Computer Science E-75

Building Dynamic Websites

Harvard Extension School

http://cs75.net/

Lecture 9: Scalability

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MySQL Conference & Expo 2008

April 14–17, 2008
Santa Clara, California

http://en.oreilly.com/mysql2008/public/content/home

Recommended Reading

- Building Scalable Websites
  by Henderson
- High Performance MySQL
  by Zawodny and Balling
- MySQL Clustering
  by Davis and Fisk
- Scalable Internet Architectures
  by Schlossnagle
- . . .

Vertical v. Horizontal Scaling

Image from *Seinfeld*.

Vertical Scaling

- CPU
  - cores, L2 Cache, ...
- Disk
  - PATA, SATA, SAS, ...
  - RAID
- RAM
- . . .

Horizontal Scaling

Image from wikimedia.org.

PHP Acceleration

- Code Optimization
- Opcode Caching
- . . .

PHP Accelerators

- Alternative PHP Cache (APC)
  http://pecl.php.net/package/APC
- eAccelerator
  http://eaccelerator.net/
- XCache
  http://xcache.lighttpd.net/
- Zend Platform
  http://www.zend.com/en/products/platform/
- . . .

Load Balancing at Layer 4

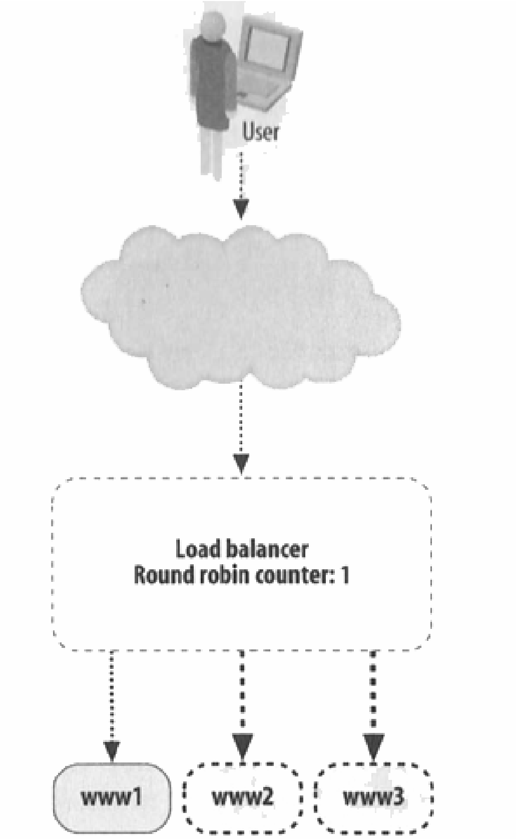


Image from *Building Scalable Websites*.

Load Balancing with BIND

```
www   IN   A   64.131.79.131
www   IN   A   64.131.79.132
www   IN   A   64.131.79.133
www   IN   A   64.131.79.134
```

Load Balancing at Layer 7

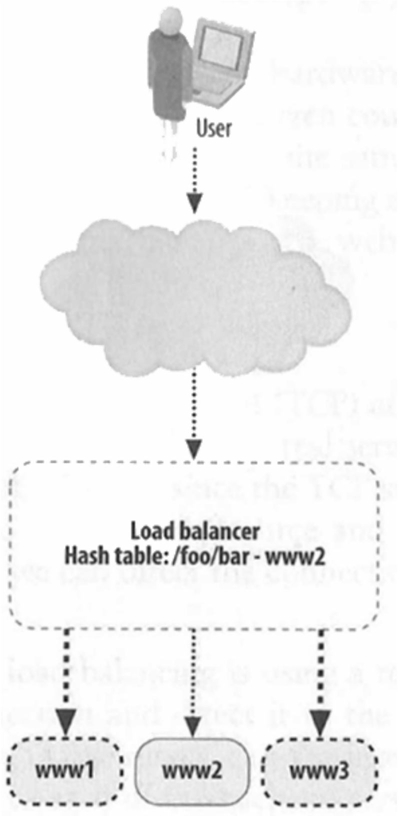


Image from *Building Scalable Websites*.

Sticky Sessions

- Layer-7 Load Balancing?
- Shared Storage?

  FC, iSCSI, NFS, *etc*.
- Cookies?

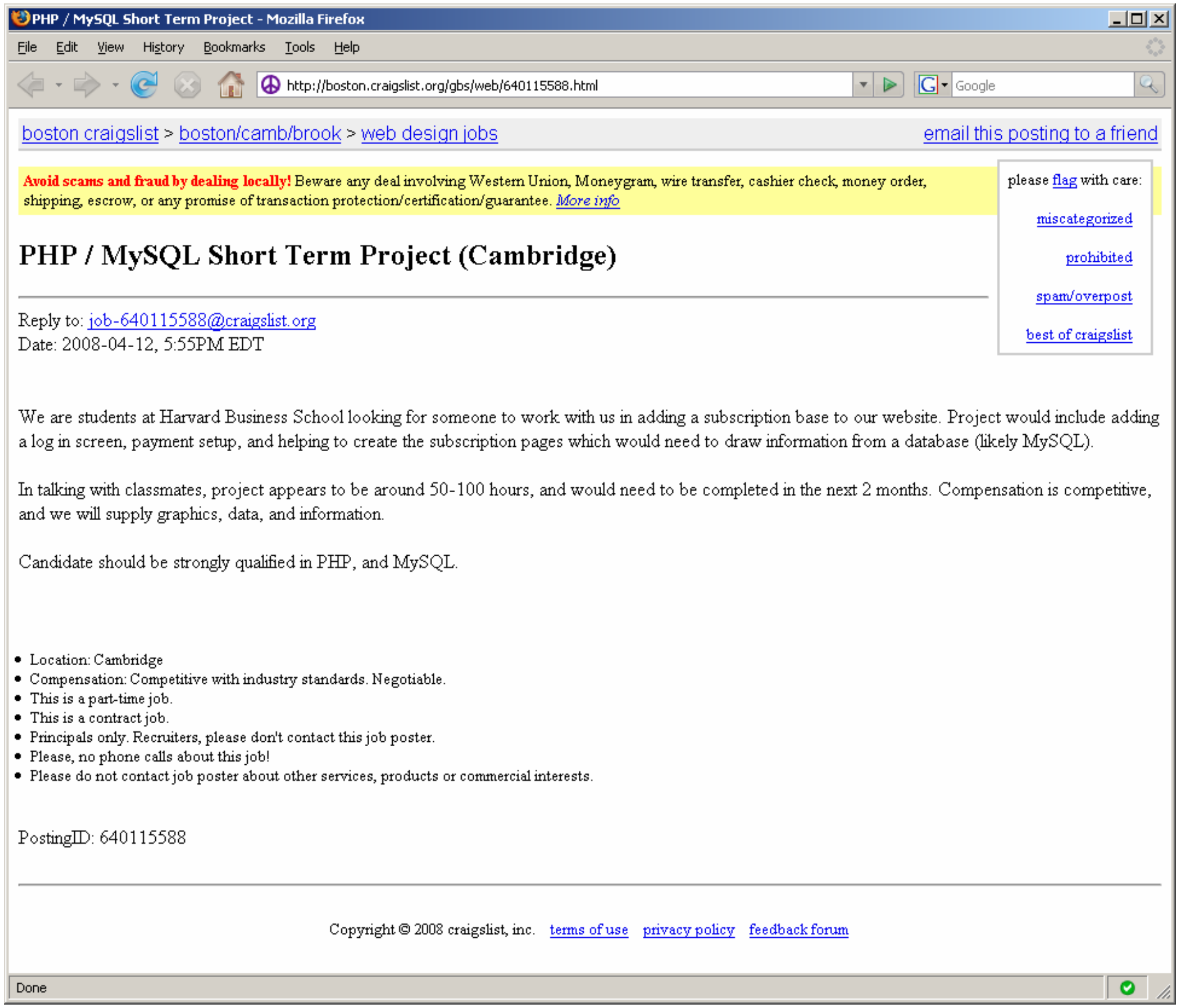
Load Balancers

- Software
  - LVS
  - Perlbal
  - Pound
  - Ultra Monkey
  - ...
- Hardware
  - Barracuda
  - Cisco
  - Citrix
  - F5
  - ...

Caching

- .html
- MySQL Query Cache
- memcached
- . . .

.html



PHP / MySQL Short Term Project - Mozilla Firefox
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http://boston.craigslist.org/gbs/web/640115588.html
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PHP / MySQL Short Term Project (Cambridge)

Reply to: job-640115588@craigslist.org
Date: 2008-04-12, 5:55PM EDT

We are students at Harvard Business School looking for someone to work with us in adding a subscription base to our website. Project would include adding a log in screen, payment setup, and helping to create the subscription pages which would need to draw information from a database (likely MySQL).

In talking with classmates, project appears to be around 50-100 hours, and would need to be completed in the next 2 months. Compensation is competitive, and we will supply graphics, data, and information.

Candidate should be strongly qualified in PHP, and MySQL.

- Location: Cambridge
- Compensation: Competitive with industry standards. Negotiable.
- This is a part-time job.
- This is a contract job.
- Principals only. Recruiters, please don't contact this job poster.
- Please, no phone calls about this job!
- Please do not contact job poster about other services, products or commercial interests.

PostingID: 640115588

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MySQL Query Cache

```
query_cache_type = 1
```

http://dev.mysql.com/doc/refman/5.0/en/query-cache.html

memcached

```
$memcache = memcache_connect(HOST, PORT);
$user = memcache_get($memcache, $id);
if (is_null($user))
{
    mysql_connect(HOST, USER, PASS);
    mysql_select_db(DB);
    $result = mysql_query("SELECT * FROM users WHERE id=$id");
    $user = mysql_fetch_object($result, User);
    memcache_set($memcache, $user->id, $user);
}
```

http://www.danga.com/memcached/

http://us2.php.net/memcache

MySQL

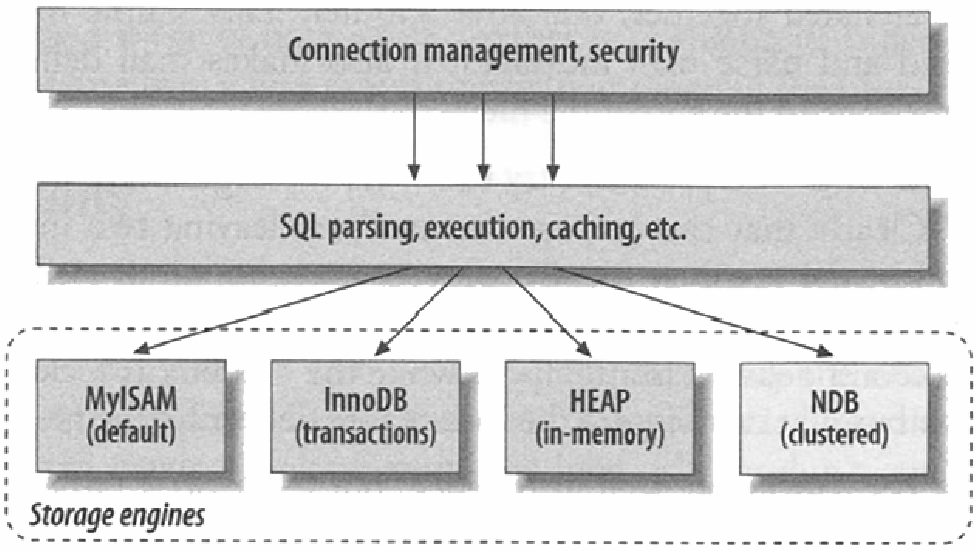
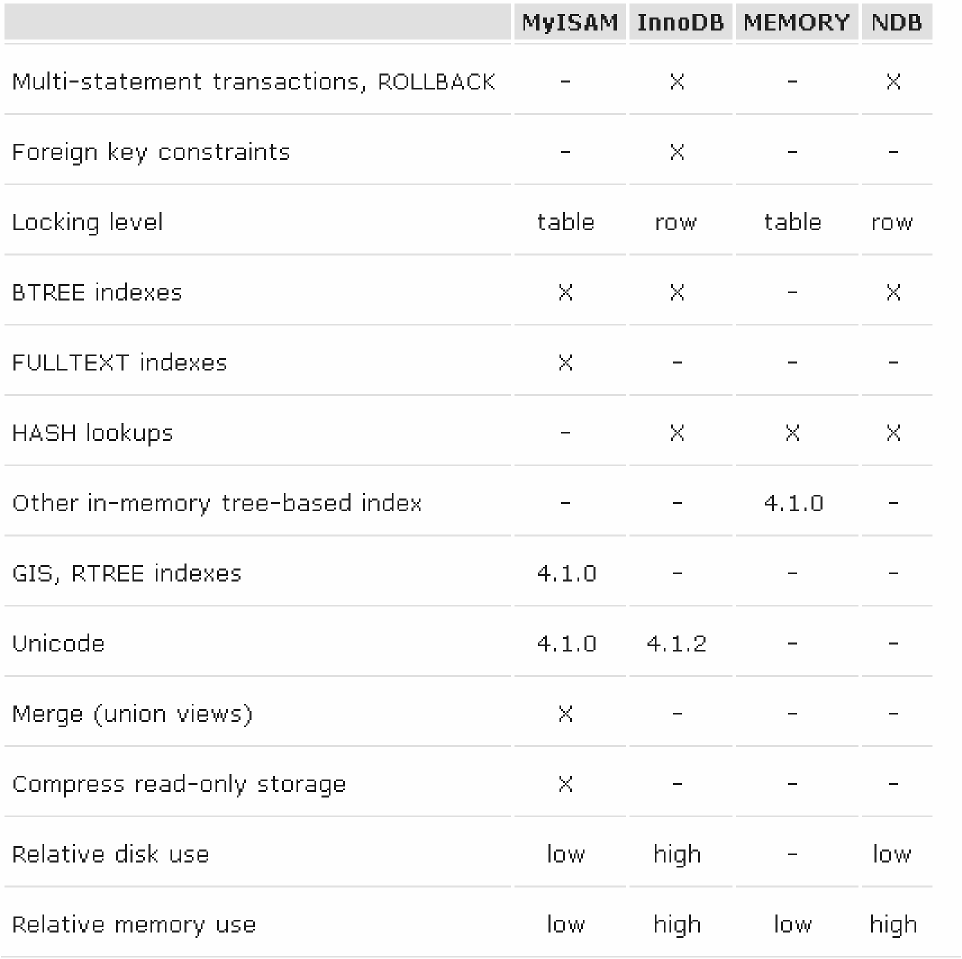


Image from *High Performance MySQL*.

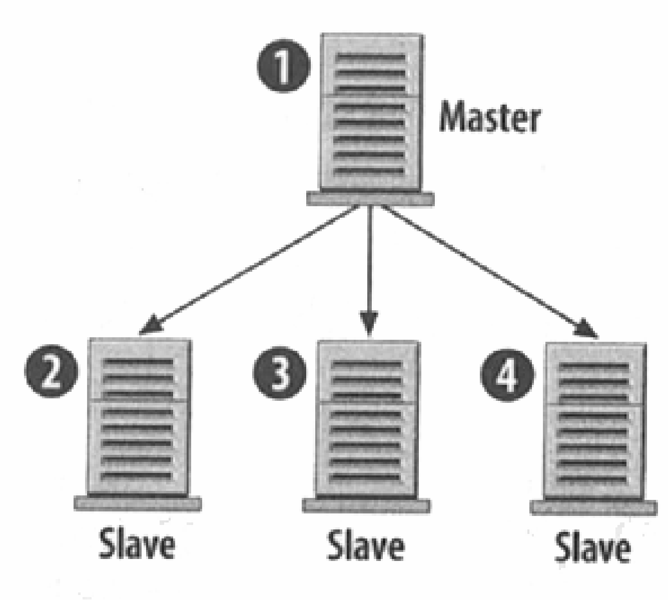
MySQL



	MyISAM	InnoDB	MEMORY	NDB
Multi-statement transactions, ROLLBACK	-	X	-	X
Foreign key constraints	-	X	-	-
Locking level	table	row	table	row
BTREE indexes	X	X	-	X
FULLTEXT indexes	X	-	-	-
HASH lookups	-	X	X	X
Other in-memory tree-based index	-	-	4.1.0	-
GIS, RTREE indexes	4.1.0	-	-	-
Unicode	4.1.0	4.1.2	-	-
Merge (union views)	X	-	-	-
Compress read-only storage	X	-	-	-
Relative disk use	low	high	-	low
Relative memory use	low	high	low	high

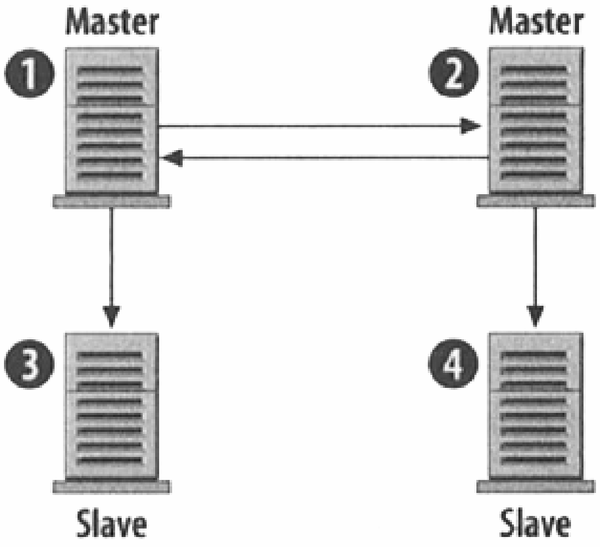
Excerpted from http://dev.mysql.com/tech-resources/articles/storage-engine/part_3.html.

Replication: Master-Slave



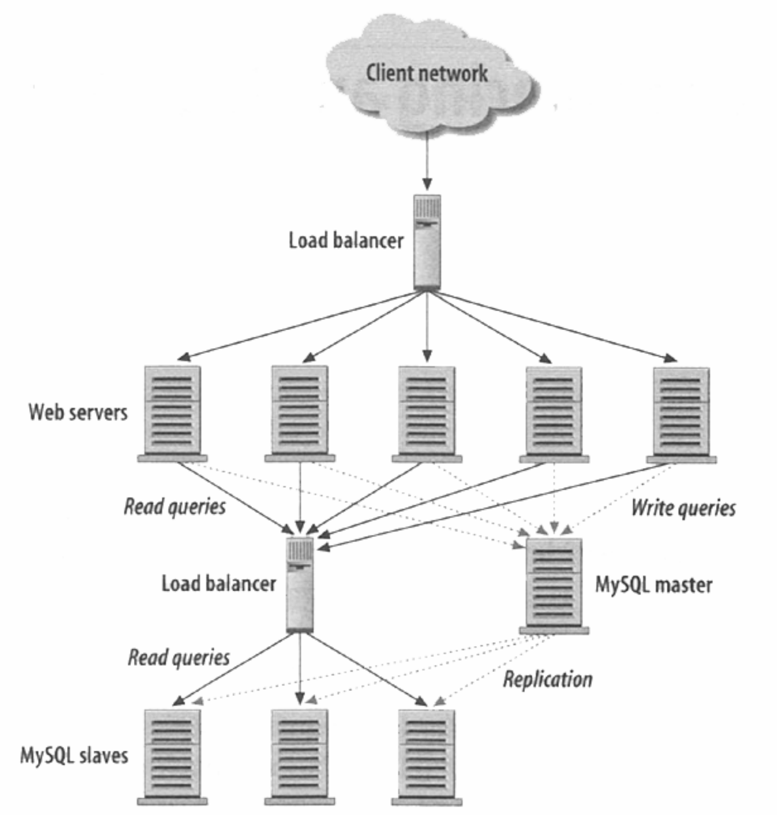
Excerpted from *High Performance MySQL*.

Replication: Master-Master



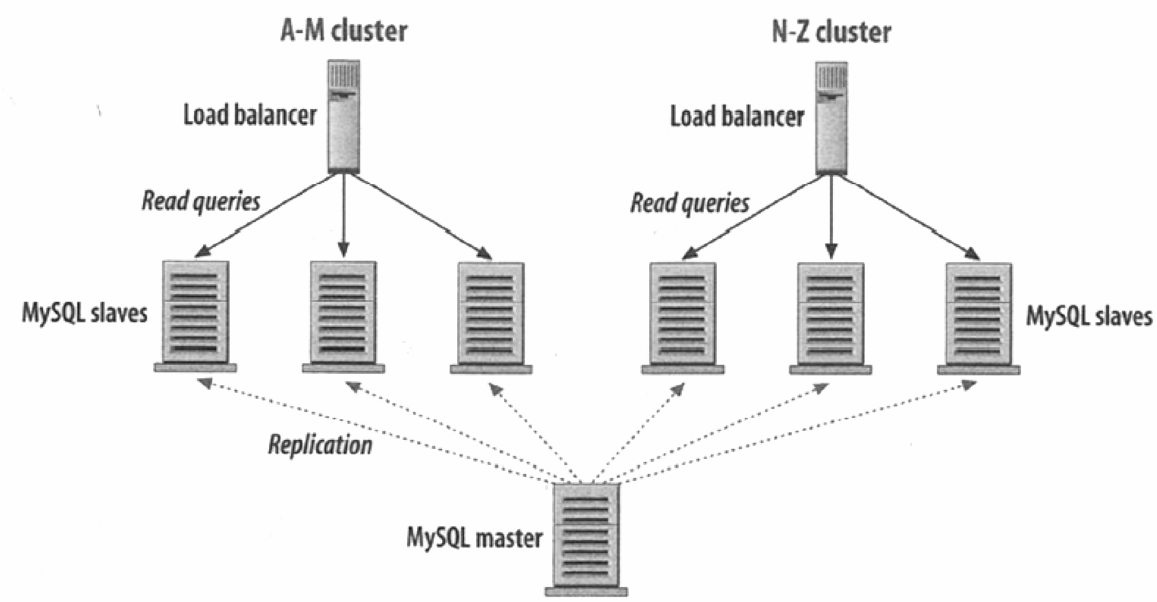
Excerpted from *High Performance MySQL*.

Load Balancing + Replication



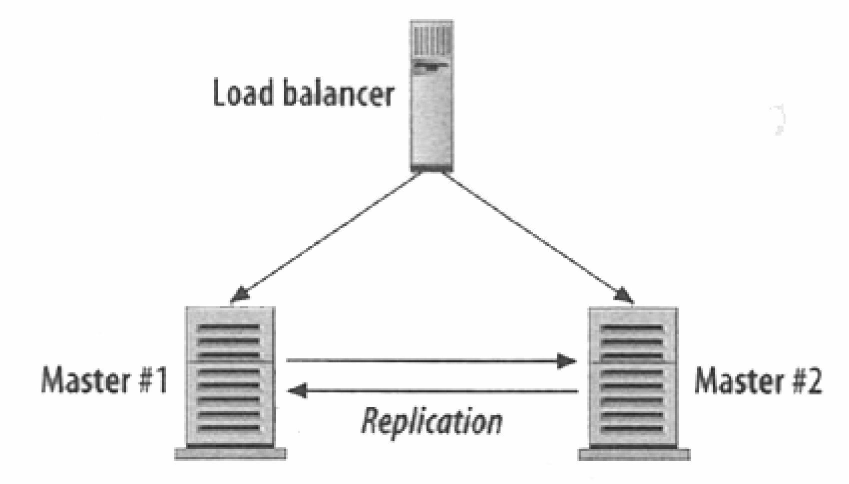
Excerpted from *High Performance MySQL*.

… + Partitioning



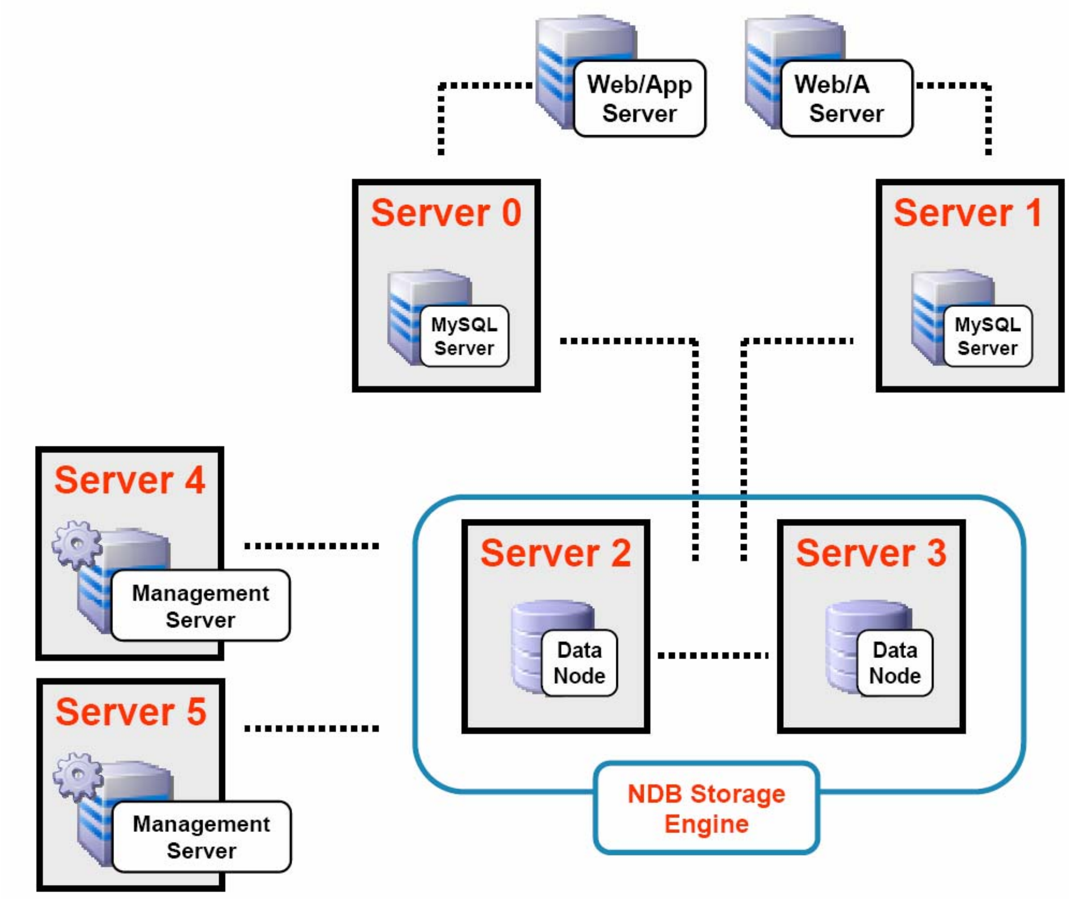
Excerpted from *High Performance MySQL*.

High Availability



Excerpted from *High Performance MySQL*.

MySQL Cluster



Excerpted from http://www.mysql.com/news-and-events/on-demand-webinars/cluster-20061116.pdf.

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