MySQL Architectures for Oracle DBA's

UKOUG Conference 2011
December 5th, Birmingham

Oli Sennhauser
Senior MySQL Consultant, FromDual

oli.sennhauser@fromdual.com
FromDual

- FromDual provides neutral and independent:
  - Consulting for MySQL (on-site and remote)
  - Remote-DBA / MySQL operations
  - Support for Galera (synchronous MySQL Replication)
  - Support for MySQL (Basic and Silver)
  - Training for MySQL
- Consulting Partner of Open Database Alliance (ODBA.org)
- Oracle Silver Partner (OPN)
- More informations at: www.fromdual.com
Our customer
Content

- The LAMP Stack
- History of MySQL
- Open Source
- Branches and Forks
- Move from Oracle?
- MySQL Architecture
- Pluggable Storage Engines
- Differences between Oracle and MySQL
- Scale-Up vs. Scale-Out
- High-Availability solutions
- Architectures put in place
The LAMP Stack

We are the Web!

- PHP
- MySQL
- Apache
- Linux

Who is behind?

- Zend Technologies
- MySQL/Oracle
- Apache Software Foundation
- Linux Foundation

Alternatives

- Perl, Java, Python, Ruby
- PostgreSQL, others
- Lighty (lighttpd), IIS
- Windows, Solaris, BSD, others

www.fromdual.com
History of MySQL

1995: project started by Monty Widenius, David Axmark and Allan Larsson

Oct 2005: Oracle buys Innobase OY InnoDB Friday

Oracle tries to buy MySQL

IPO is announced for 2008

Jun 2000: GPL

Jan 2000: v3.23 GA

Jan 2001: v3.23 GA

2008: Branching of MySQL begins

2008: Branching of MySQL begins

Apr 2009: Oracle buys Sun for USD 7400 Mio

Jan 2008: Sun buys MySQL for USD 1000 Mio

www.fromdual.com
Open Source

- Basics:
  - Source code is available and visible (transparency)
  - Source code can be changed, adapted or used elsewhere
  - Everybody can participate: Communities

- Advantages
  - „no“ Vendor Lock-in!
  - More flexibility!
  - Less costs?
  - Better Quality?
  - Higher reliability?

- Disadvantages
  - Not everything is served on a golden plate: „read the source“!
  - Potential for conflicts as soon as commercial interests come into the game
  - For me personally important: Know-how transfer, freedom of know-how
Branches and Forks

- Jul ProvenScaling MySQL Branch (†)
- Oct OurDelta MySQL Branch
- May MariaDB/Aria MySQL/MyISAM Branch
- Dec XtraDB InnoDB Branch / Percona Build / Percona Server
- Jul Drizzle MySQL Fork
- Google patches

MySQL Fork ?
Switch from Oracle?

Oracle

MySQL

It needs some time to adapt (3 - 6 monts?)!
MySQL Architecture

MySQL is a multi-thread and **NOT** a multi-process application!

```
Application / Client

Thread Cache

Connection Manager

Parser

User Authentication

Optimizer

Access Control

Table Manager

Table Open Cache (.frm, fh)

Table Definition Cache (tbl def.)

Query Cache Module

Query Cache

Command Dispatcher

Handler Interface

Logging

MyISAM  InnoDB  Memory  NDB  PBXT  Aria  XtraDB  Federated-X  ...
```
Pluggable Storage Engines (SE)

• The concept of Storage Engines (SE)
• A Storage Engine is a database kernel

Conventional (R)DBMS = monolithic

**MySQL SE**
- Handler Interface
  - ISAM
  - MyISAM
  - BDB
  - ...

**MySQL pluggable SE**
- Handler Interface
  - InnoDB
  - MyISAM
  - PBXT
  - NDB
  - ...

plug-in

built-in
The most important Storage Engines (SE)

- **MyISAM / Aria**
- **InnoDB / XtraDB / PBXT (transactional SE)**
- **MEMORY**
- **NDB (MySQL Cluster)**
- **Federated-X (~ Oracle DB-Link)**
- **CSV, Archive, Blackhole**
- **Spider, etc.**
Migration from Oracle to MySQL

- Application?
- Most difficult: PL/SQL
- >> 1 Tbyte?

- MySQL Migration Tool-kit helps you
- ETL tools help you
Differences between Oracle and MySQL

- Characteristics is SE dependent → configuration
- Transactions/Locking is SE dependent
  → InnoDB / XtraDB / PBXT are the closest SE
- Some buffers / caches are SE dependent, others are not
  → Configure differently depending on you needs
- Connections in Oracle are expensive, in MySQL they are quite cheap
- Oracle is a multi-process architecture, MySQL is a multi-thread architecture
- Oracle has a fixed size shared memory SGA, MySQL has dynamic memory for the process → can grow!
Other differences between Oracle and MySQL

- Oracle has tablespaces / redo log files → in MySQL 1 system TS (+ 1 tablespace per table) and the transaction log files (ib_logfile<n>).

- Oracle has rman, in MySQL you have many tools (mysqldump, mysql, mysqlbackup, xtrabackup, …)
  - Backup in MySQL can be done wrong!

- exp / imp → mysqldump / mysql
- rman → mysqlbackup / xtrabackup
- OEM/Grid Control → MySQL Enterprise Monitor (will be integrated into OEM/GC?)
- RAC → Galera / MySQL Cluster
- Oracle Streams Replication → MySQL Replication
Further differences between Oracle and MySQL

- MySQL has different Logs:
  - Error Log (= alert.log)
  - Binary Log (~ archive log)
  - Transaction Log (~ REDO log, but Binary Log != Transaction Log)
  - General Query log (Oracle ?)
- Schema in Oracle: User + Objects
- Schema in MySQL: independent of user
- Oracle: Scale-up, MySQL: Scale-out
MySQL Scale-Out vs. Scale-Up

**Scale-Up**
- Cost
- MySQL design
- Physical bottlenecks

**Scale-Out**
- „Relaxation of Constraints“

www.fromdual.com
The MySQL Scale-Out approach
Active/passive fail-over with SAN
Active/passive fail-over with SAN

- SPOF!
Active/passive fail-over with DRBD
Active/passive fail-over with DRBD

VIP

M

M

Load balancing (LB)
MySQL Cluster

- Application
  - NDB-API
- Application
  - NDB-API
- Load balancer
- SQL Node
  - SQL Node 1
  - SQL Node 2
  - SQL Node 3
  - ...
Some Architectures put in place
Laser welding device from the car industry

![Diagram showing a laser welding device with various components and connections.]

- GUI
- Middleware
- C#/GNU
- Central server
- C++
- RW
- RO
- DB
- NAND rw 16 Mbyte (4-5 Mbyte)
- CF ro 512 Mbyte
- SDRAM rw 4 Mbyte volatile
Data collection of laser devices
Measuring of media consumption

[Diagram showing the process of media consumption measurement involving meter units, GPRS/Modem, calling computers, and VIP interfaces to customer.]
Car-Sharing platform
Solar cell production
Solar cell production
Online Stock trading platform
Questions and Discussion

Slides: www.fromdual.com
or
oli.sennhauser@fromdual.com