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MySQL/DTrace and Memcached

Martin MC Brown
Technical Writer, Database Group
Sun Microsystems

Today's Topics

- DTrace and MySQL
  - How it works
  - What you can do with the DTrace Probes
  - Live Demo!
- Memcached
  - What it isnt
  - What it is
  - How to use It
  - Live Demo?

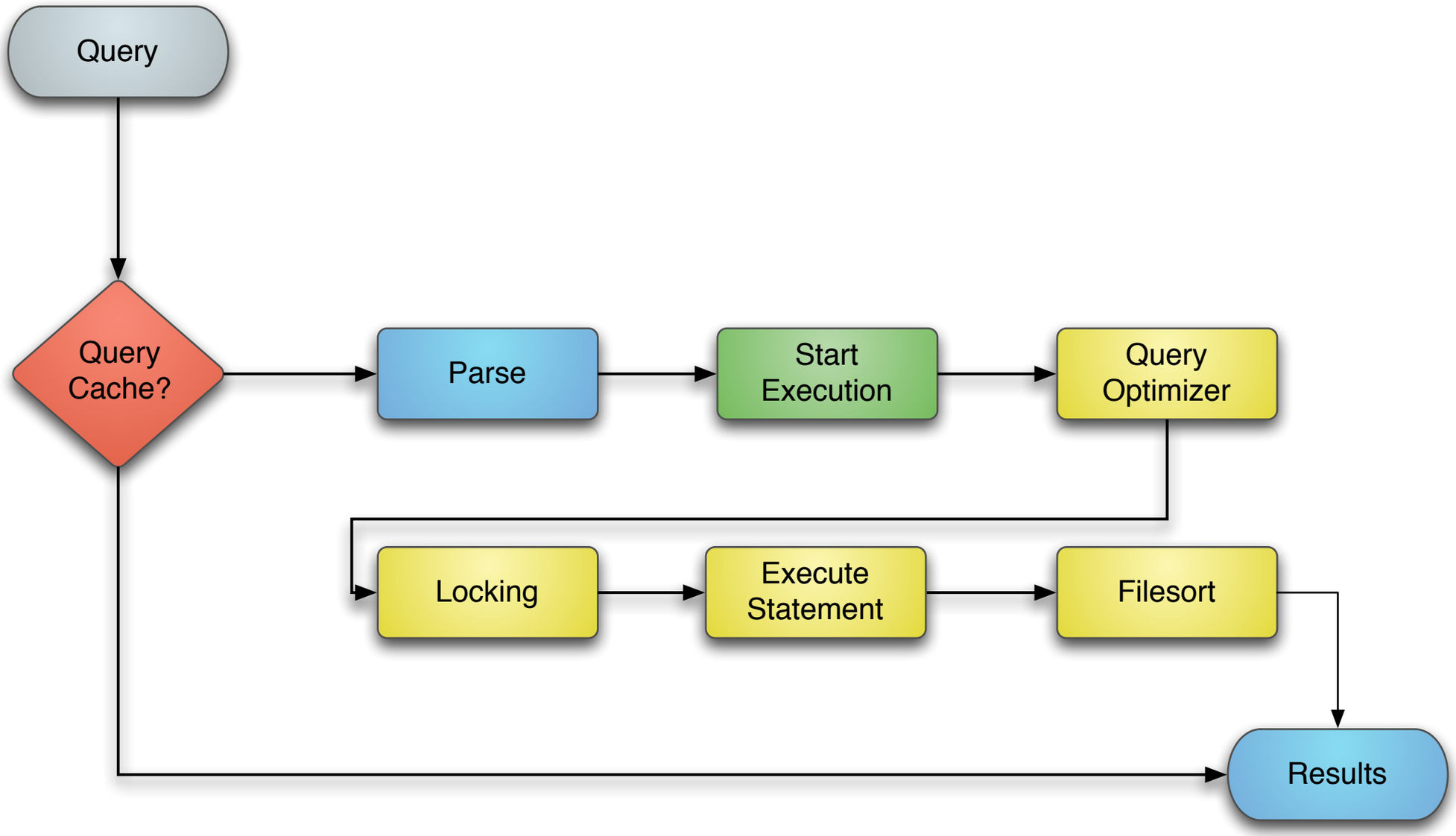
MySQL and DTrace

- MySQL
  - Database
  - SQL Based
  - Query Optimization is Key
- DTrace
  - Monitors Application Execution through Probes
  - Monitors anything, including time
  - Monitor production applications
- MySQL+DTrace
  - Best way to get execution info from MySQL

Availability

- OpenSolaris/Solaris Compatible Probes in 6.0.8
- Extended set of probes coming in 6.0.10
- Extended probes (based on 6.0.10) in OpenSolaris/ MySQL 5.1

How MySQL Executes a Query



Query Cache, Parsing and Locks

- Query Cache
  - Returns queries from memory if the SQL statement matches
  - Not perfect for all environments
  - Knowing when QC is used can be vital
- Parsing
  - Determines tables, required fields, and core information used by the optimizer
- Locks
  - Read, Write, External Locks
  - Locks can delay execution on busy servers between threads

Storage Engine

- MySQL Supports multiple Storage Engines
- MySQL/SE Interface is based on individual rows
- Engines provide hints to optimizer on execution
- Different Engines return information in different ways
- Slow downs in one engine aren't replicated

EXPLAIN

```
mysql> explain select * from t1 order by s limit 10;
+----+-------------+------+------+---------------+------+---------+------+---------+----------------+
| id | select_type | table | type | possible_keys | key  | key_len | ref  | rows    | Extra          |
+----+-------------+------+------+---------------+------+---------+------+---------+----------------+
|  1 | SIMPLE      | t1    | ALL  | NULL          | NULL | NULL    | NULL | 2097152 | Using filesort |
+----+-------------+------+------+---------------+------+---------+------+---------+----------------+
1 row in set (0.03 sec)
```

```
mysql> explain select * from t1 order by s limit 10;
+----+-------------+------+-------+---------------+------+---------+------+------+-------------+
| id | select_type | table | type  | possible_keys | key  | key_len | ref  | rows | Extra       |
+----+-------------+------+-------+---------------+------+---------+------+------+-------------+
|  1 | SIMPLE      | t1    | index | NULL          | t1b  | 86      | NULL |   10 | Using index |
+----+-------------+------+-------+---------------+------+---------+------+------+-------------+
1 row in set (0.00 sec)
```

Probe Sets

- Query
- Query Parsing
- Query Cache
- Query Execution
- Locks
- Statements
- Row-Level
- Filesort
- Network

Getting Execution Times

- query-start(query, connectionid, database, user, host)
  - query - query text
  - connectionid - MySQL process ID
  - database - DB name
  - user - user name
  - host - client host
- query-done(status)
- Combine with the built-in timestamp to get some execution times

Getting Execution Times Example

```
#!/usr/sbin/dtrace -s

#pragma D option quiet

dtrace:::BEGIN
{
   printf("%-20s %-20s %-40s %2s %-9s\n", "Who", "Database", "Query", "QC", "Time(ms)");
}
mysql*:::query-start
{
   self->query = copyinstr(arg0);
   self->connid = arg1;
   self->db    = copyinstr(arg2);
   self->who   = strjoin(copyinstr(arg3),strjoin("@",copyinstr(arg4)));
   self->querystart = timestamp;
   self->qc = 0;
}
mysql*:::query-cache-hit
{
   self->qc = 1;
}
mysql*:::query-cache-miss
{
   self->qc = 0;
}
mysql*:::query-done
{
   printf("%-20s %-20s %-40s %-2s %-9d\n",self->who,self->db,self->query,(self->qc ? "Y" : "N"),
          (timestamp - self->querystart) / 1000000);
}
```

Live Demo

- Here is where the fun begins....

Getting More Detail

- Find out how much time is spent parsing
- Time spent purely *executing* statement
- Time spent in locks
- Time spent transferring data
- Time spent doing a filesort

Live Demo

- Watch the birdie!

DTrace and Enterprise Monitor

- MySQL Enterprise Monitor
  - Monitors an entire enterprise of MySQL servers
  - Provides live query analysis
  - Works using proxy/redirection
  - Adds tiny overhead

DTrace Feeding Enterprise Monitor

- Monitor Supports REST interface
- Take the DTrace query stats
- Pass the query stats up to Enterprise Monitor
- Doesn't need the proxy
- Lower overhead
- Collates the data for multiple servers of DTrace probes

Where Next

- Go deeper into Storage Engines
- Get statistics on global server operations
- Get statistics on general locks and structures
- Get probes into other parts of the Webstack

Query Optimization Only Gets <> Far

- Query optimization speeds up queries
- You don’t always need to execute a query
- Query Cache isn’t quite what we mean
- Bigger cache
- More general purpose cache
- Flexible
- Cluster-like features

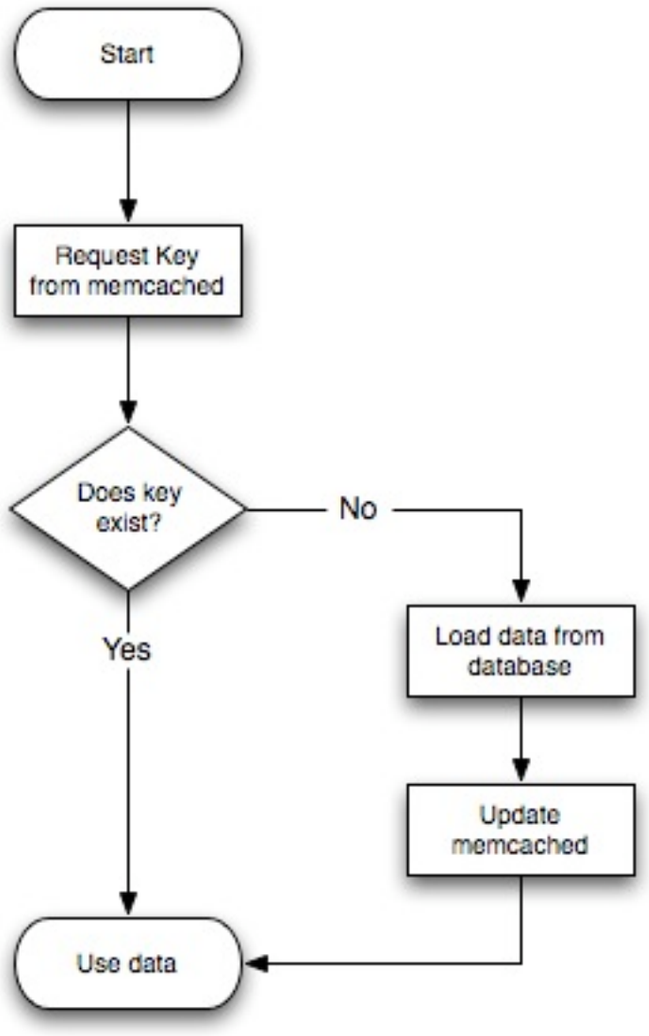
What memcached is

- Big memory cache into which you can store what you want
- Accessible from multiple applications, languages, environments
- Client-driven fault tolerance
- Client-driven data distribution (*not* replication)
- Exceedingly easy to use
- Unix/Linux
- In OpenSolaris soon

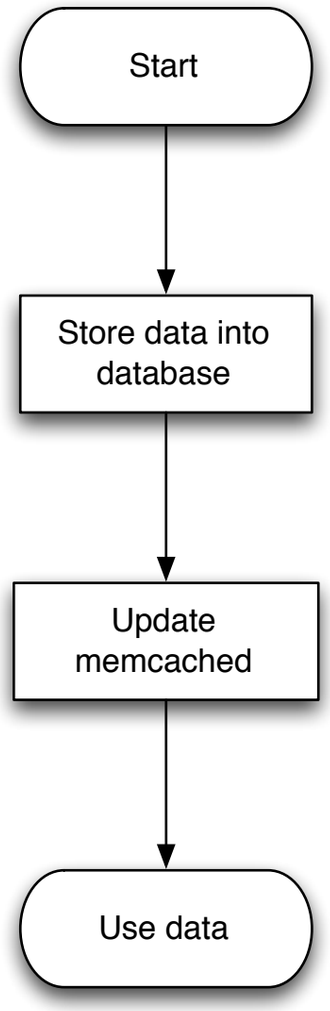
What memcached isn't

- Not a database
  - It's a cache
- Not persistent
  - It's a cache
- Not clustered
  - It's a cache
- No replication
  - It's a cache

Execution during Load



Execution during Save



What do I mean by Client Driven

- Imagine you have multiple servers
- You store data by a unique ID (user-1234)
- Client chooses which server to store the data on using hash on key ID
- Client writes data
- Another client, looking for user-1234, has the same list of servers, runs the same hash algorithm and chooses the same server, and loads the data
- Hashing algorithms

Cache Management

- Keys exist in cache until:
  - Explicitly removed (delete)
  - Removed through lack of use (Least Recently Used (LRU))
  - Entry expires
- Specific Expiry
  - Allows finer control over expiry
  - Useful for sessions
  - Specify an absolute time (epoch)
  - Specify a relative time; object will expire within # seconds of store

Some things to ponder

- It's a cache
- Cache what you need; not everything
- Don't worry about 'filling it up'
- Don't worry about 'seeding it'
- Don't worry about replication

Some more things to ponder

- Don’t panic about server failures
  - But do consider the consequences
- Don’t panic about cache misses
  - You can load it from the DB (it’s a cache!)
  - But do investigate the reasons if they are excessive
- Don’t cache things you don’t need
  - Images
  - Files that can be accessed directly through Apache

Questions

Martin ‘MC’ Brown
Technical Writer, Database Group
Sun Microsystems
mc.brown@sun.com

sun.com/mysql