Gearman

OSCON 2009

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http://oddments.org/

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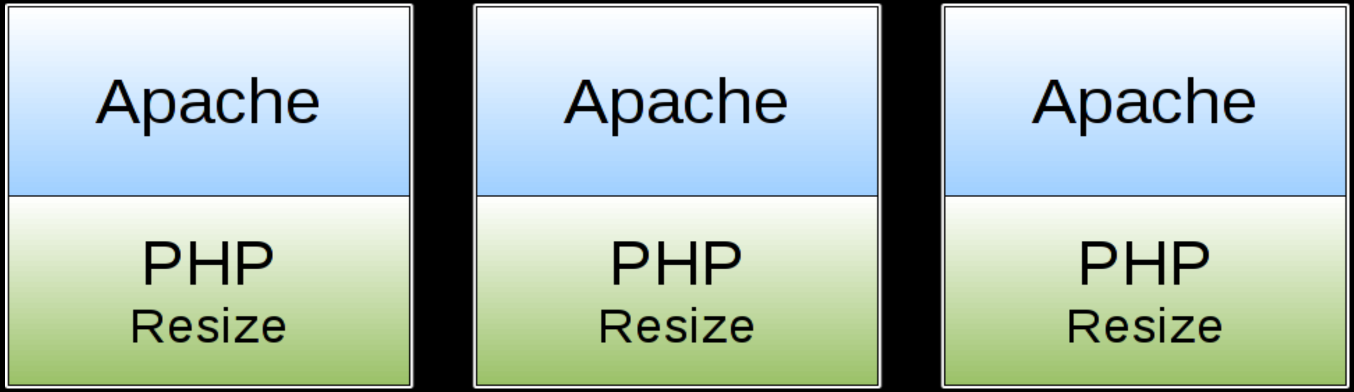
http://krow.net/

Gearman Overview

- History
- Basics
- Example
- Job Server
- Map/Reduce
- Log Analysis
- Asynchronous Queues
- Narada
- Roadmap

IM IN UR COMPUTER
EATIN UR BYTES
COMPAQ


Apache
PHP
Resize
Apache
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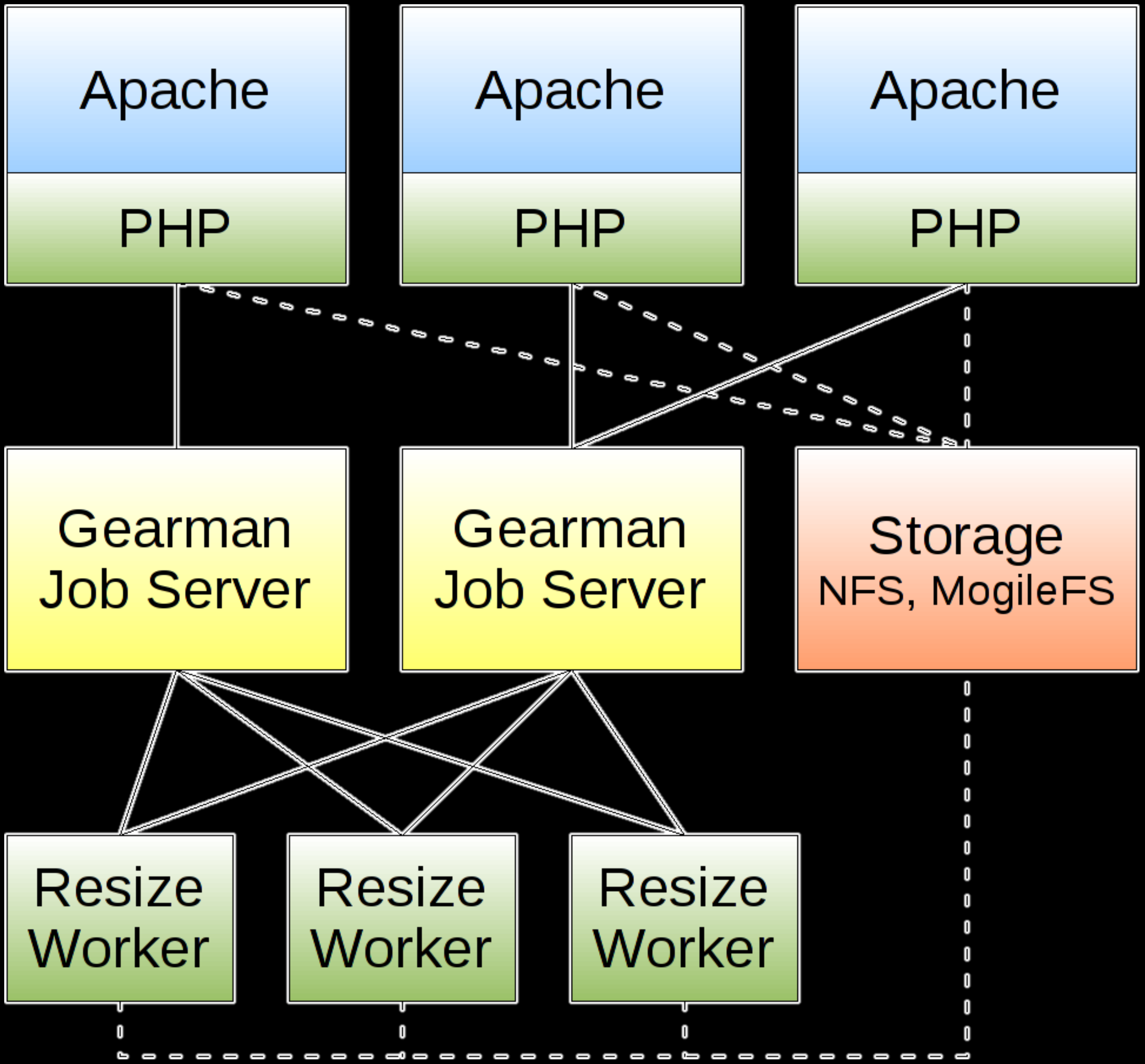
Resize


Apache
PHP
Apache
PHP
Apache
PHP
Gearman Job Server
Gearman Job Server
Storage
NFS, MogileFS
Resize Worker
Resize Worker
Resize Worker

“The way I like to think of Gearman is as a massively distributed, massively fault tolerant fork mechanism.”

- Joe Stump, Digg

History

- Danga – Brad Fitzpatrick & company
  - Related to memcached, MogileFS, ...
- Anagram for “manager”
  - Gearman, like managers, assign the tasks but do none of the real work themselves
- Digg: 45+ servers, 400K jobs/day
- Yahoo: 60+ servers, 6M jobs/day
- LiveJournal, SixApart, DealNews, xing.com, ...

Recent Development

- Rewrite in C
- New language APIs
  - PHP, Perl, Java, Drizzle, MySQL, PostgreSQL
- Command line tool
- Protocol Additions
- Multi-threaded (50k jobs/second)
- Persistent queues
- Pluggable protocol

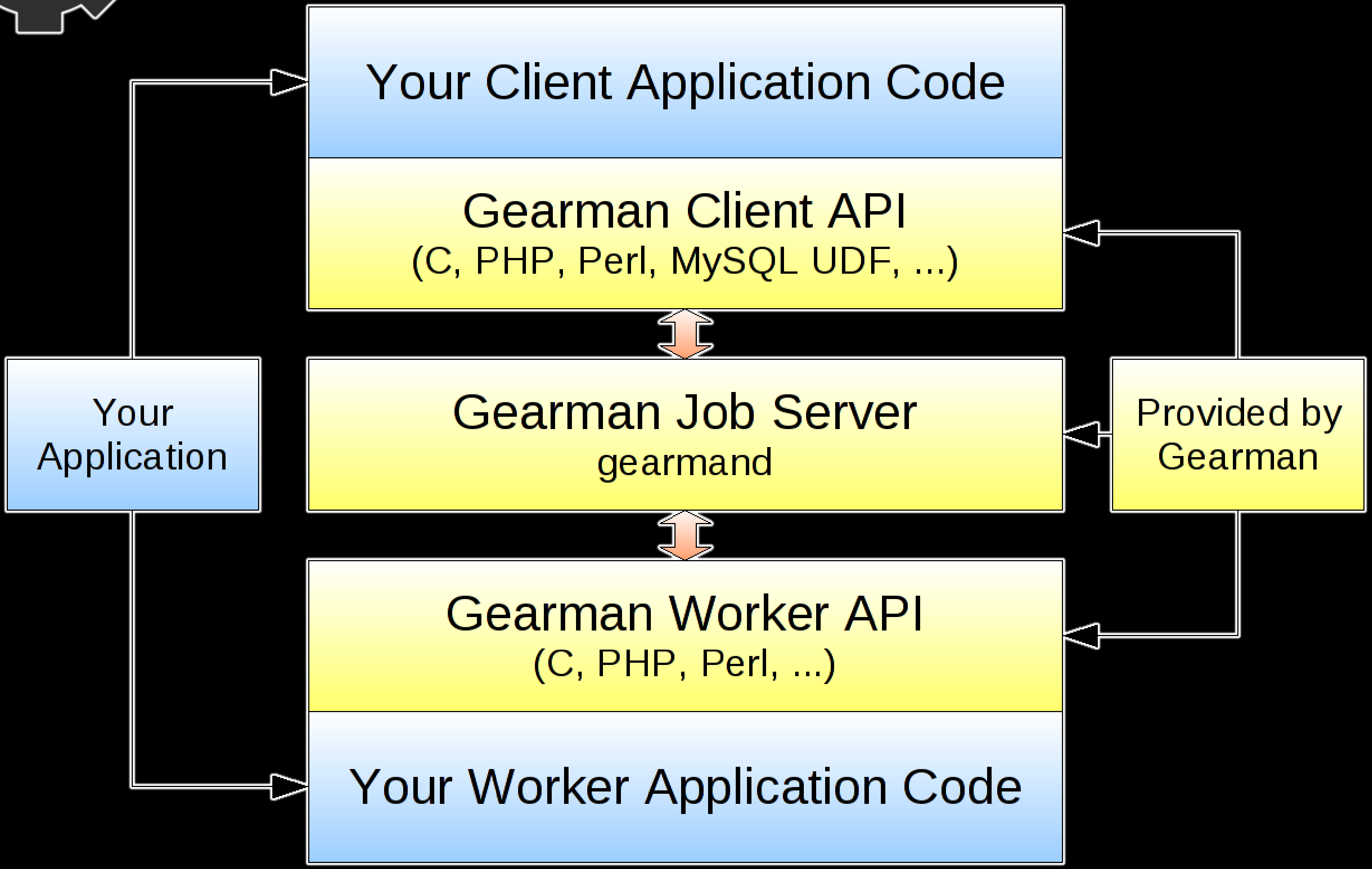
Features

- Open Source (mostly BSD)
- Simple & Fast
- Multi-language
  - Mix clients and workers from different APIs
- Flexible Application Design
  - Not restricted to a single distributed model
- Embeddable
  - Small & lightweight for applications of all sizes
- No Single Point of Failure

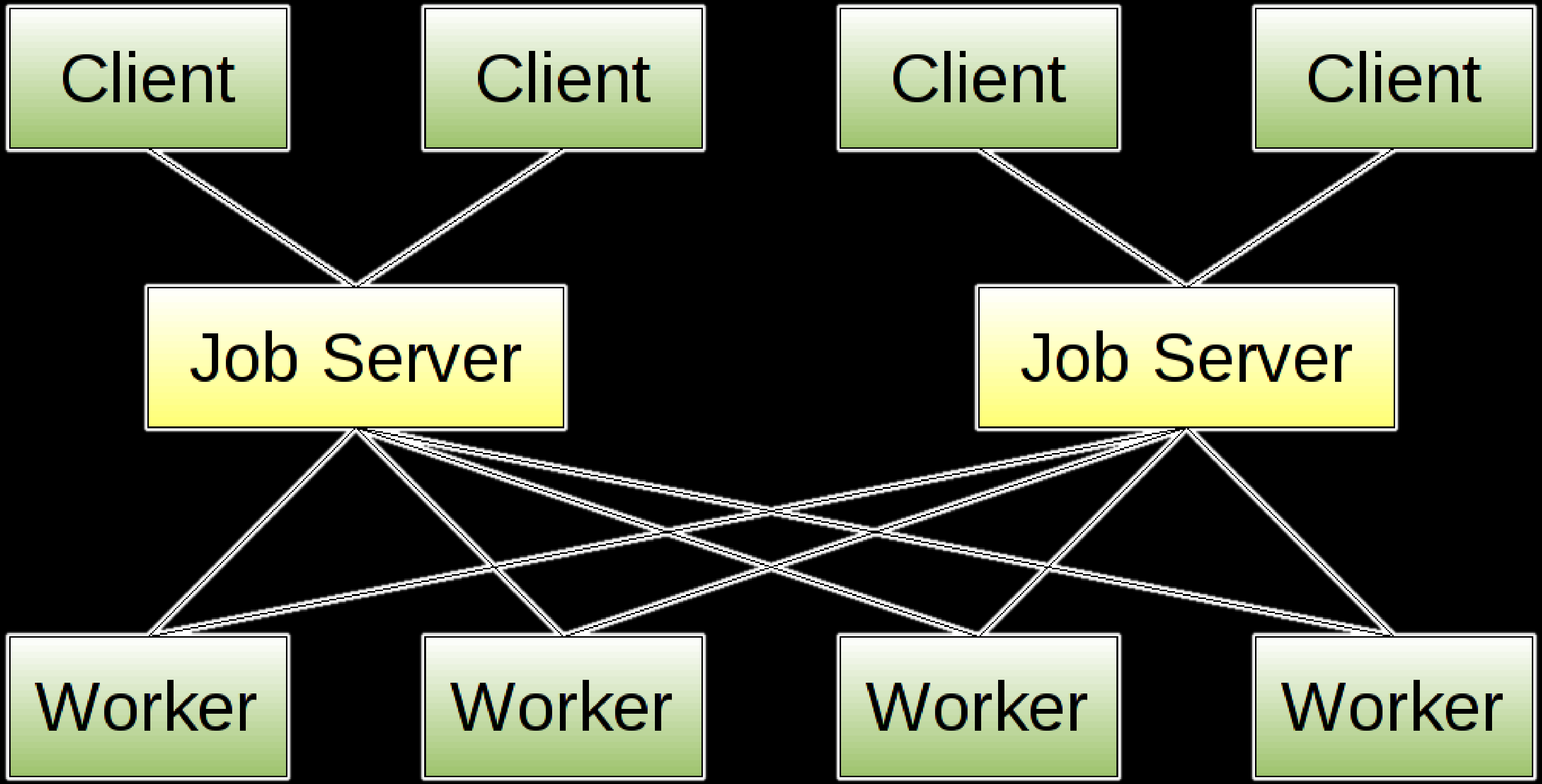
Basics

- Gearman provides a distributed application framework
- Uses TCP port 4730 (was port 7003)
- **Client** – Create jobs to be run and send them to a job server
- **Worker** – Register with a job server and grab jobs to run
- **Job Server** – Coordinate the assignment from clients to workers, handle restarts

Gearman Stack



No Single Point of Failure



Hello World

```
$client= new GearmanClient();
$client->addServer();
print $client->do("reverse", "Hello World!");
```

```
$worker= new GearmanWorker();
$worker->addServer();
$worker->addFunction("reverse", "my_reverse_function");
while ($worker->work());

function my_reverse_function($job)
{
  return strrev($job->workload());
}
```

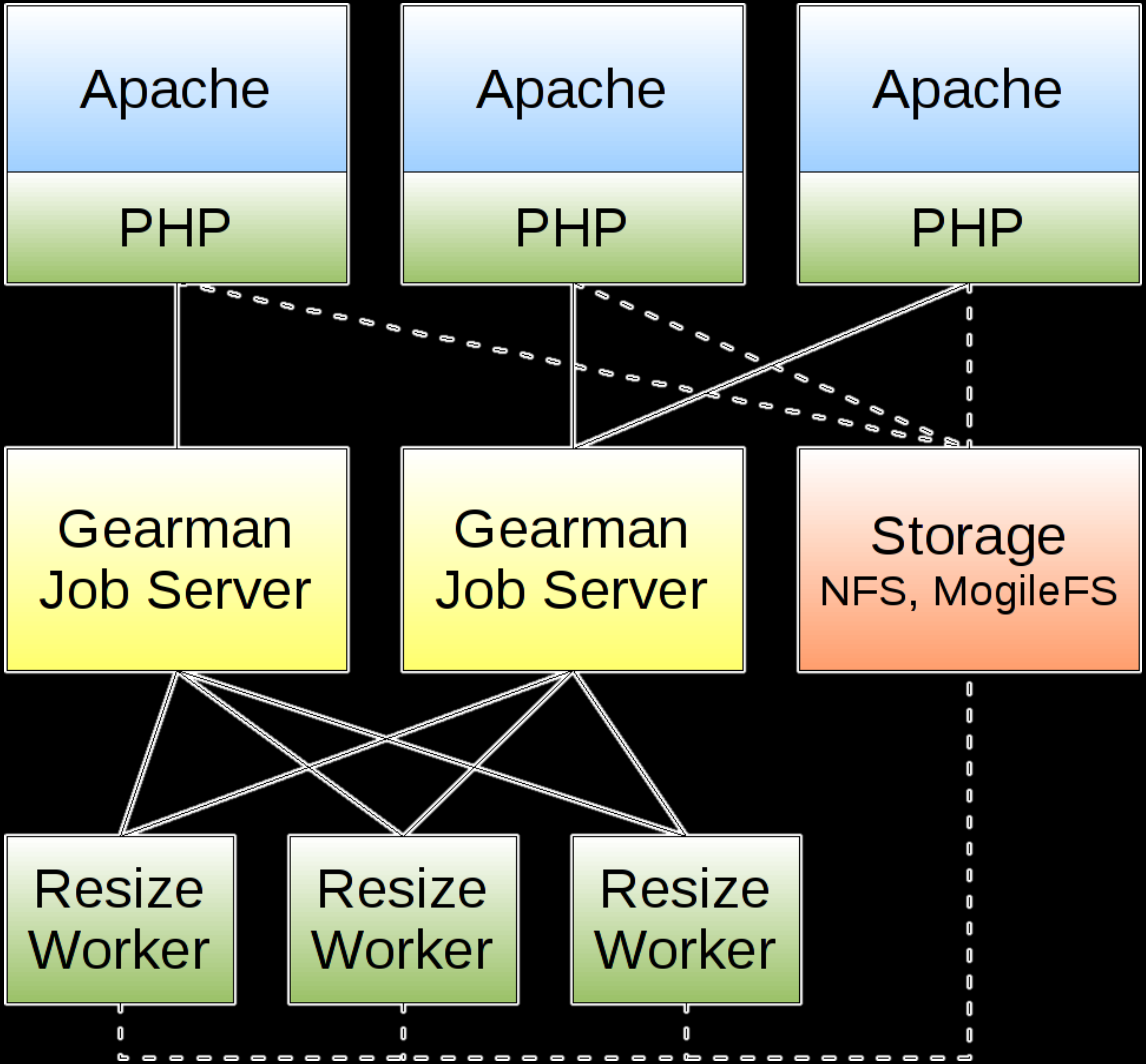
Hello World

```
shell$ gearmand -d

shell$ php worker.php &
[1] 17510

shell$ php client.php
!dlroW olleH
```

How Is This Useful?

- Provides a distributed nervous system
- Natural load balancing
  - Workers are notified and ask for work, not forced
- Multi-language integration
- Distribute processing
  - Possibly closer to data
- Synchronous and asynchronous queues

Back to the Kittens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Resize Worker

Image Resize Worker

```
$worker= new GearmanWorker();
$worker->addServer();
$worker->addFunction("resize", "my_resize_function");
while ($worker->work());

function my_resize_function($job)
{
  $thumb = new Imagick();
  $thumb->readImageBlob($job->workload());
  $thumb->scaleImage(200, 150);
  return $thumb->getImageBlob();
}
```

Image Resize Worker

```
shell$ gearmand -d

shell$ php resize.php &
[1] 17524

shell$ gearman -f resize < large.jpg > thumb.jpg

shell$ ls -sh large.jpg thumb.jpg
3.0M large.jpg   32K thumb.jpg
```

Command Line Tool

- gearman
  - Included in C server and library package
  - Command line and shell script interface
- Client mode
  - ls | gearman -f function
  - gearman -f function < file
  - gearman -f function "some data"
- Worker mode
  - gearman -w -f function -- wc -l
  - gearman -w -f function ./script.sh

Command Line Tool

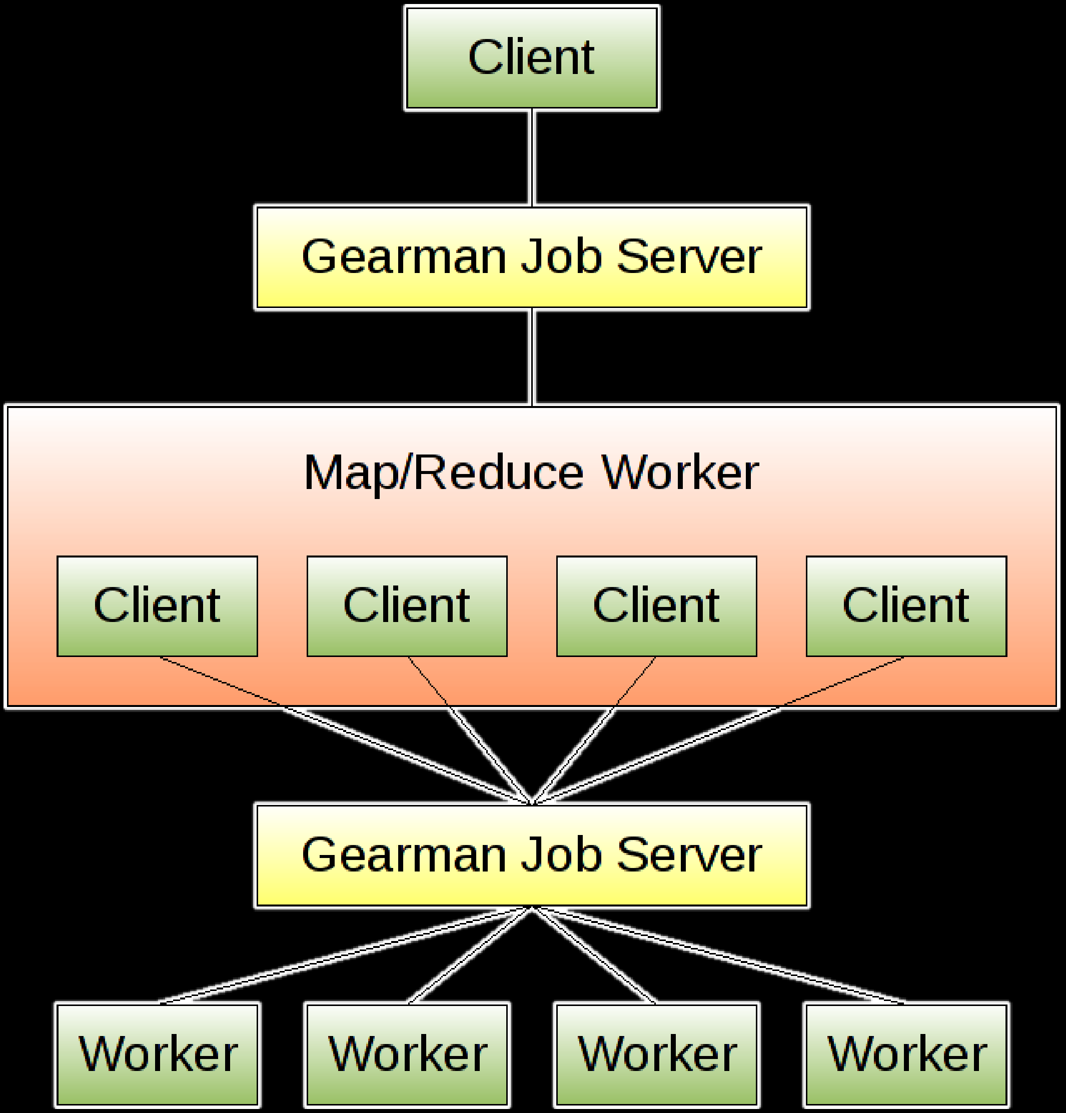
```
shell$ gearmand -d

shell$ gearman -w -f test -- grep lib &
[1] 17524

shell$ ls / | gearman -f test
lib
lib32
lib64
```

Applications

Map/Reduce


Client
Gearman Job Server
Map/Reduce Worker
Client
Client
Client
Client
Gearman Job Server
Worker
Worker
Worker
Worker

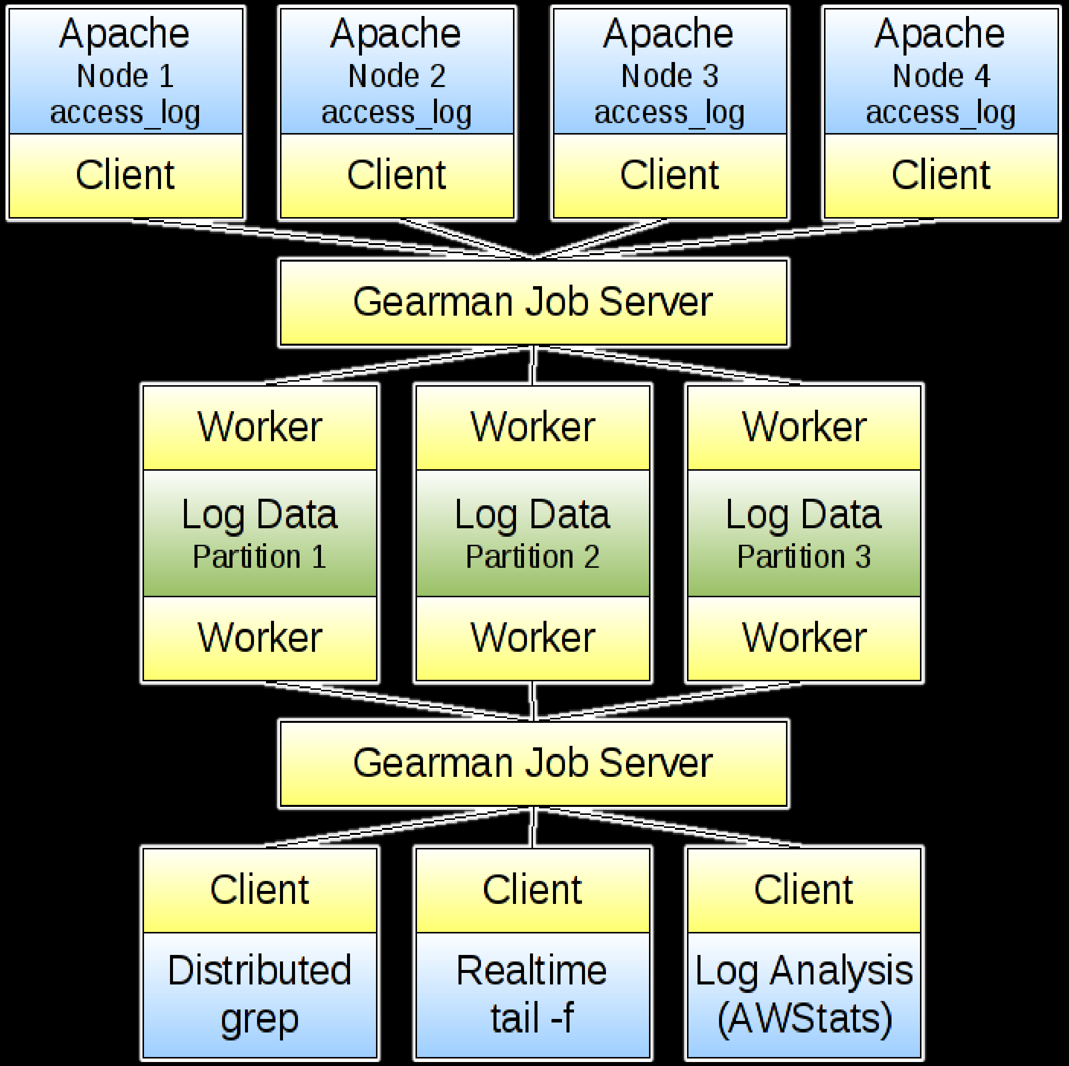
Log Processing

- Bring Map/Reduce to Apache logs
- Get log storage off Apache nodes
- Push processing to log storage nodes
- Combine data in some meaningful way
  - Summary
  - Distributed merge-sort algorithms

Log Processing

- Collection
  - tail -f access_log | gearman -n -f logger
  - CustomLog "| gearman -n -f logger" common
  - Write a Gearman Apache logging module
- Processing
  - Distributed/parallel grep
  - Log Analysis (AWStats, Webalizer, ...)
  - Custom data mining & click analysis

Log Processing



Asynchronous Queues

- Background Tasks
- They help you scale
- Distributed data storage
  - Eventually consistent data models
  - Choose “AP” in “CAP”
    - Consistency
    - Availability
    - Partitions (tolerance to network partitions)
  - Make eventual consistency work
  - Conflict resolution if needed

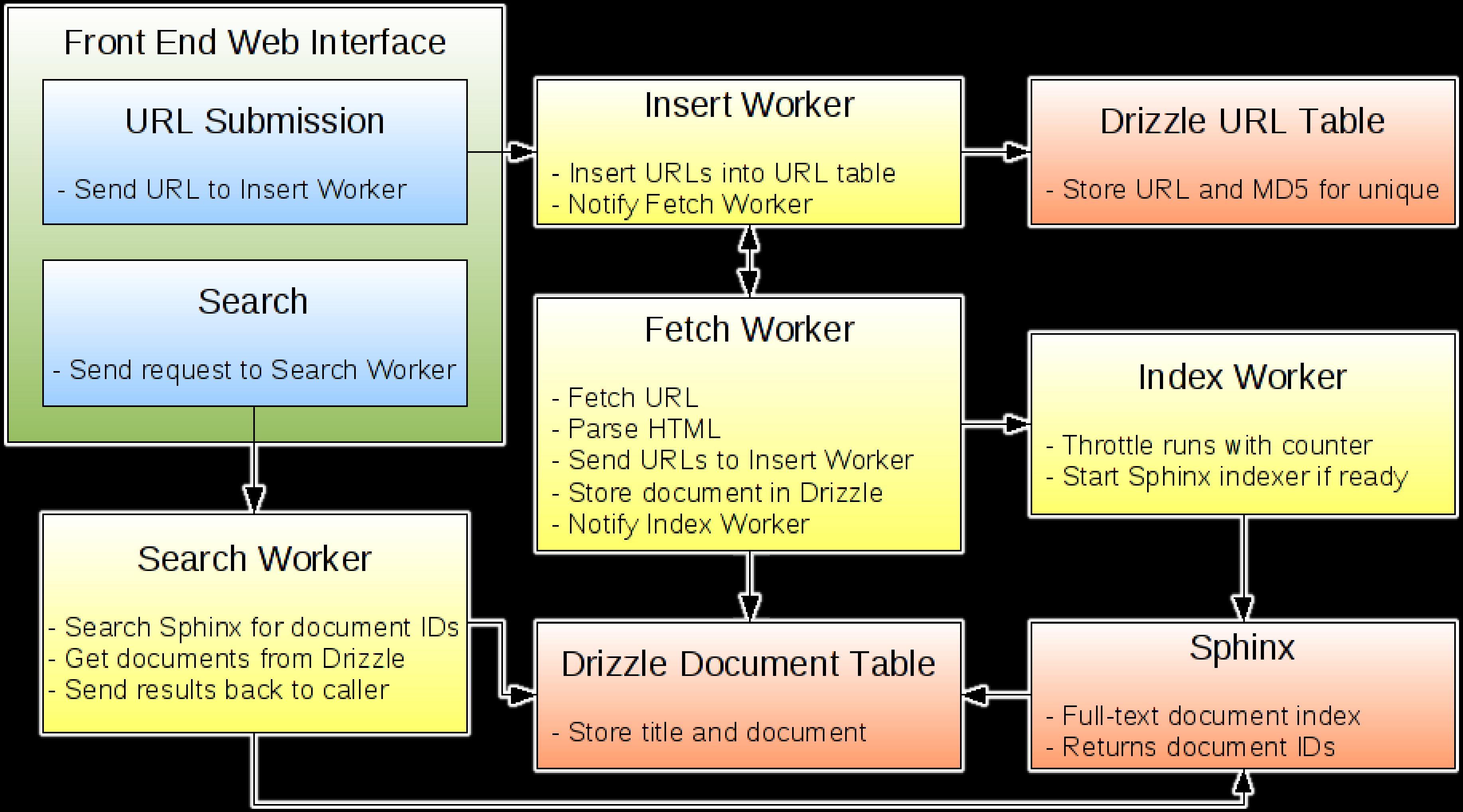
Asynchronous Queues

- Not everything needs immediate action
  - E-Mail notifications
  - Tweets
  - Certain types of database updates
  - RSS aggregation
  - Search indexing
- Allows for batch operations

Narada

- Example in Patrick Galbraith's book
- Custom search engine
- Perl, PHP, and Java implementations
- Asynchronous queues
- Drizzle or MySQL
- Optionally use memcached
- Easy to integrate into existing projects
- https://launchpad.net/narada

Narada



Front End Web Interface
URL Submission
- Send URL to Insert Worker
Search
- Send request to Search Worker
Insert Worker
- Insert URLs into URL table
- Notify Fetch Worker
Drizzle URL Table
- Store URL and MD5 for unique
Fetch Worker
- Fetch URL
- Parse HTML
- Send URLs to Insert Worker
- Store document in Drizzle
- Notify Index Worker
Index Worker
- Throttle runs with counter
- Start Sphinx indexer if ready
Search Worker
- Search Sphinx for document IDs
- Get documents from Drizzle
- Send results back to caller
Drizzle Document Table
- Store title and document
Sphinx
- Full-text document index
- Returns document IDs

Other Applications

- MogileFS
- Distributed e-mail storage
- Gearman Monitor Project
  - Configuration management (elastic)
  - Statistics gathering
  - Monitoring
  - Modular (integrate existing tools)
- What will you build?

What's Next?

- More protocol and ~~queue modules~~
- TLS, SASL, multi-tenancy
- Replication/subscription/job relay
- Job result cache (think memcached)
- Improved statistics gathering and reporting
- Event notification hooks
- Monitor service

Get involved

- http://gearman.org/
- #gearman on irc.freenode.net
- http://groups.google.com/group/gearman
- Gearman @ OSCON
  - Birds of a Feather (BoF) – Tonight @ 7PM
  - Expo Hall Booth