From One to a Cluster

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2008 MySQL Conference & Expo
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The Early Years

• 1997 - 1999 Shared Account
  • Hand edited HTML
  • Perl, PHP, msql

• 1999 - 2000 Dedicated Servers
  • Developed custom CMS
  • Dynamic content with PHP and MySQL
The first cluster

- 3-5 Web servers
- 1 NFS server
- 1 MySQL server
- 1 mail server
Bottlenecks

- Software load balancing
- Wave effect
- Closed, required specific OS version
- NFS did not scale
- Disk Cache
- Code on NFS
Solutions

• Hardware load balancing
• Arrowpoint/Cisco (from eBay)
• F5 BIG-IP (not cheap)

• Drop NFS
• Memcached - distributed memory cache
• Use rsync to push changes to production
Status in 2006

• 5 web nodes w/ hardware lb
• Using rsync to put code on servers
• 1 MySQL server
• memcached to cache data from database
• All pages built “on the fly” from cache (hopefully)
Yahoo! Effect

Graph showing page views with events labeled:
- Digg
- Radio Tour
- "Cyber Monday"
- Yahoo Front Page


Graph generated by SiteCatalyst using Report Accelerator at 05:51 PM CDT, 1 Oct 2007
First Yahoo!

Page Views

Thu. 21 Dec. 2006

Graph Generated by SiteCatalyst using Report Accelerator at 09:23 PM CDT, 1 Oct 2007
Yahoo! Effect

Graph Generated by SiteCatalyst using Report Accelerator at 05:51 PM CDT, 1 Oct 2007
Second Yahoo!

[Bar chart showing hourly unique visitors with dates and a note: Graph Generated by SiteCatalyst using Report Accelerator at 06:31 PM CDT, 1 Nov 2007]
New Bottlenecks

- Cache stampede
- 1000 requests for the same thing
- Bandwidth
  - Image bandwidth alone hit 60Mb/s
- Hundreds of lines of code =( 
Solutions

• Offload CSS, Javascript and images bandwidth to CDN
• Cache content in memory at the forward facing servers
• Use a “Pushed Cache”
• Refactor all the code
Using a CDN

Pros

• Offloads bandwidth
• Many locations, hopefully near your users
• Bandwidth is cheaper than you can buy it

Cons

• Out of your control
• More complicated to invalidate objects
Caching Proxy

- Custom PHP script
- Researched Squid and wrote Perl and Python versions too.
- Uses memcached for cache storage
- One copy of an item in cache, not several
- Apache 2 worker MPM (Yes, it does work!)
- Tried lighttpd with FastCGI as well
Pushed Cache

• User requests can never cause database load
• No cache stampede
• Data can be prepared when we are ready
• De-normalized to be ready for the site
• Data can come straight from MySQL
• Scales out with MySQL Replication
Straight from the DB?

- Use EXPLAIN a lot
- Avoid filesort and temporary
- Avoid complex joins (or any)
- Use InnoDB (row locking / transactions)
- Write a library/object for code to use
Current Architecture Overview

- Proxy
- App
- Replicated DB
- Internet
- Main DB
- Process
Load balancing

We cheat a lot with F5 BIG-IP

• Balances incoming traffic
• Balances internal services
• Not cheap, but worth it for us

Linux Virtual Server

• Open source
• Up/Down monitoring is not built in
From One to a Cluster

Not MySQL Cluster, sorry =(  

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