ORACLE

NoSQL & SQL

Blending the best of both worlds

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MySQL Cluster

Safe Harbour Statement

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What NoSQL must deliver

Scalability	
Performance	
HA	
Ease of use	

- Massive scalability
  - No application-level sharding
- Performance
- High Availability/Fault Tolerance
- Ease of use
  - Simple operations/administration
  - Simple APIs
  - Quickly evolve application & schema

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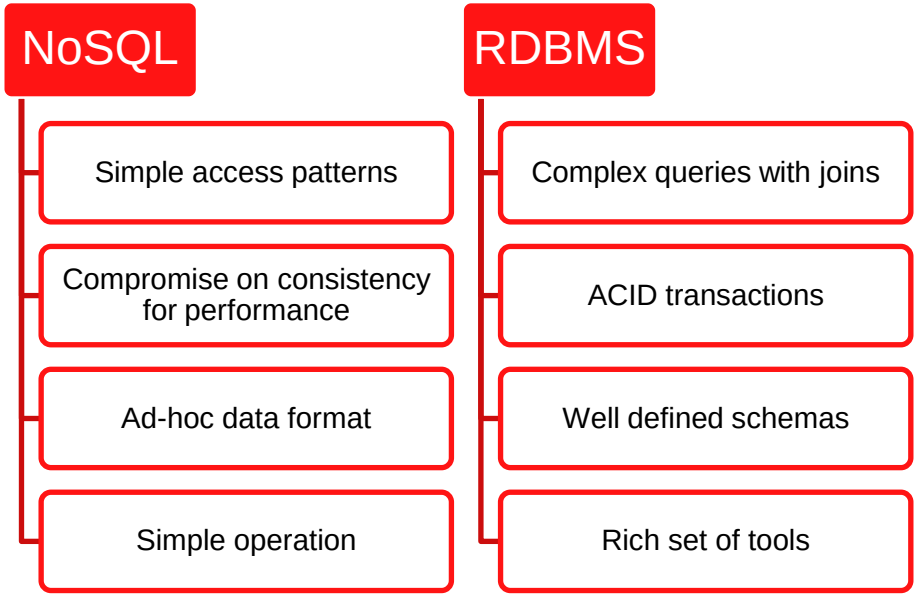
Still a role for the RDBMS?

- No best single solution fits all
- Mix and match

Scalability	
Performance	
HA	
Ease of use	
SQL/Joins	
ACID Transactions	



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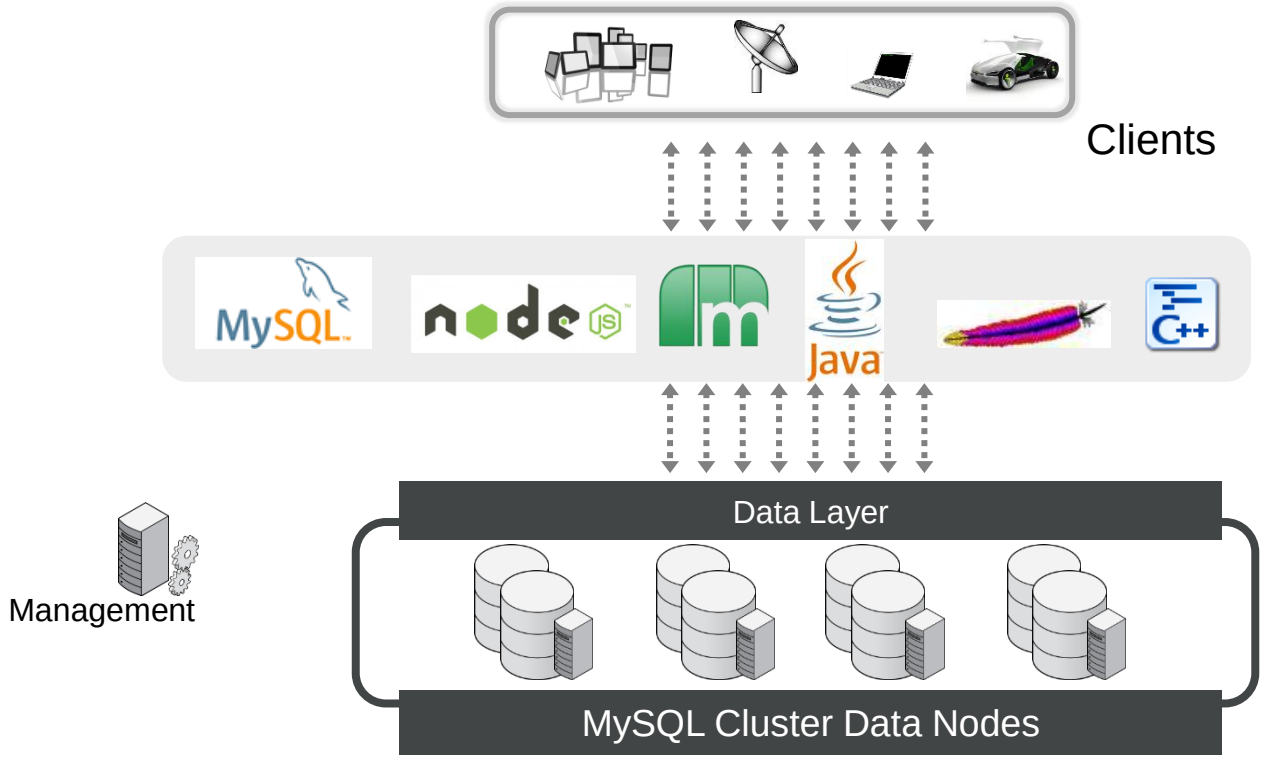
MySQL Cluster Architecture

Scalability	
Performance	
HA	
Ease of use	
SQL/Joins	✔
ACID Transactions	✔



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MySQL Cluster Architecture

Scalability	✔
Performance	
HA	
Ease of use	
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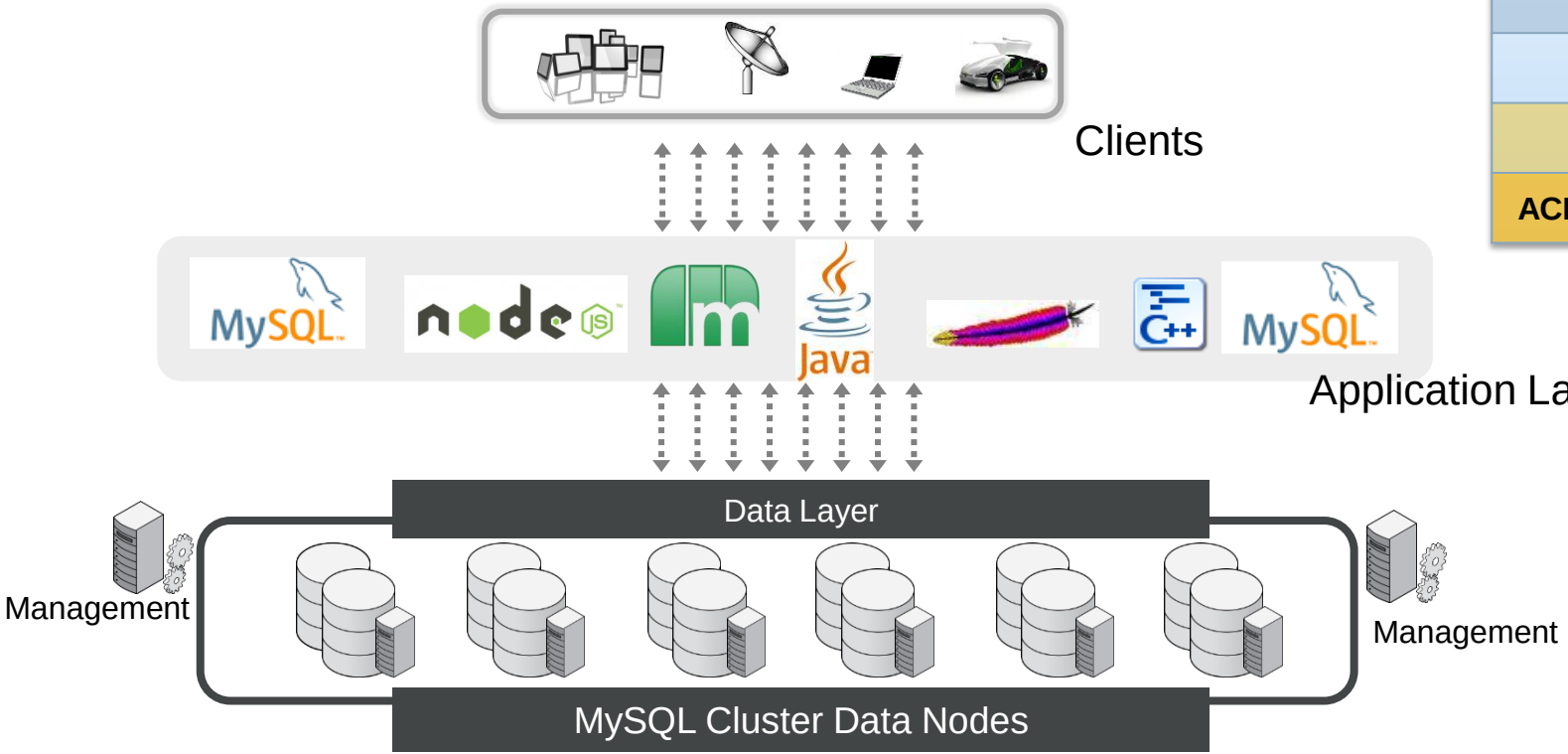
ACID Transactions	✔



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MySQL Cluster Architecture

Scalability	✔
Performance	
HA	✔
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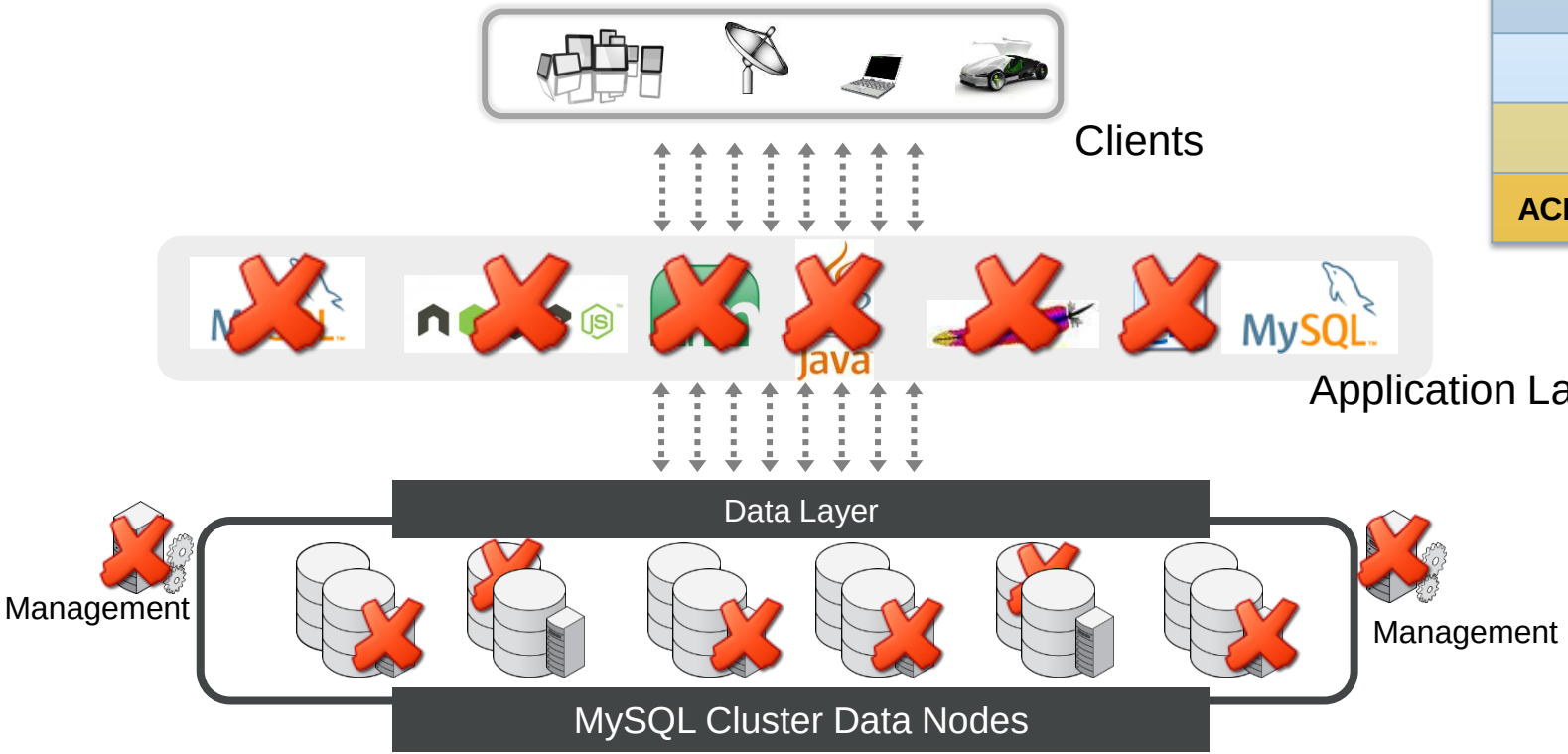

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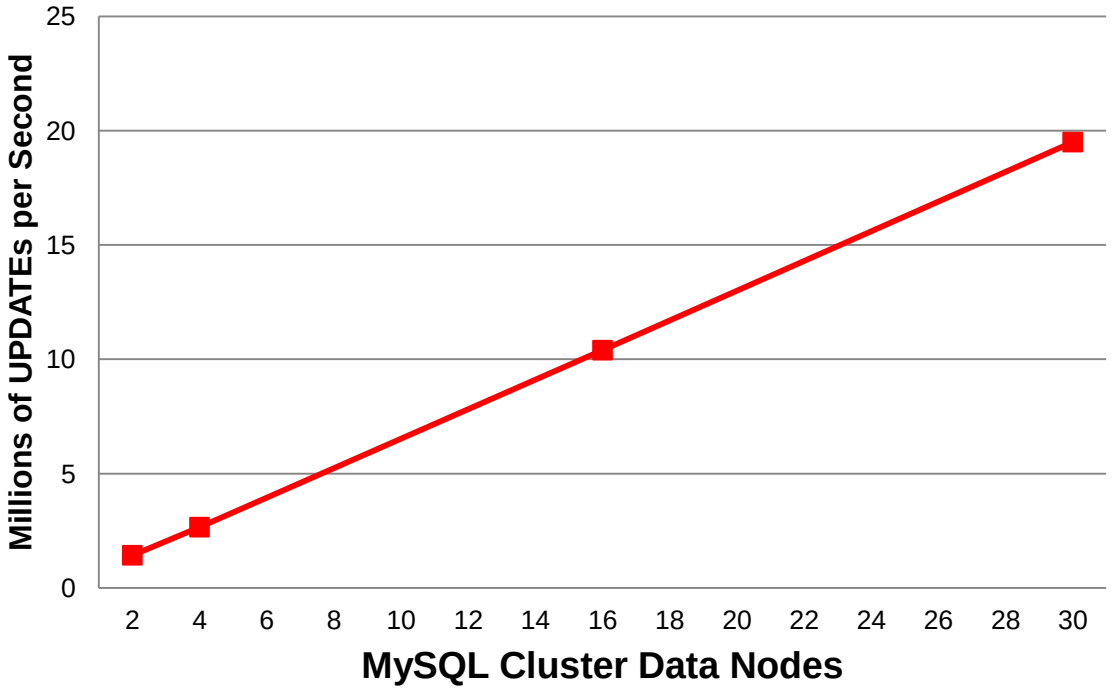
1.2 Billion UPDATEs per Minute

- 30 x Intel E5-2600 Intel Servers
- NoSQL C++ API, flexaSynch benchmark
- ACID Transactions, with Synchronous Replication



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Scalability	✔
Performance	✔
HA	✔
Ease of use	
SQL/Joins	✔
ACID Transactions	✔

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Ease of use

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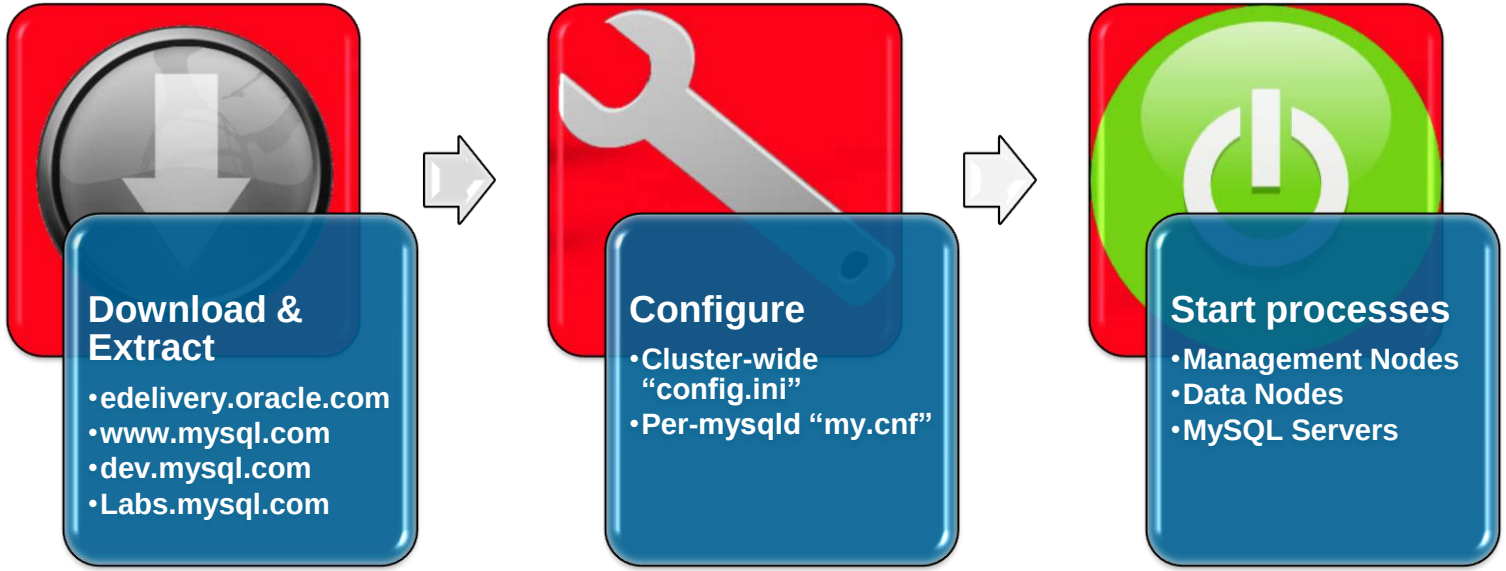
Creating & running your first Cluster

The traditional way (pre-MCM) – Up and running in 15 mins



- Up & running in 10-15 minutes using Quick Start guides from http://dev.mysql.com/downloads/cluster/
  - Versions for Linux, Windows & Solaris

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Scalability	✔
Performance	✔
HA	✔
Ease of use	✔
SQL/Joins	✔
ACID Transactions	✔

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MySQL Cluster Manager

Bootstrap single host Cluster

1. Download MCM/Cluster package from edelivery.oracle.com:
2. Unzip
3. Run agent, define, create & start Cluster!

```
$> bin\mcmd --bootstrap
```

```
MySQL Cluster Manager 1.1.2 started
Connect to MySQL Cluster Manager by running "D:\Andrew\Documents\MySQL\mcm\bin\mcm" -a NOVA:1862
Configuring default cluster 'mycluster'...
Starting default cluster 'mycluster'...
Cluster 'mycluster' started successfully
 ndb_mgmd NOVA:1186
 ndbd NOVA
 ndbd NOVA
 mysqld NOVA:3306
 mysqld NOVA:3307
 ndbapi *
Connect to the database by running "D:\Andrew\Documents\MySQL\mcm\cluster\bin\mysql" -h NOVA -P 3306 -u root
```


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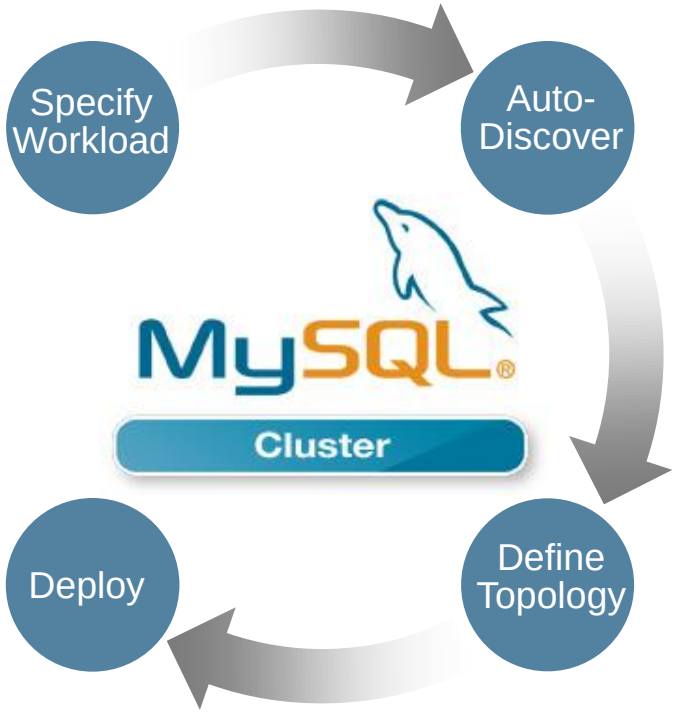
MySQL Cluster 7.3 EA: Auto-Installer

- Fast configuration
- Auto-discovery
- Workload optimized
- Repeatable best practices
- For MySQL Cluster 7.2 + 7.3



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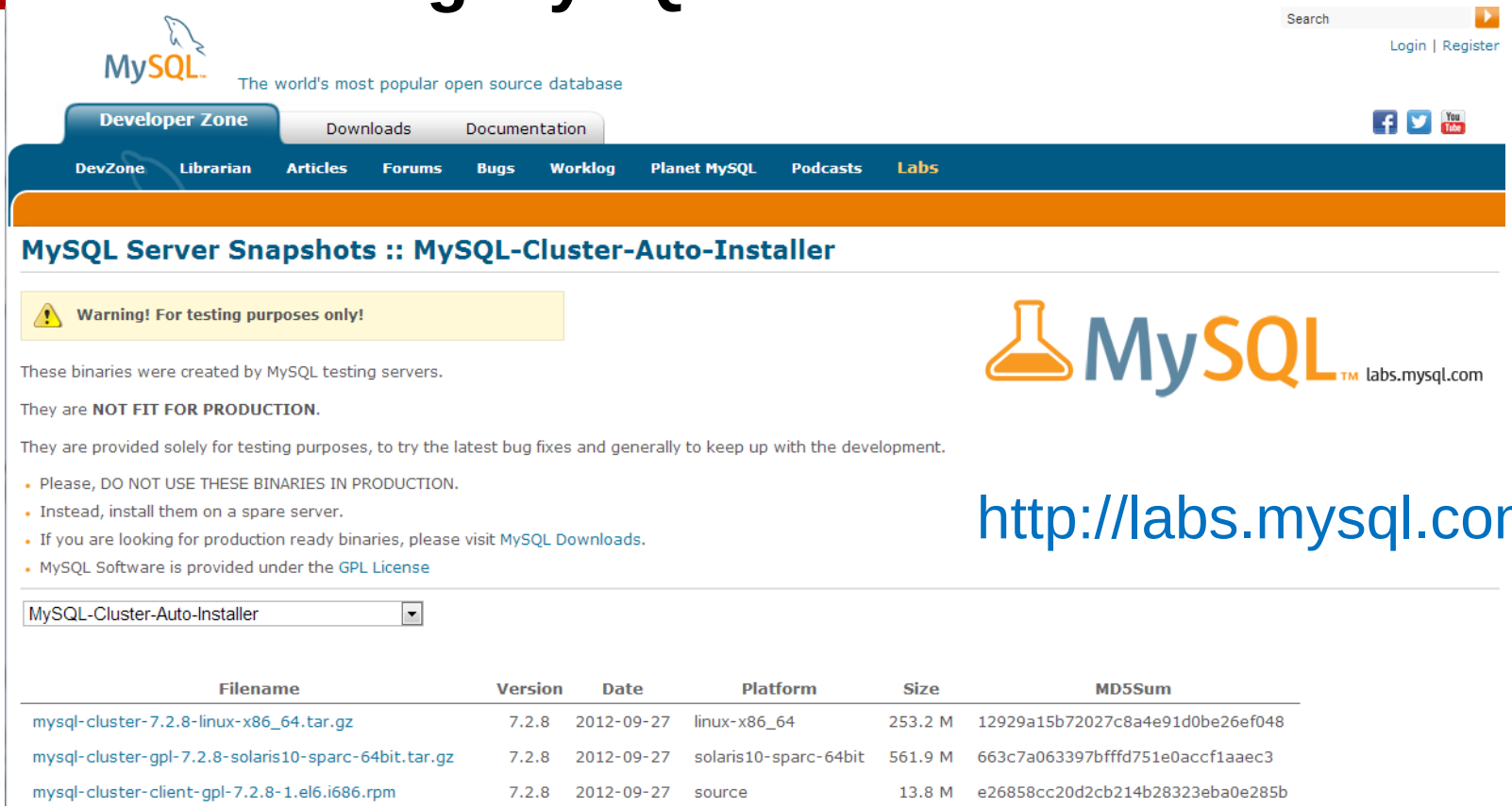
Downloading MySQL Cluster EA



Filename	Version	Date	Platform	Size	MD5Sum
mysql-cluster-7.2.8-linux-x86_64.tar.gz	7.2.8	2012-09-27	linux-x86_64	253.2 M	12929a15b72027c8a4e91d0be26ef048
mysql-cluster-gpl-7.2.8-solaris10-sparc-64bit.tar.gz	7.2.8	2012-09-27	solaris10-sparc-64bit	561.9 M	663c7a063397bfffd751e0accf1aaec3
mysql-cluster-client-gpl-7.2.8-1.el6.i686.rpm	7.2.8	2012-09-27	source	13.8 M	e26858cc20d2cb214b28323eba0e285b

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Scalability	✔
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Ease of use	✔
SQL/Joins	✔
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NoSQL APIs

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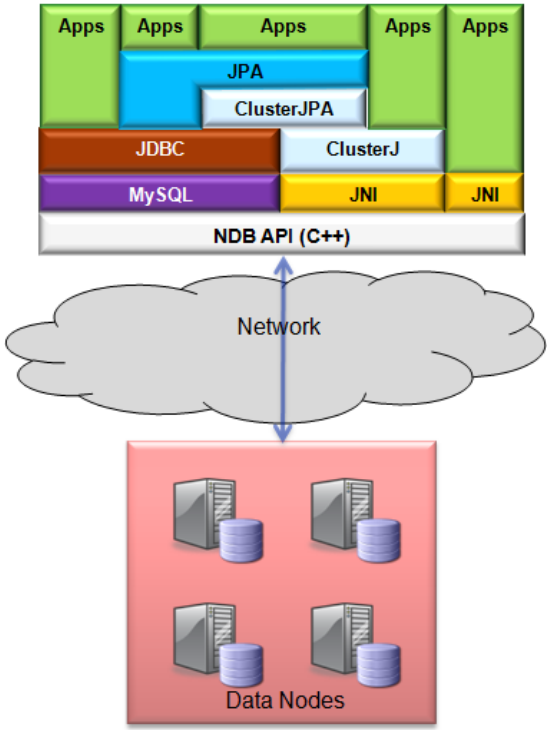
MySQL Cluster 7.1: ClusterJ/JPA



- Domain Object Model Persistence API (ClusterJ):
  - Java API
  - High performance, low latency
  - Feature rich
- JPA interface built upon this new Java layer:
  - Java Persistence API compliant
    - Implemented as an OpenJPA plugin
  - Uses ClusterJ where possible, reverts to JDBC for some operations
  - Higher performance than JDBC
  - More natural for most Java designers
  - Easier Cluster adoption for web applications

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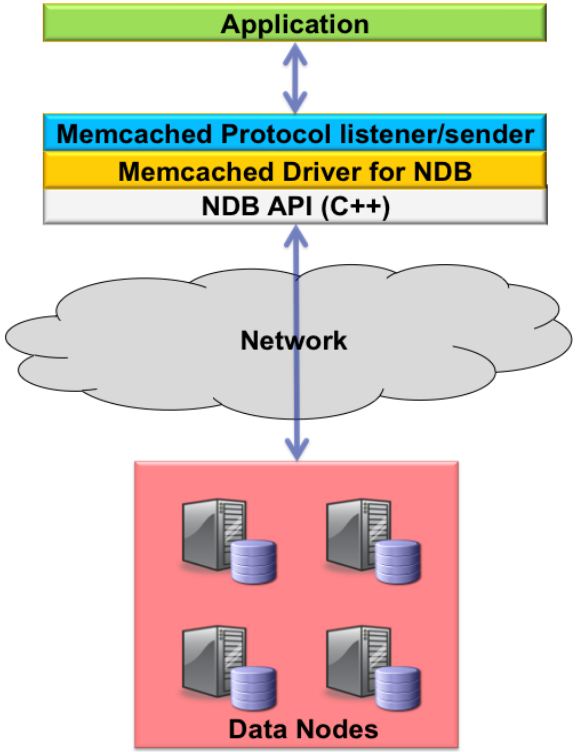
MySQL Cluster 7.2: Memcached



- Memcached is a distributed memory based hash-key/value store with no persistence to disk
- NoSQL, simple API, popular with developers
- MySQL Cluster already provides scalable, in-memory performance with NoSQL (hashed) access as well as persistence
  - Provide the Memcached API but map to NDB API calls
- Writes-in-place, so no need to invalidate cache
- Simplifies architecture as caching & database integrated into 1 tier
- Access data from existing relational tables

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Cluster & Memcached – Schema-Free

Application view

key value

<town:maidenhead,SL6>

SQL view

key value

<town:maidenhead,SL6>

Key	Value
town:maidenhead	SL6

generic table

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Cluster & Memcached – Configured Schema

Application view

key value

<town:maidenhead,SL6>

SQL view

prefix key value

<town:maidenhead,SL6>

Prefix	Table	Key-col	Val-col	policy
town:	map.zip	town	code	cluster

Config tables

town	...	code	...
maidenhead	...	SL6	...

map.zip

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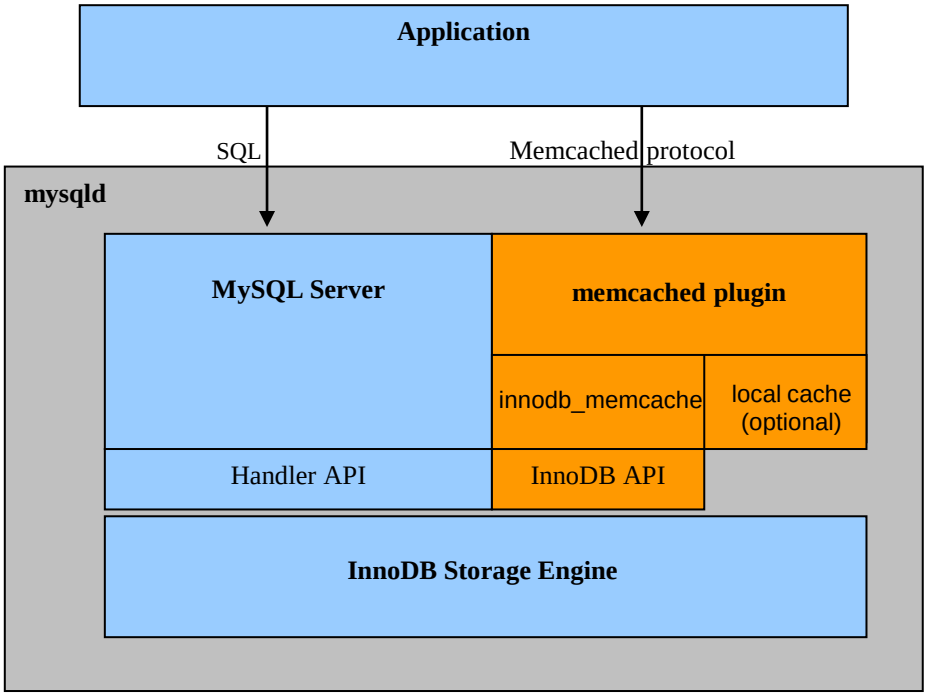
Memcached NoSQL Access with InnoDB

- Memcached as a plugin of MySQL Server; same process space, with very low latency access to data
- Memcapable: supports both memcached ascii protocol and binary protocol
- Support multiple columns: users can map multiple columns into “value”
- Optional local caching: “innodb-only”, “cache-only”, and “caching”
- Batch operations for performance



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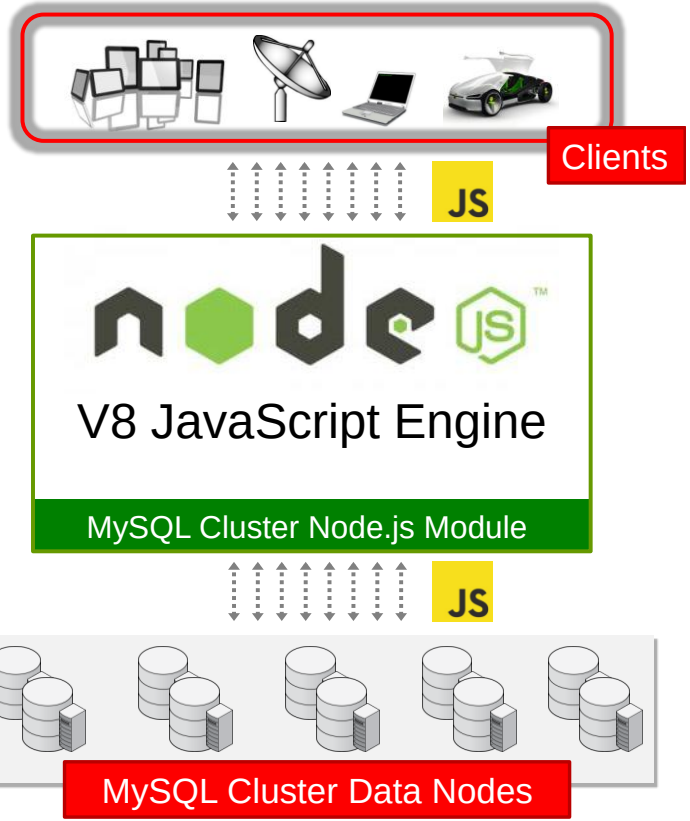
MySQL Cluster 7.3 EA: Node.js NoSQL API



- Native JavaScript access to MySQL Cluster
  - End-to-End JavaScript: browser to the app and database
  - Storing and retrieving JavaScript objects directly in MySQL Cluster
  - Eliminate SQL transformation
- Implemented as a module for node.js
  - Integrates full Cluster API library within the web app
- Couple high performance, distributed apps, with high performance distributed database

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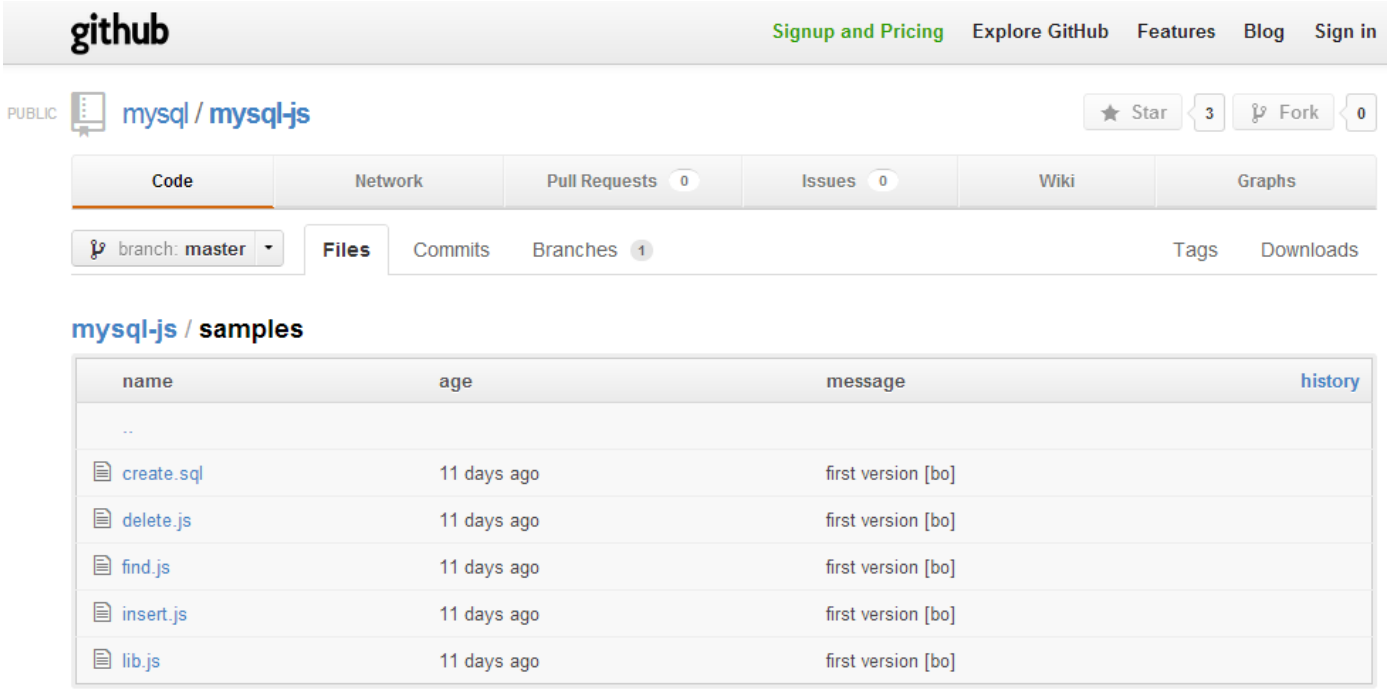
Try Node.js example for yourself

https://github.com/mysql/mysql-js/tree/master/samples



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Next Steps

Learn More

- www.mysql.com/cluster
- Authentic MySQL Curriculum: http://oracle.com/education/mysql

Try it Out

- dev.mysql.com/cluster
- labs.mysql.com
- github.com/mysql/mysql-js

Let us know what you think

- clusterdb.com
- @clusterdb
- forums.mysql.com/list.php?25

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