Linux Users Group @ UT DALLAS
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
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
Non-Relational Databases (Specialized Databases)
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
Nginx and PHP-FPM

host configurations
Nginx Portion

fastCGI (to UNIX socket)

php-fpm.conf
PHP Processing

Nginx thread 1
Nginx thread 2
Nginx thread 3

Nginx idle thread
Nginx idle thread
Nginx idle thread

PHP-FPM child 1
PHP-FPM child 2
PHP-FPM child 3

PHP-FPM idle child
PHP-FPM idle child
PHP-FPM idle child

Client 1
Client 2
Client 3
Log collection with PHP-FPM

http://sapphirepaw.blogspot.com/
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
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