Scaling and Managing LAMP at Wikimedia

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Greater San Francisco LAMP Meetup
Santa Clara, CA 2008-10-16

Basic LAMP stack

y'all know the drill...

- Linux
- Apache
- MySQL
- PHP / Perl / Python / Pwhatever

at the core...

keep it simple

Apache+PHP

MySQL

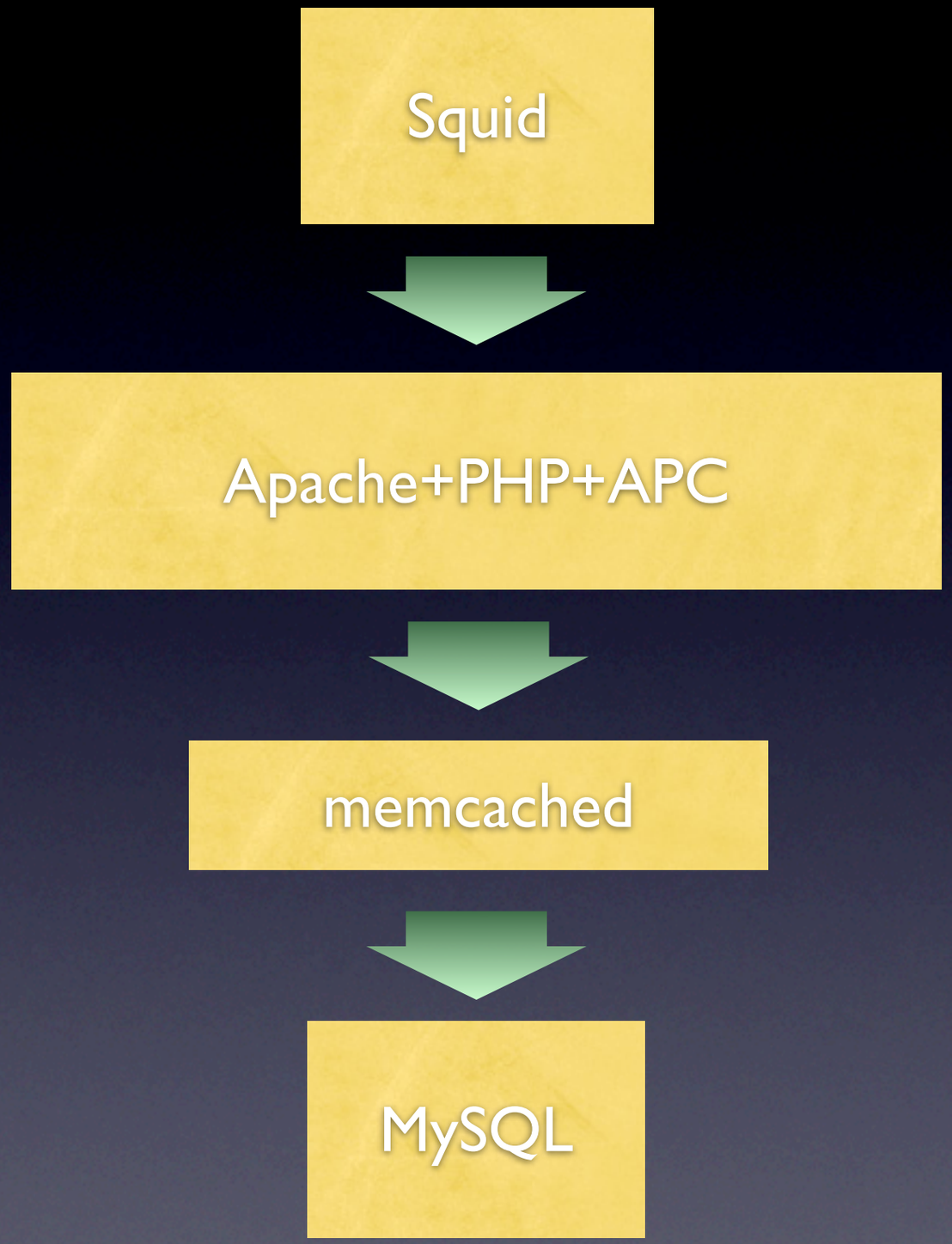
Ahhh, simple is nice.

:)

Simple is slow.

:(

First, add cache!


Squid
Apache+PHP+APC
memcached
MySQL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memcached
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Good for static-dynamic sites like a wiki...

The public face of a given page doesn't change very often, so you can cache at the HTTP level.

Seoul

Squid

Amsterdam

Squid

Tampa

Squid

Apache+PHP+APC

Good for geographic load balancing, too!

Use cheaper, faster local bandwidth...

Seoul

Squid

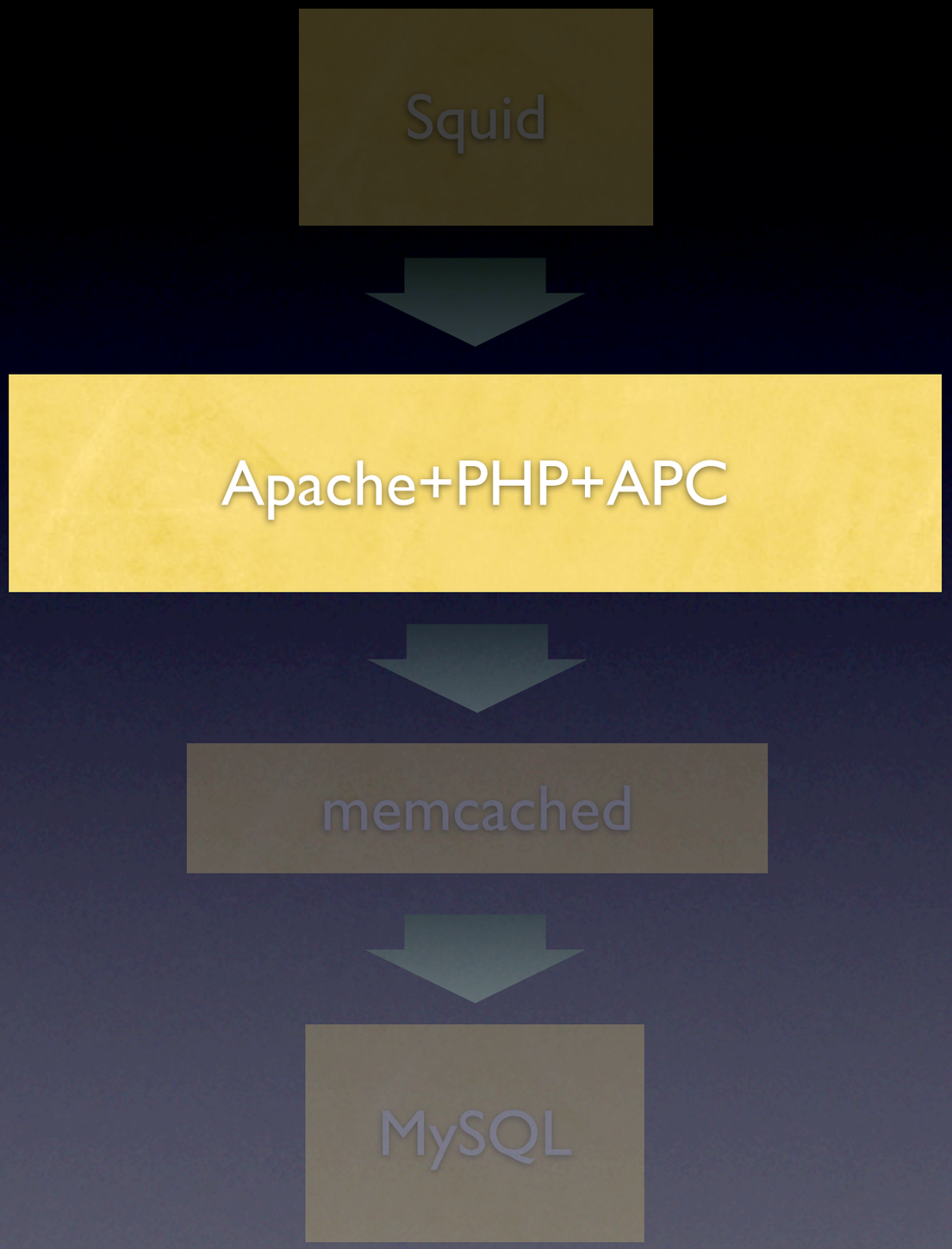
Amsterdam

Squid

Tampa

Squid

Apache+PHP+APC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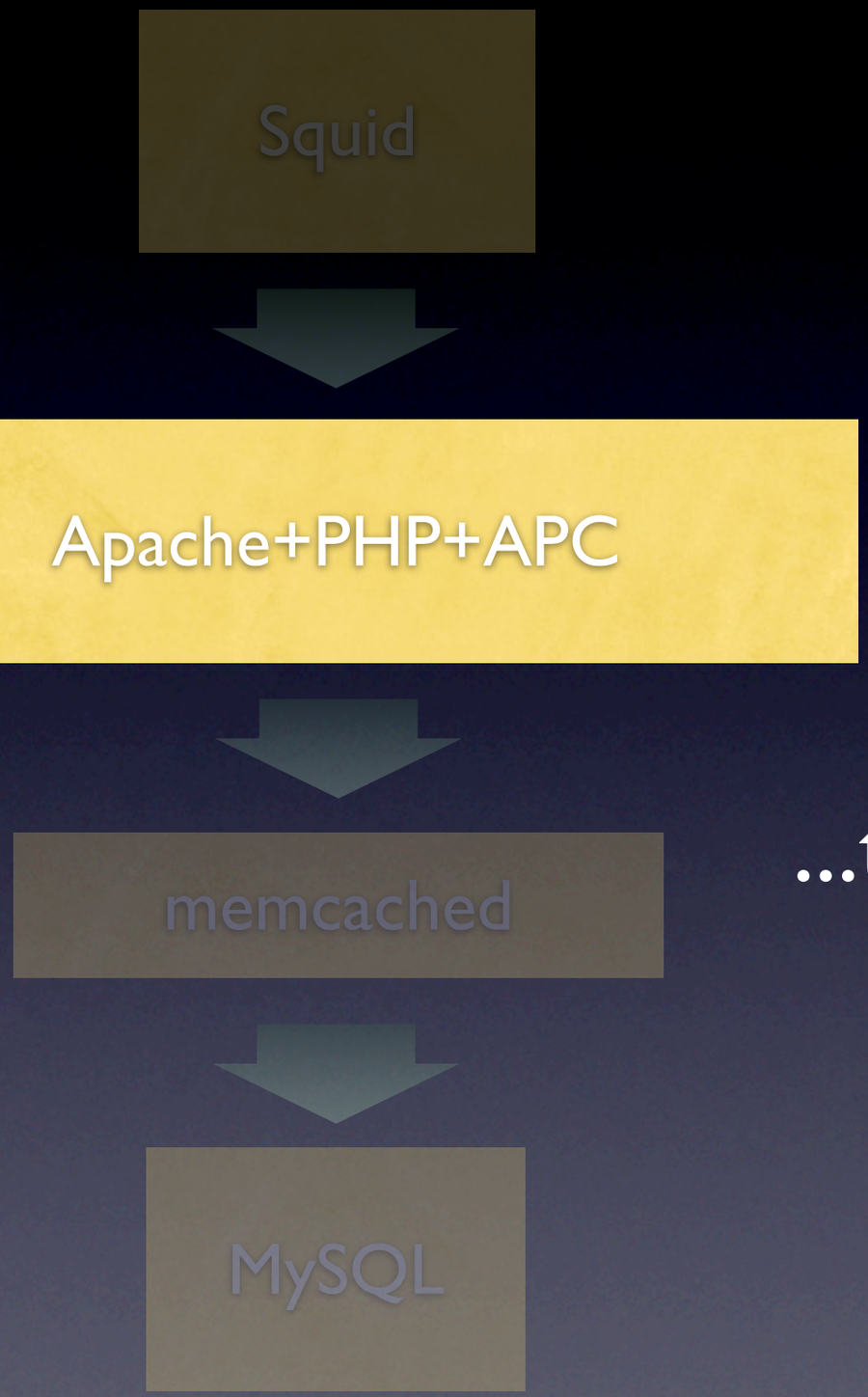
PHP compiles your scripts to bytecode...



...then throws it away after execution.

Squid

Apache+PHP+APC

memcached

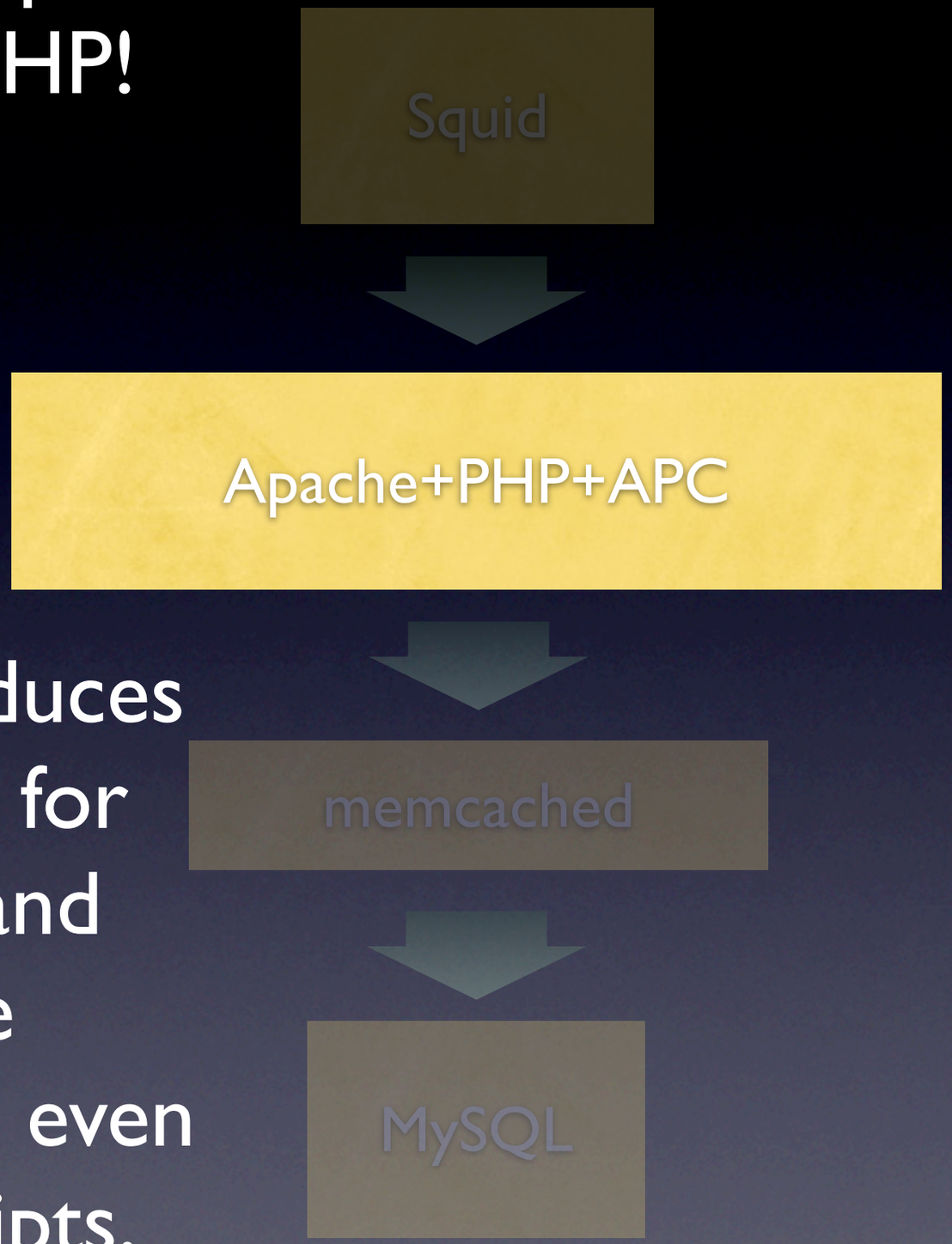
MySQL

Compiling on every run adds a lot of overhead...

...especially as your application grows...

...pulling in lots of framework and library code.

Always use an opcode cache with PHP!



APC

eAccelerator

Zend Platform

...

Drastically reduces startup time for large apps, and moderate improvements even for small scripts.


Squid
Apache+PHP+APC
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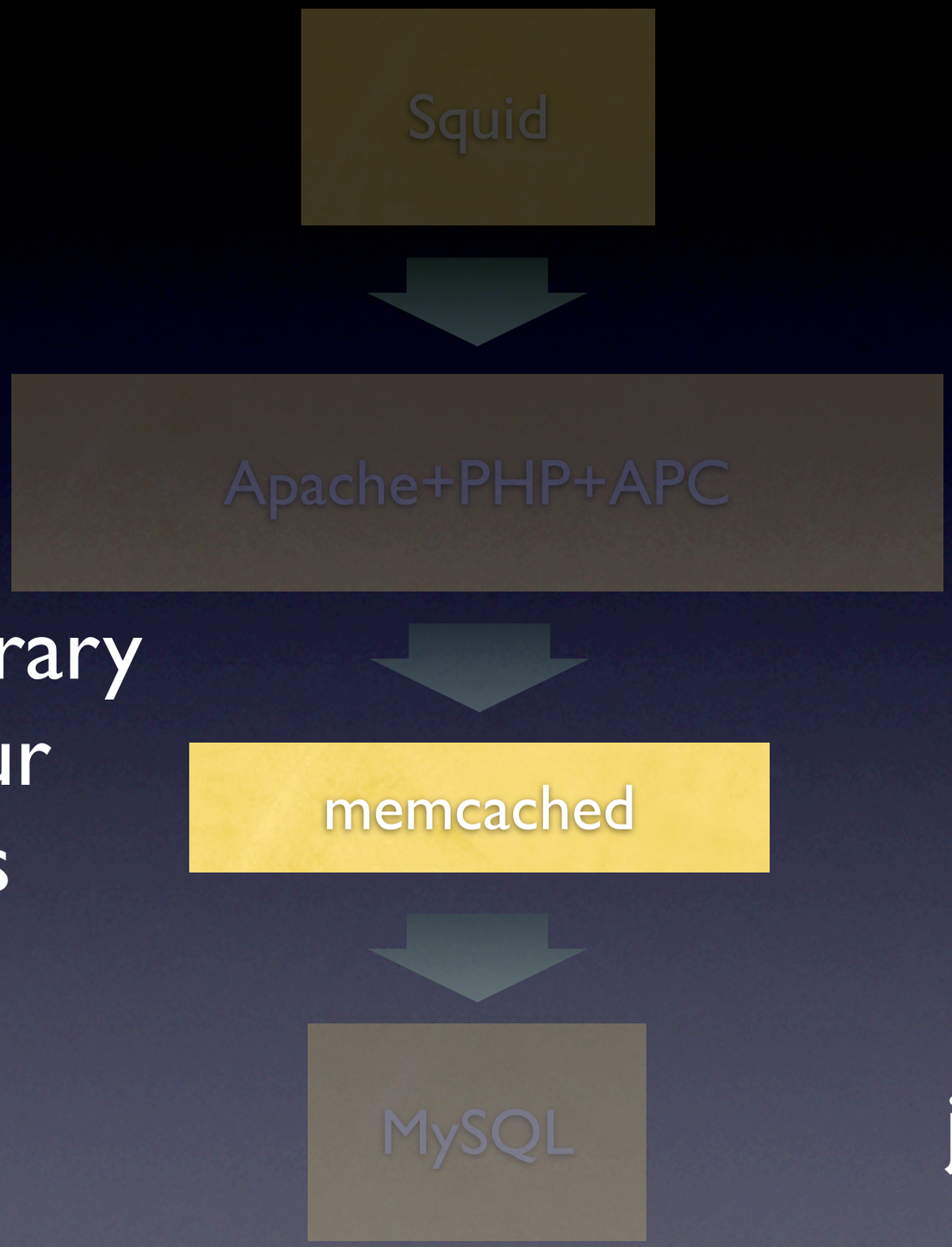

Share temporary data in your network's memory

Faster than disk-backed database when you just need an object cache...

Now add cash!

Squid

Squid

Squid

Squid

HP

PHP

PHP

PHP

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MySQL

memcached

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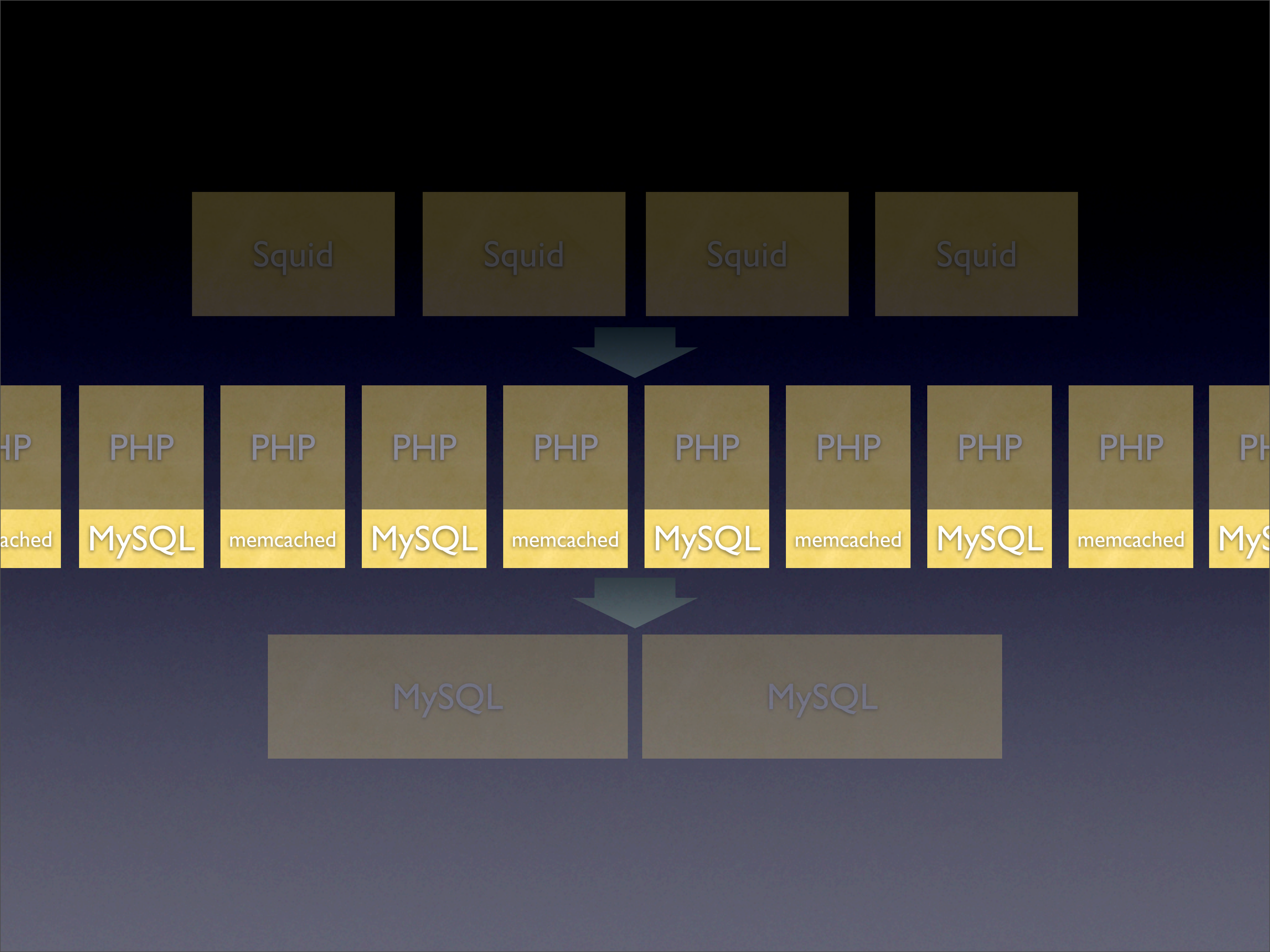
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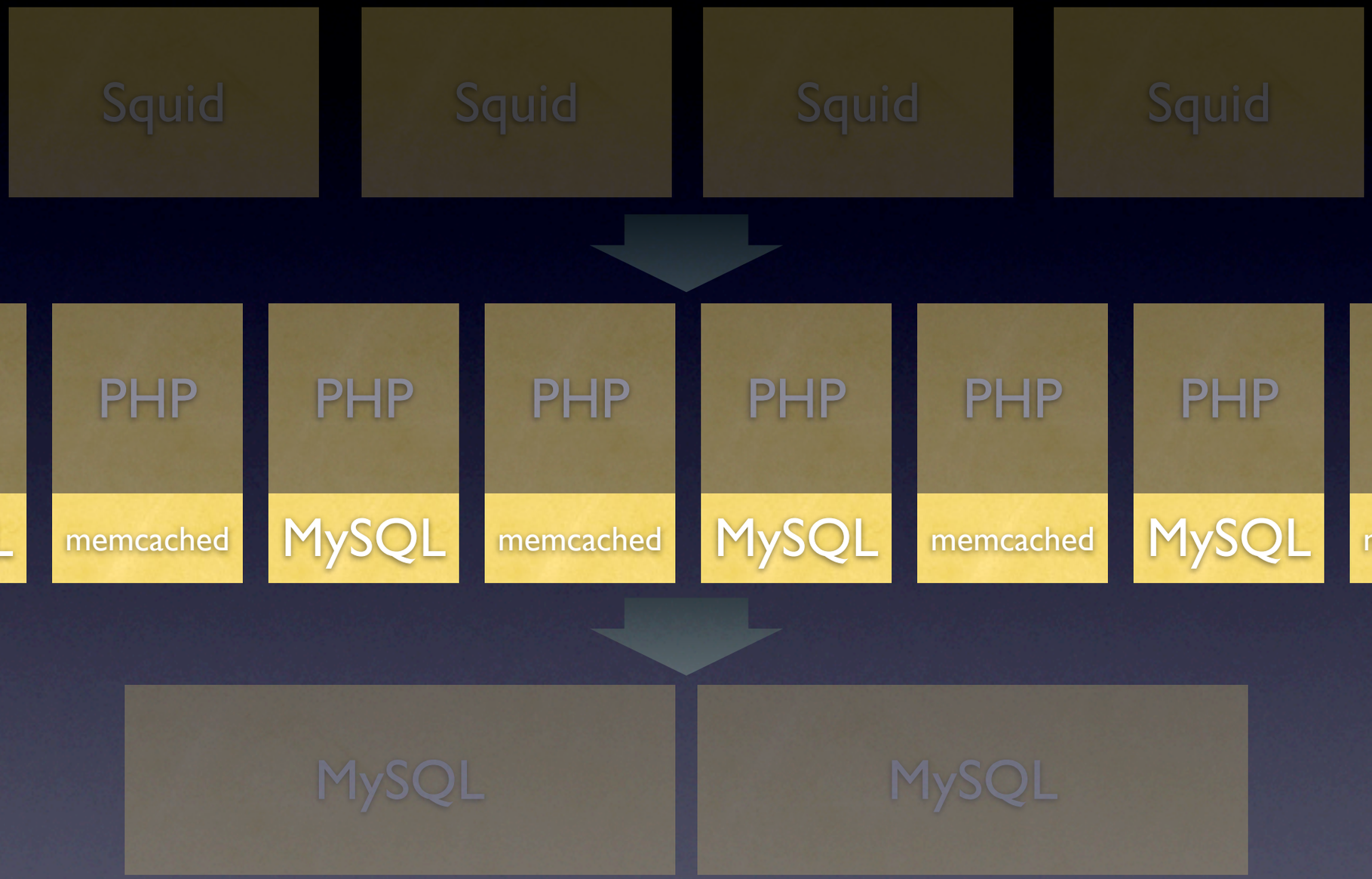
Put underutilized memory and disk to work!



Those web servers come with plenty of memory and disk space.
Use it!

SQL | memcached | MySQL | memc

HP PHP PHP PH

SQL memcached MySQL memc

A bit of memory on each server adds up to a big memcached store space...

HP

PHP

PHP

PH

SQL

memcached

MySQL

memc

Disk space can be used for replicated bulk data storage at very little CPU cost.

Squid

Squid

Squid

Squid

HP

PHP

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MySQL

Break it up...

Simple Sharding

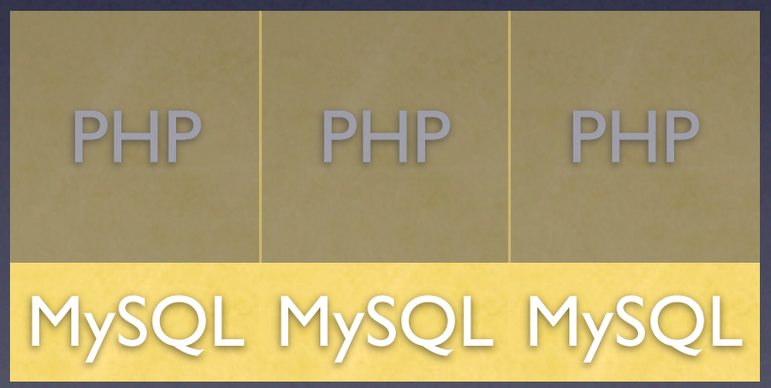
Split along logical data partitions, such as subsites that don't interact closely.

MySQL group s1	English-language Wikipedia
MySQL group s2	Next 19 biggest wikis
MySQL group s3	Next 764 wikis

Functional Sharding

Split along functional boundaries...

Page metadata, links, users...
...read/write/update
...active index scans



Append-only bulk text
...nice simple blobs

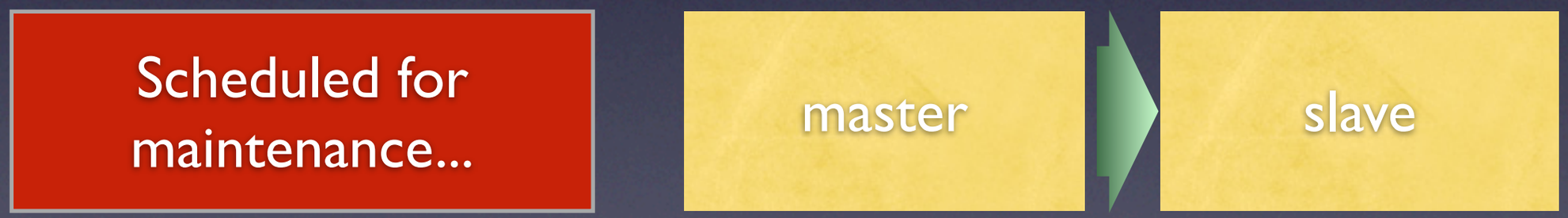
Replicate for speed!

...but your application now has to think about replication lag.

& reliability...

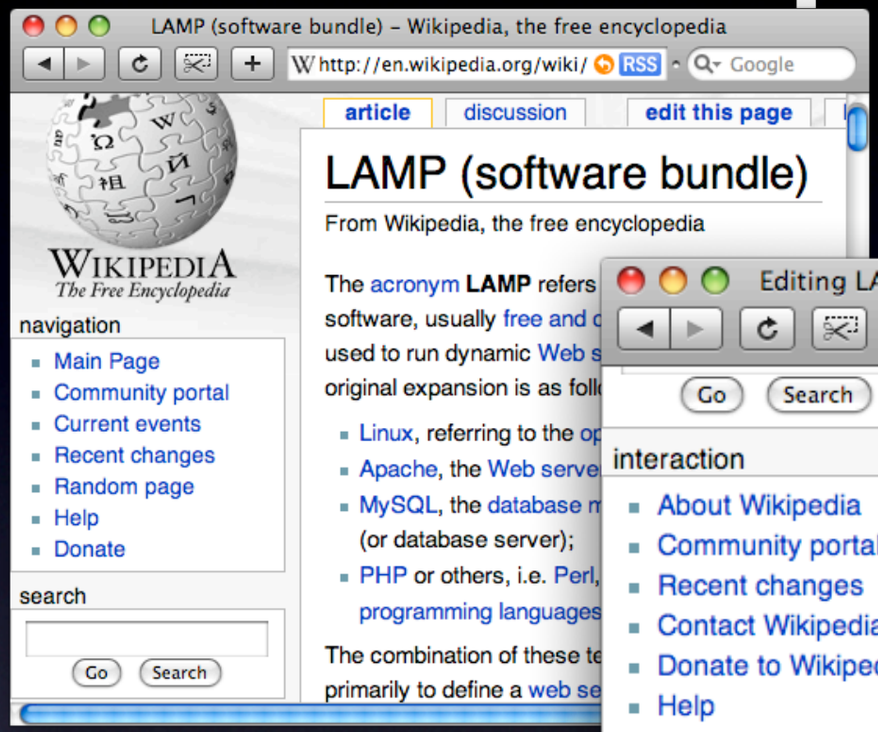
Master dead?

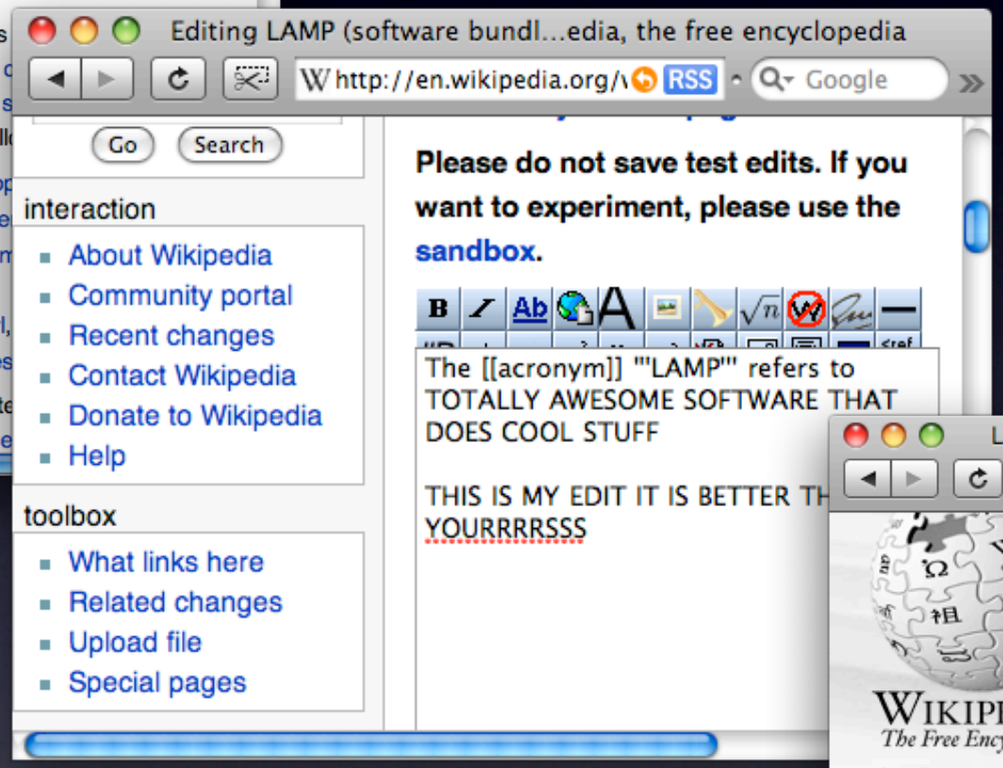
Promote a slave!



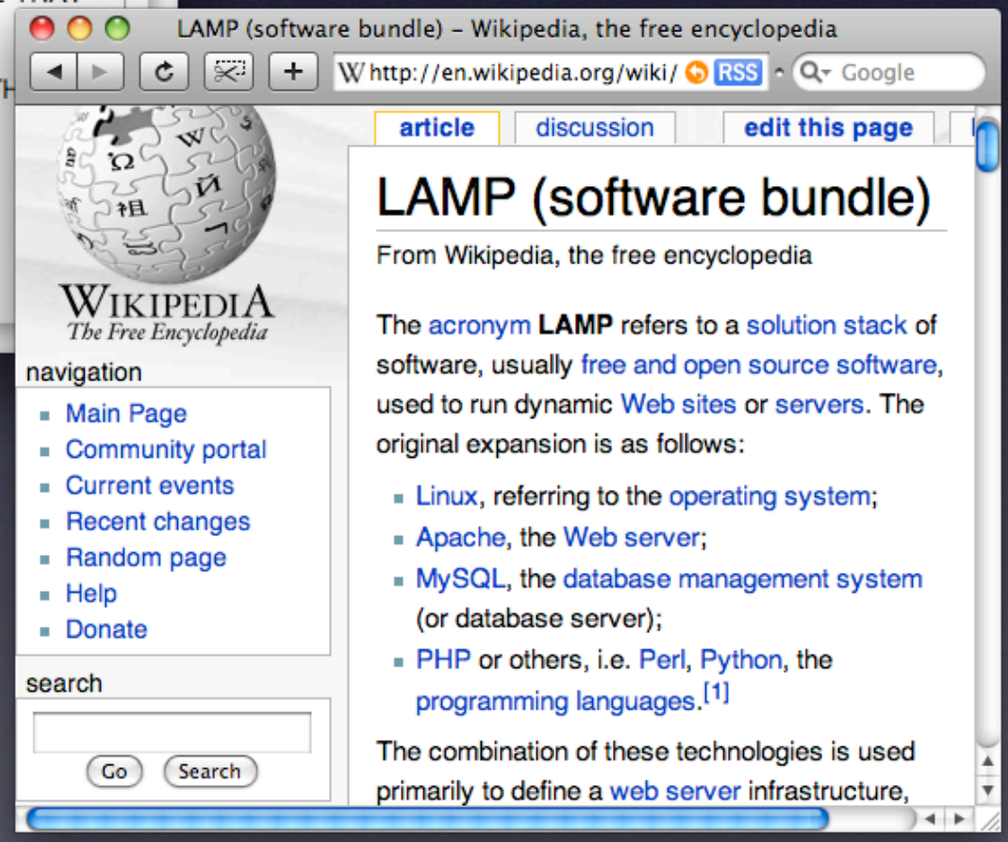
...but failover isn't automated with MySQL.

Replication lag?

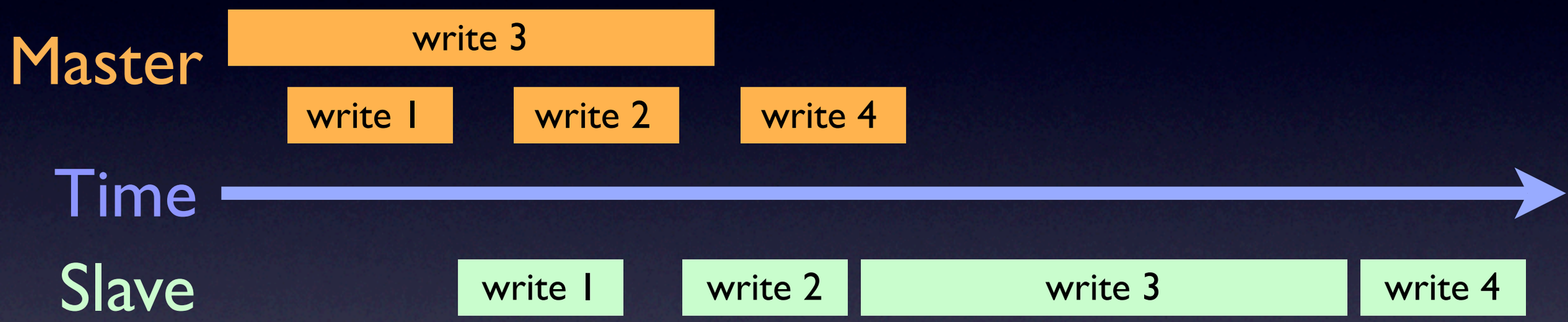




Where'd my edit go???



Replication lag!



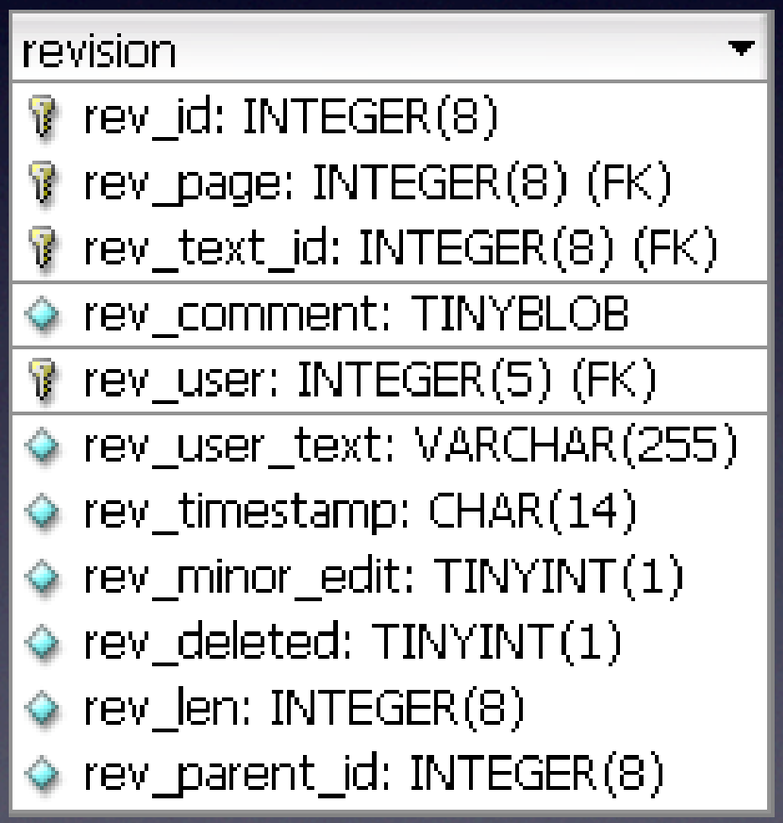
- Writes are replicated after they complete on the master...
- ...and parallel writes are serialized!

Choose hardware wisely

- **Conventional wisdom:** Master should be beefy megaserver, slaves can be wimpy
- **Secret truth:** slaves need to handle writes **faster** than master to keep up!

Avoid slow writes!

- UPDATE or DELETE of thousands of rows



- Schema updates -- ALTER TABLE

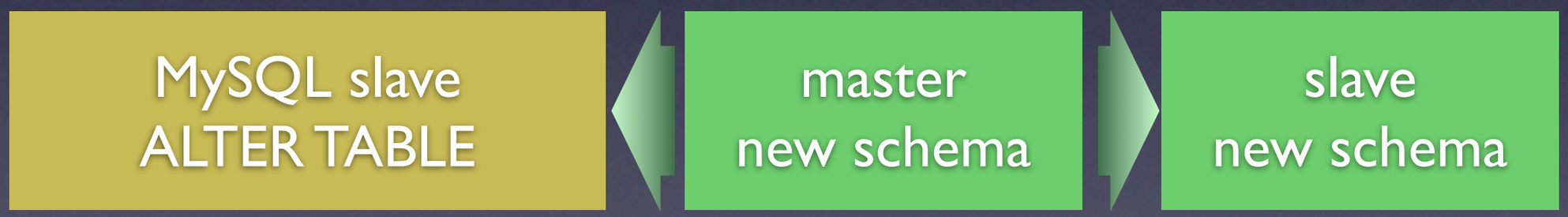
Mass updates are a schema smell

- **Hack:** Disable renaming for "George W. Bush" page so we don't have to UPDATE title in 50,000 old-revision rows
- **Better:** run bulk UPDATEs in small batches to help the replication stream serialize
- **Best:** Refactor DB schema so title need only be updated once in article page table

Fun upgrade tricks

apply schema changes on slaves,
disabling them one at time...

...then swap masters...



...for low-downtime column and index changes!

Application logic

- Check slaves for amount of lag -- application-specific fallback behavior
- Automatically engage maintenance mode if slaves are too far behind
- Store the last master position the session needs -- often we can catch up quickly!

Factory functions

Abstract your database connections!

```
$dbw = wfGetDB(DB_MASTER);
$dbw->insert(...);
```

```
$dbr = wfGetDB(DB_SLAVE);
$row = $dbr->selectRow(...);
```

```
wfGetDB(DB_MASTER)
    LoadBalancer_Multi
        connect to master...
        DatabaseMySQL
```

```
wfGetDB(DB_SLAVE)
    LoadBalancer_Multi
        check slave lag...
        find a slave caught up to session state...
        DatabaseMySQL
            report warnings if lag too high...
```

Session data!

```
/**
 * Notify the ChronologyProtector that the LBFactory
 * is done calling shutdownLB() for now.
 * May commit chronology data to persistent storage.
 */
function shutdown() {
    if ( session_id() != '' &&
        count( $this->shutdownPos ) ) {
        wfDebug( __METHOD__.": saving master pos for " .
            count( $this->shutdownPos ) .
            " master(s)\n" );
            $_SESSION[__CLASS__] =
                $this->shutdownPos;
    }
}
```

Questions?

http://leuksman.com/pages/presentations