Intro to Oracle TimesTen

--- By Sima Zhu
• Why in-memory?
• Basic Architecture
• TimesTen replication
• Transactional durability
• Advantages of TimesTen
• System with GigaBytes, TeraBytes becomes common

• Avoid frequently touching disk IO

Why in-memory?
Basic Architecture

Basic Architecture
• Row format v.s. column format
• Columnar compression
• Index reduction
## Storage Manager Design

### Row Store v. Column Store

<table>
<thead>
<tr>
<th>Record #</th>
<th>Name</th>
<th>Address</th>
<th>City</th>
<th>State</th>
</tr>
</thead>
<tbody>
<tr>
<td>0003623</td>
<td>ABC</td>
<td>125 N Way</td>
<td>Cityville</td>
<td>PA</td>
</tr>
<tr>
<td>0003626</td>
<td>Newburg</td>
<td>1300 Forest Dr.</td>
<td>Troy</td>
<td>VT</td>
</tr>
<tr>
<td>0003647</td>
<td>Flotsam</td>
<td>5 Industrial Pkwy</td>
<td>Springfield</td>
<td>MT</td>
</tr>
<tr>
<td>0003705</td>
<td>Jolly</td>
<td>529 S 5th St.</td>
<td>Anywhere</td>
<td>NY</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Record #</th>
<th>Name</th>
<th>Address</th>
<th>City</th>
<th>State</th>
</tr>
</thead>
<tbody>
<tr>
<td>0003623</td>
<td>ABC</td>
<td>125 N Way</td>
<td>Cityville</td>
<td>PA</td>
</tr>
<tr>
<td>0003626</td>
<td>Newburg</td>
<td>1300 Forest Dr.</td>
<td>Troy</td>
<td>VT</td>
</tr>
<tr>
<td>0003647</td>
<td>Flotsam</td>
<td>5 Industrial Pkwy</td>
<td>Springfield</td>
<td>MT</td>
</tr>
<tr>
<td>0003705</td>
<td>Jolly</td>
<td>529 S 5th St.</td>
<td>Anywhere</td>
<td>NY</td>
</tr>
</tbody>
</table>

Picture from: http://arxtecture.com/column_vs_row/
• Columnar compression

• Space-saving mechanism

• Improve query processing
- Most OLTP Indexes (e.g. ERP) are only used for analytic queries

- Inserting one row into a table requires updating 10-20 analytic indexes: **Slow!**

- Indexes only speed up anticipated queries & reports

---

**Storage Manager Design**

Index Reduction

TimesTen Replication
• High availability
• Log-based
• 2-safe replication
• Replication tracks

TimesTen Replication
• Multi-threaded Logging mechanism
• Checkpoint files
• Read-committed isolation
Advantages

- Full-feature SQL
- Standard API
- ACID properties
- High-availability mechanisms
Questions?