

Linux Users Group @ UT DALLAS

LEMP Stack

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What is a software stack

- Subsystems needed to make a complete platform
- Often consists of:
 - Operating System
 - Web Server or Middleware
 - Database
 - Programming Language or applications



Our LEMP Software Stack

- Linux — Operating System
- Nginx — Web Server
- MariaDB — Database
- PHP-FPM — Programming Language



Linux



Advantages of Linux?

Nginx



Web server

- HTTP requests
- Deliver web pages to clients
 - HTML, CSS, Javascript
- Receive content from clients
 - Interactive fields
 - Files

Reverse proxy

- Retrieves resources from other servers
 - Returns resources to clients
-
- Multiple servers on single LAN
 - Load Balancing

Static vs. Dynamic Content

Static

- Stored as individual files
- Served/Cached by web server
- Might be provided by a CDN (Content Distribution Network)

Dynamic

- Generated by Scripting Language
- May depend on external data

Apache is the most common web server

Netcraft statistics as of May 2014:

- Apache 38%
- Microsoft IIS 33%
- Nginx 15%

Apache

- Multi-processing modules (MPM)
 - mpm_prefork
 - mpm_worker
 - mpm_event
- Monolithic
- Executes dynamic content directly
- Per-directory configuration

Nginx

- Response to Apache's poor performance
- Designed for > 10,000 concurrent connections
 - Single-threaded server
 - Worker processes' threads for connections
- Additional modules requires recompilation
- Unified configuration

MariaDB



MariaDB

What is a database?

“An organized collection of data” -- Wikipedia

Why not use a text file?

Advantages of Database?

(and Database Management Systems)

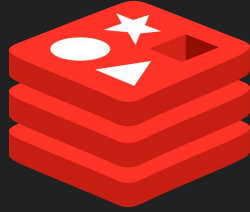
- Faster Access to data
 - Better Caching
 - Fast data structures (B-Trees)
 - Less locking
- Relational Model
- Transactions
- More efficient storage
 - Compression
 - Binary data
 - Less data duplication
- Atomic changes
- Consistency
- Isolation of data
- Durability of data
- Security
- Ordering
- Clustering
- Easier management



Database Engines

ORACLE®





redis



Non-Relational Databases (Specialized Databases)



mongoDB[®]

SQL - Standard Query Language

(for relational databases)

Database Structure

(SQL)

Databases - Collection of Tables

Tables - Structured collection of rows

Entries (rows) - Specific data

Four Row Operations

INSERT - add entries

SELECT - query entries

DELETE - delete entries

UPDATE - modify entries

Most common
database engine?



* Technically it is probably Oracle Database but that's not free

If MySQL is the most* common DB, why
are we using MariaDB?

MariaDB

Drop in replacement for MySQL

Faster

Open Source

More Features

More Choices

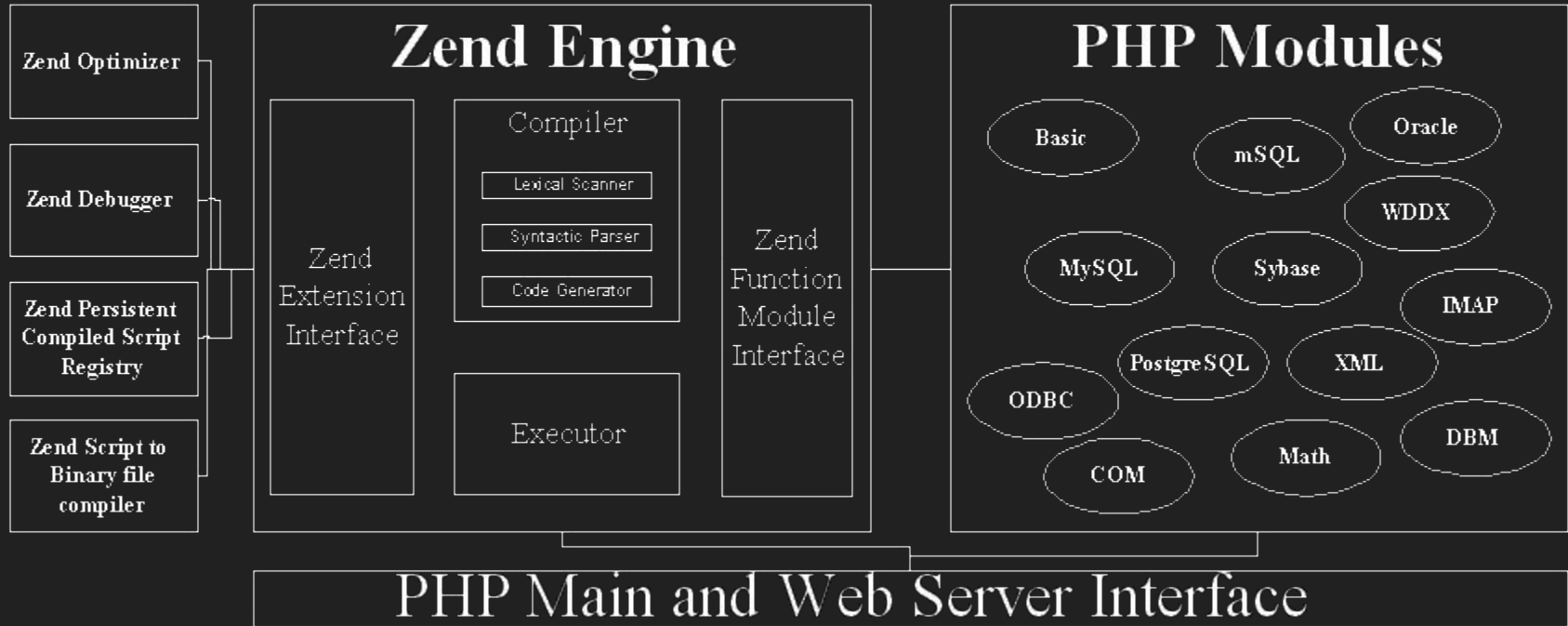
PHP-FPM



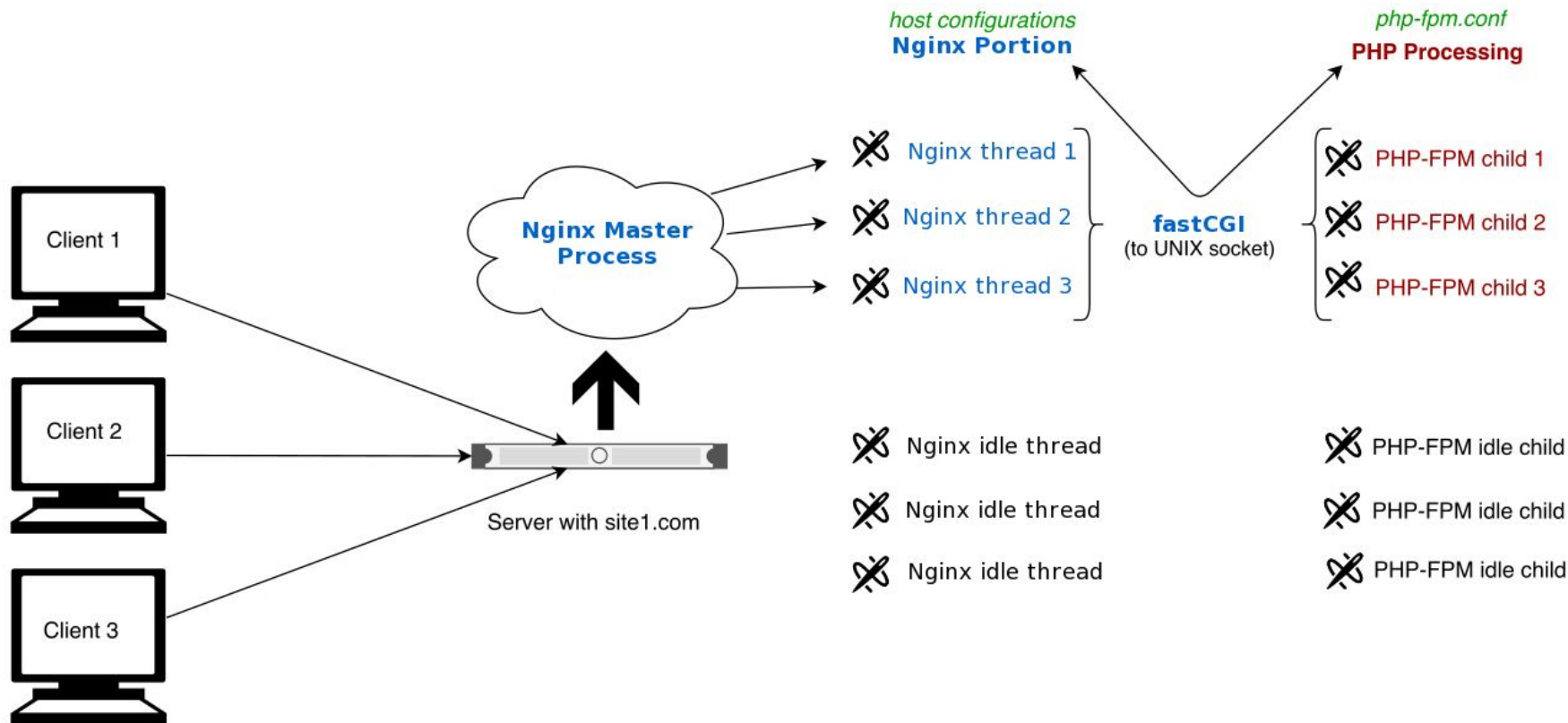
PHP-FPM

- PHP FastCGI Process Manager
- Maintains pools of PHP workers
- When work is received assign a worker
- Dynamically scales workers to load
- Collect logs in a centralized fashion

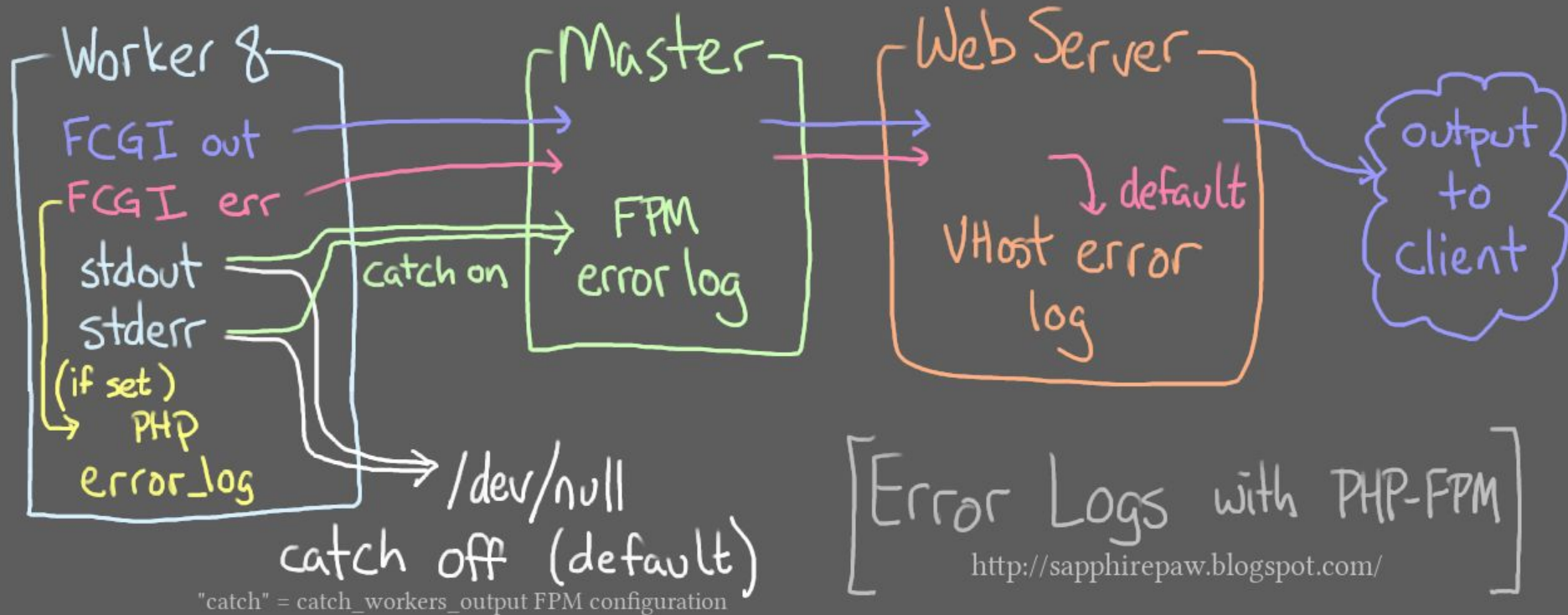
PHP Layout



Nginx and PHP-FPM



Log collection with PHP-FPM



Concerns about PHP

- Speed
- Security
 - No language boundaries -- Take data and dump it into HTML and JS tags
 - Insecure by default
 - Programmer responsible for sanitizing -- SQL Injection common
- Writeability
 - Very easy to write bad PHP
 - Inconsistent functions

PHP writability problem example

```
<?php @fopen('http://example.com/not-existing-file', 'r'); ?>
```

What will it do?

- If PHP was compiled with `--disable-url-fopen-wrapper`, it “won’t work”.
- If `allow_url_fopen` is disabled in `php.ini`, this still won’t work.
- Because of the `@`, the warning about the non-existent file won’t be printed.
- But it will be printed if `scream.enabled` is set in `php.ini`.
- Or if `scream.enabled` is set manually with `ini_set`.
- But not if the right `error_reporting` level isn’t set.
- If it *is* printed, exactly where it goes depends on `display_errors`, again in `php.ini`. Or `ini_set`.

Alternatives to PHP-FPM

- PHP-based
 - Apache's mod_php
 - Facebook's HHVM
- Python-based
 - Django
 - Pyramid
 - Gunicorn or UWSGI maintains pools
- Ruby on Rails
- C# and ASP.NET

Installation Demo