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

Normalized Response Cost over time

Cost by Response Channel
- Field - ~$90
- Telephone - ~$10
- Paper - ~$4
- Internet - ~$1

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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>Total</td>
<td>2 * 2 * 1.6 * 8 * 5 = 256X</td>
</tr>
</tbody>
</table>

- Final IDB Load Estimate: **119,026 TPS**
• 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

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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