HS - February 2015

How to secure a web server
~~like a boss~~ “comme un patron”

par Martin Dubé

Tonight’s plan

- Security 5 Ws
- Scenario
- Strategy
  - Approach
  - Choosing an Operating System
  - Choosing a web server
  - Choosing a network topology
  - Choosing an architecture
- Implementation
- Test security of the solution (penetration test)

About me

- Daddy
- Hackfest admin since 2011
  - Worked hard on Hacking Games
  - All other kind of tasks
- Security Analyst at GoSecure
  - Penetration Testing
  - Systems Hardening
  - Firewall Management (Checkpoint & Fortinet)

[Security] What?

- From OSSTMM
  - “a form of protection where a separation is created between the assets and the threat.”
- Assets
  - The web application
  - The infrastructure around
- Threat
  - Outsiders (Those who access the web site)
  - Insiders (Those who manage the web site)

[Security] Who?

- Everyone.

- Example:
  - Should the developer put time on security?
  - Should the sysadmin put time on security?

[Security] Where?

- On all available layers

- Example:
  - Operating System (OS)?
  - Network?
  - Application vs Infrastructure
  - Client side?

[Security] When?

- Until it is considered enough
  - Depend on risk acceptance
  - Depend on budgets

- Depends on the criticality of the assets and interest for the threat
  - An extranet
  - A public web site
  - An internal web site
  - A VPN web portal

[Security] Why?

- Protect assets against Threats

[Security] How?

- The following shall give some ideas.

Scenario

- We are a system admin
- We need to integrate a web app in the infrastructure
  - It is extremely insecure (let’s say we know it)
  - It is extremely critical for the company
    - Do a shit load of things
    - Must work flawless

Scenario

- The need is clear. We know that:
  - The app is coded in PHP
  - The app must run shell commands (dafuq?)
  - The app must access several servers outside the network

Scenario

We won’t waste time on:

- Performance
  - Hardcore security sometimes means performance cost. Here we don’t care.
- Monitoring
  - This is essential for security but it would make a 5 hours presentation. :)

Strategy

Securing by component

- OS
- Web server
- PHP
- ~~Database~~
- ~~Application arch.~~
- ~~Application source~~

Strategy

For each component

- Ask about their communications (in / out)
- Ask about DIC
  - Authenticity
  - Integrity
  - Disponibility
- Implement relevant security mechanism
  - Fuck Security by Obscurity.
- Understand what the hell you do.

[Strategy] Choosing a secure OS

- We want an OS that
  - Offer multiple relevant security mechanism
  - Is supported by an active community
    - Quick security fix
  - Is well documented

[Strategy] Choice: OpenBSD

- Why?
  - Is secure by default
    - “Four years without a remote hole in the default install!”
  - Full of security mechanisms
    - Memory Protection (W^X, ProPolice, strlcpy/strlcat)
    - chroots (by default on some packages)
  - Privilege separation, by default (51 user, 39 for low priv.)
  - Powerful randomness (arc4random, libressl)
  - Regular source code audits (6 to 12 members security team)
  - Quick security updates
  - No damn /proc :)

[Strategy] Choice: OpenBSD

DEFAULT SECURITY	
feature	**OpenBSD**
Random Stack Gap	default
W^X (GOT, PLT, ctors, dtors, .rodata, atexit)	default
ASLR (PIE, mmap, malloc)	default
Stack Smashing Protection	default, system wide
StackGhost (sparc64)	default
NULL page mapping	default
strlcpy()/strlcat()	default
Randomness/arc4random()	default
swap encrypted	default
LibreSSL	default
Privilege separation	default
Securelevel	default 1
systrace	available
Jails	not implemented
Mandatory Acces Control framework	not implemented
pf version	lastest, default

Thanks to: http://networkfilter.blogspot.ca/2014/12/security-openbsd-vs-freebsd.html

[Strategy] Choice: OpenBSD

- Securelevel: 1 (default)
  - - /dev/mem and /dev/kmem may not be written to raw disk devices of mounted file systems are read-only
  - - system immutable and append-only file flags may not be removed
  - - kernel modules may not be loaded or unloaded
  - - a panic or trap cannot be forced

[Strategy] Choice: OpenBSD

- Securelevel 2: "Highly secure mode"
  - all effects of securelevel 1
  - raw disk devices are always read-only whether mounted or not
  - settimeofday(2) and clock_settime(2) may not set the time backwards or close to overflow
  - firewall and NAT rules may not be altered

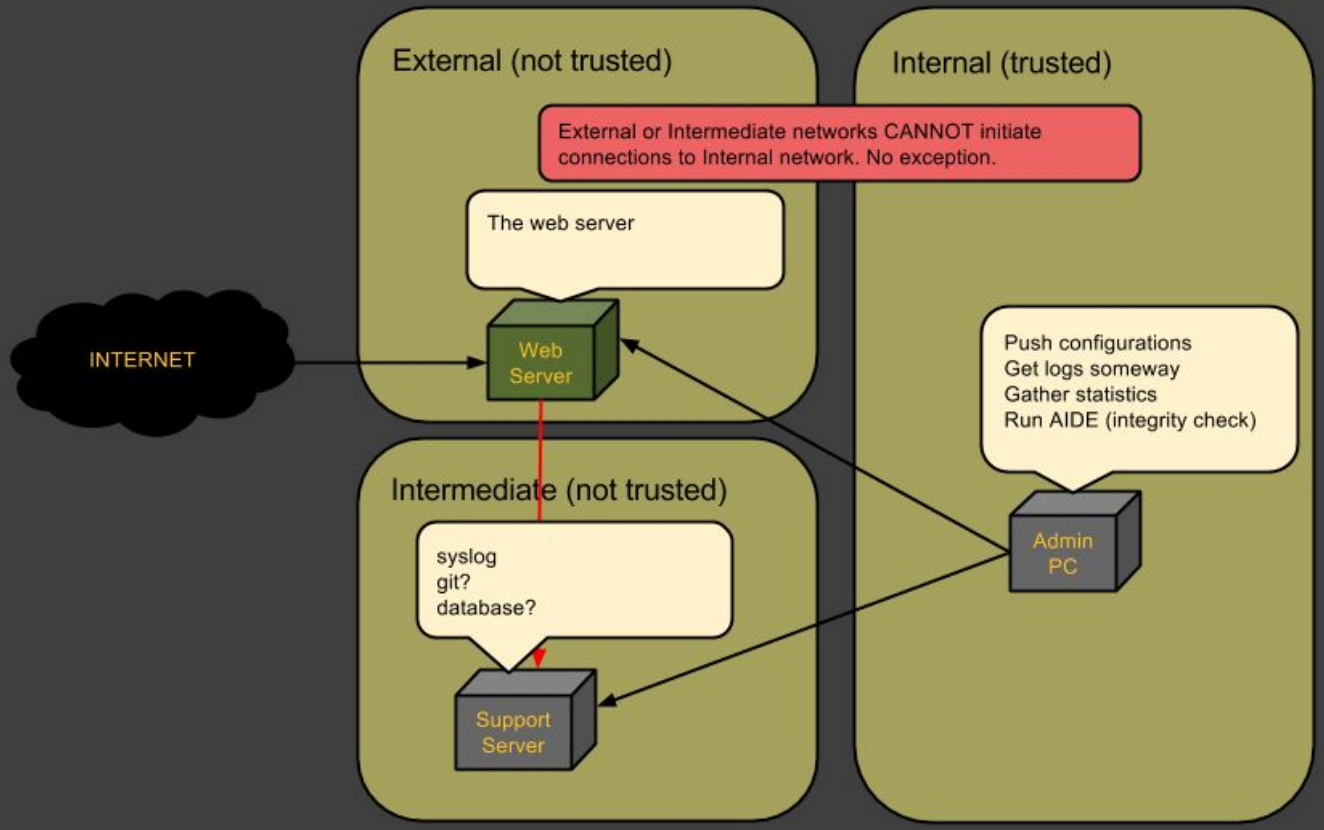
[Strategy] Choosing a web server

- Nginx vs Apache
- Both are mature and well documented
  - Nginx pros
    - Chrooted by default
    - Less vulnerabilities documented (8 on nginx vs 284 on apache @ cvedetails)
  - Apache pros
    - mod_security
    - .htaccess
- Understanding how to use it is what matter!

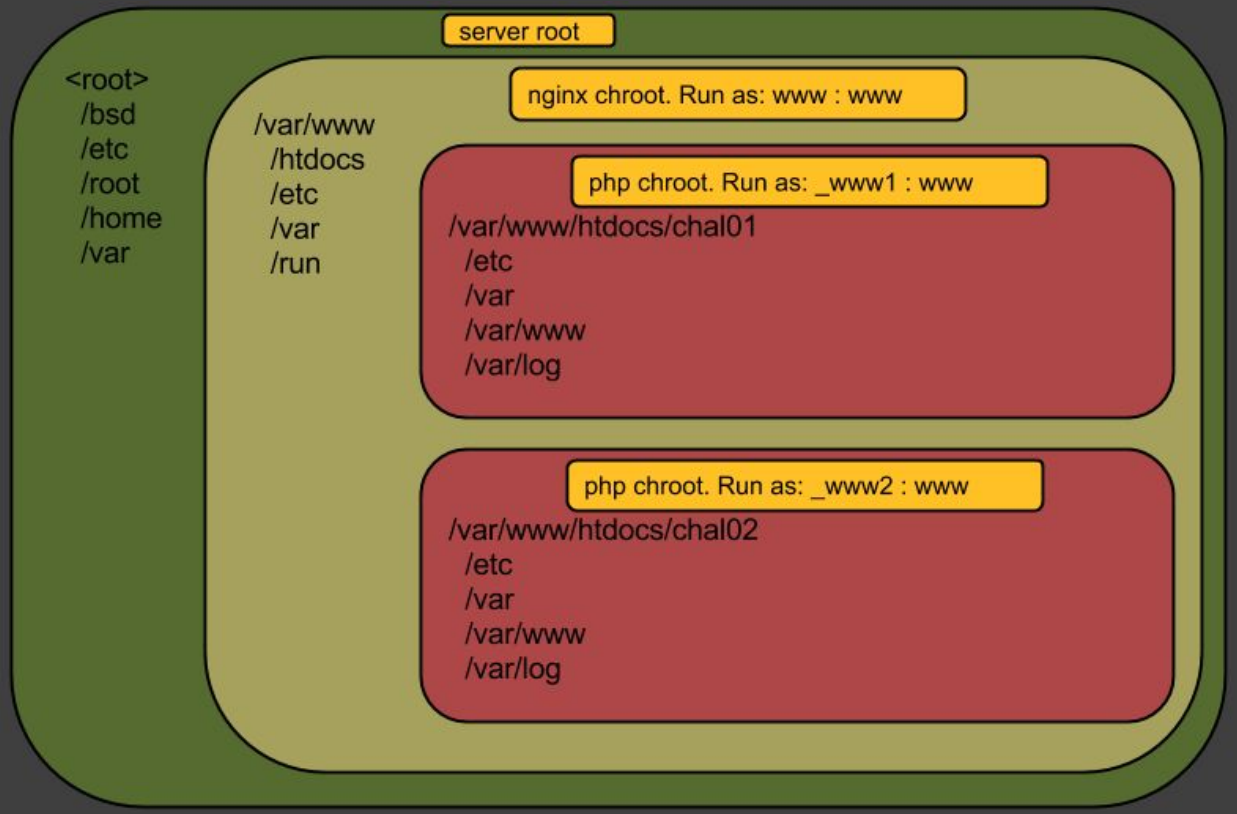
[Strategy] Choice: nginx

- Why?
  - For previously enumerated reasons.

[Strategy] Choosing a topology



[Strategy] Choosing an architecture



[Impl.] OS Installation

- Minimal Install. Enable only what's needed.

```
Set name(s)? (or 'abort' or 'done') [done] -game56.tgz
    [X] bsd            [X] etc56.tgz      [ ] xbase56.tgz    [ ] xserv56.tgz
    [X] bsd.rd         [X] comp56.tgz     [ ] xetc56.tgz
    [ ] bsd.mp         [X] man56.tgz      [ ] xshare56.tgz
    [X] base56.tgz     [ ] game56.tgz     [ ] xfont56.tgz
```

- During install
  - An admin user **can** be created
  - OpenSSH server **can** be installed
  - root login **can** be restricted on OpenSSH
  - A ntp server **can** be configured
- After install
  - Install your favourite tools

[Impl.] OS Hardening

- Filesystem integrity
  - Install, configure and run AIDE (Advanced Intrusion Detection Environment)

```
[WEB] root@obsdhs:~$ pkg_info -Q aide
aide-0.15.1
[WEB] root@obsdhs:~$ pkg_add aide
quirks-2.9 signed on 2014-07-31T22:37:55Z
aide-0.15.1: ok
[WEB] root@obsdhs:~$ vim /etc/aide.conf
[WEB] root@obsdhs:~$ aide --init

AIDE, version 0.15.1

### AIDE database at /var/db/aide.db.new initialized.
```

```
/usr/bin                R
/usr/include            R
/usr/lib                R
/usr/libdata            R
/usr/libexec            R
/usr/local/bin          R
/usr/local/etc          L+s+sha1
/usr/local/lib          R
/usr/local/libexec      R
/usr/local/sbin         R
/usr/local/share        R
/usr/sbin               R
/usr/share              R

=/tmp$                  L

# root related
# by mdube
/root$                  R

# Web related
# by mdube
/var/www/bin            R
/var/www/conf           R
/var/www/htdocs         R
/var/www/cgi-bin        R
```

[Impl.] OS Hardening

- Filesystem integrity
  - Don’t forget to download the file at a safe place!
  - Keep understanding what you are doing :)

```
#
# AIDE 0.10
#
# example configuration file
#
# IMPORTANT NOTE!! PLEASE READ
#
# This configuration file checks the integrity of the
# AIDE package.
#
# This file is not intended to be used as the primary aide.conf file for
# your system. This file is intended to be a showcase for different
# features for aide.conf file.
#
# WRITE YOUR OWN CONFIGURATION FILE AND UNDERSTAND WHAT YOU ARE WRITING
#
#
# Default values for the parameters are in comments before the
# corresponding line.
#
```

[Impl.] OS Hardening

- Filesystem integrity
  - To check for changes on the file system:
    - Upload latest baseline at /var/db/aide.db
    - aide --check
  - To update database with new files
    - aide --update

[Impl.] OS Hardening

- Password Policy

```
[WEB] root@obsdhs:/sbin$ pkg_add passwdqc
quirks-2.9 signed on 2014-07-31T22:37:55Z
passwdqc-1.3.0: ok
--- +passwdqc-1.3.0 -------------------
To enable passphrase quality checking using pwqcheck(1) globally, add
the following lines at the end the "default" class in login.conf(5).

        :passwordcheck=/usr/local/bin/pwqcheck -1:\
        :passwordtries=0:
```

[Impl.] OS Hardening

- Password Policy
  - Add these lines in /etc/login.conf

```
41 default:\
42     :path=/usr/bin /bin /usr/sbin /sbin /usr/X11R6/bin /usr/local/bin /usr/local/sbin:\
43     :umask=022:\
44     :datasize-max=512M:\
45     :datasize-cur=512M:\
46     :maxproc-max=256:\
47     :maxproc-cur=128:\
48     :openfiles-cur=512:\
49     :stacksize-cur=4M:\
50     :localcipher=blowfish,8:\
51     :ypcipher=old:\
52     :tc=auth-defaults:\
53     :tc=auth-ftp-defaults:\
54     :passwordcheck=/usr/local/bin/pwqcheck -1 config=/etc/passwdqc.conf:\
55     :passwordtries=0:
56
```

[Impl.] OS Hardening

- Password Policy
  - Configure policy in /etc/passwdqc.conf

```
#min=disabled,24,11,8,7
min=disabled,50,25,20,16
#max=40
max=128
passphrase=3
match=4
similar=deny
random=47
enforce=everyone
retry=3
```

[Impl.] OS Hardening

- Password Policy
  - Test the policy

```
[WEB] root@obsdhs:~$ echo "Abcd123!" | pwqcheck -1 config=/etc/passwdqc.conf
Bad passphrase (too short)
[WEB] root@obsdhs:~$ echo "Abcdefghijklm1234567!" | pwqcheck -1 config=/etc/passwdqc.conf
Bad passphrase (based on a common sequence of characters and not a passphrase)
[WEB] root@obsdhs:~$ echo "Abcde$fghijklm123!4567!" | pwqcheck -1 config=/etc/passwdqc.conf
Bad passphrase (too short)
[WEB] root@obsdhs:~$ echo "Abcde$fghijklM123!4567!" | pwqcheck -1 config=/etc/passwdqc.conf
Bad passphrase (too short)
[WEB] root@obsdhs:~$ echo "Ab3cde$fghijklM123!45a67!" | pwqcheck -1 config=/etc/passwdqc.conf
Bad passphrase (too short)
[WEB] root@obsdhs:~$ echo "Ab3cde$fghijklM123!45a67!f" | pwqcheck -1 config=/etc/passwdqc.conf
Bad passphrase (too short)
[WEB] root@obsdhs:~$ echo "$$Ab3c1de$fghijklM123!45a67!f" | pwqcheck -1 config=/etc/passwdqc.conf
OK
```

[Impl.] OS Hardening

- Server Management: OpenSSH
  - Server side consideration

```
PermitRootLogin no            # Avoid logging in as root
PasswordAuthentication no     # Force user to login with key
X11Forwarding no              # Avoid running GUI apps on the server from SSH
AllowTcpForwarding no         # Disable Forwarding

ChrootDirectory %h            # Chroot user in his home folder. Useful for files
                              # uploads on a web site.
```

  - Client side consideration
    - Create a strong key (-t rsa -b 4096)
    - Encrypt it with PKCS#8

[Impl.] OS Hardening

- Partitions security
  - Default partitions scheme

```
[WEB] root@obsdhs:~$ mount
/dev/wd0a on / type ffs (local)
/dev/wd0k on /home type ffs (local, nodev, nosuid)
/dev/wd0d on /tmp type ffs (local, nodev, nosuid)
/dev/wd0f on /usr type ffs (local, nodev)
/dev/wd0g on /usr/X11R6 type ffs (local, nodev)
/dev/wd0h on /usr/local type ffs (local, nodev)
/dev/wd0j on /usr/obj type ffs (local, nodev, nosuid)
/dev/wd0i on /usr/src type ffs (local, nodev, nosuid)
/dev/wd0e on /var type ffs (local, nodev, nosuid)
```

  - Other interesting options: noexec, rdonly

[Impl.] OS Hardening

- Logs export
  - Distributed setup
    - Authenticate and Encrypt communication with log server
    - http://cromwell-intl.com/cybersecurity/syslog-tls-cloud.html
  - Local setup
    - Just send logs on a remote server
    - Use a dedicated network

[Impl.] OS Hardening

- Logs export
  - Config on client
    - /etc/syslog.conf

```
# Logs to send to obsdlogs
*.*                     @obsdlogs
```

    - /etc/hosts

```
127.0.0.1       localhost
::1             localhost
192.168.56.3    obsdlogs
```

  - Config on server
    - /etc/syslog.conf

```
+obsdhs
#*.*                                    /var/log/obsdhs.log
*.notice;local7,auth,authpriv,cron,ftp,kern,lpr,mail,user.none   /var/log/obsdhs/messages
kern.debug;syslog,user.info                                      /var/log/obsdhs/messages
auth.info                                                        /var/log/obsdhs/authlog
authpriv.debug                                                   /var/log/obsdhs/secure
cron.info                                                        /var/log/obsdhs/cron
daemon.info                                                      /var/log/obsdhs/daemon
ftp.info                                                         /var/log/obsdhs/xferlog
lpr.debug                                                        /var/log/obsdhs/lpd-errs
mail.info                                                        /var/log/obsdhs/maillog
```

    - /etc/hosts

```
127.0.0.1       localhost
::1             localhost
192.168.56.2    obsdhs
```

    - /etc/rc.conf.local (*Note: -u flag is considered insecure.)*

```
ntpd_flags=
syslogd_flags="-u"
```

[Impl.] OS Hardening

- Firewall rules

```
# Block everything by default
block log all
block in quick from <abusive_ips>

# In: Web Access from management
pass in quick on $mgmt_int inet proto tcp from $mgmt_net to port $web_ports

# In: Public web access. Throttle web connections per second
#  Max number of connections per source: 100
#  Rate limit the number of connections to 15 in 5 second
pass in on $ext_int proto tcp to ($ext_int) port $web_ports flags S/SA keep state (max-src-conn 100, max-src-conn-rate 15/5, overload <abusive_ips> flush)

# In: SSH Access
pass in quick on $mgmt_int inet proto tcp from $mgmt_net to port ssh

# Out: Syslog push
pass out quick on $mgmt_int inet proto udp from ($mgmt_int) to $log_host port 514

# Out: Repo access for packages download to openbsd.cs.toronto.edu
pass out quick on $ext_int inet proto tcp from ($ext_int) to $repo_hosts port $web_ports
```

[Impl.] OS Hardening

- If SSH must be publicly accessible
  - Implement fail2ban with PF
  - http://www.bsdguides.org/2012/fail2ban-with-pf-on-openbsd-5-2/

[Impl.] Web server Installation

- Installation

```
[WEB] root@obsdhs:~$ pkg_add nginx-1.5.7p3
quirks-2.9 signed on 2014-07-31T22:37:55Z
nginx-1.5.7p3: ok
The following new rcscripts were installed: /etc/rc.d/enginx
See rc.d(8) for details.
Look in /usr/local/share/doc/pkg-readmes for extra documentation.
```

- Remove “nodev” flag from /var

```
[WEB] root@obsdhs:~$ vim /etc/fstab
[WEB] root@obsdhs:~$ reboot
```

```
1  58093c6b0d750e4b.b none swap sw
2  58093c6b0d750e4b.a / ffs rw 1 1
3  58093c6b0d750e4b.k /home ffs rw,nodev,nosuid 1 2
4  58093c6b0d750e4b.d /tmp ffs rw,nodev,nosuid 1 2
5  58093c6b0d750e4b.f /usr ffs rw,nodev 1 2
6  58093c6b0d750e4b.g /usr/X11R6 ffs rw,nodev 1 2
7  58093c6b0d750e4b.h /usr/local ffs rw,nodev 1 2
8  58093c6b0d750e4b.j /usr/obj ffs rw,nodev,nosuid 1 2
9  58093c6b0d750e4b.i /usr/src ffs rw,nodev,nosuid 1 2
10 58093c6b0d750e4b.e /var ffs rw,nosuid 1 2
```

[Impl.] Web server Hardening

- Remove default web site
  - /etc/nginx/nginx.conf
    - Delete: section http -> server
    - Add: include conf.d/*.conf;
- Configure logging

```
error_log   logs/error.log notice;
error_log   syslog:server=unix:/dev/log,facility=local7,tag=nginx,severity=error notice;
access_log          logs/access.log combined;
access_log          syslog:server=unix:/dev/log,facility=local7,tag=nginx,severity=info combined;
```

- Remove nginx version in errors

```
server_tokens  off;          # Disable emitting nginx version
```

[Impl.] Web server Hardening

- Set limits

```
worker_processes        1;      # Nb of CPU to use
worker_rlimit_nofile    1024;   # worker max number of opened files
events {
    worker_connections  50;     # Max number of simultaneous connections by worker
}
```

- Set more limits

```
# Size Limits & Buffer Overflows
client_body_buffer_size     1K;     # Default 8K or 16K
client_header_buffer_size   1k;     # Increase if large cookies
client_max_body_size        1k;     # Check content-length. if exceed: 413 Request Entity Too Large
large_client_header_buffers 2 1k;   # Max number and size of buffers.
```

[Impl.] Web server Hardening

- Set timeouts

```
# Timeouts
client_body_timeout   10;   # Default: 60. Set the read timeout for the request body
                            # Send a "Request timeout" (408) if exceeded
client_header_timeout 10;   # Default: 60. Set the read timeout for the request body
                            # Send a "Request timeout" (408) if exceeded
keepalive_timeout     5 5;  # Default: 75. For this time, a keep-alive client connection
                            # will stay open on the server side
send_timeout          10;   # Default: 60. Sets a timeout for transmitting a response to the
                            # client
```

[Impl.] Web server Hardening

- Set max simultaneous connections

```
# Control simultaneous connections
limit_conn_zone $binary_remote_addr zone=conn:5m;
# Then use "limit_conn conn <NUMBER OF CONN>;" in server section
```

- Set max concurrent connections

```
# Limit number of request
limit_req_zone $binary_remote_addr zone=req:10m rate=1r/s;
# Then use "limit_req zone=req burst=10 nodelay;" in server section
```

[Impl.] Web server Hardening

- Limit access to our domain(s)

```
# Allow access to domain names only
if ($host !~ ^(obsdhs|obsdhs.hf)$ ) {
    return 444;
}
```

- Limit Request Methods

```
# Only allow these request methods
if ($request_method !~ ^(GET|HEAD|POST)$ ) {
    return 404;
}
```

[Impl.] Web server Hardening

- Block Referrer (Spam)

```
# Deny certain Referers
if ( $http_referer ~* (babes|forsale|girl|jewelry|love|nudit|organic|poker|porn|sex|teen) ){
    # return 404;
    return 403;
}
```

- Block Image Hotlinking

```
# Stop deep linking or hot linking
location /images/ {
   valid_referers none blocked www.example1.com www.example2.com;
   if ($invalid_referer) {
      return 403;
   }
}
```

[Impl.] Web server Hardening

- Limit access to some folder/files by password

```
# Protect the admin section
# Set password with: htpasswd -c /var/www/conf/.htpasswd mdube
location ~ /admin/*|wp-admin* {
    auth_basic  "Restricted";
    auth_basic_user_file   /var/www/conf/.htpasswd;
}
```

- Limit access to some folder/files by IP

```
# Turn on stats
# Allow only from 1 IP.
location /status {
    stub_status on;
    access_log   off;
    allow 192.168.56.1/32;
    deny all;
}
```

[Impl.] Web server Hardening

- TLS

```
# Just an example of secure TLS implementation
server {
    listen       443;

    # Enable HSTS
    add_header Strict-Transport-Security "max-age=2678400; includeSubdomains;";

    ssl                  on;
    ssl_certificate      /etc/ssl/srv.https.scoreboard.crt;
    ssl_certificate_key  /etc/ssl/srv.https.scoreboard.key;

    ssl_session_timeout  5m;
    ssl_session_cache    shared:SSL:10m;

    ssl_protocols TLSv1 TLSv1.1 TLSv1.2;

    # Enable Perfect Forward Secrecy (PFS)
    ssl_ciphers "HIGH:!aNULL:!MD5 or HIGH:!aNULL:!MD5:!3DES";

    #ssl_prefer_server_ciphers   on;

}
```

[Impl.] Web server Hardening

- Secure logs

```
[WEB] root@obsdhs:/var/log/nginx$ ls -l
total 560
-rw-r--r--  1 root  wheel  182382 Feb 25 23:22 access.log
-rw-r--r--  1 root  wheel  101471 Feb 25 23:22 error.log
[WEB] root@obsdhs:/var/log/nginx$ chflags sappnd *
[WEB] root@obsdhs:/var/log/nginx$ echo "" > access.log
ksh: cannot create access.log: Operation not permitted
```

Remember what does Securelevel=1 ?

```
[WEB] root@obsdhs:/var/log/nginx$ chflags nosappnd *
chflags: access.log: Operation not permitted
chflags: error.log: Operation not permitted
```

[Impl.] PHP Installation

```
[WEB] root@obsdhs:~$ pkg_add php-fpm-5.5.14
quirks-2.9 signed on 2014-07-31T22:37:55Z
|No change in quirks-2.9Ambiguous: choose dependency for php-fpm-5.5.14:
 a       0: php-5.5.14p0
         1: php-5.5.14p0-ap2
Your choice: 0
php-fpm-5.5.14:libxml-2.9.1p1: ok
php-fpm-5.5.14:femail-0.98: ok
php-fpm-5.5.14:femail-chroot-0.98p2: ok
php-fpm-5.5.14:php-5.5.14p0: ok
php-fpm-5.5.14: ok
The following new rcscripts were installed: /etc/rc.d/php_fpm
See rc.d(8) for details.
Look in /usr/local/share/doc/pkg-readmes for extra documentation.
--- +php-5.5.14p0 -------------------
To enable the php-5.5 module please create a symbolic link from
/var/www/conf/modules.sample/php-5.5.conf to
/var/www/conf/modules/php.conf. As root:

    ln -sf /var/www/conf/modules.sample/php-5.5.conf /var/www/conf/modules/php.conf

The recommended php configuration has been installed to:
    /etc/php-5.5.ini.
```

[Impl.] PHP Hardening

- Remove default pool
  - /etc/php-fpm.conf
    - Comment section [www]
    - Add: include=/etc/fpm.d/*.conf
- Create and harden one php file per apps
  - php_value vs php_admin_value
    - The application cannot change its php.ini parameters with php_admin_value with ini_set()

[Impl.] PHP Hardening

- Harden unix socket security

```
[chal01]
listen = /var/www/htdocs/chal01/var/run/php-fpm.sock
listen.owner = _www1                    ; Unix socket owner
listen.group = www                      ; Unix socket group
listen.mode = 0660                      ; Unix socket permissions
listen.backlog = -1
```

[Impl.] PHP Hardening

- Harden process security

```
8  user = _www1                          ; Process uid
9  group = www                           ; Process gid
10 chroot = /var/www/htdocs/chal01       ; Process chroot
11 catch_workers_output = yes            ; Redirect worker stdout and stderr into main error log
```

- Harden memory management

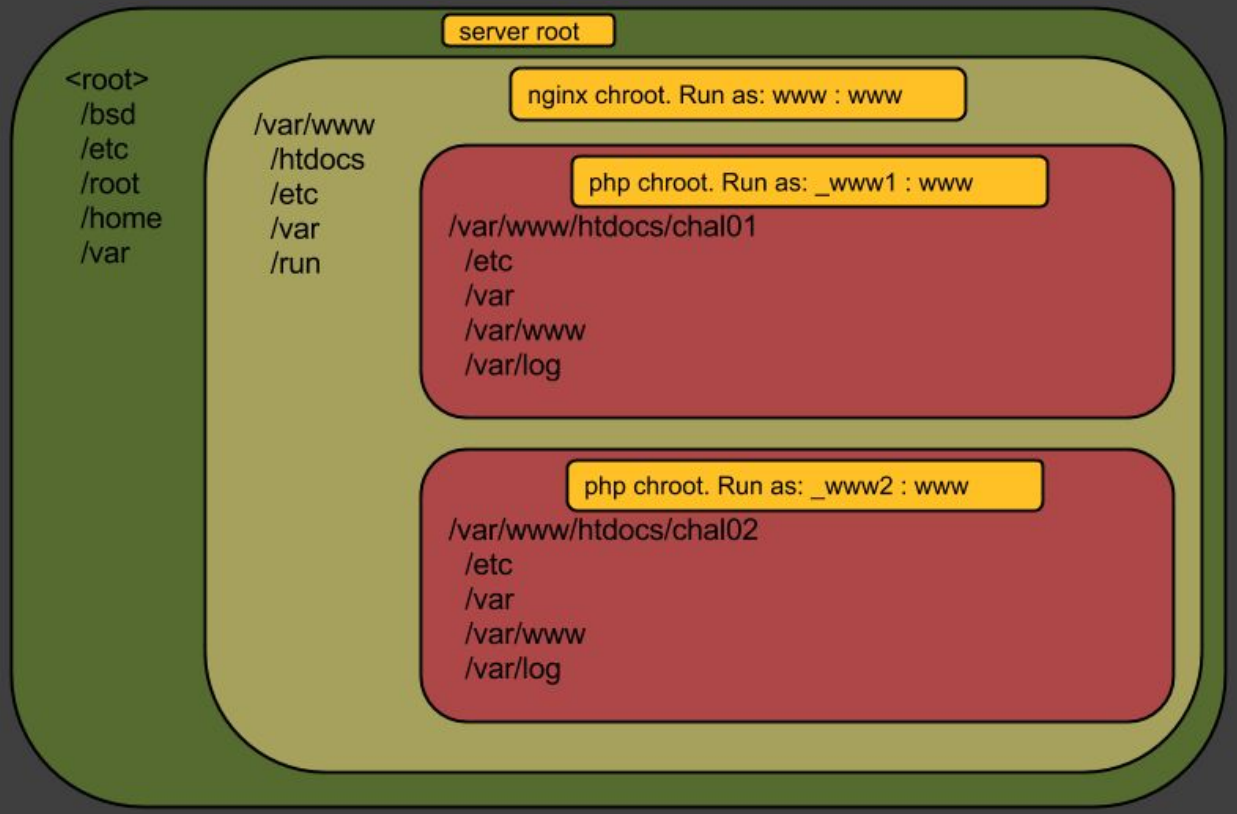
```
13 pm = dynamic                          ; Choose how the process manager will control child
14 pm.max_children = 10
15 pm.start_servers = 2
16 pm.min_spare_servers = 2
17 pm.max_spare_servers = 8
18 pm.status_path = /status
```

[Impl.] PHP Hardening

- PHP ini file

```
36 php_admin_value[error_log] = /var/log/php-chal01-error.log
37 php_admin_value[disable_functions] = dl,exec,passthru,shell_exec,system,proc_open,popen,curl_exec,curl_multi_exec,
38                                      parse_ini_file,show_source,include,include_once,require,require_once,file_get_contents,
39                                      readfile,fopen,fread,fwrite,fsockopen,socket_create,stream_socket_client,stream_socket_server
40 php_admin_value[max_execution_time] = 5 ; Maximum execution time of each script, in seconds
41 php_admin_value[max_input_time] = 60    ; Maximum amount of time each script may spend parsing request data
42 php_admin_value[memory_limit] = 8M      ; Maximum amount of memory a script may consume (8MB)
43 php_admin_value[post_max_size] = 1M     ; Maximum size of POST data that PHP will accept.
44 php_admin_value[file_uploads] = Off     ; Whether to allow HTTP file uploads.
45 php_admin_value[upload_max_filesize] = 1M   ; Maximum allowed size for uploaded files.
46 php_admin_value[display_errors] = Off       ; Do not expose PHP error messages to external users
47 php_admin_value[safe_mode] = On             ; Turn on safe mode
48 php_admin_value[safe_mode_exec_dir] = php-required-executables-path     ; Only allow access to executables in isolated directory
49 php_admin_value[safe_mode_allowed_env_vars] = PHP_      ; Limit external access to PHP environment
50 php_admin_value[expose_php] = Off        ; Restrict PHP information leakage
51 php_admin_value[log_errors] = On         ; Log all errors
52 php_admin_value[register_globals] = Off  ; Do not register globals for input data
53 php_admin_value[post_max_size] = 1K      ; Minimize allowable PHP post size
54 php_admin_value[cgi.force_redirect] = 0  ; Ensure PHP redirects appropriately
55 php_admin_value[sql.safe_mode] = On      ; Enable SQL safe mode
56 php_admin_value[allow_url_fopen] = Off   ; Avoid Opening remote files
57 php_admin_value[allow_url_include] = Off ; Avoid Opening remote files
58 php_admin_value[include_path] = .        ; Smallest path possible
```

[Impl.] Application Integration



[Impl.] File/Folder Security?

- Whereas php run as _www1:www and nginx run as www:www
  - Is this acceptable?
    - nop

```
drwxrwxrwx  2 _www1  www     512 Feb 24 20:43 .
-rw-rw-rw-  1 _www1  www  153307 Feb 24 20:15 index.php
-rw-rw-rw-  1 _www1  www      20 Feb 22 11:10 phpinfo.php
```

  - Is this enough?
    - nop

```
drwxr-x---  2 _www1  www     512 Feb 24 20:43 .
-rw-r-----  1 _www1  www  153307 Feb 24 20:15 index.php
-rw-r-----  1 _www1  www      20 Feb 22 11:10 phpinfo.php
```

  - Is this secure?
    - yes

```
drwxr-x---  2 root  www     512 Feb 24 20:43 .
-rw-r-----  1 root  www  153307 Feb 24 20:15 index.php
-rw-r-----  1 root  www      20 Feb 22 11:10 phpinfo.php
```

[Impl.] More Hardening

- User / Groups / Files security
  - Make /tmp be writable but not readable
    - chmod 730 tmp
  - Verify that php user (_www1) run as gid 67 (www)

```
[WEB] root@obsdhs:/var/www/htdocs$ ps -U _www1 -aux -o gid
USER       PID %CPU %MEM   VSZ   RSS TT  STAT  STARTED      TIME COMMAND            GID
_www1    25859  0.0  0.6 10064  6148 ??  S      7:27PM   0:00.14 php-fpm-5.5: poo    67
_www1    16018  0.0  0.6 10064  6144 ??  S      7:27PM   0:00.10 php-fpm-5.5: poo    67
_www1    13068  0.0  0.6 10064  6132 ??  S      7:28PM   0:00.11 php-fpm-5.5: poo    67
```

[Impl.] Still need more?

- systrace demo

```
$ systrace -i -A -d /etc/systrace -E /var/log/systrace.log /bin/ksh
$ ls -l
total 3580
-r-xrwx---  1 0  67  111824 Feb 26 02:03 cat
-r-xrwx---  1 0  67   11352 Feb 26 02:09 id
-r-xrwx---  1 0  67  443600 Feb 26 01:53 ksh
-r-xrwx---  1 0  67  246992 Feb 26 02:03 ls
-r-xrwx---  1 0  67  443600 Feb 26 01:53 sh
-r-xrwx---  1 0  67    8544 Feb 26 01:55 sh_systrace
-r-xrwx---  1 0  67    8544 Feb 26 01:58 sh_systraceA
-r-xrwx---  1 0  67  427216 Feb 26 01:53 systrace
$ ^D
$ systrace -i -a -d /etc/systrace -E /var/log/systrace.log /bin/ksh
$ ls
/bin/ksh: ls: Operation not permitted
$ ls -l
total 3580
-r-xrwx---  1 0  67  111824 Feb 26 02:03 cat
-r-xrwx---  1 0  67   11352 Feb 26 02:09 id
-r-xrwx---  1 0  67  443600 Feb 26 01:53 ksh
-r-xrwx---  1 0  67  246992 Feb 26 02:03 ls
-r-xrwx---  1 0  67  443600 Feb 26 01:53 sh
-r-xrwx---  1 0  67    8544 Feb 26 01:55 sh_systrace
-r-xrwx---  1 0  67    8544 Feb 26 01:58 sh_systraceA
-r-xrwx---  1 0  67  427216 Feb 26 01:53 systrace
```

Step 1: Create policy

Step 2: Apply policy

Step 3: Test policy
"ls" : Fail
"ls -l" : Success

[Impl.] Still need more?

- systrace logs!

```
systrace: deny user: unknown(2001), prog: /bin/ksh, pid: 14714(0)[26867], policy: /bin/ksh, filters: 52, syscall: nativ
e-execve(59), filename: /bin/ls, argv: ls
```

Pentest Time!

- Challenge #1
  - Find the flag file and read its content
- Challenge #2
  - Exploit an eval()
- URL: http://192.168.1.103/

Thanks!

References

- http://www.tldp.org/HOWTO/Chroot-BIND-HOWTO-2.html
- http://www.cyberciti.biz/tips/linux-unix-bsd-nginx-webserver-security.html
- http://cromwell-intl.com/cybersecurity/syslog-tls-cloud.html
- http://networkfilter.blogspot.ca/2014/12/security-openbsd-vs-freebsd.html
- http://www.cyberciti.biz/tips/php-security-best-practices-tutorial.html
- http://martin.kleppmann.com/2013/05/24/improving-security-of-ssh-private-keys.html
- http://www.openbsd.org/faq/pf/config.html