Real Life Stories on Extreme Performance with In-Memory Database Technology

Presented at Oracle Open World
The Lockheed Martin Census Practice
TimesTen Use in UK Census

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Between the Idea and the Achievement, There Is One Important Word: HOW ... And It Is the HOW that Makes All the Difference
**Use Case: UK 2011 Census**

**Cost by Response Channel**
- **Field** - $\sim$90
- **Telephone** - $\sim$10
- **Paper** - $\sim$4
- **Internet** - $\sim$1

**Normalized Response Cost over time**

![Cost by Response Channel](image)

![Normalized Response Cost over time](image)

![Daily Responses](image)

![Hourly Responses](image)

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Challenge: Central DB Load

- **Requirement:** Must store data after each page
- **Initial IDB Load Estimate:** 465 TPS

<table>
<thead>
<tr>
<th>Change</th>
<th>Increased load on IDB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load Balancer design solution</td>
<td>2X</td>
</tr>
<tr>
<td>WSH integration/login redirection solution</td>
<td>2X</td>
</tr>
<tr>
<td>24-&gt;32 page questionnaires</td>
<td>1.6X</td>
</tr>
<tr>
<td>Questionnaire App Database Interaction</td>
<td>8X</td>
</tr>
<tr>
<td>Increased Internet Uptake</td>
<td>5X</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2 * 2 * 1.6 * 8 * 5 = 256X</strong></td>
</tr>
</tbody>
</table>

- **Final IDB Load Estimate:** **119,026 TPS**
Use of Times 10

- Rearchitected solution to reduce load on IDB
- Used TimesTen as local data cache in cluster
  - Served local transactions
  - Read from IDB during login
  - Aged to IDB after local transaction
- Enabled move from risky Active/Active to Active/Passive IDB

- Concerns
  - Deployment Location
  - Sizing
  - Aging latency
  - Network load
Before

Internet

IDC

SIG (P)

LB

FW

SM

SM

SM

SM

FW

LB

IDC

SIG (P)

LB

FW

SM

SM

SM

SM

FW

LB

WS

WS

WS

WS

WS

WS

WS

WS

WS

IDC

SIG (P)

LB

FW

SM

SM

SM

SM

FW

LB

Advanced Replication

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Results

- Verified with cloud based full scale load testing:
  - 3.0 million daily responses
  - 200,000 peak concurrent users
  - 1 second average page response time
  - IDB: 6,118 TPS
  - Availability maintained through simulated site, cluster and component failure

- Actual production usage:
  - 3.7 million total responses
  - 36,000 peak concurrent users
  - <1 second average page response time
  - IDB: 1,101 TPS
  - Production availability: 99.94%
Lessons Learned

- Performance better than expected – 10X better
- Needed more RAM than expected – 24GB/CPU
- Log writing greater than expected
  - Data written to XDB disk then aged to central IDB
  - Disks need to be sized to handle transaction load
- TimesTen deployment doesn’t have to be coresident with app
- Latency somewhat configurable
  - Max Latency = aging frequency + max time to age
- Network load not overly burdensome
  - On par with Advanced Replication traffic load - ~10Mbps
- Cloud based testing was most cost effective to do full load test
Thank You!

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