A brief introduction to PHP and HTTPS in Apache

A practical approach in arch linux

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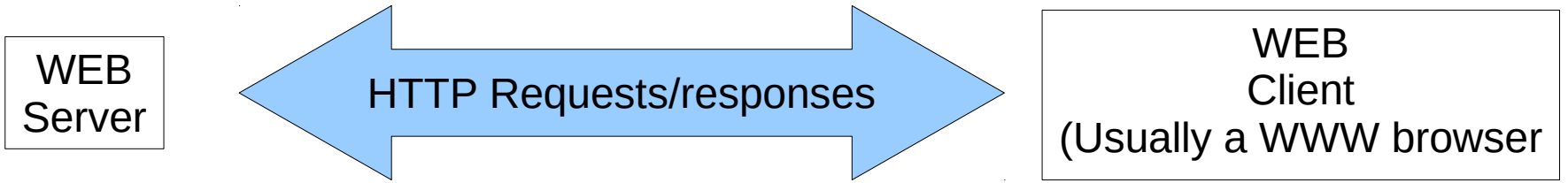
Agenda

- Introduction
- Installation
- HTTP 1.1 protocol inspection
- Apache configuration – Arch Linux
  - PHP
  - HTTPS
- Tests

Introduction

- WEB servers
  - Usually listens on port 80 (HTTP well-known-port)
  - Uses HTTP protocol
  - CLIENT/SERVER model



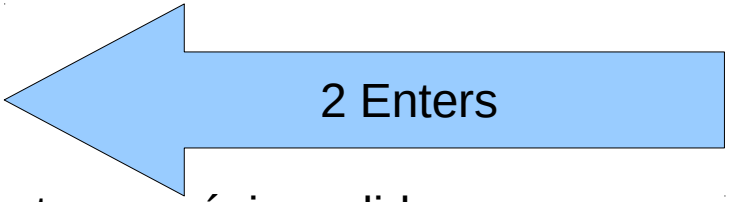
Installation

- `pacman -S apache`
- `systemctl start httpd`
- `systemctl status httpd`
  - Observe that it shows **`disabled`**. So enable it for this target:
- `systemctl enable httpd.service`

HTTP protocol Inspection

- Access some web server:

```
telnet hypnos 80
Trying 192.168.200.52...
Connected to hypnos.fatec.br.
Escape character is '^]'.
GET / HTTP/1.1
Host: hypnos
```



Resposta no próximo slide...

HTTP protocol Inspection

```
HTTP/1.1 200 OK

Date: Tue, 20 Nov 2012 17:28:06 GMT

Server: Apache/2.2.3 (CentOS)

Last-Modified: Wed, 15 Aug 2012 00:19:52 GMT

ETag: "1ed17b-547-e2b31a00"

Accept-Ranges: bytes

Content-Length: 1351

Content-Type: text/html; charset=ISO-8859-1


<HTML>

<HEAD>..
```

HTTP protocol Inspection

- “Emulate” a web server:
  - Run http-dump program:

```
scp aluno@MAQUINA-DO-PROFESSOR:http-dump .
```

Example: `scp aluno@192.168.80.45:/tmp/http-dump .`

```
./http-dump 9999
```

  - Open firefox and type the following URL:

```
http://localhost:9999/
```

HTTP protocol Inspection

- Observe the http-dump output:

```
Message received:

GET / HTTP/1.1

Host: localhost:9999

User-Agent: Mozilla/5.0 (X11; Linux i686; rv:15.0)
Gecko/20100101 Firefox/15.0.1

Accept:
text/html,application/xhtml+xml,application/xml;q=0.9,*/*;q=0.8

Accept-Language: en-us,en;q=0.5

Accept-Encoding: gzip, deflate

Connection: keep-alive

Cookie: org.cups.sid=04e22f9a096c8e9570427c2febd7a56f
```

Directories and files

- `/srv/http/` → document root
- `/etc/httpd/` → config directory
- `/etc/httpd/conf/httpd.conf` → main configuration file
- `/usr/lib/systemd/system/httpd.service` → httpd systemd unit

Initial test

- `echo '<html>Hi</html>' > /srv/http/index.html`
- `links http://localhost`

Apache configuration
A brief overview of file httpd.conf

- **ServerRoot "/usr"** -> install base dir (modules) - used when path names don't start with “/”. (See path examples with LoadModule)
- **PidFile run/httpd.pid** -> /var/run/httpd.pid (file that keeps the apache pid)
- **Timeout 300** -> timeout in seconds for idle connections to be terminated
- **KeepAlive On** -> allow HTTP/1.1 to use it's ability to make several requests using a sinlge connection
- **MaxKeepAliveRequests 100** -> maximun number of requests using a single connection
- **KeepAliveTimeout 15** -> timeout in seconds for idle connections to be terminated
- **Listen 80** -> server port to listen to connections

Apache configuration
A brief overview of file httpd.conf

- **Include *file*** -> include other configuration files
- **LoadModule** -> load a module
- **User apache** -> User owner of the apache process
- **Group apache** -> Group owner of the apache process
- **DocumentRoot "/srv/http"** -> directory to host resources (htmls, image files, etc..) to be returned to requesters
- **DirectoryIndex index.html index.html.var** -> default file to be returned when asked for a resource using only a dir name
- **AccessFileName .htaccess** -> per directory configuration - useful for authentication (but not so secure nowadays)

Apache useful commands

- `httpd -t - verify configuration files syntax`
- `httpd -S - test VirtualHost configuration`
- `apachectl stop`
- `apachectl start`
- `apachectl restart`
- `httpd -l - list available modules at server`
- `httpd -M - list loaded modules`
- `httpd -L - list directives and affected modules`

PHP - Installing

- `pacman -S php-apache`

PHP - Enabling

- nano /etc/httpd/conf/httpd.conf

```
#LoadModule  mpm_event_module  modules/mod_mpm_event.so

LoadModule  mpm_prefork_module  modules/mod_mpm_prefork.so

LoadModule  php7_module  modules/libphp7.so

...

DirectoryIndex index.html index.php

….

Include conf/extra/php7_module.conf
```

- systemctl restart httpd.service
- Create a php file to test: echo "<?php phpinfo(); ?>" > /srv/http/info.php
- Test: links http://localhost/info.php

HTTPS

- URL starting with "`https://`" uses SSL (Secure Sockets Layer) to secure communication between CLIENT and SERVER
- SSL runs in a separate layer under HTTP
- SSL is now known as TLS (Transport Layer Security) - **BUT IT'S STILL POPULAR KNOWN AS SSL**
  - SSL 1.0 → SSL 2.0 → SSL 3.0 → TLS 1.0 → TLS 1.1 → TLS 1.2 → TLS 1.3 (draft)

HTTPS

- Steps to use SSL + HTTP:
  1. Site owner generates PUBLIC and PRIVATE keys
  2. Site owner generates a Certificate Signing Request (CSR) - Contains PUBLIC KEY + COMPANY NAME
  3. Site owner sends the CSR to a Certificate Authority (CA) in order to be SIGNED
  4. CA returns a SIGNED CERTIFICATE which contains:
     - site PUBLIC KEY
     - site COMPANY NAME
     - CA “signature”

HTTPS

- Steps to use SSL + HTTP:
  - Real example at wiki.locaweb.com.br/pt-br/SSL

HTTPS

1) Generate private key using RSA parameters:

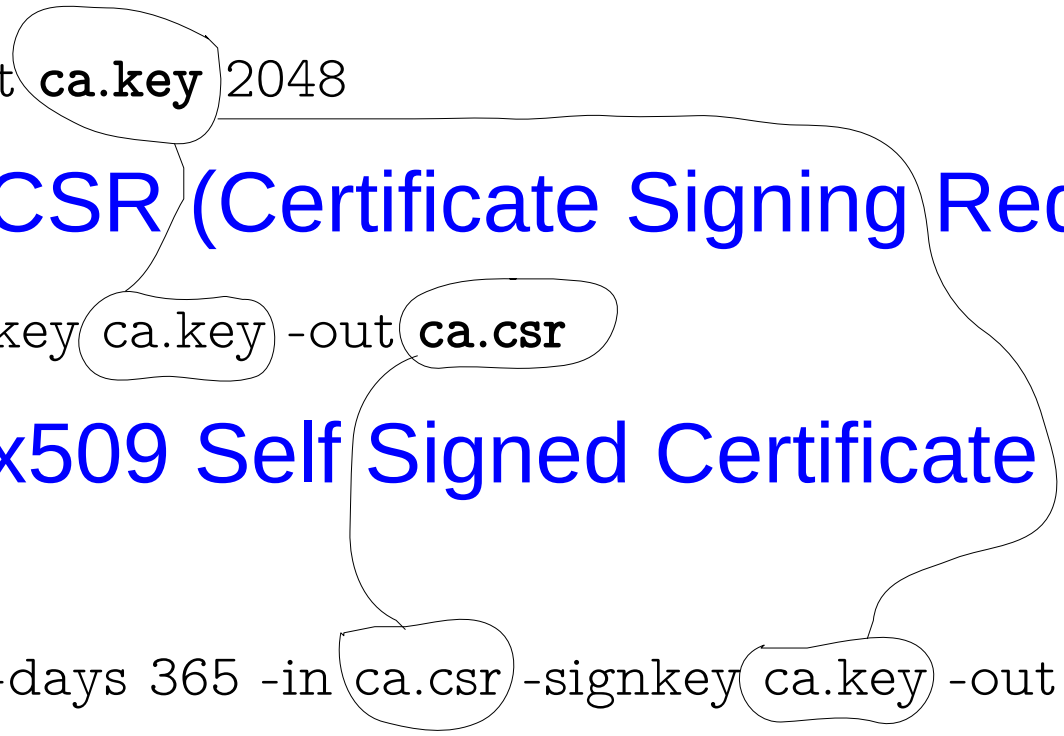
```
openssl genrsa -out ca.key 2048
```

2) Generate CSR (Certificate Signing Request)

```
openssl req -new -key ca.key -out ca.csr
```

3) Generate x509 Self Signed Certificate (valid for 365 days)

```
openssl x509 -req -days 365 -in ca.csr -signkey ca.key -out ca.crt
```



This step emulates a Certificate Authority (CA)

HTTPS

4) Copy files to locations described in extra/httpd-ssl.conf (next slide):

```
cp ca.crt /etc/httpd/conf/server.crt

cp ca.key /etc/httpd/conf/server.key
```

5) nano /etc/httpd/conf/httpd.conf: find and load the following modules:

```
ssl_module              # SSL MODULE. Modules are used by SSL:
log_config_module       # Flexible logging of clients
setenvif_module         # Set internal environment variable
socache_shmcb_module    # Shared object cache provider
```

(According to “Required modules:” in extra/httpd-ssl.conf)

HTTPS

6) Edit httpd.conf: uncomment line:

```
Include conf/extra/httpd-ssl.conf
```

7) Restart apache

```
systemctl restart httpd.service
```

8) Test: open a browser and type the url:

```
links https://localhost
```

More details:

www.openssl.org/docs/apps/x509.html, httpd.apache.org/docs/current/mod/{mod_log_config.html, mod_socache_shmcb.html, mod_setenvif_module, mod_ssl.html}

HTTPS

- Viewing certificates at Firefox version 44.0.2
  - Type at the URL field: `about:preferences#advanced`
    - View Certificates (Tab Servers or Authorities)
      - Authoritites
        - Select some certificate and click “View”
        - Select some certificate and click “Export” (use this file at the examples below - replace server.crt with the file you saved at this step)
- Viewing keys with openssl
  - `openssl rsa -in server.key -noout -text`
- Viewing certificates with openssl
  - `openssl x509 -in server.crt -noout -text`

HTTPS

- Calculating public key associated with a private key
  - `openssl rsa -in server.key -pubout`
- Saving public key associated with a private key
  - `openssl rsa -in server.key -pubout -out server.pub.key`

HTTPS only

- Previous configuration still allows http (port 80) connection
- To disable non-ssl connection comment line "`Listen 80`" on file `httpd.conf`