Adaptik and Oracle Exadata Benchmark White Paper

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Abstract:

Adaptik, Oracle and CGI conducted a four-week benchmarking study of Adaptik's policy administration software for insurance on Oracle's Exadata database server in April 2013 with the following results:

- **Performance:** The throughput achieved far exceeded expectations by executing more than one million online business transactions and nearly 1.8 million batch renewal transactions per hour.

- **Scalability:** Comparing performance at four different hardware levels, Adaptik was observed to exhibit near perfect linear scalability.

- **Cost saving:** Compared to a baseline test conducted on the commodity hardware, the platform used for these tests have approximately 58% reduced total cost of ownership.

This white paper details the test results, the hardware platform, and the methodology used.

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Performance Requirements for Policy Administration

Insurance policy administration systems manage the lifecycle of insurance policies from the creation of a quote through the issuance of a policy and subsequent transactions such as policy changes, renewals, and cancellations.

To be competitive, a policy administration system must perform well, have a low total cost of ownership and be highly scalable due to the great variation in transactional volumes of insurance companies.

Systems that are used by the largest personal lines insurers in the United States must be able to support thousands of active users, maintain approximately 30 million in-force policies and process 175 million online policy administration transactions per year consisting of 50 million quotes, 10 million new business transactions and 80 million change, cancel and reinstate transactions. In addition, such systems must process approximately 35 million batch transactions per year which include renewals and other miscellaneous transactions.

Therefore, considering peak load periods, a policy administration system must support 200,000 online transactions per hour and have a batch processing capacity of 150,000 renewals per hour.

Tests Conducted

The tests conducted on Adaptik's software sought to measure the end user response times, scalability, and throughput of the system under various load levels starting with 40 million pre-populated policies that were used to simulate the existing policies of a large insurance carrier.

Four different environments were used to evaluate system scalability — that is, the product's ability to effectively utilize additional resources in order to support a higher volume of concurrent processing. The hardware capacity was doubled at each level for both online and batch processing.

Also conducted were "Maximum Throughput" tests. The objective of these tests was to observe the maximum transaction throughput that can be obtained using the full hardware capacity available.

Test Environments

Figure 1 shows the configuration of each environment. All configurations utilized the Oracle Enterprise Linux 5.8 operating system from Oracle, as well as the Intel Xeon E5-2690 (2.90 GHz). All configurations were deployed within Intel X3-2 dual socket server.

All configurations utilized the IBM WebSphere Application Server - ND 7.0.0.19. For the database, Oracle Enterprise Database Server 11gR2 was utilized.
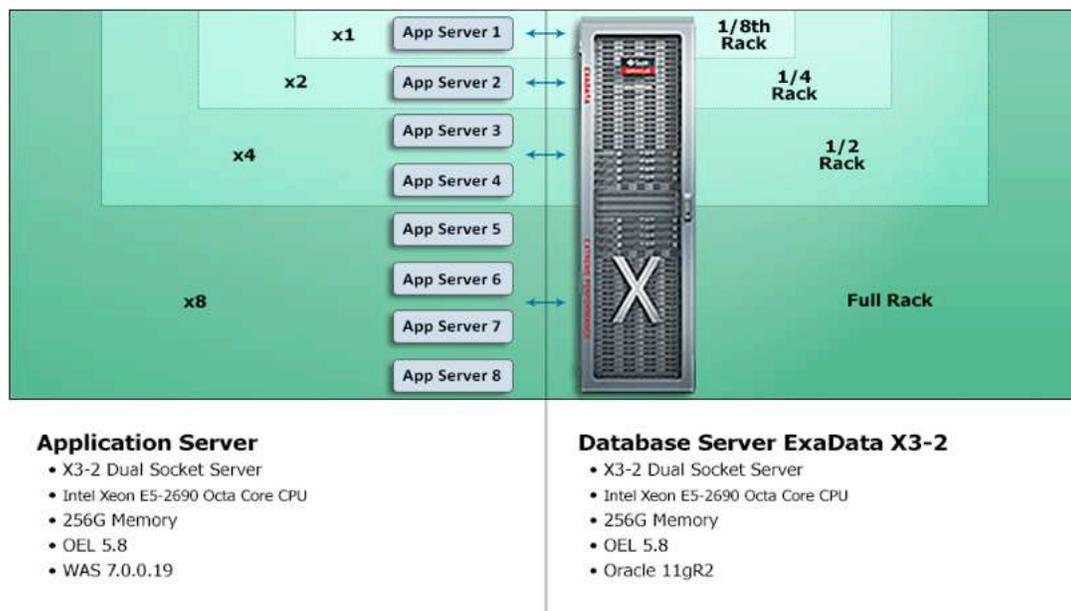
Configuration 1: One application server and ExaData X3-2 database server one eighth rack

Configuration 2: Two application servers and ExaData X3-2 database server one quarter rack

Configuration 3: Four application servers and ExaData X3-2 database server one half rack

Configuration 4: Eight application servers and ExaData X3-2 database server one full rack

Figure 1:

Application Server
- X3-2 Dual Socket Server
- Intel Xeon E5-2690 Octa Core CPU
- 256G Memory
- OEL 5.8
- WAS 7.0.0.19

Database Server ExaData X3-2
- X3-2 Dual Socket Server
- Intel Xeon E5-2690 Octa Core CPU
- 256G Memory
- OEL 5.8
- Oracle 11gR2

In preliminary tests, the optimal ratio of application servers to database servers was determined to be 1:1, and the optimal load for one node was found to be 1,024 users for online processing and 44 streams for batch processing.

Database: All configurations executed against a database deployed on an ExaData X3-2 Oracle Database Server.

Load Generator: Apache's JMeter v2.9 r1437961 testing tool was utilized to deliver requests to the system, validate responses and measure response time for online processing. The requests were distributed equally to all application servers without the use of an HTTP or a load balancing server.

MQ Server: IBM WebSphere MQ Server 6.0.2.5 was utilized for batch processing.

Test Scenarios

Online policy processing was simulated by four business transactions: A new personal auto policy with two operators and two vehicles was created and issued; it was then changed by adding an operator and a vehicle. After that, the policy was cancelled and then reinstated.

Batch policy processing was simulated by selecting business policies for renewal and then creating and issuing renewal transactions.

Test Execution

For each online test, multiple JMeter instances were deployed with multiple threads organized into thread groups. Each JMeter instance was configured to target a specific application server. Each thread group was targeted to a particular application server JVM to simulate requests from virtual users and distribute the load placed on the system evenly at any given point in time. Once reaching the end of a sequence of requests, the thread group began executing from the beginning and looped in this fashion until the iteration count was fulfilled. Each test was executed in approximately 135 minutes starting with 30 minutes of ramp-up, followed by 70 minutes of peak time, and concluding with 30 minutes of ramp-down.

For each batch test, one instance of MQ Server was utilized to queue policies for renewal processing. The batch module of the Adaptik application stack was configured to run at a scheduled time. The module identified the policies to be renewed and queued them in MQ Server. Process threads in the stack picked and processed the messages from the queue.

Test Results

All tests were conducted successfully with no errors.

Online Tests
Statistics are reported on a request-level basis and rolled up to the page level. The average response time of requests from the browser to the application server was found to be below 0.6 second across all tests conducted.

Page response time measures the average combined response time for all the requests from the browser to the application server resulting from a single user request including any AJAX style requests as well as initial loading and submission of a page. Across all the conducted tests, the page response time was found to be below 3 seconds 98% of the time. The 90 percentile page response time for each test is shown in Table 1
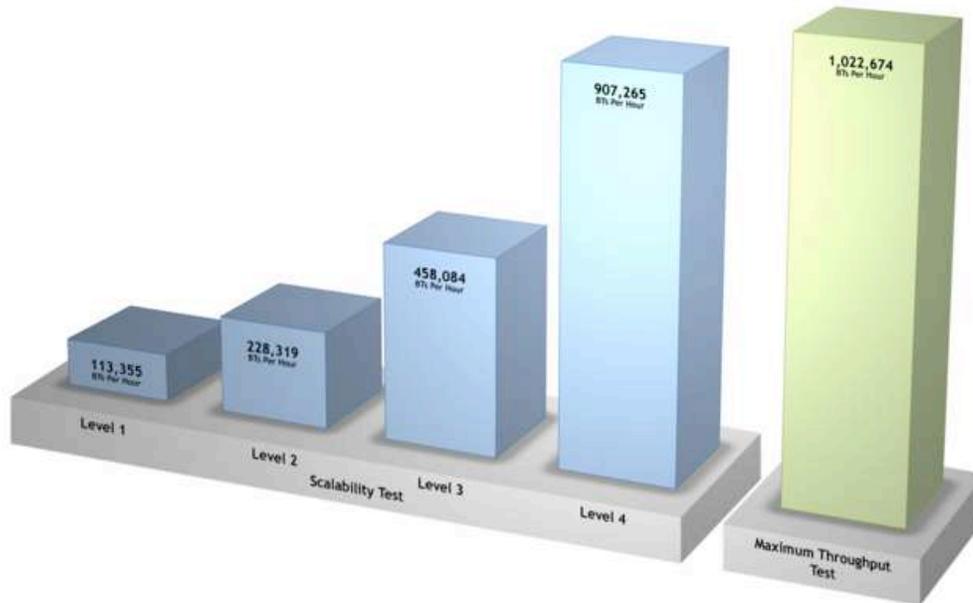
Table 1 – Online Test Characteristics & Performance Metrics

Test Level	Number of Nodes	Number of Virtual Users	90 Percentile Page Response Time (seconds)	Application Server CPU Utilization	DB Server CPU Utilization
Level 1	1 Node	1,000	1.64	69.3%	45.2%
Level 2	2 Node	2,048	1.68	72.4%	47.4%
Level 3	4 Node	4,096	1.66	70.7%	49.6%
Level 4	8 Node	8,192	1.70	69.4%	51.5%
Max	8 Node	10,240	1.89	81.7%	79.2%

In online tests, application server resource utilization peaked at 82 percent. Database processor utilization reached 80 percent at peak utilization.

Business transaction throughput reported is based on the number of business transactions processed per hour at peak system load (Figure 2).

*Figure 2 – Hourly Online Business Transaction Throughput*

Batch Tests

During batch tests, application server resource utilization peaked at 43 percent. Database processor utilization reached 80 percent at peak utilization (Table 2).

Table 2 – Batch Test Characteristics & Performance Metrics

Test Level	Number of Nodes	Number of Batch Streams	Application Server CPU Utilization	DB Server CPU Utilization
Level 1	1 Node	44	45.9%	52.7%
Level 2	2 Node	88	39.7%	50.2%
Level 3	4 Node	176	39.9%	50.7%
Level 4	8 Node	352	39.6%	62.1%
Max	8 Node	560	42.4%	79.7%

Statistics are collected on the total time spent for the creation and issuance of each renewal, counting the combination of these two steps as a single renewal transaction. The reported renewal transaction throughput is based on the number of renewals processed per hour at peak system load (Figure 3).
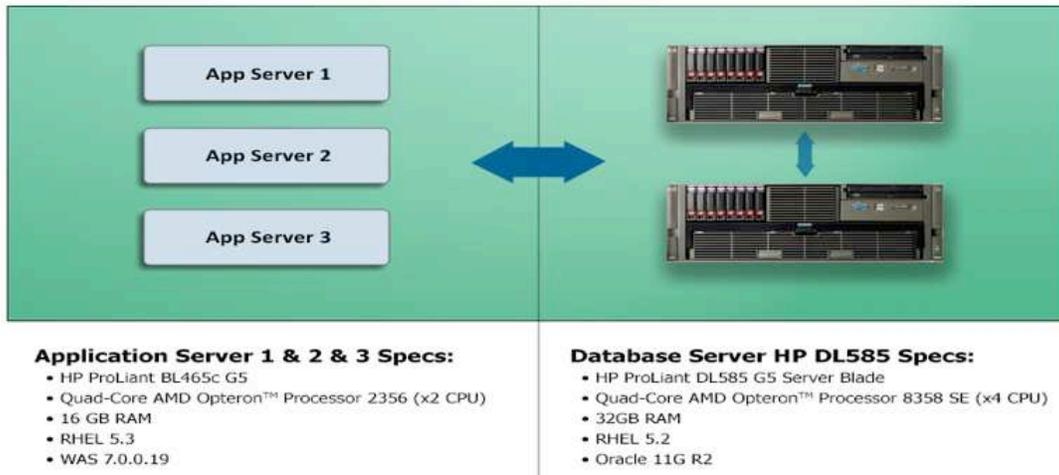
*Figure 3 – Hourly Batch Renewal Throughput*
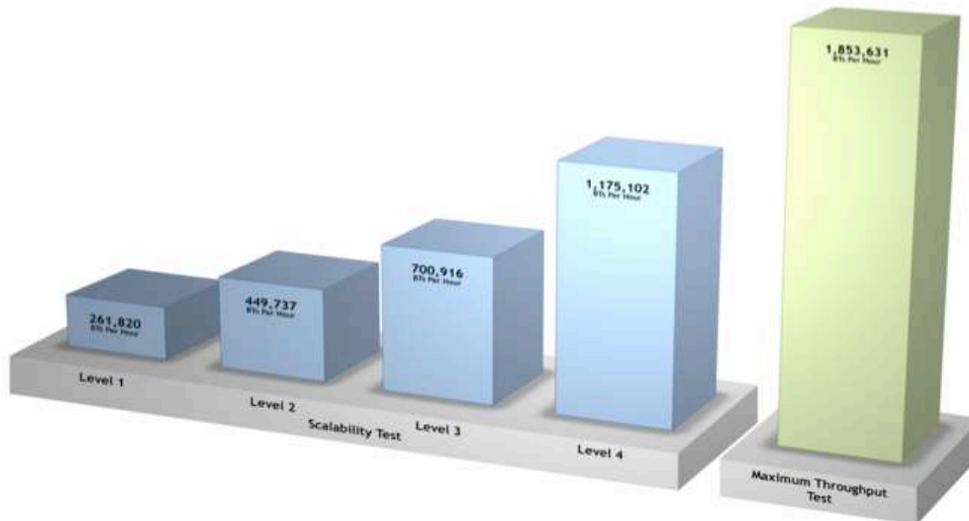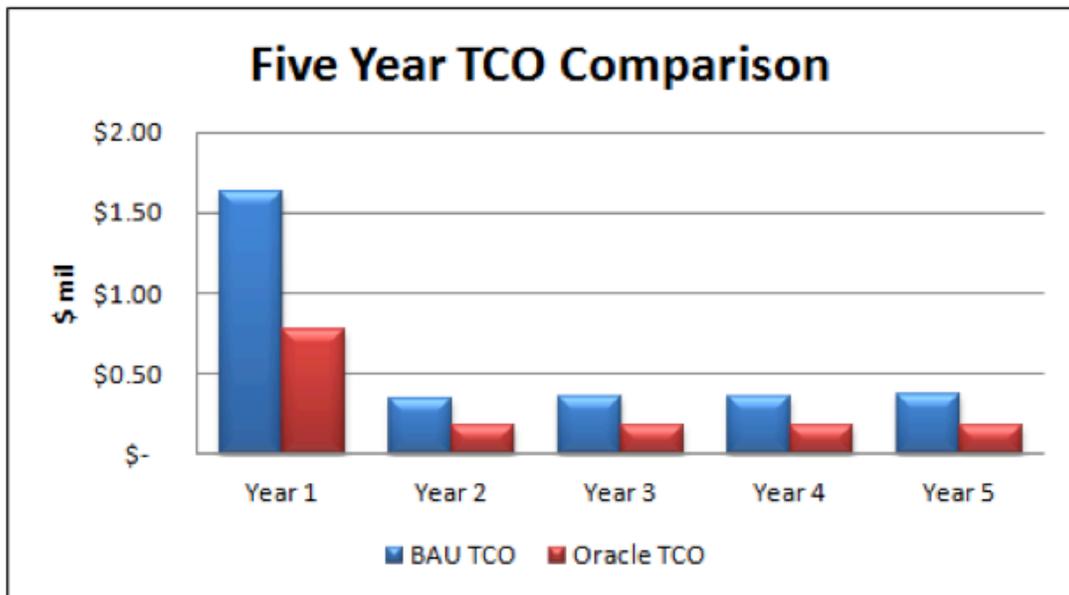
Cost of Ownership

Baseline tests had been conducted several weeks earlier on the commodity hardware (Baseline Assembly Unit - BAU) shown in Figure 4. In those tests, using the same test scripts against the same version of Adaptik, the throughput obtained was 44,544 online transactions and 71,182 batch renewals per hour compared to 1,022,674 online transactions and 1,853,631 batch renewals per hour using the target Exadata Architecture.

Figure 4 – Baseline Assembly Unit (BAU)

Application Server 1 & 2 & 3 Specs:
- HP ProLiant BL465c G5
- Quad-Core AMD Opteron™ Processor 2356 (x2 CPU)
- 16 GB RAM
- RHEL 5.3
- WAS 7.0.0.19

Database Server HP DL585 Specs:
- HP ProLiant DL585 G5 Server Blade
- Quad-Core AMD Opteron™ Processor 8358 SE (x4 CPU)
- 32GB RAM
- RHEL 5.2
- Oracle 11G R2

Based on the throughput findings and the costs associated with each platform, the Exadata platform was found to have approximately 58% lower total cost of ownership compared to the BAU platform.

Five Year TCO Comparison
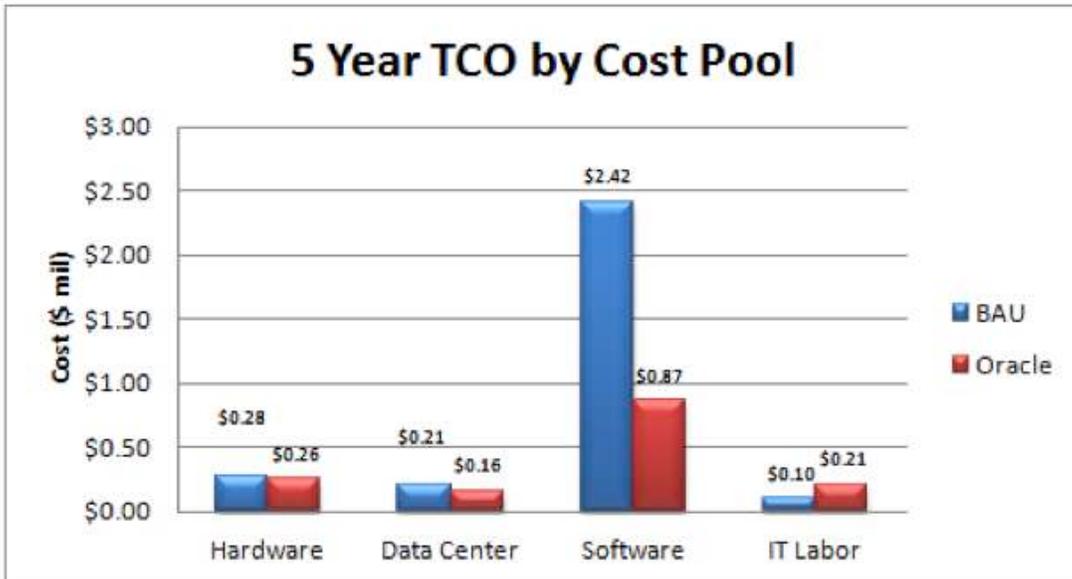
Besides its total cost of ownership (TCO) advantage, the Exadata Database Machine X2-2 has complete redundancy built in to support the demands of mission critical applications. Each Exadata Database Machine has redundant InfiniBand connectivity, redundant Power Distribution Units (PDU), and the servers all have hot-swappable power supplies for high availability. Oracle RAC protects against database server failure and ASM provides disk mirroring to protect against disk failures. Hot swappable components ensure the database can tolerate server and disk drive failure. In addition, data is mirrored across storage servers to protect against loss of data and safeguard data accessibility.

Test Conclusion

Adaptik, CGI and Oracle jointly executed a set of load tests against Adaptik's policy administration software, to confirm that the application is highly scalable and can readily support the high-volume processing needs of the largest insurance companies.

All goals of the test were met. Adaptik was able to process more than 1,000,000 online transactions and 1,850,000 batch renewals per hour while serving 10,000+ concurrent users. These results greatly exceed the transactional volumes needed by the largest insurance carriers (by a factor of 5 for online and a factor of 12 for batch processing).

The tests also proved out Adaptik's scalability by being able to double the transaction throughput each time the hardware capacity was doubled.

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