ORACLE 12
E-BUSINESS SUITE

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O R A C L E   E - B U S I N E S S   B E N C H M A R K   R E V .   1 . 3

E-BUSINESS SUITE APPLICATIONS R12 (R12.1.3) (OLTP) BENCHMARK - USING ORACLE DATABASE 11*g* ON ORACLE'S M6 SERVER RUNNING SOLARIS 11

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 OLTP benchmark test was run on a 96-core server.

Online Workload		
Number of Users	**Average Response (Sec)**	**90th Percentile Response Time (Sec)**
2,330 Users Order Man.	1.13	1.95
2,430 Users iProcure.	1.11	1.21
(Search)	(0.52)	(0.55)
7,000 Users Cust. Service	0.39	0.39
4,000 Users HR Self-Serv.	0.69	2.31
(Search)	(0.52)	(0.79)
2,800 Users Financials	0.22	0.49
(Search)	(0.21)	(0.48)
Net Weighted Averages	0.61	1.16
(Search)	(0.39)	(0.58)

Many factors can influence performance and your results may differ. Notes times are Save/Update or (Search).

BENCHMARK PROFILE

In March 2014 Oracle conducted a benchmark in Burlington MA to measure the online (OLTP) performance of five Oracle E-Business business flows in an environment running Oracle E-Business Suite R12 (12.1.3) using the Oracle Database 11*g* with Oracle Solaris 11.1 operating system (OS) on an Oracle's SPARC M6 server, configured as four environments. Moreover, seven of Oracle's Sun Server X3-2L devices were used for data storage (~400 GB).

The benchmark measured the Order to Cash, iProcurement, Customer Service, HR Self-Service and Financials OLTP business process response times 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 online response times for the Oracle E-Business Suite R12 Benchmark, using Oracle's SPARC servers running Oracle Solaris 11 OS in a server-consolidation configuration.**
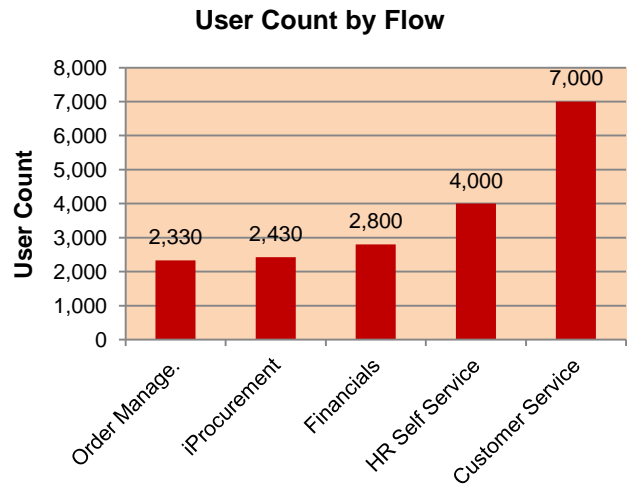
User Count by Flow

Figure 1: Oracle E-Business Suite Benchmark Concurrent User Distribution

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BENCHMARK METHODOLOGY

E-Business Suite 12 Benchmark 12.1.3 online processes can be initiated from a browser. For this benchmark, all runs used a browser to initiate the on-line user transactions.

Oracle® OATS® was used as the load driver, simulating concurrent users. It submitted transactions at an average rate of one every 1.5 to 15 minutes for each concurrent user.

Measurements were recorded on all of the servers when the user load was attained and the environment reached a steady state. Note that the measured response times may be shorter than a live user would experience as client and browser latency is not simulated by this load test system.

Figure 2 shows the configuration used for this benchmark run. Figure 3 shows the logical domains and E-Business Suite environments.
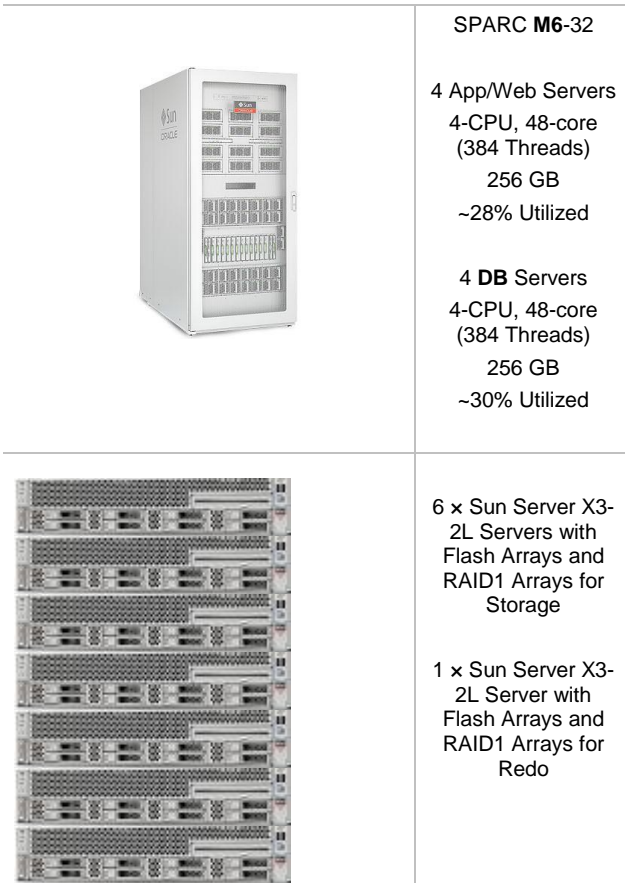

SPARC **M6**-32

4 App/Web Servers
4-CPU, 48-core
(384 Threads)
256 GB
~28% Utilized

4 **DB** Servers
4-CPU, 48-core
(384 Threads)
256 GB
~30% Utilized

6 × Sun Server X3-2L Servers with Flash Arrays and RAID1 Arrays for Storage

1 × Sun Server X3-2L Server with Flash Arrays and RAID1 Arrays for Redo

Figure 2: 3-Tier Configuration

This benchmark was run as a "Physical" 3-Tier configuration with discrete machine zones hosting the Database and Application/Web server instances on their respective OS images.

The complete E-Business Suite benchmark consists of a mix of on-line transactions and batch processes running in parallel. This test utilized five flows of OLTP transactions. The following table describes the on-line transactions included in the benchmark run.

Oracle Application Product Flow	Users	Pacing in Min
Order to Cash	(2,330)	
Create & Book Order	666	3
Pick Release	333	1.5
Ship Confirm / ITS	333	1.5
Receivables - Invoice	333	1.5
AR Customer Summary	333	7.5
OM Order Summary Report	333	15
iProcurement	(2,430)	
SS Create & Query Req.	405	3
Create Approve PO	405	3
View Purchase Order	405	3
Create Payables Invoice	405	3
View Payables Invoice	405	3
PO Report	405	15
Customer Service	(7,000)	
Create Service Request	2,800	4
Update Service Request	2,800	4
Close Service Request	1,400	4
HR Self-Service	(4,000)	
Cash Expenses	800	6
Credit Expenses	800	6
Submit Time Card	1,200	6
View Payslip	1,200	6
Financials	(2,800)	
AR View Cust. Transaction	400	7.5
FA Create & Query Asset	400	7.5
GL Journal Entry	400	7.5
INV View Item Attributes	400	7.5
INV Insert Misc. Transactions	400	7.5
AR Aging Report	400	15
Min/Max Inventory Report	400	15
	18,500	

Table 1: Online Transaction Mix

Order to Cash OLTP Processes

Create & Book Order: The user navigates to the "Orders" page, enters customer information and creates a 5-line order. Finally, the user clicks on "Book Order" to enter the completed order. The response time is to 'save' the entry.

Pick Release: The user navigates to the "Shipping/Release Sales Orders" page and enters the order number and clicks on "Execute Now." Finally, the user clicks on "OK" to acknowledge that "Pick Release Only" has completed. The response time is to 'save' the entry.

Ship Confirm: The user navigates to the "Shipping/Transactions" page and enters "From Order Number" and "To Order Number" before clicking on "Find." Finally, the user clicks through the confirmation steps and then clicks on "OK" to acknowledge that "ship Confirm" has completed. The response time is to 'save' the entry.

Receivables – Insert Invoice: The user navigates to the "Transactions/Transactions" page and enters Source, Reference Number, and Line Item information. After entering 5 items, the user save the form. The response time is to 'save' the entry.

iProcurement OLTP Processes

Create & Query Requisition: The user navigates to the "iProcurement" page, enters an Item Name to search for. The item is added to the Shopping Cart along with four more. The user clicks on "Checkout." The user steps through the approval details and submits the requisition for Auto Approval. Finally, the user clicks on "Requisitions" to search for the requisition. The response time is to 'search' for the requisition.

Create & Approve Purchase Order: The user navigates to the "AutoCreate" page and clicks through the AutoCreate process. The user enters a supplier and clicks on "Create." Finally, the user clicks on "Approve" to complete the PO creation. The response time is to 'save' the entry.

View Purchase Order: The user navigates to the "Purchase Order/Purchase Order Summary" page and enters a PO number to search for. Finally, the user clicks through the Order Header and Order Lines forms. The response time is to 'search' each category.

Create Payables Invoice: The user navigates to the "Invoices/Entry/Invoices" page and enters the PO Number, Invoice Number, and Invoice Amount information. After saving that form, the user proceeds through the Distributions steps and saves the form. The response time is to 'save' the form.

View Payables Invoice: The user navigates to the "Invoices/Inquiry/Invoice Overview" page and enters the Invoice Number, then clicks on "Find.". Proceed through the "Invoice Overview" and "Invoices" forms. The response time is to 'search' each category.

Customer Service OLTP Processes

Create Service Request: The user navigates to the "Customer Management" page, enters customer information and the issue owner's name. The user selects an Instance number and enters the Problem Code. Then they enter the Tracking Summary and Notes. Finally, the user clicks on "SAVE" to enter the completed request. The response time is to 'save' the entry.

Update Service Request: The user navigates to the "Service Requests" page and searches open requests for the specified customer. They enter a Note and change the status of the request. Finally, the user clicks on "SAVE" to enter the updated request. The response time is to 'save' the entry.

Close Service Request: The user navigates to the "Service Requests" page and clicks on the first request listed. Finally, the user clicks on "Close Request" to close out this request. The response time is to 'save' the entry.

HR Self-Service OLTP Processes

Cash Expenses: The user navigates to the "Expenses Home" and enters various travel and lodging expenses including airfare, car rental, hotel, entertainment, meals, etc. Finally, the user clicks on "Submit" to enter the completed expense report. The response time is to 'save' the entry.

Credit Card Expenses: The user navigates to the "Expenses Home" and enters various travel and lodging expenses including airfare, car rental, hotel, entertainment, meals, etc. Finally, the user clicks on "Submit" to enter the completed expense report. The response time is to 'save' the entry.

Create Timecard: The user navigates to the "Create Timecard" button and enters information about their project, the type(s) of tasks undertaken and the hours spent. Finally, the user clicks on "Submit" to enter the completed time card. The response time is to 'save' the entry.

View Payslip: The user navigates to the "Employee Self-Service" page and clicks on 'Payslip.' The response time is for the 'retrieval' of the search.
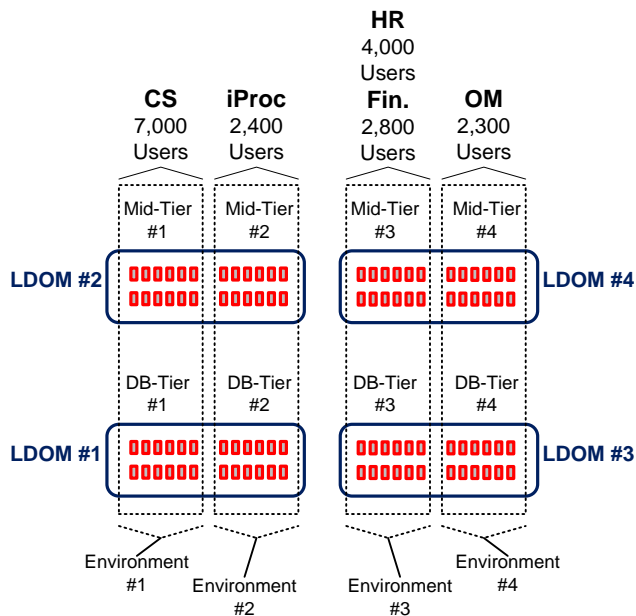
Figure 3: Benchmark Configuration (Logical Domains & Environments)

BENCHMARK RESULTS

Online Business Metrics		Achieved Output
Number of Order Lines Created		55,900
Number of Invoice Lines Created		217,000
Number of Order Summary Reports		725
Fixed Assets Created		3,000
GL Journal Entries		29,600
Inventory Transactions		15,400
Number of Requisitions Created		5,500
Number of Purchase Orders Created		32,500
Number of PO Invoices Created		6,500
Number of Service Requests Created		40,600
Number of Service Requests Closed		18,500
Number of Cash Expenses Created		6,400
Number of Credit Expenses Created		6,400
Number of Timecards Created		10,700

Table 2: Online Transactions Completed (18,500 Users)

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

	18,500 Users	
	Avg. (Sec)	90th% (Sec)
Order to Cash		
Insert Order	2.578	4.031
Pick Release	0.254	0.653
Ship Confirm	0.353	0.883
Insert Manual Invoice	2.281	3.56
OM Order Summary Report	0.207	0.61
iProcurement		
SS_Req_Submit_Data_SAVE	1.072	1.122
CREATE_APPROVE_PO-SAVE	1.956	2.166
Create_Payables_invoice_Submit	0.302	0.332
VIEW_PAYABLES_INVOICE_Find	0.102	0.119
VIEW_PAYABLES_INVOICE_Details	0.179	0.202
VIEW_PURCHASE_ORDER_Find	0.547	0.591
VIEW_PURCHASE_ORDER_Schedule_Search	1.236	1.297
Customer Service		
Create Service Request	0.261	0.271
Update Service Request	0.351	0.358
Close Service Request	0.551	0.554
HR Self-Service		
Submit Cash Exp.	0.742	1.134
Submit Credit Card Expense	0.774	1.206
Submit Project Timecard	0.567	4.591
View Emp. Payslip Search	0.523	0.787
Financials		
AR View Cust. Transaction Tab	0.111	0.373
AR View Cust. Trans. Credit	0.38	0.719
FA Create Assets Save	0.245	0.512
FA Create Assets Inquiry	0.253	0.55
GL Journal Entry Save	0.374	0.67
GL Journal Entry Find	0.059	0.245
Inv. View Item Attributes Find	0.241	0.523
Inv. View Item Attributes Save	0.127	0.371
Inventory Insert Misc.	0.15	0.417
Weighted Average Saves	0.613	1.159
Weighted Avg. Searches	0.390	0.582
Transactions/min	~4,300	

Table 3: Detailed Online Transaction Response Times

The transaction rate is estimated by dividing the number of running users by the average pacing.

SERVER PERFORMANCE

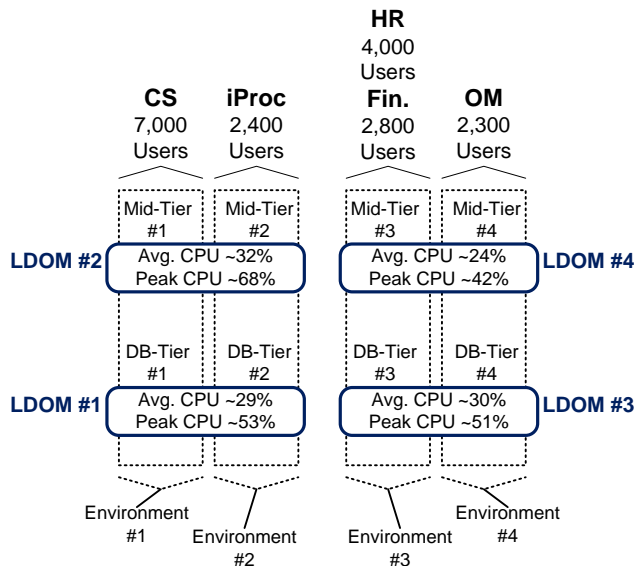Figure 4 shows the Steady-State CPU for each logical domain.

Figure 4: Average CPU Utilization by Domain

Each server scaled smoothly as users were added, keeping the load fairly constant over the steady state period.

Logical Domains	% User	% System	% Idle
LDOM1 DB Servers	25.92	3.21	70.64
LDOM2 App/Web Ser.	28.96	3.05	68.09
LDOM3 DB Servers	26.32	3.52	70.15
LDOM4 App/Web Ser.	21.77	2.11	76.12

Table 4: Average CPU Utilization Breakout

Total Memory Used By:	9,430 Users
LDOM1 DB Servers	402 GB
LDOM2 App/Web Ser.	548 GB
Total Memory Used By:	9,130 Users
LDOM3 DB Servers	336 GB
LDOM4 App/Web Ser.	380 GB

Table 5: Average Memory Utilization Breakout

I/O PERFORMANCE

Six Sun Server X3-2L units was used for storage. The batch workload requires optimal I/O performance.

I/O Performance		Env. 1	Env. 2	Env. 3	Env. 4
Writes/Sec	Avg	951	402	59	127
	Peak	1,630	607	109	299
Reads/Sec	Avg	69	12	3	8
	Peak	99	156	144	357
KB Written/Sec	Avg	7,606	5,735	2,732	6,808
	Peak	13,037	9,337	6,051	17,217
KB Read/Sec	Avg	556	126	44	101
	Peak	793	2,258	2,146	5,520
Avg Service Time (ms)	Avg	0.5	1.1	2.2	1.9
	Peak	0.9	1.8	6.3	3.5

Table 6: 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	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
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 Combos	93,417

Table 7: Data Composition

PATCHES

The following patches were applied to the benchmark environment on top of Oracle E-Business Applications R12 (12.1.2 and 12.1.3).

DB-tier patches:

Patch 13366268 : ID: 14394336

Patch 13258936 : ID: 14465000

Patch 13004894 : ID: 14182829

Patch 13001379 : ID: 14706905.1

Patch 12985184 : ID: 14321186

Patch 12960302 : ID: 14254252

Patch 12942119 : ID: 14210496

Patch 9858539 : ID: 14308099

Patch 4247037 : ID: 14211388

Mid-tier patches:

Installed Patch List:

 1) Patch 8300196
 2) Patch 5651245
 3) Patch 7329300
 4) Patch 7580744
 5) Patch 7379122
 6) Patch 7121788
 7) Patch 6400501
 8) Patch 5394728
 9) Patch 3559326
 10) Patch 7140405
 11) Patch 7281456
 12) Patch 7195389
 13) Patch 7016961
 14) Patch 4526825
 15) Patch 4407272
 16) Patch 6857221
 17) Patch 7229760
 18) Patch 12647406
 19) Patch 13487351

TUNING

```
Drop index applsys.wf_notifications_n1;
create index applsys.wf_notifications_n1 on applsys.wf_notifications
(recipient_role, status, message_type);
```

```
exec dbms_utility.analyze_schema('APPLSYS','ESTIMATE',
estimate_percent=> 25);
exec fnd_stats.gather_table_stats('APPLSYS','WF_ITEMS',
PERCENT=>100);
exec fnd_stats.gather_table_stats('APPLSYS','WF_NOTIFICATIONS',
PERCENT=>35);
```

```
Delete aso.aso_order_feedback_t;
alter table aso.aso_order_feedback_t move;
exec
fnd_stats.gather_table_stats('ASO','ASO_ORDER_FEEDBACK_T');
```

```
Drop index hr.pay_element_entry_values_f_n50;
create index hr.pay_element_entry_values_f_n50 on
hr.pay_element_entry_values_f
(element_entry_id,effective_start_date,effective_end_date,screen_entry
_value);
```

```
update pay_action_parameter_values
set parameter_value = 30
where parameter_name = 'CHUNK_SIZE' ;
```

```
exec fnd_stats.gather_table_stats
('APPLSYS','FND_CURRENCIES',100,cascade=>TRUE);
exec fnd_stats.gather_schema_stats (schemaname =>
'HR',estimate_percent => 100,degree => 32);
```

```
update fnd_concurrent_programs
set enable_trace = 'N'
where enable_trace = 'Y' ;
```

```
alter table hr.pay_recorded_requests cache;
alter table hr.per_all_assignments_f cache;
```

```
select * from per_all_assignments_f where job_post_source_name =
'xxx';
select * from pay_recorded_requests where attribute20 = 'xxx';
```

```
update ap_credit_card_trxns_all
    set report_header_id = null,
    expensed_amount =10,
    transaction_amount=10,
    billed_amount=10,
    billed_date = sysdate,
    posted_date = sysdate,
    transaction_date = sysdate;
```

```
update pa_projects set completion_date = completion_date+365;
update pa_tasks set completion_date = completion_date + 365;
commit;
```

```
update pa_projects_all
  set completion_date = completion_date+365;
select project_id, name, segment1, completion_date from
pa_projects_all
  where project_id = 2779;
commit;
update pa_tasks set completion_date = '30-DEC-12' where task_id in (
  select task_id from pa_tasks a,pa_projects_all b where
a.project_id=b.project_id and b.completion_date = '30-DEC-12');
commit;
```

TUNING CONTINUED

```
Drop index inv.mtl_system_items_b_tn3;
create index inv.mtl_system_items_b_tn3 on inv.mtl_system_items_b
(organization_id, upper(segment1), customer_order_enabled_flag );
```

```
exec fnd_stats.gather_table_stats('APPLSYS','WF_ITEMS',
PERCENT=>100);
```

```
Delete po.po_requisition_headers_all where requisition_header_id
in (select h.requisition_header_id from
po.po_requisition_headers_all h, fnd_user u where h.preparer_id =
u.employee_id and h.active_shopping_cart_flag = 'Y');
delete po.po_req_distributions_all where requisition_line_id in
(select requisition_line_id from po.po_requisition_lines_all where
requisition_header_id in
(select h.requisition_header_id from
po.po_requisition_headers_all h, fnd_user u where
h.preparer_id = u.employee_id and h.active_shopping_cart_flag = 'Y'));
delete po.po_requisition_lines_all where
requisition_header_id in
(select h.requisition_header_id from
po.po_requisition_headers_all h, fnd_user u where
h.preparer_id = u.employee_id and
h.active_shopping_cart_flag = 'Y');
commit;
```

```
Drop index hr.pay_action_information_N2 ;
create index hr.pay_action_information_n2 on
hr.pay_action_information(action_context_id, action_context_type,
action_information_category) parallel nologging ;
alter index hr.pay_action_information_n2 noparallel logging ;
```

```
Drop index hr.pay_action_information_n5 ;
create index hr.pay_action_information_n5 on
hr.pay_action_information (assignment_id,effective_date,
action_information_category,action_context_id,action_information16)
parallel nologging;
alter index hr.pay_action_information_n5 noparallel logging ;
```

```
Drop index hr.pay_legislative_field_info_n1 ;
create index hr.pay_legislative_field_info_n1 on
hr.pay_legislative_field_info ( field_name,legislation_code,rule_type) ;
```

```
exec
fnd_STATS.load_histogram_cols('INSERT',801,'PAY_ACTION_INF
ORMATION','EFFECTIVE_DATE');
exec
fnd_STATS.load_histogram_cols('INSERT',801,'PAY_ACTION_INF
ORMATION','ACTION_CONTEXT_TYPE');
exec
fnd_STATS.load_histogram_cols('INSERT',801,'PAY_ACTION_INF
ORMATION','ACTION_INFORMATION_CATEGORY');
exec
fnd_stats.gather_table_statS('HR','PAY_ACTION_INFORMATION',P
ERCENT=>35);
```

```
analyze index hr.pay_action_information_n2 compute statistics;
analyze index hr.pay_action_information_n5 compute statistics;
analyze index hr.pay_legislative_field_info_n1 compute statistics;
```

BENCHMARK ENVIRONMENT

HARDWARE CONFIGURATION

DATABASE/APPLICATION SERVERS

A single SPARC M6-32 server was divided into four logical domains. Each domain hosted two zones. This yielded four E-Business Suite environments, each with a database server and mid-tier server. It was equipped with the following:

- 8 × 3.6 GHz SPARC™ M6 Twelve-Core processors each with 16 Kilobytes of Instruction and 16 Kilobytes of Data Level-1 on core cache, 128 Kilobytes of shared Instruction and Data Level-2 cache per core, and 48 Megabytes of Level-3 on-chip cache (96 cores total – 768 vcpus/threads)
- 1024 Gigabytes of Memory (~548 GB used at peak load) per LDOM
- 2 × PCI Express 8-Port 6Gbps SAS HBA (LSI)
- 2 × 300 GB SAS Internal Drives

Six Sun Server X3-2L servers were used for storage. The storage servers were equipped with the following:

- 2 × 2.4 GHz Intel Xeon E5-2609 Eight-Core processors
- 16 Gigabytes of Memory
- 4 × Flash Accelerator F40 PCI-E 400GB modules
- 3 × 8 RAID 1 Volumes per LDOM#1 & per LDOM#3

One Sun Server X3-2L server was used for redo.
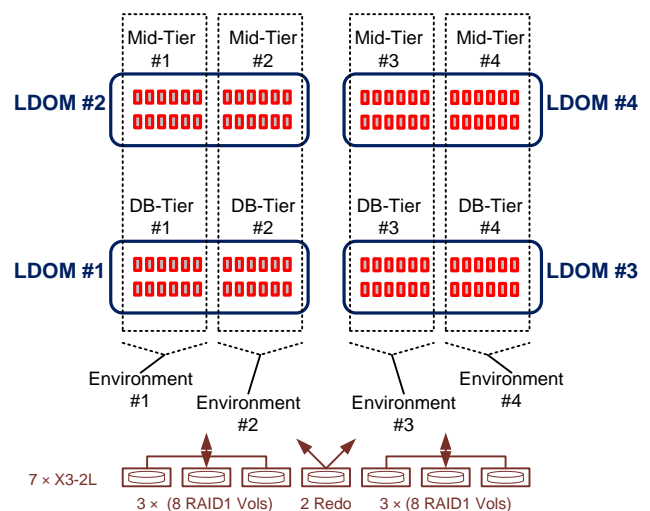- As above, but only 1 × 8 RAID 1 Volume for LDOM#1 & LDOM#3

Figure 5: M6-32 Configured as Eight Servers

LOAD DRIVER SERVER(S)

Four of Oracle's Sun Fire X4170 M2 servers were used as OATS controllers. They were equipped with the following:

- 2 × 2.93 GHz Intel Xeon 5670 Hex-Core processors, each with 2 × 6 Megabytes of Level-2 on-chip cache (12 cores total)
- 72 Gigabytes of Memory

Five of Oracle's Sun Server X3-2 server modules were used as load drivers (OATS 'Agents'). They were equipped with the following:

- 2 × 2.9 GHz Intel Xeon E5-2690 Eight-Core processors, each with 6 Megabytes of Level-3 cache (16 cores total)
- 64 Gigabytes of Memory

Two of Oracle's Sun Server X2-8 server modules were used as load drivers (OATS 'Agents'). They were equipped with the following:

- 8 × 2.4 GHz Intel Xeon E7-8870 Ten-Core processors, each with 30 Megabytes of Level-3 cache (80 cores total)
- 512 Gigabytes of Memory

SOFTWARE VERSIONS

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

Oracle11*g* 11.2.0.3.0 (64-bit)

Oracle Solaris 11.1 on the database servers

Oracle Solaris 11.1 on the app/web servers

Oracle Enterprise Linux 6.4 (64-bit) on the OATS controller and drivers

Oracle® Application Test Suite 9.3.1 (OATS)

Glossary and Acronyms:

ATP	Available to Promise
BEE	Batch Element Entries
HVOP	High Volume Order Processing
OASB	Oracle Applications Standard Benchmark
OATS	Oracle Application Test Suite
OLTP	On Line Transaction Processing
RAC	**R**eal **A**pplications **C**lusters

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