solidDB Fundamentals & Features
Relational Database Software Powers Enterprise Applications

**Leading Relational Databases Efficiently Support**

- **100s to 1,000s** of users
- **Milliseconds to seconds** response times
- **1,000s** of transactions **per minute**
As Number of Users Increase and Data Volumes Grow
Data Management Performance Must Increase 10x

**Communications**
- Brokerage Application
  - Receive market feed
  - Evaluate equity positions
  - Check for fraud

**Financial Services**
- Evaluate **30,000+ rules** on **500 trades per second** for 15 million trades per day

**Web 2.0**
- Online Retail Web Site
  - Authenticate user
  - Manage personal wishlists
  - Generate page contents with cross-sell data

**Online Charging**
- Authenticate and authorize
- Initiate service
- Manage credit balance
- Manage volume discounts

- **100,000s to 1,000,000s** of concurrent requests
- **10s of microseconds** for database calls

- Facebook: **10,000,000** concurrent sessions = two billion page views a day
- Wikipedia: **3000 page views a second** and **25,000 SQL requests per second**

**Communications**
- Evaluate 30,000+ rules on 500 trades per second for 15 million trades per day
# Comparison of On-Disk and In-Memory Databases

<table>
<thead>
<tr>
<th>On-Disk Databases</th>
<th>In-Memory Databases</th>
</tr>
</thead>
<tbody>
<tr>
<td>All data stored on disk, disk I/O needed to move data into main memory when needed</td>
<td>All data stored in main memory, no need to perform disk I/O to query or update data</td>
</tr>
<tr>
<td>Data is always persisted to disk</td>
<td>Data is persistent or volatile depending on the in-memory database product</td>
</tr>
<tr>
<td>Traditional data structures like B-Trees designed to store tables and indices efficiently on disk</td>
<td>Specialized data structures and index structures assume data is always in main memory</td>
</tr>
<tr>
<td>Support very broad set of workloads, i.e. OLTP, data warehousing, mixed workloads, etc.</td>
<td>Optimized for specialized workloads</td>
</tr>
<tr>
<td>Virtually unlimited database size (order of Terabytes, Petabytes)</td>
<td>Database size limited by the amount of main memory (Gigabytes)</td>
</tr>
</tbody>
</table>

Even when on-disk databases cache all data into main memory, in-memory databases **always** provide **shorter and more consistent** response times and **higher transaction throughput**.
Relational, In-Memory, Database Technologies
Process Performance Critical Data 10 times faster

Throughput of Tens of Thousands of Transactions per Second

- solidDB
- Disk-based database

Response Times Measured in Microseconds

- solidDB in-memory DB achieves 10x the performance of an on-disk database even when on-disk database cached all data into main memory
- solidDB in-memory Cache achieves 5.25x to 20x the performance of an on-disk database

- solidDB
- Disk-based database
Agenda

- Fundamentals of solidDB
- Installation and Basic Configuration of solidDB
- New features for solidDB 100
solidDB 100
Relational, In-Memory Database for Extreme Speed
## Platform Support

<table>
<thead>
<tr>
<th>OS</th>
<th>OS Details</th>
<th>Hardware</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIX</td>
<td>AIX V5.3 / V6.1 / V7.1 for POWER5 / POWER6 / POWER7 systems</td>
<td>64-bit systems with POWER5™, or later processors are required</td>
</tr>
<tr>
<td>Linux</td>
<td>Red Hat Enterprise Linux (RHEL) 6 and 5</td>
<td>32-bit and 64-bit (x64) Linux: All systems based on Intel® or AMD processors that are capable of running the supported Linux operating systems (x86 and x64 systems)</td>
</tr>
<tr>
<td></td>
<td>SUSE Linux Enterprise Server (SLES) 10 and 11</td>
<td></td>
</tr>
<tr>
<td>Solaris</td>
<td>Solaris 10 for UltraSPARC and x86 servers</td>
<td>64-bit Systems with UltraSPARC or x86 processors are required</td>
</tr>
<tr>
<td>HP-UX</td>
<td>HP-UX 11i v2 and 11i v3 for HP 64-bit Integrity servers (Itanium-based systems)</td>
<td>Itanium-based 64-bit HP Integrity Series systems are required</td>
</tr>
<tr>
<td>Windows</td>
<td>32-bit and 64-bit (x64) Windows Server 2008 and 2012, Standard, Enterprise and Datacenter Editions</td>
<td>32-bit and 64-bit (x64) Windows: All systems based on Intel® or AMD processors that are capable of running the supported Windows (x86 and x64 systems)</td>
</tr>
<tr>
<td></td>
<td>32-bit and 64-bit (x64) Windows 7 and 8 Professional, Enterprise and Ultimate Editions</td>
<td></td>
</tr>
<tr>
<td></td>
<td>32-bit and 64-bit (x64) Windows Vista Business, Enterprise, and Ultimate editions</td>
<td></td>
</tr>
</tbody>
</table>
solidDB

- In-Memory Relational Database
  - Extreme Speed
    - Designed to achieve very high throughput and very low response times (measured in microseconds)
    - Throughput of tens of thousand of transactions per second
    - Dual storage database
      - M-tables and D-tables with equal transactional capabilities
    - In-Memory tables keep data in main memory at all times
  - Extreme Availability
    - Supports 99.9999% availability
    - Provides instant application failover and transparency to users
  - Low Cost
    - Avoids costs associated with outages
    - Near-zero administration, runs virtually unattended
    - Easy to deploy, fully featured standards compliant relational database
    - Low development cost, leverages existing SQL skills
solidDB
In-Memory Relational Database

- Installation
  - solidDB is installed using Java based InstallAnywhere
  - Installation requires JVM in path
  - Evaluation License is provided in the 'base' directory
  - solidDB server is just one executable: `solid`

- Basic Configuration
  - solid.ini

- Operation
  - Startup
  - Shutdown

- Data Management Tools
  - solsql – command line tool for SQL
  - solcon – command line admin tool
solidDB Installation
Samples Directory

- Each directory contains
  - readme.txt
  - makefile
  - runme.bat
  - Sample code

- Copy the solideval license file into the directory to execute the runme.bat

- Many of these samples have been used to create the bootcamp labs
  - Hot Standby
  - ODBC/JDBC
  - Data Aging
  - SQL Passthrough
  - Linked Libraries
solidDB Basic Configuration
solid.ini Configuration File

- Default Location is the current directory ('.')
  - Location can be specified with `-c`
    - `-c /home/solid/db`
  - Location can be defined by SOLIDDIR environment variable
    - to override SOLIDDIR use
      - `-x inifile:<path to solid.ini>`

- Define the way solidDB operates
  - Specify directories for the database, backup and log files
  - Set Communication settings
  - Define Memory usage
  - Create Timed commands

- Typically few parameters are needed
  - Default values apply in most cases
solidDB Basic Configuration
Setting Parameters in solid.ini

- Divided into sections delimited by square brackets
  - [Com], [General], [IndexFile], [Logging], [Srv], etc.
- Parameters syntax
  - `<param_name>=<param_value>`
- Spaces allowed
- Not case sensitive
- Comments follow semi-colon
  - `; This is a comment`
  - `<param_name>=<param_value> ; another comment`
- Look for messages in solmsg.out
solidDB Basic Configuration

Access Modes

- Access mode indicates whether a parameter can be changed dynamically and when the change takes effect

  - RO: Read Only
    - The value cannot be changed dynamically
  
  - RW: Read/Write
    - The value may be changed dynamically and the change takes effect immediately
  
  - RW/Startup
    - The value may be changed dynamically but the change takes effect upon next server startup
  
  - RW/Create
    - The value can be changed but the change will not be applied until a new database is created
solidDB Basic Configuration Sample

- **[Com]**
  - **Listen**
    - Defines Unique Network name (protocol + name)
    - Default: depends on OS
    - Access Mode = RW

- **[Logging]**
  - **LogEnabled**
    - Specifies whether to enable transaction logging
    - Default = Yes
    - Access Level = RW/Startup

- **[Data Sources]**
  - **Purpose**
    - Give the server a descriptive name
  - **Definition**
    - Logical Name
    - Network name

---

[Com]
Listen = tcpip 1315, shm solid1315

[Logging]
LogEnabled = NO

[Data Sources]
SOLDB = tcp 192.168.154.154 1315
Data Management Tools

- solidDB SQL Editor (solsql)
  - Operations
    - All administrative operations: ADMIN COMMANDs
    - SQL statements
  - Use when
    - A command line based UI is needed
    - Executing SQL scripts
    - Testing simple SQL statements
  - Terminate command with semi-colon
  - Type `quit;` to exit
  - Options
    - Use `-a` for autocommit
    - Use `-t` to display execution times

- solidDB Remote Control (solcon)
  - Operations
    - Only ADMIN COMMANDs
  - Requires
    - SYS_ADMIN_ROLE or SYS_CONSOLE_ROLE
  - Use to
    - Speed up admin operations
    - Limit access to admin operations
Starting solidDB

- Database is created automatically
- First time server is started requires
  - Default catalog name
  - System administrator name
  - System administrator password
- Special options use -x (partial list)
  - forcerecovery
  - execute: <input file>
  - reorganize
  - infodbfreefactor
  - ignoreerrors
  - keypwdfile:<filename>
  - testintegrity
  - Inifile:<full path to config file>

solid -c <working dir> -U username -P password -C catalog
Operation
Shutting down solidDB

- Abnormal shutdown doesn't corrupt database, but makes the next server start take longer
  - Power failures
  - System crashes
  - OS shutdown (sometimes)

- Ways to shut down the server gracefully
  - solid data management tools (solcon, solsql)
  - Server icon (Windows)
  - net stop (Windows system service)

```
ADMIN COMMAND 'shutdown';
ADMIN COMMAND 'shutdown force';
ADMIN COMMAND 'sd force';
```
solidDB 100 - What's New

- New Features and Improvements
  - Audit Information
    - Ability to monitor and log all the SQL activity in the database
  - Data Compression
    - Compression of disk-based table data
  - Cache Segment Partitioning
    - Ability to segment data to separate segments in the cache. E.g. hot and history.
  - Performance improvements
  - Better diagnostic functionality