

Computer Systems Security

exercises

Henrik Lund Kramshoej
hlk@zencurity.com

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Preface

This material is prepared for use in *Computer Systems Security workshop* and was prepared by Henrik Lund Kramshøj, <http://www.zencurity.com> . It describes the networking setup and applications for trainings and workshops where hands-on exercises are needed.

Further a presentation is used which is available as PDF from [kramse@Github](https://github.com/kramse/kramse-labs)
Look for `system-security-exercises` in the repo `security-courses`.

These exercises are expected to be performed in a training setting with network connected systems. The exercises use a number of tools which can be copied and reused after training. A lot is described about setting up your workstation in the repo

<https://github.com/kramse/kramse-labs>

Prerequisites

This material expect that participants have a working knowledge of TCP/IP from a user perspective. Basic concepts such as web site addresses and email should be known as well as IP-addresses and common protocols like DHCP.

Have fun and learn

Exercise content

Most exercises follow the same procedure and has the following content:

- **Objective:** What is the exercise about, the objective
- **Purpose:** What is to be the expected outcome and goal of doing this exercise
- **Suggested method:** suggest a way to get started
- **Hints:** one or more hints and tips or even description how to do the actual exercises
- **Solution:** one possible solution is specified
- **Discussion:** Further things to note about the exercises, things to remember and discuss

Please note that the method and contents are similar to real life scenarios and does not detail every step of doing the exercises. Entering commands directly from a book only teaches typing, while the exercises are designed to help you become able to learn and actually research solutions.

Exercise 1

Download Kali Linux Revealed (KLR) Book 10 min



Kali Linux Revealed Mastering the Penetration Testing Distribution

Objective:

We need a Kali Linux for running tools during the course. This is open source, and the developers have released a whole book about running Kali Linux.

This is named Kali Linux Revealed (KLR)

Purpose:

We need to install Kali Linux in a few moments, so better have the instructions ready.

Suggested method:

Create folders for educational materials. Go to <https://www.kali.org/download-kali-linux-revealed-book/> Read and follow the instructions for downloading the book.

Solution:

When you have a directory structure for download for this course, and the book KLR in PDF you are done.

Discussion:

Linux is free and everywhere. The tools we will run in this course are made for Unix, so they run great on Linux.

Kali Linux is a free pentesting platform, and probably worth more than \$10.000

The book KLR is free, but you can buy/donate, and I recommend it.

Exercise 2

Check your Kali VM, run Kali Linux 30 min



Objective:

Make sure your virtual machine is in working order.

We need a Kali Linux for running tools during the course.

Purpose:

If your VM is not installed and updated we will run into trouble later.

Suggested method:

Go to <https://github.com/kramse/kramse-labs/>

Read the instructions for the setup of a Kali VM.

Hints:

If you allocate enough memory and disk you won't have problems.

Solution:

When you have a updated virtualisation software and Kali Linux, then we are good.

Discussion:

Linux is free and everywhere. The tools we will run in this course are made for Unix, so they run great on Linux.

Kali Linux includes many hacker tools and should be known by anyone working in infosec.

Exercise 3

Check your Debian VM 10 min



Objective:

Make sure your virtual Debian 9 machine is in working order.

We need a Debian 9 Linux for running a few extra tools during the course.

This is a bonus exercise - one is needed per team that want to try these tools. Tools which need Debian are Zeek and Suricata.

Purpose:

If your VM is not installed and updated we will run into trouble later.

Suggested method:

Go to <https://github.com/kramse/kramse-labs/>

Read the instructions for the setup of a Kali VM.

Hints:

Solution:

When you have a updated virtualisation software and Kali Linux, then we are good.

Discussion:

Linux is free and everywhere. The tools we will run in this course are made for Unix, so they run great on Linux.

Exercise 4

Risk Assessment 101

In quantitative risk assessment an annualized loss expectancy (ALE) may be used to justify the cost of implementing countermeasures to protect an asset. This may be calculated by multiplying the single loss expectancy (SLE), which is the loss of value based on a single security incident, with the annualized rate of occurrence (ARO), which is an estimate of how often a threat would be successful in exploiting a vulnerability.

Quote from https://en.wikipedia.org/wiki/Risk_assessment

Objective:

Do calculations to understand risk assessment better

Purpose:

Suggested method:

Hints:

Solution:

Discussion:

What we have done here is Quantitative Risk Assessment.

Other risk analysis methods exist, qualitative risk analysis - used when it is difficult to put amount

Exercise 5

Run Armitage - Hail Mary

Objective:

Try hacking using a graphical program, see how quick and easy it can be.

Purpose:

Show that when a vulnerability exist attacks can be quick and easy.

Suggested method:

1. Boot up Kali Linux
2. Boot up Metasploitable - from ISO
3. Run Armitage Hail-Mary against Metasploitable
4. Note which succeeded, describe those attacks that succeeded in relation to MITRE ATT&CK framework

Hints:

Solution:

Discussion:

Exercise 6

SELinux Introduction

Objective:

Purpose:

Suggested method:

Try enabling and disabling the policies

Hints:

Solution:

Discussion:

Exercise 7

Example AUPs

Objective:

See real world high level policies

Purpose:

Suggested method:

Find your AUP for the ISPs we use, you use, your company uses

Hints:

Solution:

Discussion:

Exercise 8

Database Security

Objective:

Purpose:

Suggested method:

Hints:

Solution:

Discussion:

Databases - discussion about Relational Database Management System RDBMS Model and NoSQL

Exercise 9

SYN flooding 101

Objective:

Purpose:

Suggested method:

Hints:

Solution:

Discussion:

Exercise 10

Medical Security Policies

Objective:

Purpose:

Suggested method:

Find example medical security policies

Fitbit

Hints:

Solution:

Discussion:

Exercise 11

Perform privilege escalation using files

Objective:

Perform a simple privilege escalation attack

Purpose:

Suggested method:

1. Make a non-privileged user
2. make a system directory writable
3. create root cronjob without path
4. Insert a malicious script as one of the commands from the root cron job

Hints:

A cron job runs scheduled commands. They usually perform cleanup functions, removing old files, doing a backup or similar

Solution:

Discussion:

This was chosen as I found a similar vulnerability in a professional product, in 2019

Exercise 12

Anti-virus and "endpoint security"

Objective:

Discuss when to use Anti-virus and "endpoint security"

Purpose:

Suggested method:

Hints:

Solution:

Discussion:

Exercise 13

SSL/TLS scanners 15 min

Objective:

Try the Online Qualys SSLabs scanner <https://www.ssllabs.com/> Try the command line tool sslscan checking servers - can check both HTTPS and non-HTTPS protocols!

Purpose:

Learn how to efficiently check TLS settings on remote services.

Suggested method:

Run the tool against a couple of sites of your choice.

```
root@kali:~# sslscan --ssl2 web.kramse.dk
Version: 1.10.5-static
OpenSSL 1.0.2e-dev xx XXX xxxx

Testing SSL server web.kramse.dk on port 443
...
  SSL Certificate:
Signature Algorithm: sha256WithRSAEncryption
RSA Key Strength:    2048

Subject: *.kramse.dk
AltNames: DNS:*.kramse.dk, DNS:kramse.dk
Issuer:  AlphaSSL CA - SHA256 - G2
```

Also run it without --ssl2 and against SMTPTLS if possible.

Hints:

Originally sslscan is from <http://www.titania.co.uk> but use the version on Kali, install with apt if not installed.

Solution:

When you can run and understand what the tool does, you are done.

Discussion:

SSLscan can check your own sites, while Qualys SSLabs only can test from hostname

Exercise 14

Nmap Ikescan IPsec

Objective:

Try Nmap and Ikescan

Purpose:

Suggested method:

Hints:

Solution:

Discussion:

Exercise 15

SSH scanners

Objective:

Try ssh scanners, similar to sslscan and Nmap sshscan

Purpose:

Suggested method:

Hints:

Solution:

Discussion:

Exercise 16

Password Cracking

Objective:

Crack your own passwords **Purpose:**

Suggested method:

Hints:

Solution:

Discussion:

Exercise 17

Email Security 2019

Objective:

Purpose:

DNSSEC, SPF, DMARC - DNS based updates to your email domain security

Suggested method:

Hints:

Solution:

Discussion:

Exercise 18

VM escapes

Objective:

Purpose:

Research VM escapes

Suggested method:

Hints:

Solution:

Discussion:

Exercise 19

Centralized syslog

Objective:

Centralized syslogging and example system

Purpose:

Suggested method:

Hints:

Solution:

Discussion:

Exercise 20

File System Forensics

Objective:

Open a file system dump **Purpose:**

Suggested method:

Hints:

Solution:

Discussion:

Exercise 21

Clean or rebuild a server

Objective:

Purpose:

Suggested method:

Hints:

Solution:

Discussion:

Exercise 22

Cloud environments influence on incident response

Objective:

Purpose:

Suggested method:

Hints:

Solution:

Discussion:

Exercise 23

System Security in Practice

Objective:

Purpose:

Suggested method:

- Work on our model network, each team has a router and an attacker - prevent most of the attacks on the Metasploitable server by firewall configuration
- Investigate Debian as a server - default settings for Web, we will install a system which requires database and web server configured
- Configure SSH keys

Hints:

Solution:

Discussion:

Exercise 24

Evaluate our network PCI

Objective:

Evaluate our network, quick gap analysis for becoming PCI compliant

Purpose:

Suggested method:

Hints:

Solution:

Discussion: