

WordCamp Austin 2014

Cluster Fudge

Recipes for Running WordPress
in the Cloud

Grant K Norwood

@grantnorwood

#clusterfudge

Slides and code at: bit.ly/cluster-fudge



Are we talking about food or functions()?

- ❖ Both!
- ❖ This talk is about the tools we need to scale WordPress horizontally.
- ❖ Why do we need to deploy our sites to clustered environments?
 - ❖ Performance
 - ❖ Redundancy & fault tolerance
 - ❖ Modern WordPress sites are full-blown web applications!
- ❖ 3 different recipes, using the same available ingredients, from food trailer to fancy, to suit everybody's tastes & budgets.



6 minutes

It takes about as long to respond to your website going down as it does to boil water.



Michael Dell

Shared publicly · Jan 14, 2013

344k



Susan & I invite you read our thoughts on how philanthropy can accelerate positive change in the year ahead



Founders' Letter 2013

ow.ly

+45

7



Hide comments ▾



ted kelly Jan 14, 2013

link's not working for me - error establishing db connection or just hangs waiting for msdf.org

it's good now!



David Brin Jan 14, 2013

I look forward to reading it. (We met at the FiRe Conference of Mark Anderson.) My latest novel EXISTENCE discusses how in 30 years a larger fraction of the well-off may think as
Read more (10 lines)



Ryan Hayes

Jan 14, 2013

The link is working on my side. Thank you +Michael Dell and Susan Dell for supporting and promoting these important causes.

624k



Michael Dell @MichaelDell · 14 Jan 2013

Susan & I invite you read our thoughts on how #philanthropy can accelerate positive change in the year ahead- ow.ly/gK1zq #socent

Collapse



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5:42 PM · 14 Jan 2013 · Details



Michael Dell shared a link via Michael & Susan Dell Foundation.

January 14, 2013



Susan & Michael Dell issue a call to action: ask questions; set goals; build markets; exercise discipline
www.msdf.org

This year, the foundation will hit a symbolic watershed: \$1 billion committed to support education reform, better...

Like · Comment · Share

46 1 1



Michael Dell shared Michael & Susan Dell Foundation's status.

January 14, 2013

Call to Action: An open letter from Michael and Susan Dell on philanthropy's role in accelerating positive change for children living in urban poverty.

<http://www.msdf.org-founders-letter-2013/>

Unlike · Comment · Share

21 2

55k



Over 1 million followers,
plus shares and retweets!

Turning down the heat ...

30,000ms - Time for URL monitoring alerts to trigger

60,000ms - Time for me to read my text message and call my hosting provider

60,000ms - Time for my support team to diagnose the problem

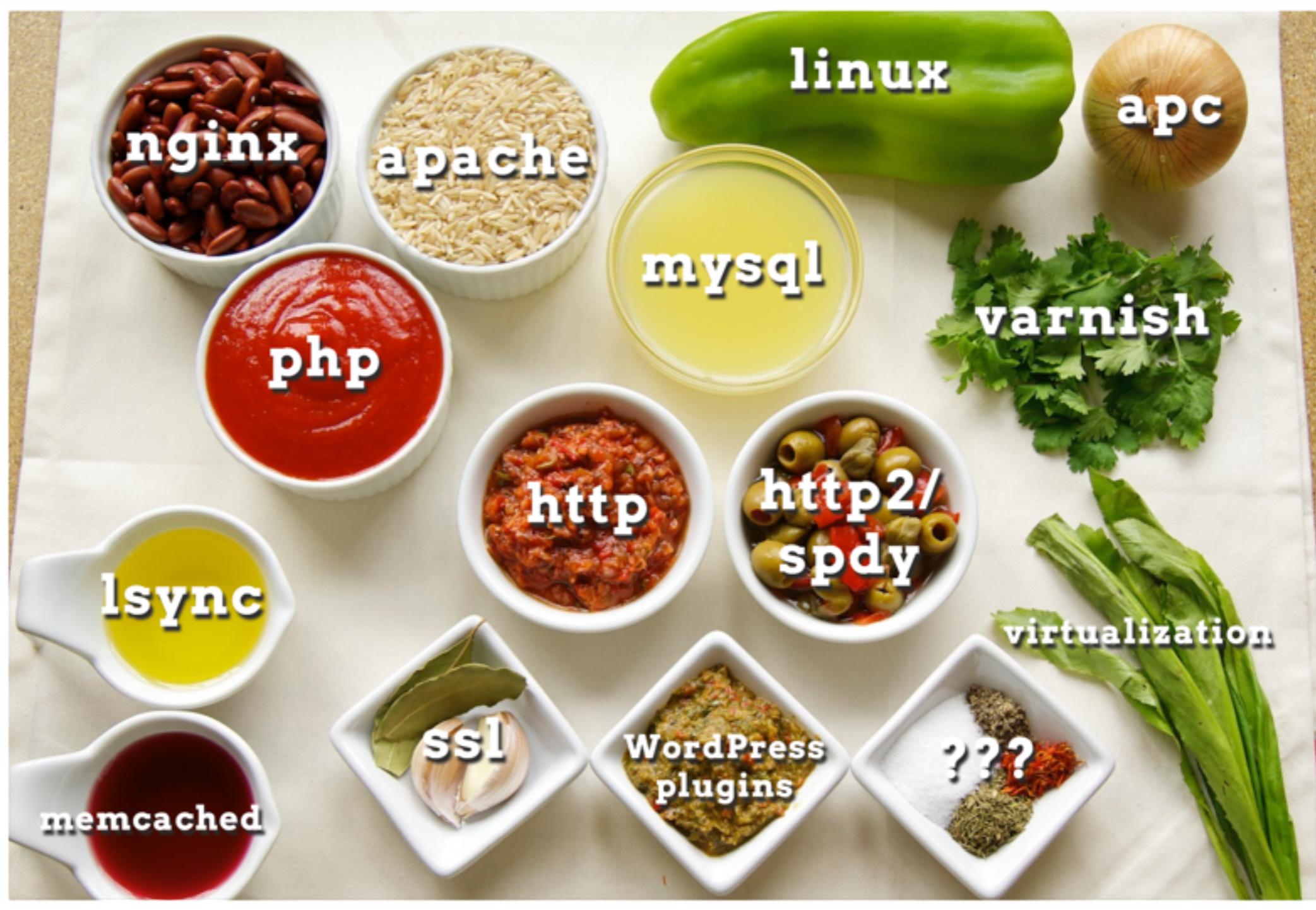
180,000ms - Time to kill connections and reboot

Our one-server configuration could scale up, but not out.

That's a problem!



Ingredients



Paul Qui

Born in Manila, Philippines, moved to Virginia at 10 years old. Texas Culinary Academy in 2003.

Began his career working for free at Uchi, rising to be executive chef at Uchiko. Owner/founder of East Side King and Qui Austin.

Winner of Top Chef 2009, James Beard Award 2012

A modern approach to food, with no boundaries and accessible to all, from his trailers to his brick and mortars.



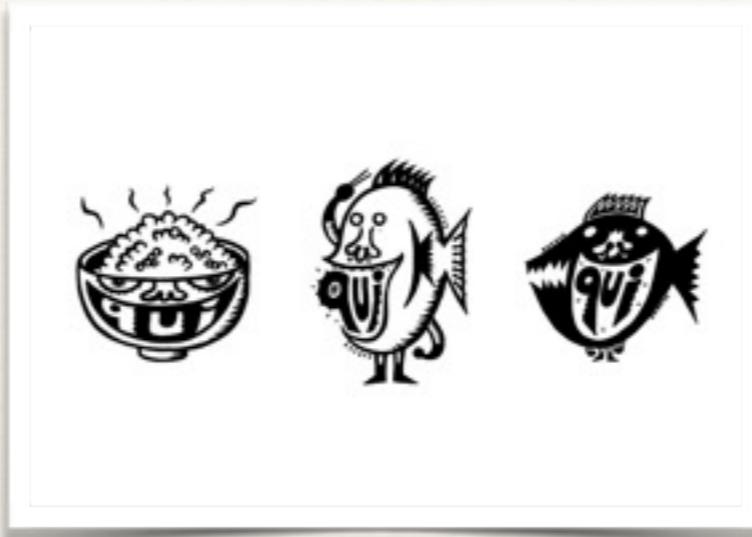
Whatcha want for dinner?



East Side King

A quick, cheap, and easy meal from a nearby trailer.

You're basically just load-balancing the technologies you already know.



Qui

More complex flavors, but still affordable.

Add more layers, more caching, more performance, but requires more management.



Uchiko

Treat yourself.
You get what you pay for.

Customize everything, or have the chef make his favorite dish for you.

East Side King



Good starter solution, with more performance and redundancy than a single server.

Ingredients

Linux

APC

Apache

lsyncd

MySQL

memcached

PHP

W3 Total Cache

Prepare your LAMP stack. Stir in APC, lsync, and W3 Total Cache configured for Memcached. Add SSD drives or loads of memory to taste.

LAMP Stack

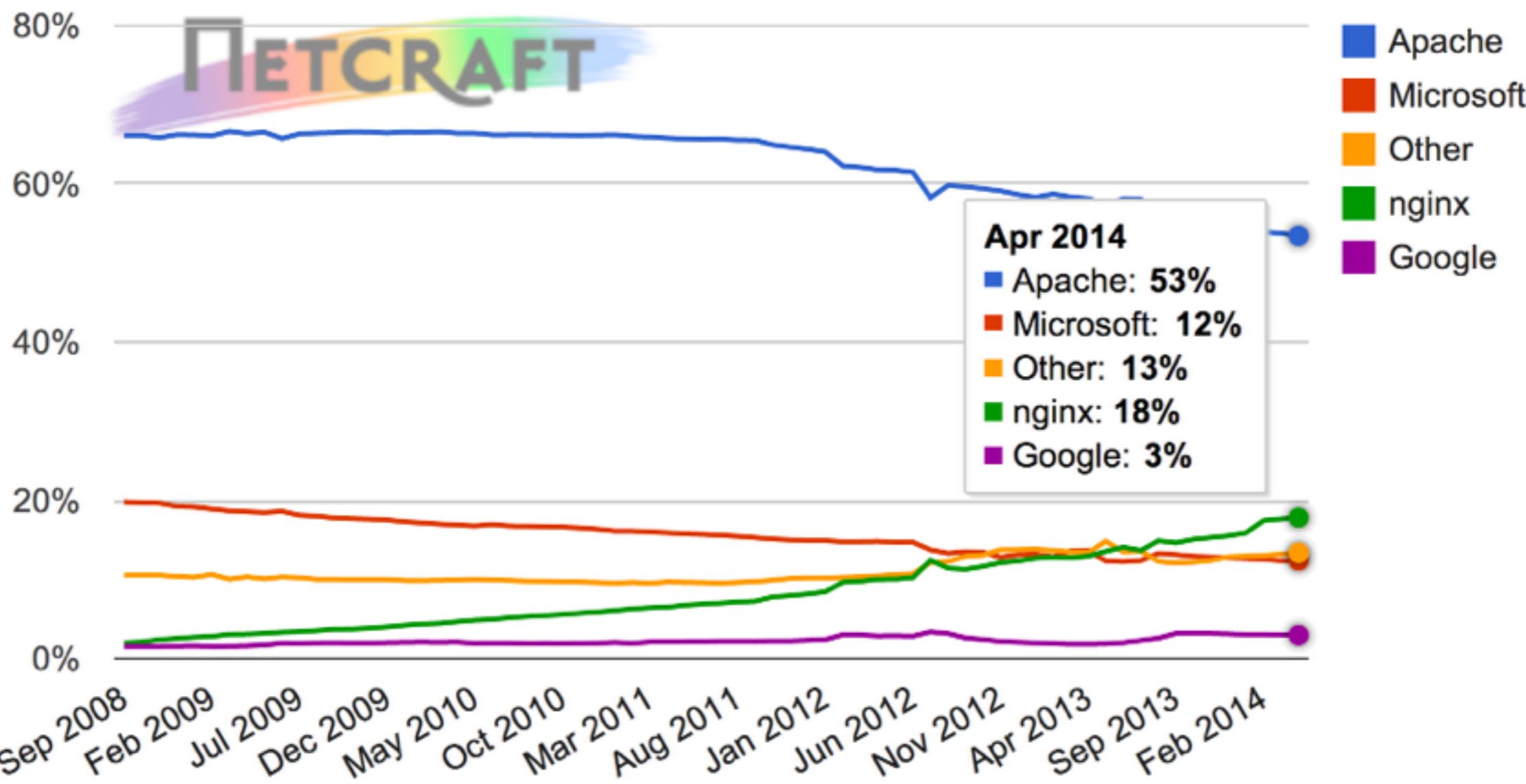


- ❖ **Linux**
 - ❖ **Tip:** Choose LTS releases to make patching multiple servers faster & easier. Supported for 5 years, versus 9 months for regular release.
 - ❖ Do you want to be a server administrator or a developer? Maintaining your clustered environment can take away from time spent building new things.
- ❖ **Apache**
 - ❖ Apache web server began in early 1995 after work on the NCSA HTTPd server code stalled.
 - ❖ The most popular HTTP server in use since April 1996.
 - ❖ Easy to administer with lots of documentation, and high compatibility with other software.
- ❖ **MySQL**
- ❖ **PHP**

Apache HTTP Server



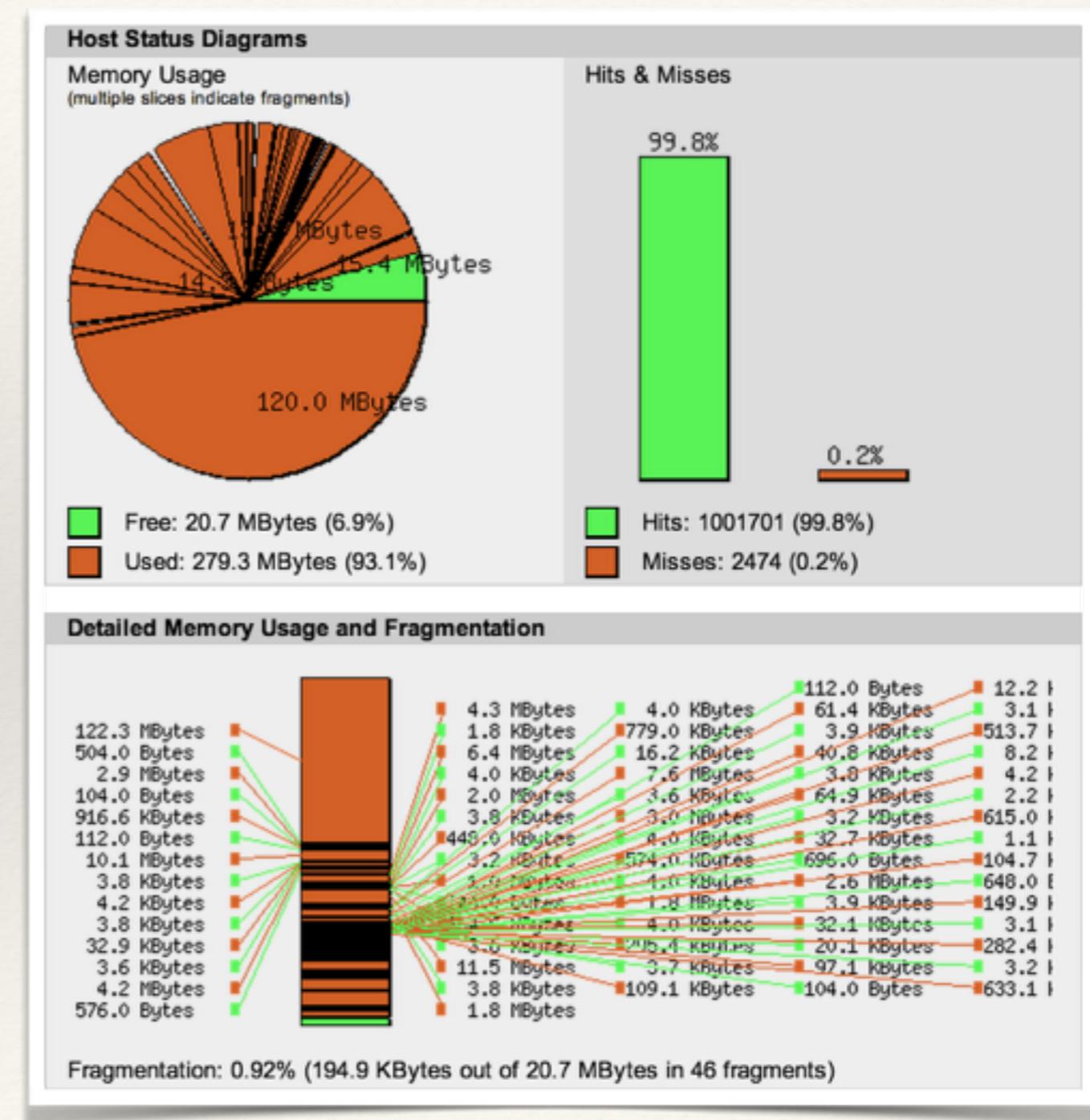
Web server developers: Market share of the top million busiest sites



APC



- ❖ The Alternative PHP Cache (APC) is a free and open opcode cache for PHP.
- ❖ Caches and optimizes compiled intermediate code so your application runs 3x-4x faster.
- ❖ With PHP 5.5, Zend open sourced their cache offering, under the new name of Zend OpCache — it is now included with PHP itself, in addition to being available for older PHP versions going all the way back to PHP 5.2!
- ❖ Tip: Zend OpCache will likely be the recommendation going forward.



lsyncd

- ❖ Lsyncd watches a local directory trees event monitor interface (inotify or fsevents).
- ❖ Aggregates and combines events for a few seconds and then spawns one (or more) process(es) to synchronize the changes.
- ❖ Config file uses Lua syntax.
- ❖ Use SSH keys to allow the master server to log into slaves securely & without a password.



lsyncd

lsyncd-sample.lua

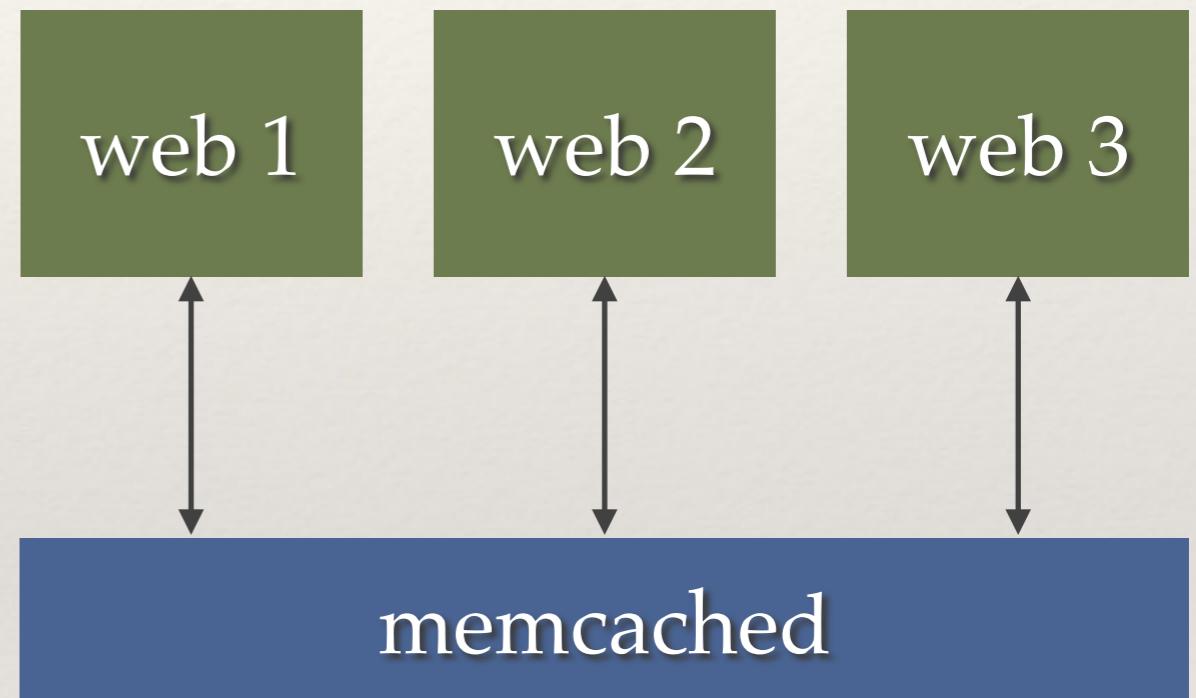
- ❖ **Tip:** Set your directory structure up where all vhosts are synced from a single root, or add as many sync blocks as you need.
- ❖ **Tip:** Consider excluding directories with temp files.
- ❖ **Tip:** Use private IP addresses to improve speed by leveraging the private network.

```
lsyncd-sample.lua  x
1  |
2  — Sample lsyncd.lua configuration file.
3  —
4
5  settings {
6      logfile = "/var/log/lsyncd/lsyncd.log",
7      statusFile = "/var/log/lsyncd/lsyncd-status.log",
8      statusInterval = 20
9  }
10 — First Target
11 sync {
12     default.rsync,
13     source = "/var/www/vhosts/",
14     target = "10.x.x.1:/var/www/vhosts/", — Enter your IP!
15     — exclude = "/var/www/vhosts/example.org/wp-content/upgrade",
16     excludeFrom = "/etc/lsyncd.exclude", — loads exclusion rules from
17     this file, one rule per line.
18     rsync = {
19         compress = true,
20         acl = true,
21         verbose = true,
22         rsh = "/usr/bin/ssh -p 22 -o StrictHostKeyChecking=no"
23     }
24 }
25 — Second Target
26 sync {
27     default.rsync,
28     source = "/var/www/vhosts/",
29     target = "10.x.x.2:/var/www/vhosts/", — Enter your IP!
30     — exclude = "/var/www/vhosts/example.org/wp-content/upgrade",
31     excludeFrom = "/etc/lsyncd.exclude", — loads exclusion rules from
32     this file, on rule per line
33     rsync = {
34         compress = true,
35         acl = true,
```

memcached



- ❖ Short-term memory for your WordPress website. W3 Total Cache can leverage memcached for caching:
 - ❖ Pages
 - ❖ Database query results
 - ❖ Objects/Transients
- ❖ **Tip:** Disable PHP sessions if you can. If you must have PHP sessions, use memcached for fast, shared session handling.
- ❖ **Tip:** As with lsyncd, use private IP addresses to speed things up.
- ❖ Supports auto-expiration of values.



W3 Total Cache

- ❖ Author Frederick Townes is a forum ninja, and provides fantastic support.
- ❖ Supports many types of cache storage.
- ❖ **Tip:** Try to avoid caching to disk, even if you're on SSDs. It can get wonky on clustered sites.
- ❖ **Tip:** Use memcached for fast, shared memory storage of pages, queries, and objects.
- ❖ **Tip:** Use the built-in compatibility check to ensure things will work correctly.



W3 Total Cache

Page Cache

Enable page caching to decrease the response time of the site.

Page cache:

 Enable

Caching pages will reduce the response time of your site and increase the scale of your web server.

Page cache method:

Memcached



Save all settings

Empty cache

W3 Total Cache

Database Cache

Enable database caching to reduce post, page and feed creation time.

Database Cache:

 Enable

Caching database objects decreases the response time of your site. Best used if object caching is not possible.⁴⁴

Database Cache Method:

Memcached



[Save all settings](#)

[Empty cache](#)

W3 Total Cache

Object Cache

Enable object caching to further reduce execution time for common operations.

Object Cache:

 Enable

Object caching greatly increases performance for highly dynamic sites that use the [Object Cache API](#).

Object Cache Method:

Memcached



Save all settings

Empty cache

W3 Total Cache

Memcached hostname:port / IP:port:

10.10.20.20:11211

Test

Multiple servers may be used and separated by a comma; e.g. 192.168.1.100:11211, domain.com:22122

Maximum lifetime of cache objects:

180

seconds

Determines the natural expiration time of unchanged cache items. The higher the value, the larger the cache.

Garbage collection interval:

3600

W3 Total Cache

Reverse Proxy

Purge policies are set on the [Page Cache settings](#) page.

Enable varnish cache purging

Varnish servers:

10.10.10.1

10.10.10.2

10.10.10.3

Specify the IP addresses of your varnish instances above. The VCL's ACL must allow this request.

[Save all settings](#)

[Purge cache](#)

W3 Total Cache

CDN

Host static files with your content delivery network provider to reduce page load time.

CDN:

 Enable

Theme files, media library attachments, CSS, JS files etc will appear to load instantly for site visitors.

CDN Type:

Akamai

Select the CDN type you wish to use.

Save all settings

Purge cache

W3 Total Cache

Browser Cache

Reduce server load and decrease response time by using the cache available in site visitor's web browser.

Browser Cache:



Enable HTTP compression and add headers to reduce server load and decrease file load time.

[Save all settings](#)

❖ Tip:

- ❖ Set far-future expiration for static files (1 day, 1 week, 1 month, 20 years ...)
- ❖ Set far lower expiration for your dynamic content (30 secs, 5 mins, 1 hour)

Qui



More gooey layers, more complex flavors, more robustness at an affordable price.

Ingredients

Linux

nginx

MySQL

PHP

APC

lsyncd

memcached

W3 Total Cache

Varnish

The LEMP stack is an improvement on the LAMP stack in many regards, with some minor sacrifices in compatibility. More layers means troubleshooting can be more difficult.

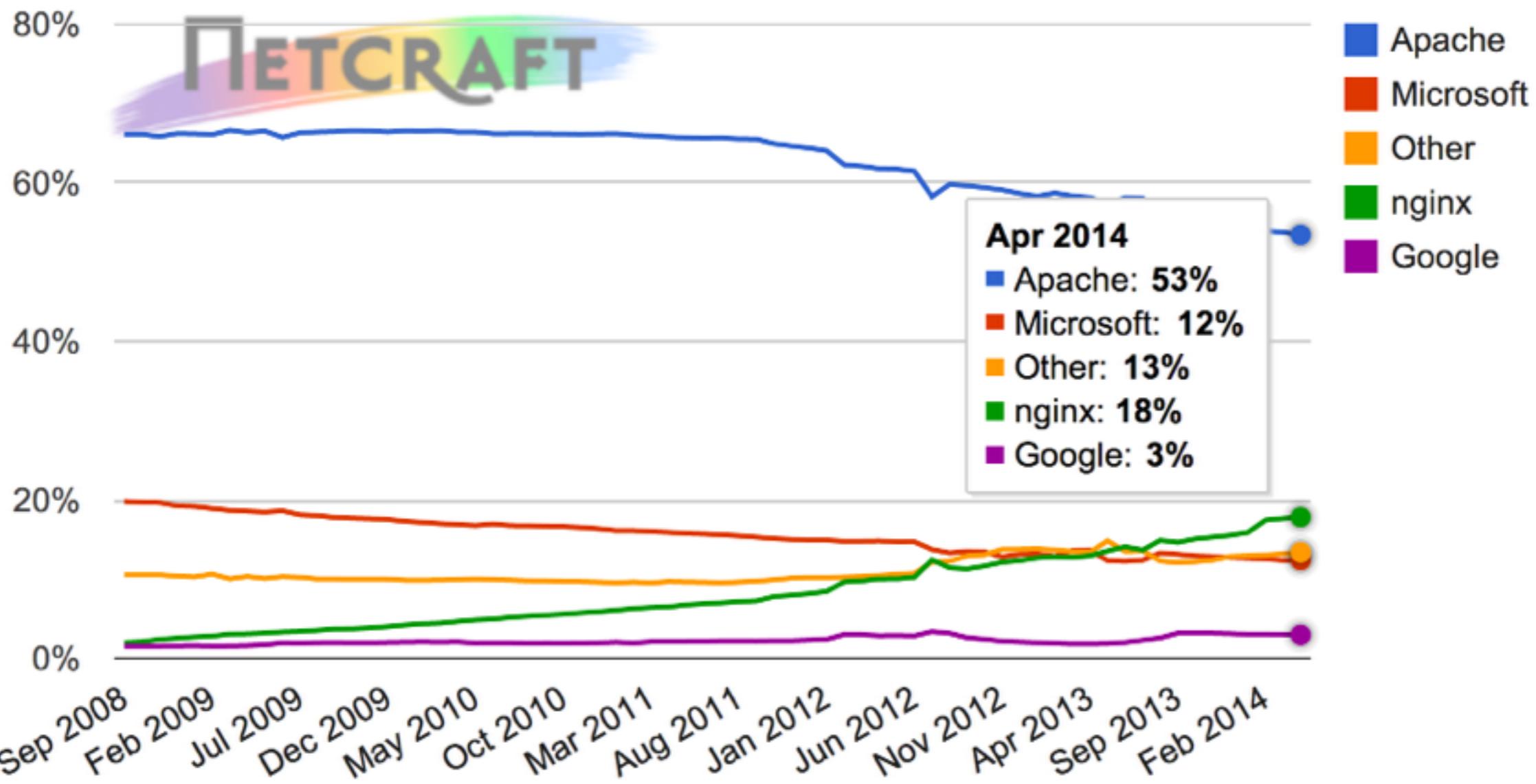
❖ About

- ❖ Uses event-driven architecture instead of process-based architecture to make more efficient use of resources.
- ❖ Asynchronous == non-blocking
- ❖ Can be an HTTP server or reverse-proxy. (Reverse-proxying to Apache can get a bit spicy for my taste ...)

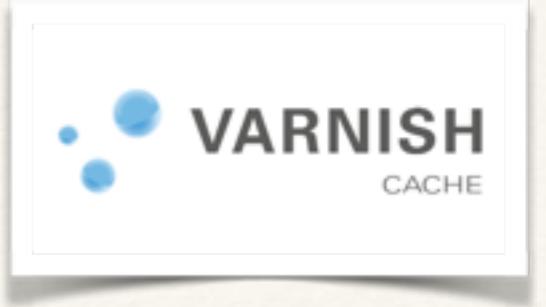
❖ Compared to Apache

- ❖ nginx does not create a process for every new request, Apache does.
- ❖ nginx serves static files faster than Apache because of lower memory overhead.
- ❖ nginx can be tougher to configure, and documentation is not as prevalent as the available docs for Apache.

Web server developers: Market share of the top million busiest sites



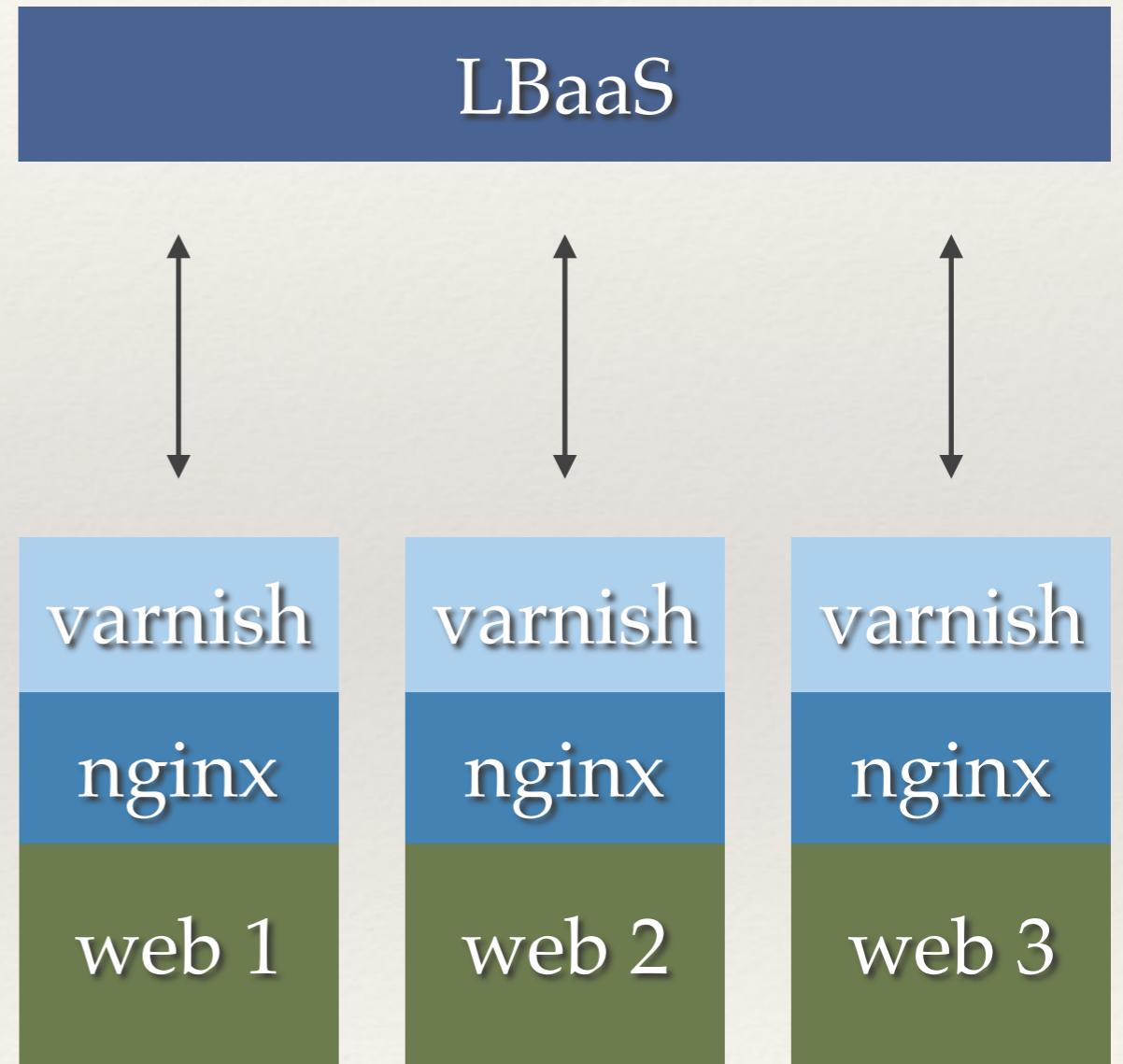
Varnish



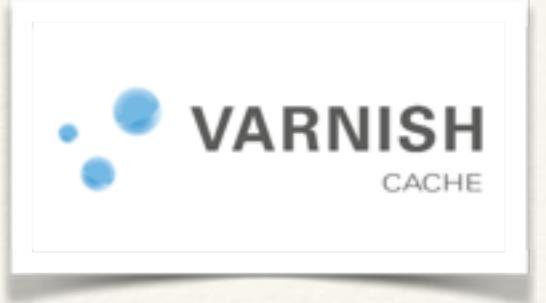
A web application accelerator also known as a caching HTTP reverse proxy.

Typically speeds up delivery with a factor of 300 - 1000x, depending on your architecture.

Put Varnish in front of your web server and configure it to cache the HTTP content.

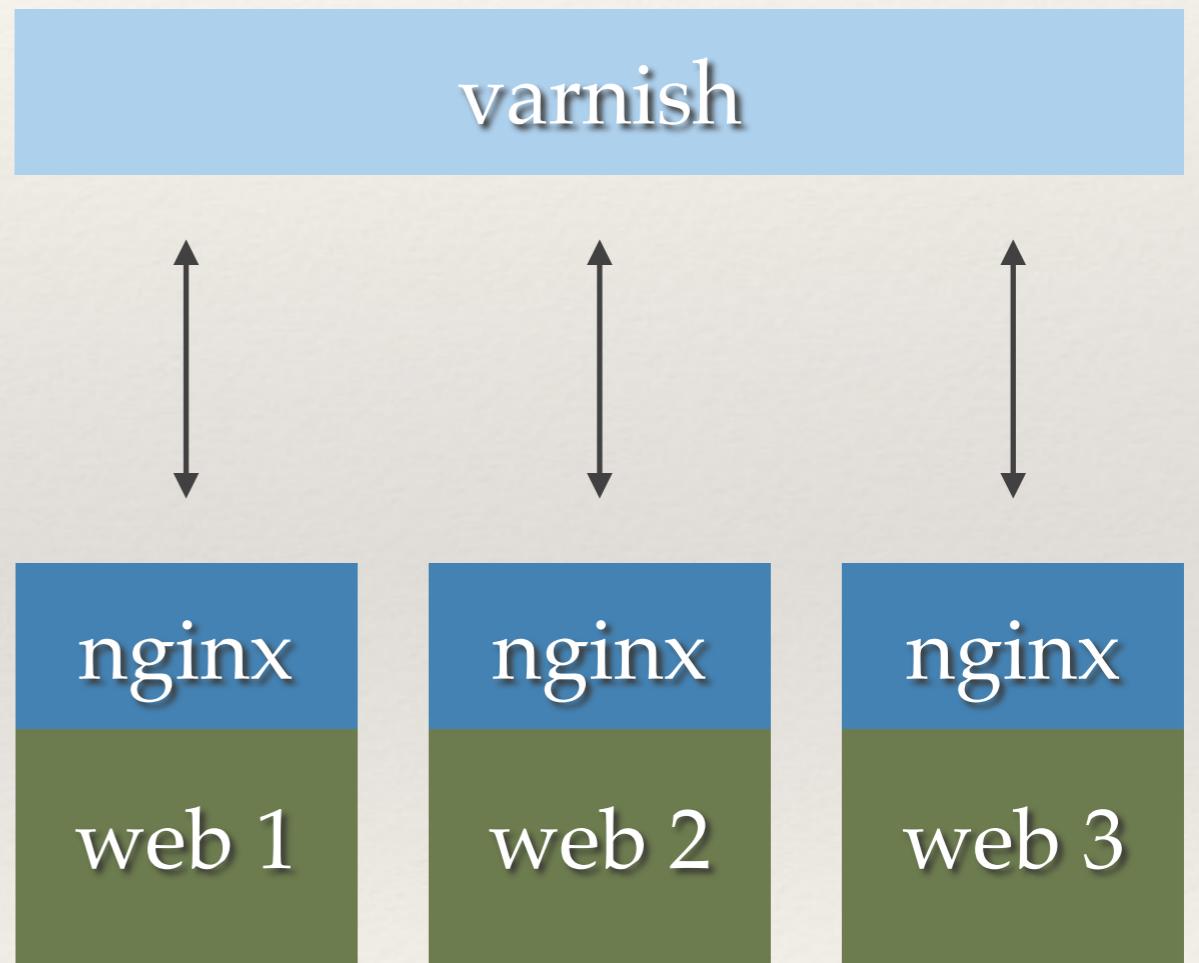


Varnish

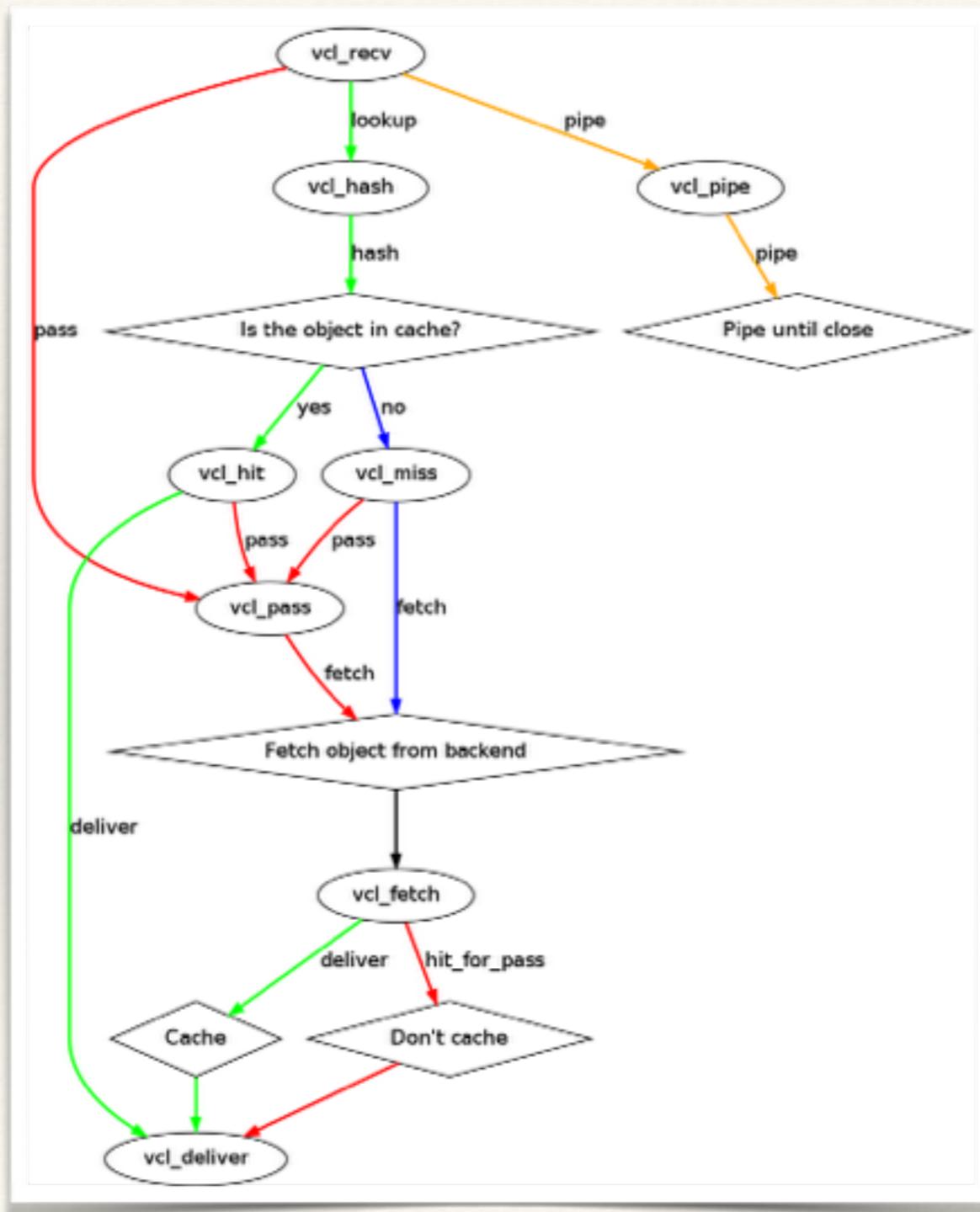


Or, how about simply using Varnish as the load-balancer.

Leveraging a dedicated LB takes a bit more effort to manage, but will help insulate you from the rare attacks on shared resources that ruin it for everybody.



Varnish



Varnish



Best Practices

- ❖ Really cache your homepage, it gets the most traffic. (Try stripping cookies!)
- ❖ Never cache wp-admin, wp-login, or registration pages. Consider not caching front-end pages when a user is logged in.
- ❖ Route all your wp-admin traffic to the master.
- ❖ Exclude preview URLs from cache.
- ❖ Cache all static assets, strip cookies.
- ❖ Do not cache POST requests.
- ❖ Exclude certain AJAX requests used for WP comments, login, and registration.
- ❖ Sessions (and their cookies) can ruin cacheability!
- ❖ You can achieve higher hit rates if you set higher TTLs on objects, and then simply purge dynamic content as soon as it's been updated. (W3 Total Cache!)

```
default-sample.vcl  •  
27  
28  /**  
29  *  
30  * The first function executed after Varnish has decoded the request.  
31  * (@see https://www.varnish-software.com/static/book/VCL_Basics.html#vcl-vcl-recv)  
32  *  
33  */  
34 sub vcl_recv {  
35  
36     if (req.request == "PURGE" || req.request == "BAN") {  
37         if (!client.ip ~ purge) {  
38             error 405 "Not allowed.";  
39         }  
40         ban("req.http.host == " + req.http.host);  
41         error 200 "Purged.";  
42     }  
43  
44     # Only on first VCL loop.  
45     if (req.restarts == 0) {  
46  
47         # Pass the client's IP on in the X-Forwarded-For HTTP header.  
48         if (req.http.x-forwarded-for) {  
49             set req.http.X-Forwarded-For =  
50                 req.http.X-Forwarded-For + ", " + client.ip;  
51         } else {  
52             set req.http.X-Forwarded-For = client.ip;  
53         }  
54     }  
55  
56     # Never cache the admin pages, login pages, the server-status page, POST requests, or WordPress  
57     # post previews.  
58     if (req.url ~ "wp-(admin|login)" || req.http.Content-Type ~ "multipart/form-data" || req.url ~  
59     # "preview=true") {  
60         ##set req.backend = master;  
61         return(pass);  
62     }  
63  
64     # Always cache these images & static assets, and remove their cookies.  
65     if (req.request == "GET" && req.url ~ "\.(  
66         css|js|gif|jpeg|bmp|png|ico|img|tga|wmf|pdf|zip|woff|eot|ttf|svg)$") {  
67         remove req.http.cookie;  
68     }  
69  
70     # Cache GET requests for xmlrpc.php and wlmanifest.xml, and remove their cookies.  
71     if (req.request == "GET" && req.url ~ "(xmlrpc.php|wlmanifest.xml)") {  
72         remove req.http.cookie;  
73     }  
74 }
```

Uchiko



Often expensive and time-consuming, but you're on the leading edge of clustered WordPress!

Ingredients

Linux

nginx

Clustered MySQL

PHP

APC

lsyncd

memcached

W3 Total Cache

Varnish

???

Building on the last recipe, we can experiment by swapping out layers and modules with whatever is new and cool. Finally add some database redundancy.

Clustered MySQL



- ❖ Want to setup and maintain your own MySQL cluster?
Not me!

Some DBaaS Options

- ❖ Amazon RDS
- ❖ Rackspace Cloud Databases
- ❖ Azure Cloud via ClearDB

SPDY



- ❖ HTTP is old! Modern web apps have more requests, more resources, more dynamic content, more personalized content, CDNs, and so much more.
- ❖ SPDY aims to correct the challenges of HTTP 1.1
 - ❖ Header compression
 - ❖ Multiplexing
 - ❖ Server push

SPDY



Header compression

- ❖ Today, headers are in plain text and uncompressed.
- ❖ Headers often include redundant info. The browser agent string never changes, and cookies are updated rarely, but they are sent with every request/response. What a waste!
- ❖ HTTP supports compression of the content only.
- ❖ In some cases, like small scripts or icons, headers can be as large as, or larger than, the response content!
- ❖ SPDY compresses request & response headers to save bytes on the wire.

SPDY



Multiplexing

- ❖ Better parallel processing of requests & responses.
- ❖ Every request requires a response before the next request can be sent.
 - ❖ Head of line blocking: If a response is slow, all other requests are delayed.
 - ❖ HTTP 1.1 introduced pipelining, which allows multiple requests to be sent at the same time.
 - ❖ Still requires responses to be received in the same order.
- ❖ SPDY enables true multiplexing.
 - ❖ Priority can be set by the client for server responses, indicating which resources should be returned first.
 - ❖ Per host only. If your browser requests resources from 10 different hosts, 10 different connections will still be created.

SPDY



Server Push

- ❖ HTTP requires that every request/response be initiated from the client.
- ❖ With SPDY, when updated content like news articles or sports scores are available, they are pushed to the client over the already established connection.
- ❖ “Server Hint” helps to avoid the server pushing files to the client that already exists in the browser’s cache.
- ❖ Still an experiment to learn how all this is best used in the real world.

SPDY



Pros & Cons

- ❖ SPDY leverages HTTPS (port 443) to be compatible with existing firewalls and network devices.
- ❖ **Browser support:** Chrome, FireFox, Oprah, Android 4.x, IE11, Amazon Silk - some support different versions of SPDY than others.
- ❖ **Server support:** Nginx (built-in, experimental support), Apache has mod_spdy
- ❖ HTTP2 is in development and based on SPDY (coming soon!)

HipHop



- ❖ Specifically, HHVM (HipHop Virtual Machine)
- ❖ Open-sourced by Facebook, 2x to 20x performance increase over PHP-FPM.
- ❖ Compiles Hack and PHP into an intermediate bytecode. This bytecode is then translated into x64 machine code dynamically at runtime by a JIT compiler.
- ❖ Facebook's production version is completely run on HHVM since Q1 2013.
- ❖ FastCGI support for Apache, Nginx, Lighttpd, etc. Used in place of php5-fpm.
- ❖ **Bonus:** MySQLi support added / fixed in 3.0.1! WordPress 3.9 contains several fixes specifically for HHVM.
- ❖ **Bug:** WordPress cookies not fully working yet, but should be production-ready very soon!
- ❖ **Tip:** Requires a 64-bit OS.

<http://hhvm.com/>

<https://kinsta.com/blog/hhvm-and-wordpress/>

Get Your Cloud On!

A couple of my favs ...

❖ Rackspace

- ❖ <http://developer.rackspace.com/devtrial/>
- ❖ Get USD \$300 in free cloud services - that's up to USD \$50 per month credit for six months on your Rackspace Cloud account.
- ❖ Lots of full-featured, leading edge products!



❖ Digital Ocean

- ❖ <https://www.digitalocean.com>
- ❖ Start with \$10 credit with promo code:
DEPLOY2DO (*Expires April 30, 2014*)
- ❖ Really, really cheap cloud hosting!





WordCamp Austin 2014

Thank you.

Slides and code at: bit.ly/cluster-fudge

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@grantnorwood

<http://grantnorwood.com>



Links

Further Reading

<http://kaanon.com/blog/work/making-wordpress-shine-varnish-caching-system-part-1>

Credits

Creative Commons Images

"Chocolate Fudge Cubed" by ZakVTA

"A Watched Pot..." by Brandon Warren