DB System).**

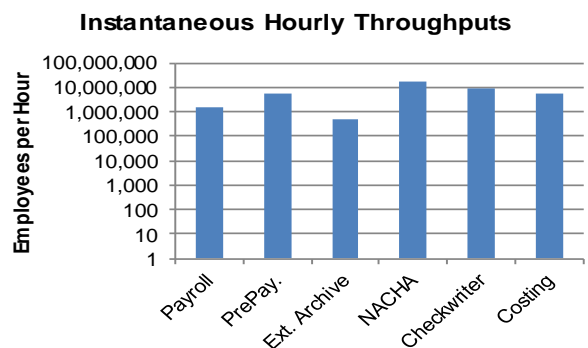


Figure 1: Oracle E-Business Suite Payroll Batch Throughputs

BENCHMARK METHODOLOGY

Oracle E-Business Suite R12 Benchmark batch processes are initiated from a benchmark-provided SQL script.

The batch workloads were run as standard concurrent processes via the concurrent manager.

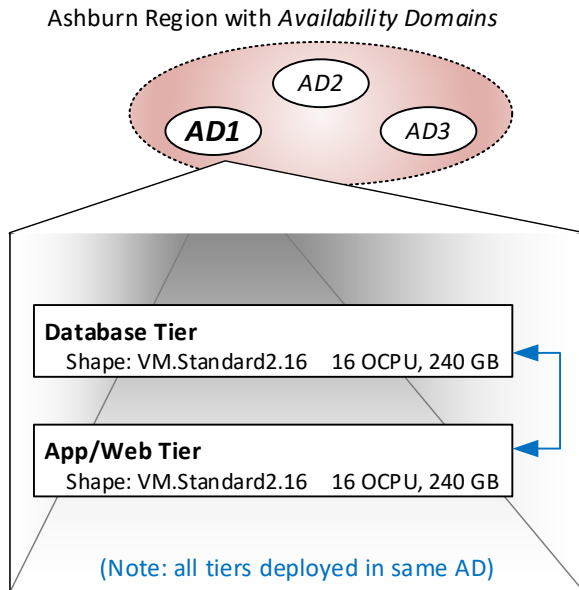


Figure 2: DB & App. Tier Resource Provisioning

BENCHMARK BUSINESS PROCESSES

This Oracle E-Business Suite benchmark consists of a batch flow with six metered processes.

Batch Payroll Processes

Business Process	Number of Threads Used	Process Type
Payroll Process	30	Pro*C
PrePayments	30	Pro*C
External Archive Process	30	Pro*C & PL/SQL
NACHA	30	Pro*C
Check Writer	30	Pro*C & Oracle Report Writer
Costing	30	Pro*C

Table 2: Payroll Batch Processes

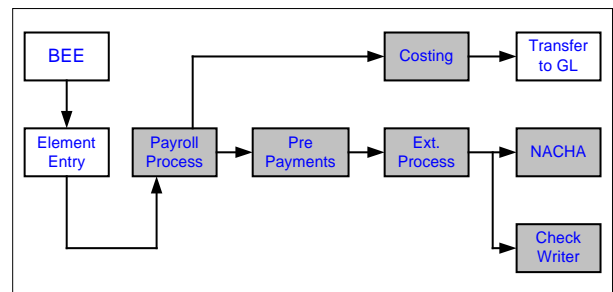


Figure 3: Payroll Process Flow

The Oracle E-Business Suite R12 Payroll processes tested are as follows:

Payroll Process: Identifies all employees to be processed and performs calculations required to complete the gross-to-net calculation, including earnings, deductions, and taxes. The specific groups of employees processed can be controlled by multiple parameters to the payroll process, including the ability for a user to define a rules-based set of employees.

PrePayments: Distributes the net pay for each employee across the various payment methods (Direct Deposit, Check, or Cash). This can be run for a single payroll process or across multiple payroll processes.

External Archiving Process: (Pro*C, PL/SQL) Replicates the results of the Payroll run into a separate archive for audit purposes. This data is primarily used for payslips (Both printed and on line), as a source for check and direct deposit printing, third party interfaces, and tax remittance reporting.

NACHA: This is the US version of the Global Direct Deposit process, which creates the bank interface file as per NACHA rules, based on the rules in the Pre Payment process.

Check Writer: (Oracle Report Writer) This process allocates check numbers and creates/prints the payroll check and associated paper payslip.

Costing: This process associates the payroll transaction data with the General Ledger (GL) accounts in preparation for transfer of the data to GL. This process uses a sophisticated hierarchical rules-based engine to determine the mapping of the HRMS data and payroll results to the GL accounts.

BENCHMARK RESULTS

Batch Business Metrics	Achieved Output
Payroll	
Payroll Process	500,000
PrePayment	250,000
NACHA + Check	250,000
Costing	250,000

Table 3: Batch Transactions Completed

In this test, 250,000 employees were processed. One checkpoint was completed during the measurement interval. Table 4 shows the processing time in minutes.

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Table 4: Payroll Batch Performance

Oracle E-Business Suite R12 Application changes, data model additions and test methodology improvements render direct comparison to previous Oracle E-Business Suite release 11.5.10 and 11.5.9 results invalid.

SERVER PERFORMANCE

Figure 4 shows the average CPU utilization on the Database Tier. The value shown is the average across the processors (16 cores total).

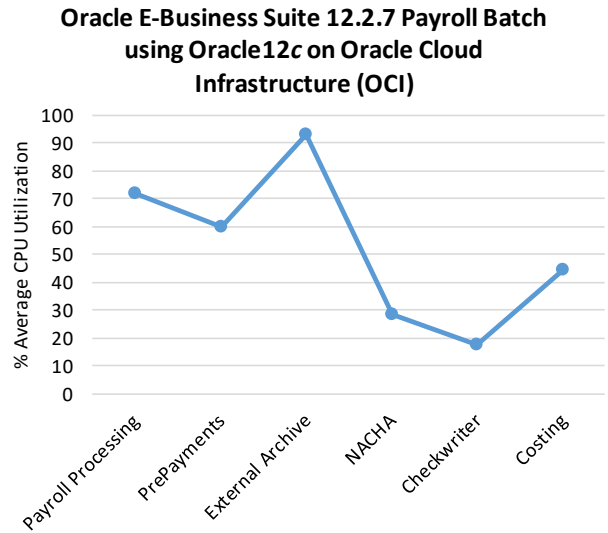


Figure 4: Average DB CPU Utilization by Process

Batch Workload	% User	% Sys	% Wait	% Idle
Payroll Processing	66.70	5.25	0.00	28.03
PrePayments	54.49	5.14	0.01	40.36
External Archive	89.27	3.66	0.01	7.05
NACHA	23.94	4.44	0.01	71.59
Checkwriter	15.21	2.21	0.01	82.57
Costing	39.36	5.19	0	55.45
Wall Clock Avg.	58.23	3.39	0.07	38.30

Table 5: Average DB Tier CPU Utilization

Average GB Used	DB Tier
30-Threads	170 GB

Table 6: Average Memory Utilization

I/O PERFORMANCE

Four Oracle locally attached NVMe SSD drives were used for storage of tables and indexes. The batch workload requires optimal I/O performance.

I/O Performance		30-Thread
Transfers/Sec	Avg	172
	Peak	2,577
Writes KB/Sec	Avg	11,639
	Peak	97,529
Reads KB/Sec	Avg	323
	Peak	16,731

Table 7: Average DB I/O Utilization Breakout

DATA COMPOSITION DESCRIPTION

Major data components for the model under test are summarized in the following table.

Application	Business Objects	Large Model
HR	Employees	250,000

Table 8: Data Composition

PERFORMANCE INITIALIZATION

Database parameter settings:

```
_sort_elimination_cost_ratio =5  
_like_with_bind_as_equality = TRUE  
_fast_full_scan_enabled = FALSE  
_b_tree_bitmap_plans = FALSE  
_sqlexec_progression_cost = 2147483647
```

Create index:

```
APPLSYS.FND_LOOKUP_VALUES_U3 on
```

```
APPLSYS.FND_LOOKUP_VALUES
```

```
(lpad(lookup_code,2,0));
```

PERFORMANCE INITIALIZATION CONT.

Update Statistics:

```
exec fnd_stats.gather_schema_stats (schemaname =>
'FND',estimate_percent => 100,degree => 8);
```

```
exec fnd_stats.gather_schema_stats (schemaname =>
'HR',estimate_percent => 100,degree => 8);
```

```
exec fnd_stats.gather_schema_stats (schemaname =>
'PST',estimate_percent => 100,degree => 8);
```

```
exec fnd_stats.gather_schema_stats (schemaname =>
'PTS',estimate_percent => 100,degree => 8);
```

```
exec fnd_stats.gather_schema_stats (schemaname =>
'PACT',estimate_percent => 100,degree => 8);
```

```
exec fnd_stats.gather_schema_stats (schemaname =>
'PEL',estimate_percent => 100,degree => 8);
```

```
exec fnd_stats.gather_schema_stats (schemaname =>
'PET',estimate_percent => 100,degree => 8);
```

```
exec fnd_stats.gather_schema_stats (schemaname =>
'PEE',estimate_percent => 100,degree => 8);
```

```
exec fnd_stats.gather_schema_stats (schemaname =>
'ACT',estimate_percent => 100,degree => 8);
```

```
exec fnd_stats.gather_schema_stats (schemaname =>
'RO',estimate_percent => 100,degree => 8);
```

```
exec fnd_stats.gather_schema_stats (schemaname =>
'BACT',estimate_percent => 100,degree => 8);
```

```
exec fnd_stats.gather_schema_stats (schemaname =>
'ORG',estimate_percent => 100,degree => 8);
```

```
exec fnd_stats.gather_schema_stats (schemaname =>
'RCU',estimate_percent => 100,degree => 8);
```

```
exec fnd_stats.gather_schema_stats (schemaname =>
'CITYTAX',estimate_percent => 100,degree => 8);
```

```
exec fnd_stats.gather_schema_stats (schemaname =>
'PPA',estimate_percent => 100,degree => 8);
```

```
exec fnd_stats.gather_schema_stats (schemaname =>
'PAP',estimate_percent => 100,degree => 8);
```

```
exec fnd_stats.gather_schema_stats (schemaname =>
'PAI',estimate_percent => 100,degree => 8);
```

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```
exec fnd_stats.gather_schema_stats (schemaname =>
'PAA',estimate_percent => 100,degree => 8);
```

```
exec fnd_stats.gather_schema_stats (schemaname =>
'PBD',estimate_percent => 100,degree => 8);
```

```
exec fnd_stats.gather_schema_stats (schemaname =>
'WF',estimate_percent => 100,degree => 8);
```

```
exec fnd_stats.gather_schema_stats (schemaname =>
'WI',estimate_percent => 100,degree => 8);
```

```
exec fnd_stats.gather_schema_stats (schemaname =>
'WI2',estimate_percent => 100,degree => 8);
```

```
exec fnd_stats.gather_schema_stats (schemaname =>
'PRT',estimate_percent => 100,degree => 8);
```

```
exec fnd_stats.gather_schema_stats (schemaname =>
'PRB',estimate_percent => 100,degree => 8);
```

BENCHMARK ENVIRONMENT

HARDWARE CONFIGURATION

Database Server (Tier):

A single COMPUTE Instance of Oracle's Cloud Infrastructure 16.2.2 was used for this test. 1 × Oracle Linux Database Cloud Service – Virtual Machines, with Shape VM.Standard2.16 (16 OCPU as 32 vCPU) was used. It was equipped with the following:

- 16 OCPU (32vcpu) running on 2.00 GHz Intel® Xeon™ Platinum 8167M
- 240 Gigabytes of Memory (~170 peak)
- 4 × 3.2 TB (12.8 TB total) locally attached NVMe SSD drives were used to host Linux and Oracle 12c Database software.

Application Server (Tier):

A single COMPUTE Instance of Oracle's Cloud Infrastructure 16.2.2 was used for this test. 1 × Oracle Linux COMPUTE Instance with Shape VM.Standard2.16 (16 OCPU as 32 vCPU) was used as an application server to host the Concurrent Manager.

- 16 OCPU (32vcpu) running on 2.00 GHz Intel® Xeon™ Platinum 8167M
- 240 Gigabytes of Memory (~175 peak)
- One Oracle Public Storage Volume for a total of 155 GB was used to host Linux and the Application Tier software.

SOFTWARE VERSIONS

Oracle E-Business Suite R12 (12.2.7)

Oracle12c™ 12.1.0.2.0 (64-bit) [multi-tenant single CDB / PDB]

Oracle Linux 6.9 (64-bit) on the database server.

Oracle Linux 7.5 (64-bit) on the application-tier server.

Xen 4.3.1 OVM

Java HotSpot™ 64-bit server VM (build 25.161-b12), mixed mode on the database server

Java HotSpot™ 64-bit server VM (build 24.51-b03), mixed mode on the application-tier server

The following Java™ Standard Edition (SE) versions have all been used in the Oracle E-Business Suite Applications environment:

- Java 1.8.0_161-b12 database
- Java 1.7.0_51-b13 application-tier

Glossary and Acronyms:

CDB / PDB Container DB / Provision DB

NVMe Non-Volatile Memory Express

OASB Oracle Applications Standard Benchmark

OCPU Oracle CPU (1 physical core, for 2 execution threads with Hyper threading enabled)

RAC Real Applications Clusters



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Integrated Cloud Applications & Platform Services

Oracle E-Business Suite R12 Payroll Batch
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