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Oracle Communications Elastic Charging Engine: Performance Test for High Volume, Real-time Transaction Processing
Introduction

Increasing volumes of data usage, the transition to all-IP networks, competitive pressures, and the increasing expectations of customers, are placing higher demands on communications service providers. In the face of these demands, service providers are looking for new approaches to boost profitability and are recognizing the increasing importance of advanced real-time charging, analytics and policy control capabilities.

The Oracle Communications Elastic Charging Engine, a new rating, charging, and balance management application, is built upon proven Oracle technologies, such as Java and Oracle Coherence, and supports the current and future requirements of communications service providers. As a 100 percent real time charging system, it's designed to process the most demanding transaction volumes for any service, and any network. And, it's "always on", supporting the stringent online requirements of prepaid service providers, yet providing real-time benefits to postpaid subscribers as well, all within a single charging system.

The performance characteristics of the Oracle Communications Elastic Charging Engine were measured in September, 2012 in Oracle’s Santa Clara, CA performance laboratory. The application was tested on an Oracle Exalogic Elastic Cloud system under several workloads. The Oracle Communications Elastic Charging Engine exhibited a maximum throughput of more than 3 billion transactions per hour at an average latency of 5ms. That's the equivalent of processing in real time:

- All of the world’s fixed and mobile circuit switched phone calls\(^1\).

- Or, over four times the world’s SMS traffic\(^2\).

- Or, by using four Oracle Exalogic Elastic Cloud systems, all of the world’s data traffic\(^3\).
Performance Test Description

In September 2012, the Oracle Communications Global Business Unit Performance Group conducted a performance test to measure the throughput, latency, sustainability and scalability characteristics of the Oracle Communications Elastic Charging Engine Release 11.1. The results provide vital technical data necessary to provide performance information to Oracle customers, system integrators, and partners.

Three specific scenarios were considered in this performance test:

- High transaction volume
- Large subscriber volume
- Long processing duration

The tests measure the processing performance of the Oracle Communications Elastic Charging Engine by executing scenarios which load the server with Initiate, Update, Terminate (IUT) requests that simulate real-world charging transactions. After a warm-up phase intended for the systems to reach a steady operating state, multiple tests were conducted at a target throughput for the test duration. System statistics, latency and throughput numbers were measured on each node during the load test, with the warm-up excluded from the statistics.

An Oracle Communications Elastic Charging Engine load simulator was used as a client, which generated traffic against the system and collected performance metrics such as measured throughput and average latency. Multiple simulator instances were distributed across several nodes to ensure sufficient load generation capacity. Kernel, Java Virtual Machine and Oracle Coherence resource utilizations were monitored and recorded via an Oracle Enterprise Manager console.

All tests were conducted in a controlled environment with no other applications running on the hardware. All test results were collected in steady state with significant run time to minimize fluctuation due to noise from the test environment.

System Configuration

The test system was comprised of one Oracle Exalogic X2-2, consisting of thirty compute nodes (60 CPUs). Twenty-four nodes were assigned for the Oracle Communications Elastic Charging Engine server deployment, and six nodes were assigned for simulator deployment (to simulate subscriber data and usage). Figure 1 illustrates the environment used for the test.
Hardware

Oracle Exalogic X2-2 Elastic Cloud:

- 30 Sun Fire® X4170M2 Compute Nodes. Each node with 2 x 6-Core Intel® Xeon® Processors (3.06 GHz).

Software

- Oracle Communications Elastic Charging Engine Release 11.1
- Oracle JDK 1.7.0_05, 64 bit, Hotspot, G1GC collector
- Oracle Enterprise Linux: OEL5.6 label 2.6.32-100.23.1.el5

Data Composition

Subscriber data was created by a customer generator and loaded into the Oracle Communications Elastic Charging Engine servers via the customer loader. All subscriber accounts were configured with three products, along with pricing configuration information.
Performance Results

High Transaction Volume
The high transaction volume test was intended to measure peak high volume transactional performance of the Oracle Communications Elastic Charging Engine during a ten minute time duration test. The servers were loaded with 20 million subscribers and performance was measured at 840,000 transactions per second, or 3 billion transactions per hour with an average latency of 5ms.

Large Subscriber Volume
The large subscriber volume test measured performance of the Oracle Communications Elastic Charging Engine under extreme subscriber volumes. In this test, 400 million subscribers were loaded with a test duration of ten minutes. Performance was measured at 500,000 transactions per second, or 1.8 billion transactions per hour. The average latency was 3ms.

Long Processing Duration
The long processing duration test measured the performance of the Oracle Communications Elastic Charging Engine under a prolonged test period of 48 hours. The servers were loaded with 20 million subscribers and performance was measured at 500,000 transactions per second or 1.8 billion transactions per hour. The average latency was 8ms.

Table 1 summarizes the results of the performance tests.

<table>
<thead>
<tr>
<th>Test Scenario</th>
<th>Subscriber Volume</th>
<th>Throughput (Transactions per hour)</th>
<th>Average Latency</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Transaction Volume</td>
<td>20 million</td>
<td>3.024 billion</td>
<td>5 ms</td>
</tr>
<tr>
<td>Large Subscriber Volume</td>
<td>400 million</td>
<td>1.8 billion</td>
<td>3ms</td>
</tr>
<tr>
<td>Long Processing Duration</td>
<td>20 million</td>
<td>1.8 billion</td>
<td>8ms</td>
</tr>
</tbody>
</table>

Table 1. Oracle Communications Elastic Charging Engine performance test results summary

Conclusion
This performance test demonstrates that the Oracle Communications Elastic Charging Engine running on Oracle Exalogic X2-2 is capable of processing over 3 billion transactions per hour with an average latency of just 5ms. The tests also demonstrate that the Oracle Communications Elastic Charging Engine is capable of supporting subscriber numbers up to 400 million with outstanding performance, and will perform reliably with outstanding performance for long durations.

The tests confirm that the Oracle Communications Elastic Charging Engine exhibits high performance with low latency, on a minimal hardware footprint, to satisfy the most stringent real-time charging demands required by communications service providers.
Informa Telecoms and Media estimates that there were 9.8 trillion telephone calls made in 2011 in their blog at [http://blogs.informatandm.com/6130/operators-are-becoming-less-fearful-over-mobile-voip/](http://blogs.informatandm.com/6130/operators-are-becoming-less-fearful-over-mobile-voip/).


Informa Telecoms and Media estimate that there were 60 trillion data sessions in 2011 in their blog at [http://blogs.informatandm.com/6130/operators-are-becoming-less-fearful-over-mobile-voip/](http://blogs.informatandm.com/6130/operators-are-becoming-less-fearful-over-mobile-voip/).