E-BUSINESS SUITE APPLICATIONS R12 (R12.1.3) ORDER-TO-CASH (BATCH) BENCHMARK - USING ORACLE DATABASE 11*g* ON A CISCO UCS B200 M3 SERVER

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 Order/Inv. Lines	**Threads**	**Time (Min)**	**Hourly Order Line Throughput**
HVOP	32	1.17	5,128,205
Pick Release	32	9.53	629,591
Ship Confirm	1	0.25	24,000,000
Interface Trip Stop	32	1.12	5,357,143
Inventory	500	1.70	3,529,412
Auto Invoice	32	6.08	986,842
Revenue Recognition	10	2.68	2,238,806
Accounting Submit	1	1.00	6,000,000
Accounting Create	1	2.25	2,666,667
Parent Proc Total:		25.78	232,739
Wall Clock Duration*		29.20	205,479

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.

* 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. Consequently, the throughput for larger workloads would converge towards the "Parent Process Total:" value.

BENCHMARK PROFILE

In September 2012, Oracle and Cisco conducted a benchmark in San Jose, CA to measure the batch performance of the Oracle E-Business Standard Benchmark processes in an environment running Oracle E-Business Suite R12 (12.1.3) with Oracle11*g*™ database (11.2.0.3) for the Linux® operating system on a Cisco® UCS™ B200 M3 server configured with two eight-core processors (16-cores total), running Oracle® Enterprise Linux® 5.7 (64-bit) OS. A single EMC® VNX5300 Storage System was used for 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 a Cisco UCS server running Oracle Enterprise Linux 5.7.**

BENCHMARK METHODOLOGY

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 shows the configuration used for this benchmark run.

	UCS B200 M3
	DB Server/ App Server
	16-core
	128 GB Memory
	45% Utilized
	VNX5300 Storage System
	75 Disks Drives (Data and Logs)
	1% Utilized

Figure 2: 2-Tier Configuration

This benchmark was run as a "Physical" 2-Tier configuration with a single machine hosting both the Database and Application server instances on a single OS image.

BENCHMARK BUSINESS PROCESSES

This 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 (500)
Auto Invoice	32 (32)
Revenue Recognition	32 (10)
Accounting Processes	32 (1)

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).
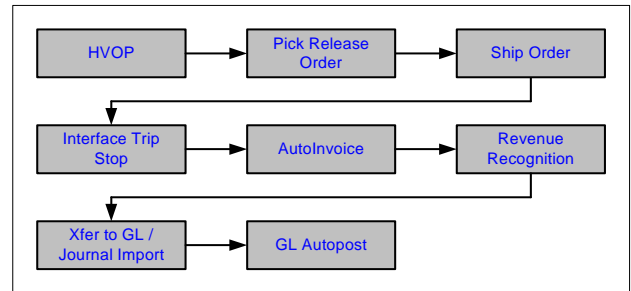
Figure 3: Order-to-Cash Process Flow

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	200,000

Table 1: Batch Transactions Completed

100,000 order lines were processed in this test. Table 2 shows the processing time in minutes.

Batch Workload			
100,000 Order/Inv. Lines	**Threads**	**Time (Min)**	**Hourly Order Line Throughput**
HVOP	32	1.17	5,128,205
Pick Release	32	9.53	629,591
Ship Confirm	1	0.25	24,000,000
Interface Trip Stop	32	1.12	5,357,143
Inventory	500	1.70	3,529,412
Auto Invoice	32	6.08	986,842
Revenue Recognition	10	2.68	2,238,806
Accounting Submit	1	1.00	6,000,000
Accounting Create	1	2.25	2,666,667
Parent Proc Total:		25.78	232,739
Wall Clock Duration*		29.20	205,479

Table 2: Order-to-Cash (32 Worker) Batch Performance

R12.1.3 Application changes, data model additions and test methodology improvements render direct comparison to previous Oracle E-Business release 12.0.4, 11.5.10 and 11.5.9 results invalid.

SERVER PERFORMANCE

Figure 4 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.
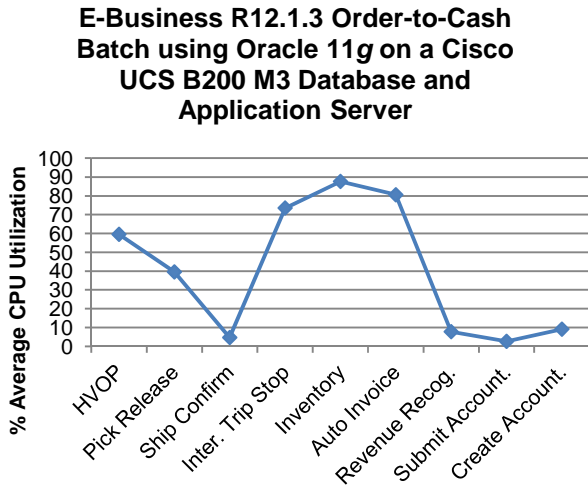
E-Business R12.1.3 Order-to-Cash Batch using Oracle 11g on a Cisco UCS B200 M3 Database and Application Server

Figure 4: Average DB/App/Web CPU Utilization

Order-to-Cash Batch 12.1.3
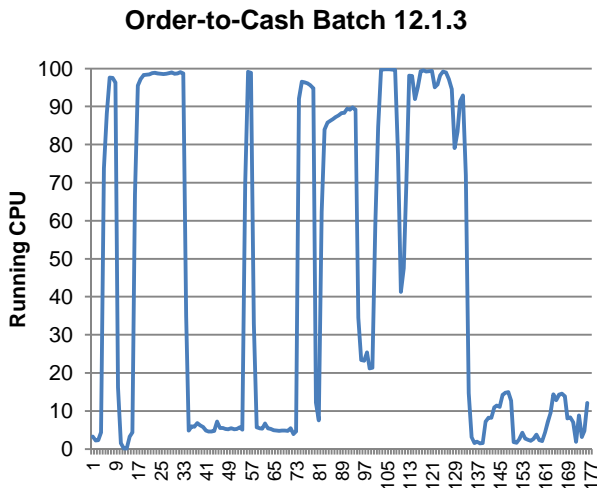
Figure 5: Running CPU Utilization

Workload	% User	% System	% I/O Wait	% Idle
HVOP	55.06	2.35	2.13	40.46
Pick Release	37.44	1.20	0.94	60.43
Ship Confirm	3.81	0.23	0.66	95.31
Interface Trip Stop	69.34	3.03	1.15	26.47
Inventory	83.84	3.06	0.74	12.37
Auto Invoice	77.94	1.72	0.89	19.45
Rev. Recognition	7.10	0.28	0.43	92.19
Submit Accounting	1.70	0.13	0.87	97.31
Create Accounting	7.82	0.29	1.05	90.85
Wall Clock Avg.	42.48	1.30	0.96	55.26

Table 3: Average CPU Utilization Breakout (32 Workers)

Average GB Used	O-to-C
DB/App Server	98.62 GB

Table 4: Average Memory Utilization

I/O PERFORMANCE

An EMC VNX5300 Storage System equipped with 5 Disk Array Enclosures (75 disk drives total) was used for storage. The batch workload requires optimal I/O performance.

I/O Performance		O-to-C
Transfers/Sec	Avg	165.76
	Peak	2735.70
Writes/Sec	Avg	137.42
	Peak	2731.00
Reads/Sec	Avg	28.33
	Peak	1934.60
Avg. Service Time (ms)	Avg	1.30
	Peak	43.00

Table 5: 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 7: Data Composition

PATCHES

The following patches were applied to the benchmark environment on top of Oracle E-Business Suite R12 (12.1.3).

1. 9858539: DATA PUMP IMPORT FAILS for LOGON TRIGGER ORA-04072: INVALID TRIGGER TYPE

2. 12942119: APPSPERF: CBO USING EMPTY INDEX STATS VS DYNAMIC SAMPLING for TAB W/NO STATS

3. 12960302: TST&PERF: QUERY REPORT CORRUPT METADATA OF CONTEXT INDEX AFTER DATABASE UPGRADE

4. 13588248: COREDUMP IN RAC ENV WITH SESSION POOLING, DRCP, FLASH CACHE, SERVER CACHE, AC

5. 13656236: MERGE REQUEST on top of 11.2.0.3.0 for Bugs 13004894 13370330

APPLICATION TUNING

Database:

1. Gather stats as follows:

```
exec fnd_stats.gather_table_stats ('AR',
'RA_CUSTOMER_TRX_ALL', 100, cascade=>TRUE);

exec fnd_stats.gather_table_stats ('AR',
'RA_CUSTOMER_TRX_LINES_ALL', 100,
cascade=>TRUE);

exec fnd_stats.gather_table_stats ('AR',
'RA_INTERFACE_LINES_ALL', 100, cascade=>TRUE);

exec fnd_stats.gather_table_stats ('AR',
'RA_INTERFACE_DISTRIBUTIONS_ALL', 100,
cascade=>TRUE);

exec fnd_stats.gather_table_stats ('AR',
'RA_INTERFACE_SALESCREDITS_ALL', 100,
cascade=>TRUE);

exec fnd_stats.gather_table_stats ('ZX',
'ZX_PROCESS_RESULTS', 100, cascade=>TRUE);

exec fnd_stats.gather_table_stats ('ZX', 'ZX_RATES_B',
100, cascade=>TRUE);

exec fnd_stats.gather_table_stats ('ZX',
'ZX_SUBSCRIPTION_DETAILS', 100, cascade=>TRUE);

exec fnd_stats.gather_table_stats ('ZX', 'ZX_TAXES_B',
100, cascade=>TRUE);
```

OPERATING SYSTEM TUNING

DATABASE OPERATING SYSTEM TUNING

1. The following additional Kernel parameters were automatically setup during boot
   via the /etc/sysctl.conf file:

```
fs.aio-max-nr = 3145728
fs.file-max = 6815744
kernel.core_uses_pid = 0
kernel.sem = 20010 2561280 20010 256
kernel.shmall = 4294967296
kernel.shmmax = 4398046511104
kernel.shmmni = 4096
kernel.msgmax = 65536
kernel.msgmnb = 65536
kernel.msgmni = 2878
kernel.sysrq = 0
net.ipv4.conf.default.rp_filter = 1
net.ipv4.conf.default.accept_source_route = 0
net.ipv4.ip_forward = 0
net.ipv4.ip_local_port_range = 9000 65500
net.ipv4.tcp_syncookies = 1
net.core.rmem_default = 262144
net.core.rmem_max = 4194304
net.core.wmem_default = 262144
net.core.wmem_max = 4194304
vm.min_free_kbytes = 51200
vm.nr_hugepages = 48000
```

2. The following limits were modified via the /etc/security/limits.conf file:

```
* soft nofile 131072
* hard nofile 131072
* soft nproc unlimited
* hard nproc unlimited
* soft core unlimited
* hard core unlimited
* soft memlock unlimited
* hard memlock unlimited
```

3. Hugepages were enabled for the database instance

BENCHMARK ENVIRONMENT

HARDWARE CONFIGURATION

A Cisco® UCS™ B200 M3 server was used for the database server. It was equipped with the following:

- 2 × 2.90 GHz Intel® Xeon™ Eight-Core E5 2690 processors with Hyper-Threading enabled (2-processors, 16-cores, 32-threads total), each with 20 MB of Level 3 cache

- 128 Gigabytes of Memory (~101.7 peak)

- 2 × 300 GB internal disk drives attached to an embedded LSI MegaRAID SAS 2004 3-Gbps SAS Controller

- 1 × EMC VNX5300 Storage System attached to a Cisco UCSB-MLOM-40G-01 Virtual Interface Card for data and logs

- ~39 TB raw disk space available for allocation (75 × 536 GB)

- Database storage configured using Oracle Automatic Storage Management (ASM) with 1024 GB RAID 5 storage for data and 256 GB RAID 1/0 storage for logs

SOFTWARE VERSIONS

Oracle's E-Business Suite (E-Business Suite Kit) R12.1.3

Oracle11*g* 11.2.0.3.0 (64-bit)

Oracle Enterprise Linux® 5 update 7 (64-bit) on the database/application/web server.

The following Java versions have all been used in the Oracle Apps environment:
- Java 1.4.1_04-b05
- Java 1.4.2_08-b03
- Java 1.4.2_10-b03
- Java 1.5.0_07-b03
- Java 1.5.0_08-b03
- Java 1.5.0_18-b02
- Java 1.5.0_30-b03
- Java 1.6.0_17-b04

Glossary and Acronyms:

HVOP   High Volume Order Processing

OASB   Oracle Applications Standard Benchmark
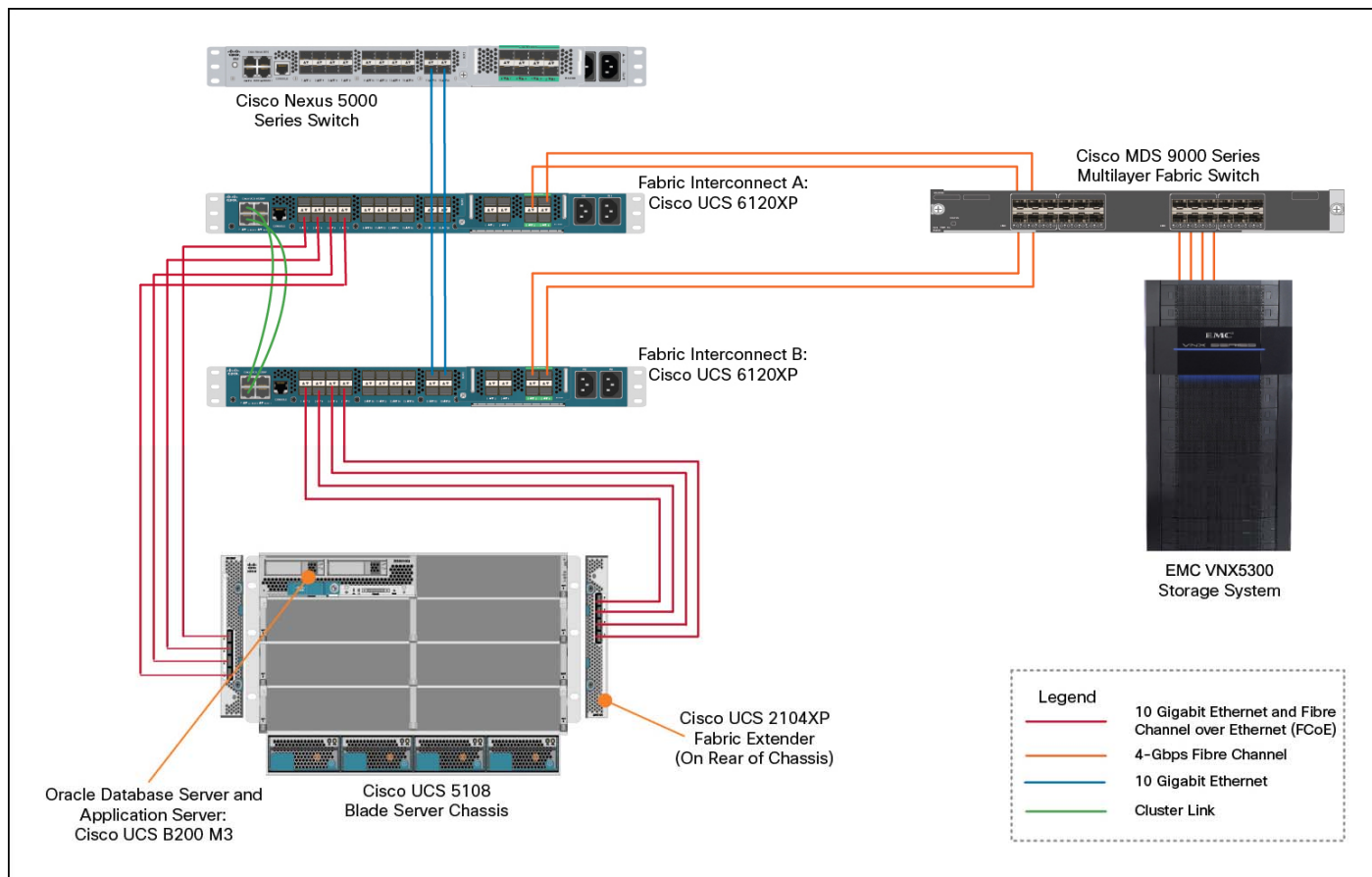
ORACLE®

The results published in this report have been independently reviewed and audited by:

INFO S SIZING

ORACLE®

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

Hardware and Software, Engineered to Work Together