

ORACLE E-BUSINESS SUITE R12 (R12.2.7) ORDER-TO-CASH (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				
100,000 Lines	Order/Inv.	Threads	Time (Min)	Hourly Order Line Throughput
HVOP		32	4.83	1,241,379
Pick Release		32	21.47	279,503
Ship Confirm		1	0.20	30,000,000
Interface Trip Stop		32	3.40	1,764,706
Inventory		200	4.92	1,219,512
Auto Invoice		32	21.45	279,720
Revenue Recognition		8	4.13	1,451,613
Accounting Submit		1	1.00	6,000,000
Accounting Create		1	4.72	1,272,085
Sel. Process Total:			66.12	90,744
Wall Clock Duration*			77.47	77,453

Table 1: Order-to-Cash Batch Performance

More processes are included in this summary than were reported in either 12.0.4 or 11i. Consequently, these results cannot be compared to earlier releases. Note that the hourly throughput numbers mentioned above are linear extrapolations. Many factors can influence performance and your results may differ.

No other workloads were active during this benchmark's execution.

* The "Wall Clock Duration" includes all of the job scheduling and management activity (parent process) as well as some idle intervals due to polling or waiting for all workers in a particular process to complete prior to kicking off the subsequent process. These intervals would not increase substantially, if at all, as the workload size is increased.

BENCHMARK PROFILE

In June 2019, Oracle conducted a benchmark initiated from Pleasanton California using cloud resources located in Ashburn Virginia, to measure the batch performance of the Oracle E-Business Suite Standard Benchmark processes in an environment running Oracle E-Business Suite 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 with Oracle® Linux® 6.9 (64-bit) OS. Moreover, the instance of 16 OCPU, 32 threads, 240 GB used the attached 2.4 TB of block storage for data storage and redo log storage.

The benchmark measured the Order Management batch business process hourly throughputs for a 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).**

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 1 shows the configuration used for this benchmark run.

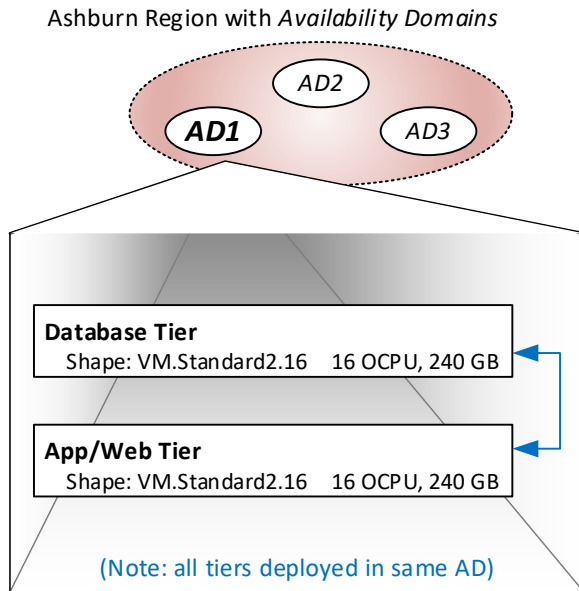


Figure 1: DB Server Resource Provisioning

BENCHMARK BUSINESS PROCESSES

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

Batch Order-to-Cash Processes

Business Process	Number of Threads Used
HVOP	32 (32)
Pick Release	32 (32)
Interface Trip Stop	32 (32)
Inventory	32 (200)
Auto Invoice	32 (32)
Revenue Recognition	8 (8)
Accounting Processes	1 (1)

Table 2: Batch Execution Threads

Note that while 32 threads (workers) were entered at setup, the actual number of child processes spawned may have been larger (Inventory) or smaller (Revenue Recognition and Accounting).

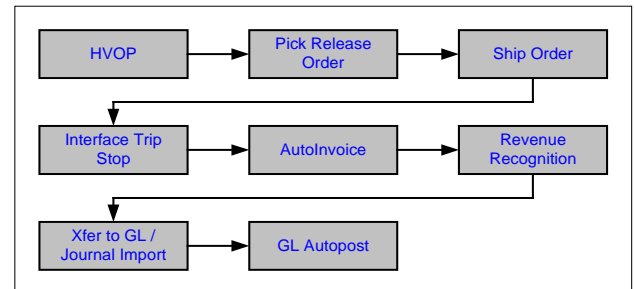


Figure 2: Order-to-Cash Process Flow

High Volume Order Processing (HVOP): The HVOP program processes orders by reading the rows from the Order Management Interface tables and converting the interface records into permanent order headers and their respective order lines. The orders are then booked and advanced to the shipping state.

Pick Release (and Ship Confirm): Pick Release finds and releases the eligible delivery lines that meet the release criteria, and creates move orders. The process of transacting move orders creates a reservation and determines the inventory source sub-inventory.

Ship Confirm is the process of confirming that items have shipped. When a delivery is ship-confirmed, Shipping Execution confirms that the delivery lines associated with the delivery have shipped.

Batch Order-to-Cash Processes Continued

Interface Trip Stop: The deliveries created in the previous step are then assigned to trips, which may involve multiple stops depending upon the shipping addresses of the deliveries. SRS has been modified to accept Organization code as a parameter and process the trip stops for the specified organization. Interface Trip Stop - SRS has also been enhanced to spawn multiple child processes to process trip stops in parallel. The parameter Stops per Batch is used to specify the number of stops to be processed by each thread of the Interface Trip Stop - SRS. Interface Trip Stop - SRS has also been enhanced to defer the Inventory Interface processes. In the E-Business Suite kit, this profile is set to Yes so that the Inventory Interface transactions are processed in the background by the Inventory transaction manager.

INV Material: The material transaction manager is configured to execute material transaction by periodic concurrent request submissions and by direct submission of multiple transaction managers via the benchmark SQL script. The execution interval is set to 5 minutes.

Auto-Invoice: The Auto-Invoice process is used to import invoices, credit memos, debit memos, and on-account credits. 'Receivables' ensures that the data imported is accurate and valid.

Revenue Recognition: Revenue Recognition program generates the revenue distribution records for the invoices and credit memos that use Invoicing and Accounting Rules. Accounting rules were assigned to recognize revenue over a 12-month accounting period. The Revenue Recognition program will create distribution records for the invoices and credit memos that are created in Receivables and imported using Auto-Invoice.

Transfer to General Ledger & Journal Import: The General Ledger Interface program transfers Receivables transaction accounting distributions to the general ledger interface table (GL_INTERFACE) and creates either detailed or summarized journal batches. "Receivables" creates un-posted journal entries in general ledger and executes Journal Import from Oracle General Ledger. It posts journal batches in Oracle General Ledger to update account balances.

General Ledger Auto-post: This posts journal batches to update the account balances of the detail and summary accounts. It can post actual budget or encumbrance journal batches.

BENCHMARK RESULTS

Batch Business Metrics	Achieved Output
Order to Cash	
Number of Order Lines Created/Booked	100,000
Number of Order Lines Picked	100,000
Number of Order Lines Ship Confirmed	100,000
Number of Order lines Interface Trip Stopped	100,000
Number of Invoice Headers Created	100,000
Number of Invoice Lines Created	400,000

Table 3: Batch Transactions Completed

100,000 order lines were processed in this test. Table 4 shows the processing time in minutes.

Batch Workload				
100,000 Order/Inv. Lines	Threads	Time (Min)	Hourly Order Line Throughput	
HVOP	32	4.83	1,241,379	
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Wall Clock Duration*		77.47	77,453	

Table 4: Order-to-Cash (32 Worker) Batch Performance

R12.2.7 Application changes, data model additions and test methodology improvements render direct comparison to previous Oracle E-Business Suite release 12.0.4, 11.5.10 and 11.5.9 results invalid.

SERVER PERFORMANCE

Figure 3 shows the average CPU utilization on the server. The value shown is the average across the processors (16 cores total, 32 vCPUs). Note that the sampling rate yielded few data points to average for the briefest processes. Also note that the large number of sub-process workers (200) during the 'Inventory process' execution saturated the processors.

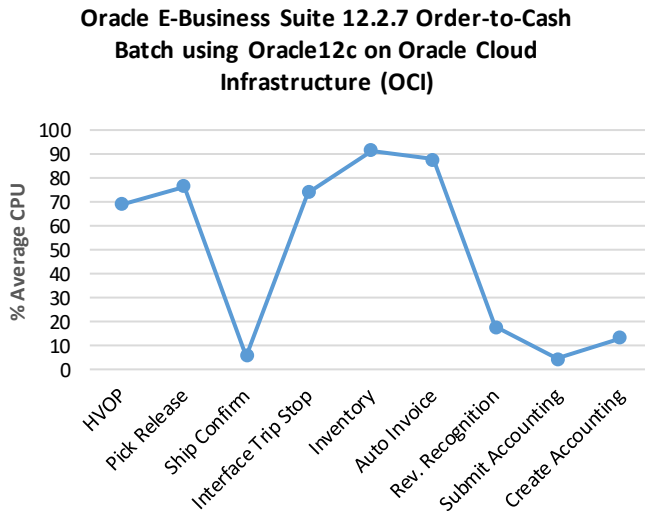


Figure 3: Average Database CPU Utilization

Oracle E-Business Suite 12.2.7 Order-to-Cash Batch using Oracle12c on Oracle Cloud Infrastructure (OCI)

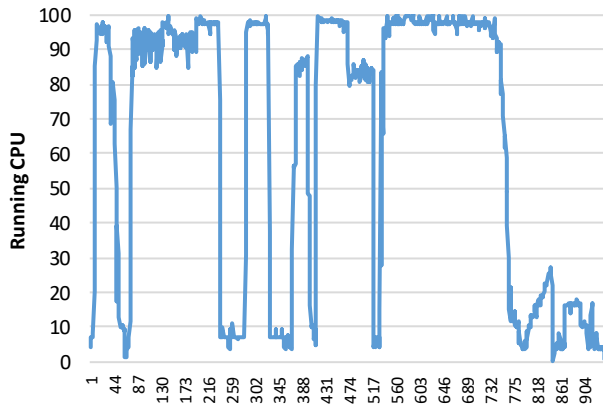


Figure 4: Running CPU Utilization

Workload	% User	% System	% Wait	% Idle
HVOP	65.67	3.26	0.13	30.94
Pick Release	73.90	2.55	0.06	23.49
Ship Confirm	3.84	1.68	0.06	94.38
Interface Trip Stop	68.60	5.16	0.00	26.21
Inventory	86.52	4.79	0.00	8.68
Auto Invoice	85.31	2.22	0.01	12.46
Rev. Recognition	15.48	2.10	0.01	82.40
Submit Accounting	2.94	1.66	0.02	95.38
Create Accounting	11.31	1.87	0.01	86.80
Wall Clock Avg.	62.64	2.67	0.05	34.63

Table 5: Average CPU Utilization Breakout (32 Workers)

Average GB Used	O-to-C
Database Server	199 GB

Table 6: Average Memory Utilization

I/O PERFORMANCE

Block storage memory Volumes were used for storage. The batch workload requires optimal I/O performance.

I/O Performance		32-Thread
Transfers/Sec	Avg	203
	Peak	1,460
Writes KB/Sec	Avg	11,152
	Peak	109,028
Reads KB/Sec	Avg	277
	Peak	18,769

Table 7: Average 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/Extra-Large Model
TCA	Organizations	1,100,000
	Contacts	4,900,000
	Contact Points	3,700,000
	Accounts	1,100,000
	Account Sites	1,090,000
	Account Site Uses	2,180,000
Contracts	Contracts	222,000
Install Base	Instances	1,300,000
	Trackable Items	5
	Items	1,100,000
HR	Managers	800
	Employees	250,000
	Payroll Users	250,000
	Users	20,000
	Credit Card Entries	4,000,000
	Supplier(s)	10,000
Assets	Asset Categories	984
General Ledger	GL Code Combinations	93,417

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
_sqllexec_progression_cost = 2147483647
```

Create indexes:

1. Create index INV.MTL_RESERVATIONS_T on INV.MTL_RESERVATIONS("INVENTORY_ITEM_ID","ORGANIZATION_ID","SUPPLY_SOURCE_TYPE_ID");
2. Create index INV.MTL_TRANSACTIONS_INTERFACE_T on INV.MTL_TRANSACTIONS_INTERFACE(TRANSACTION_HEADER_ID,TRANSACTION_BATCH_ID);
3. Create index INV.MTL_SYSTEM_ITEMS_B_tn18 on inv.MTL_SYSTEM_ITEMS_B(upper(segment1)) ;
4. Create index HXC.HXC_DATA_SETS_TN1 ON HXC.HXC_DATA_SETS(STATUS, START_DATE, END_DATE);
5. Create index ZX.ZX_RATES_B_T on ZX.ZX_RATES_B(TAX_RATE_CODE,TAX_CLASS,SOURCE_ID,TAX_RATE_ID);
6. Create index AR.RA_INTERFACE_SALESCREDITS_T on AR.RA_INTERFACE_SALESCREDITS_ALL(INTERFACE_LINE_ATTRIBUTES6,INTERFACE_LINE_ATTRIBUTE1,INTERFACE_LINE_ATTRIBUTES3,INTERFACE_LINE_ATTRIBUTE2);
7. Create index ON.OE_ORDER_LINES_ALL_N20 ON ONT.OE_ORDER_LINES_ALL(header_id, flow_status_code);
8. Create index WSH.WSH_NEW_DELIVERIES_TN8 ON WSH.WSH_NEW_DELIVERIES(batch_id, hash_value, status_code);
9. Create index INV.MTL_TRANSACTIONS_INTERFACE_TN7 ON INV.MTL_TRANSACTIONS_INTERFACE(inventory_item_id, organization_id);
10. Create index INV.MTL_TRANSACTIONS_INTERFACE_TN8 ON INV.MTL_TRANSACTIONS_INTERFACE(process_flag, transaction_mode, lock_flag);

Actions taken prior to run:

```
TRUNCATE table HXC.HXC_DATA_SETS;
```

Gather Table Stats:

See Schema Stats

Gather Index Stats:

See Schema Stats

Gather Schema Stats

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

'HR'	'PST'	'PTS'
'PACT'	'PEL'	'PET'
'PEE'	'ACT'	'RO'
'BACT'	'ORG'	'RCU'
'CITYTAX'	'PPA'	'PAP'
'PAI'	'PAA'	'PBD'
'WF'	'WI'	'WI2'
'PRT'	'PRB'	'WSH'
'AR'	'INV'	'APPLSYS'
'GL'	'ONT'	

BENCHMARK ENVIRONMENT

HARDWARE CONFIGURATION

Database Server (Tier):

A single VM instance of Oracle's Cloud Infrastructure version 16.2.2 was used for this test. 1 x 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 (~199 peak)
- 2 × 1.2 TB Oracle block storage drives, for a total of 2.4 TB 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



Oracle is committed to developing practices and products that help protect the environment

Integrated Cloud Applications & Platform Services

Oracle E-Business Suite R12 Order-to-Cash
Batch
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