Welcome to

0. Introduction

KEA Kompetence SIEM and Log Analysis

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Slides are available as PDF, kramse@Github

0-Introduction-siem-log-analysis.tex in the repo security-courses

Contact information

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- Network and security consultant Zencurity, teach at KEA and activist
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You are welcome to drop me an email

Goals for today

- Welcome, course goals and expectations
- Prepare Virtual Machines - hope you brought a laptop
- Create a good starting point for learning
- Concrete Expectations
- Prepare tools for the exercises

Photo by Thomas Galler on Unsplash

Plan for today

- Create a good starting point for learning
- Introduce lecturer and students
- Expectations for this course
- Literature list walkthrough
- Prepare tools for the exercises
- Kali and Debian Linux introduction

Exercise theme: Chaos Computing

- Debian Linux installation
- Git tutorials, Python, Ansible
- Elastick Stack installation, Postman

Linux is a toolbox we will use and participants will use virtual machines

Time schedule

17:00 - 18:15 Introduction and basics

18:15 - 18:45 – 30min break

18:45 - 19:30 – 45min Teaching

19:30 - 19:45 – 15min break

19:45 - 20:30 – 45min Teaching

This will be the basic plan for each evening

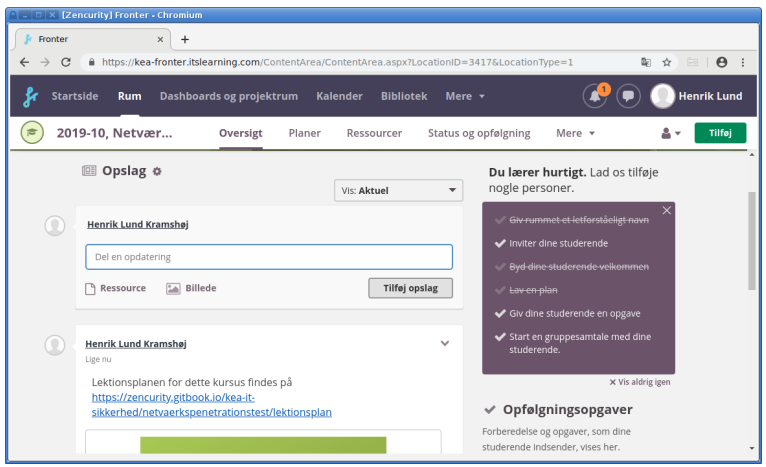
Course Materials

This material is in multiple parts:

- Slide shows - presentation - this file
- Exercises - PDF which is updated along the way
- Books listed in the lecture plan and here
- Additional resources from the internet

Note: the presentation slides are not a substitute for reading the books, papers and doing exercises, many details are not shown

Fronter Platform



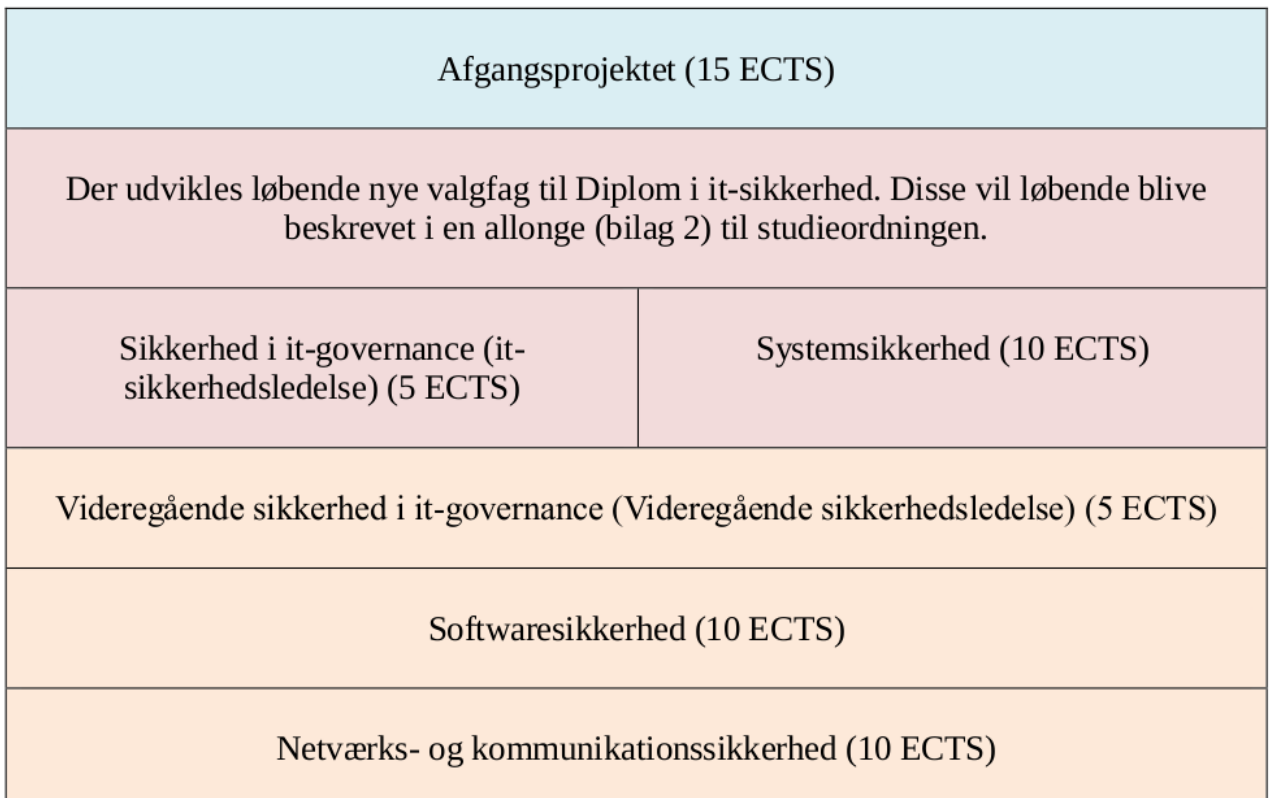
We will use fronter a lot, both for sharing educational materials and news during the course.

You will also be asked to turn in deliverables through fronter

https://kea-fronter.itslearning.com/

If you haven't received login yet, let us know

Overview Diploma in IT-security



Course: SIEM and Log Analysis (5 ECTS)

Teaching dates: mostly tuesdays and thursdays 17:00 - 20:30
24/11 2021, 29/11 2021, 1/12 2022, 6/12 2021, 8/12 2021, 13/12 2021, 15/12 2021

Exam: 5/1 2022

Photo by Pawel Janiak on Unsplash

Deliverables and Exam

- Exam
- Individual: Oral based on curriculum
- Graded (7 scale)
- Draw a question with no preparation. Question covers a topic
- Try to discuss the topic, and use practical examples
- Exam is 30 minutes in total, including pulling the question and grading
- Count on being able to present talk for about 10 minutes
- Prepare material (keywords, examples, exercises, wireshark captures) for different topics so that you can use it to help you at the exam

- Deliverables:
- 1 Mandatory assignments
- Mandatory assignments are required in order to be entitled to the exam.

Course Description

From: STUDIEORDNING Diplomuddannelse i it-sikkerhed August 2018
VF4 SIEM og log analyse (5 ECTS)

Indhold
Den studerende lærer om Security information and event management (SIEM), herunder hvordan man kan indsamle, administrere, og søge i sikkerhedshændelsesdata i et større it system (komplekse systemer, IOT deployments, corporate IT).

Læringsmål
Viden – Den studerende har viden om og forståelse for:

- Typiske SIEM arkitekturer
- Standard logformater og logtyper for standard systemer og komponenter
- Typiske SIEM produkter
- Juridiske krav til logning og bevarelse af data ifb. forensic analyse

Færdigheder – Den studerende kan:

- Lave en baseline-analyse af en infrastruktur
- Bruge log-data til at identificere infrastrukturkomponenter
- Bruge et værktøj til at analysere system log-data og netværkstrafik til at finde sikkerhedshændelser
- Udvikle "dashboards"og alarmer der viser tegn på hændelser

Kompetencer – Den studerende kan:

- Designe og implementere en SIEM løsning på tværs af diverse produkter
- Træffe beslutninger om hvilke data der skal indsamles i en givne situation
- Identificerer fejl i logopsamlingen
- Deltage i drøftelser på et praktisk og strategisk niveau i forhold til implementering af logmanagement/SIEM

Final word is the Studieordning which can be downloaded from

https://kompetence.kea.dk/uddannelser/it-digitalt/diplom-i-it-sikkerhed

Studieordning_for_Diplomuddannelsen_i_IT-sikkerhed_Aug_2018.pdf

SIEM

Security information and event management (SIEM) is a subsection within the field of computer security, where software products and services combine security information management (SIM) and security event management (SEM). They provide real-time analysis of security alerts generated by applications and network hardware.

Vendors sell SIEM as software, as appliances, or as managed services; these products are also used to log security data and generate reports for compliance purposes.[1]

The term and the initialism SIEM was coined by Mark Nicolett and Amrit Williams of Gartner in 2005.[2]

Source: https://en.wikipedia.org/wiki/Security_information_and_event_management

- Note: there are alerting examples towards the bottom of the page, with sources
- Closely related to log management, incident response

Exercises

Exercise theme: Virtual Machines allows us play with tech

Hardware

Since we are going to be doing exercises, each team will need virtual machines.

The following are recommended systems:

- One VM based on Debian, running software servers and web applications
- Setup instructions and help https://github.com/kramse/kramse-labs

Linux is a toolbox we will use and participants will use virtual machines

Expectations alignment

In groups of 2 students, brainstorm for 10 minutes on what topics you expect to have in this course

Use 5 minutes more on Agreeing on 5 topics and prioritize these 5 topics

I look forward to hearing your wishes, and hopefully we can accomodate some

PS We will from time to time have exercises, groups dont need to be the same each time.

Goals and plans

"A goal without a plan is just a wish."
Antoine de Saint-Exupéry

I want this course to

- Include everything required by studieordningen
- Be practical – you can do something useful
- Kickstart your journey into SIEM and Logging
  Getting the best books with pointers about the closely related subject incident response
- Present a lot of useful sources, data types, tools
- Prepare you for production use of the knowledge
  Example you can take Linux, Ansible and Elasticsearch almost directly into production

We only have 5 ECTS, but a lot of flexibility.

Some keywords relating to this course

Analysis Visualization Dashboards Data-driven Security
SIEM architectures frameworks acquire process Zeek
log formats data types databases JSON XML Security Operations Center
(Incident Response) Intelligence R and Python fundamentals
Practical application Building Infosec Ansible Playbooks
Collect, mine, organize, and analyze relevant data sources
Sort data create reporting and monitoring ports
IP-address Netflow nfdump Elasticsearch real-world knowledge

- Lots of new terms, technologies and tools
- Its okay if too much, we will sort it out during next weeks

Prerequisites

This course includes exercises and getting the most of the course requires the participants to carry out these practical exercises

We will use Linux for some exercises but previous Linux and Unix knowledge is not needed

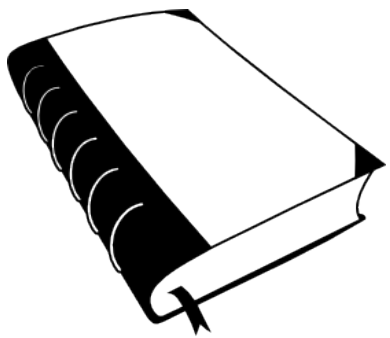
It is recommended to use virtual machines for the exercises

Security and most internet related security work has the following requirements:

- Network experience
- Server experience
- TCP/IP principles - often in more detail than a common user
- Programming is an advantage, for automating things
- Some Linux and Unix knowledge is in my opinion a **necessary skill** for infosec work
  – too many new tools to ignore, and lots found at sites like Github and Open Source written for Linux

Primary literature

Primary literature:



Free graphics by Lumen Design Studio

- *Data-Driven Security: Analysis, Visualization and Dashboards* Jay Jacobs, Bob Rudis ISBN: 978-1-118-79372-5 February 2014 https://datadrivensecurity.info/ - short DDS
- *Crafting the InfoSec Playbook: Security Monitoring and Incident Response Master Plan* by Jeff Bollinger, Brandon Enright, and Matthew Valites ISBN: 9781491949405 - short CIP
- *Intelligence-Driven Incident Response* Scott Roberts ISBN: 9781491934944 - short IDI
- *Security Operations Center: Building, Operating, and Maintaining your SOC* ISBN: 9780134052014 Joseph Muniz - short SOC

Problem: You probably dont have the books yet ...

Course overview

We will now go through a little from the Table of Contents in the books.

and the *Lektionsplan*
https://zencurity.gitbook.io/kea-it-sikkerhed/siem-and-log-analysis/lektionsplan

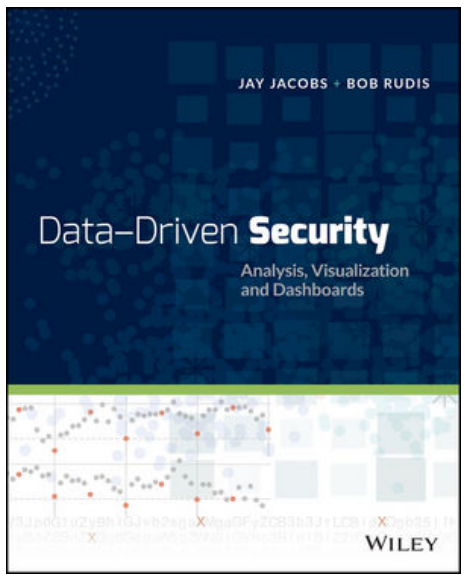
Why so many books?!

Because we not only want you to learn during the course, but be prepared for what comes after. These books are a library of relevant information that you will use when handling your job functions afterwards.

You will probably also use this course for Incident Response.

Some of you will be tasked with building a capability in-house, a SOC, virtual SOC or similar security group.

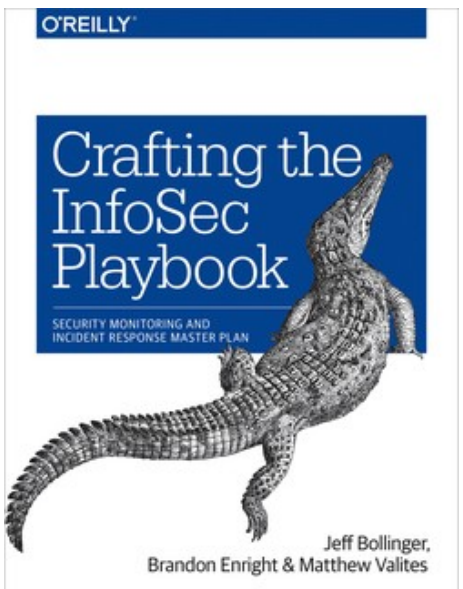
Data-Driven Security: Analysis, Visualization and Dashboards



Data-Driven Security: Analysis, Visualization and Dashboards Jay Jacobs, Bob Rudis
ISBN: 978-1-118-79372-5 February 2014 https://datadrivensecurity.info/ - short DDS

Our main book for this course. We will read a lot from this one. From basic data processing to dashboards

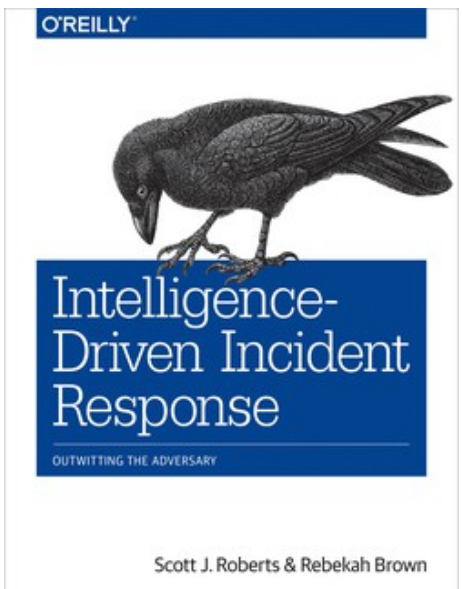
Crafting the InfoSec Playbook



Crafting the InfoSec Playbook: Security Monitoring and Incident Response Master Plan
by Jeff Bollinger, Brandon Enright, and Matthew Valites ISBN: 9781491949405 - short CIP

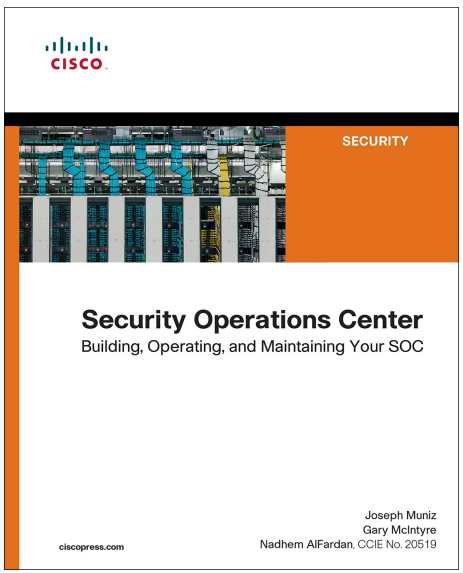
Develop your own threat intelligenceand incident detection strategy

Intelligence-Driven Incident Response



Intelligence-Driven Incident Response
Scott Roberts ISBN: 9781491934944 - short IDI

Security Operations Center

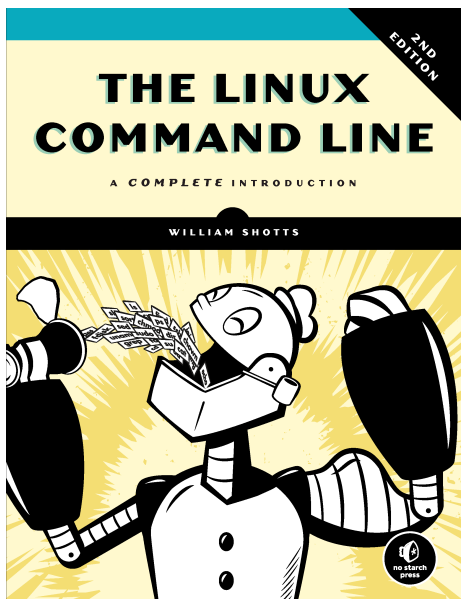


Security Operations Center: Building, Operating, and Maintaining your SOC
ISBN: 9780134052014 Joseph Muniz - short SOC

Supporting literature books

- *The Linux Command Line: A Complete Introduction*, 2nd Edition
  by William Shotts
- *Linux Basics for Hackers: Getting Started with Networking, Scripting, and Security in Kali*
  OccupyTheWeb, December 2018, 248 pp. ISBN-13: 978-1-59327-855-7 - shortened LBfH
- *The Debian Administrator's Handbook*, Raphaël Hertzog and Roland Mas
  https://debian-handbook.info/ - shortened DEB
- *Kali Linux Revealed Mastering the Penetration Testing Distribution*
  Raphaël Hertzog, Jim O'Gorman - shortened KLR

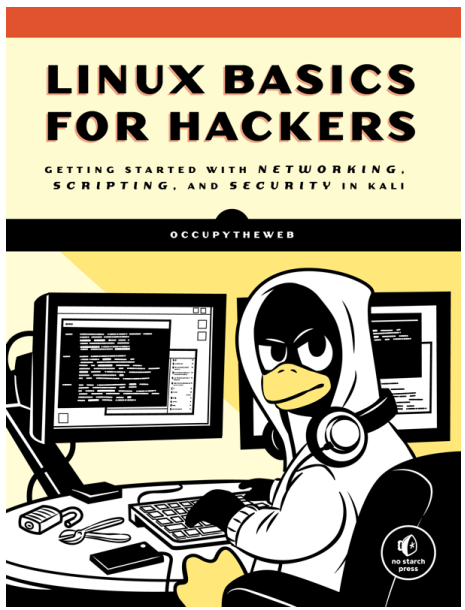
Book: The Linux Command Line



The Linux Command Line, 2nd Edition A Complete Introduction by William Shotts

Print: https://nostarch.com/tlcl2
Download – internet edition https://sourceforge.net/projects/linuxcommand

Linux Basics for Hackers (LBfH)



Linux Basics for Hackers: Getting Started with Networking, Scripting, and Security in Kali by OccupyTheWeb December 2018, 248 pp. ISBN-13: 9781593278557

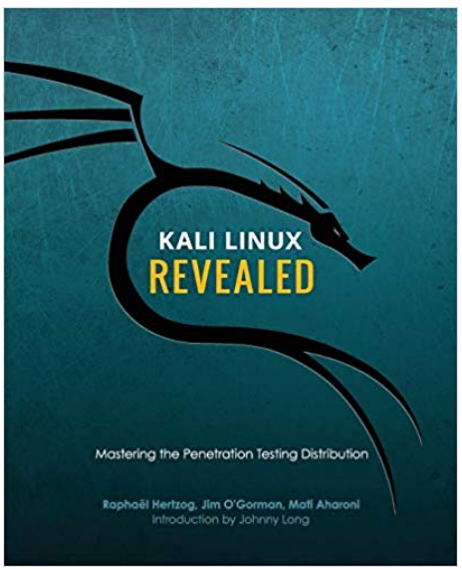
https://nostarch.com/linuxbasicsforhackers Not curriculum but explains how to use Linux

The Debian Administrator's Handbook (DEB)

The Debian Administrator's Handbook, Raphaël Hertzog and Roland Mas
https://debian-handbook.info/ - shortened DEB

Not curriculum but explains how to use Debian Linux

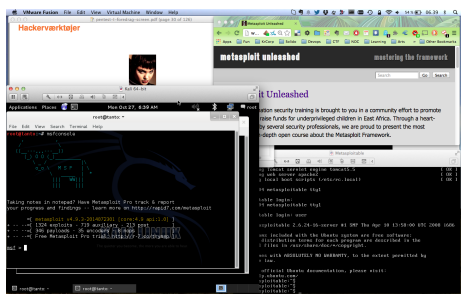
Kali Linux Revealed (KLR)



Kali Linux Revealed Mastering the Penetration Testing Distribution

Not curriculum but explains how to install Kali Linux

Hackerlab Setup



- Hardware: modern laptop CPU with virtualisation
  Dont forget to enable hardware virtualisation in the BIOS
- Virtualisation software: VMware, Virtual box, HyperV pick your poison
- Linux server system: Debian amd64 64-bit https://www.debian.org/
- Setup instructions can be found at https://github.com/kramse/kramse-labs

It is enough if these VMs are pr team

Mixed exercises

Then we will do a mixed bag of exercises to introduce technologies, find your current knowledge level with regards to:

- Linux
- Linux command line
- Git, Python and Ansible
- Elasticsearch – how to run a *service*
- Running Java on Linux – environment variables?!
- Ansible provisioning – installing and configuring software for production

Note: today we will consider all these optional, we wont be able to do them all

Later we will return to them!

Exercise CHAOS: Don't Panic – have fun learning

> "It is said that despite its many glaring (and occasionally fatal) inaccuracies, the Hitchhiker's Guide to the Galaxy itself has outsold the Encyclopedia Galactica because it is slightly cheaper, and because it has the words 'DON'T PANIC' in large, friendly letters on the cover."

Hitchhiker's Guide to the Galaxy, Douglas Adams

Your lab setup

- Go to GitHub, Find user Kramse, click through kramse-labs
- Look into the instructions for the Virtual Machine – Debian only
- Get the lab instructions, from

  https://github.com/kramse/kramse-labs/tree/master/suricatazeek

Yes, reusing instruction for the Suricata Zeek workshop - tested and working!

Command prompts in Unix

Shells :

- sh - Bourne Shell
- bash - Bourne Again Shell, often the default in Linux
- ksh - Korn shell, original by David Korn, but often the public domain version used
- csh - C shell, syntax similar to C language
- Multiple others available, zsh is very popular

Windows have `command.com`, `cmd.exe` but PowerShell is more similar to the Unix shells

Used for scripting, automation and programs

Command prompts

```
[hlk@debian hlk]$ id
uid=6000(hlk) gid=20(staff) groups=20(staff), 0(wheel), 80(admin), 160(cvs)
[hlk@debian hlk]$ sudo -s
[root@debian hlk]#
[root@debian hlk]# id
uid=0(root) gid=0(wheel) groups=0(wheel), 1(daemon), 20(staff), 80(admin)
[root@debian hlk]#
```

Note the difference between running as root and normal user. Usually books and instructions will use a prompt of hash mark # when the root user is assumed and dollar sign $ when a normal user prompt.

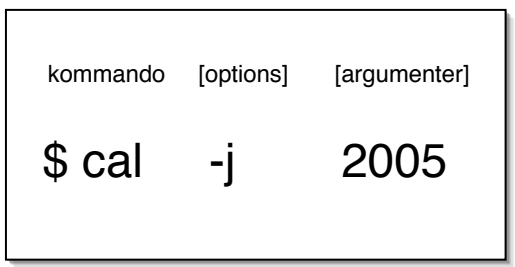
Command syntax

```
echo [-n] [string ...]
```

Commands are written like this:

- Always begin with the command to execute, like `echo` above
- Options typically short form with single dash `-n`
- or long options `--version`
- Some commands allow grouing options, `tar -c -v -f` becomes `tar -cvf`
  NOTE: some options require parameters, so `tar -c -f filename.tar` not equal to `tar -fc filename.tar`
- Optional options are in brackets `[ ]`
- Output can be saved using redirection, into new file/overwrite `echo hello > file.txt` or append `echo hello >> file.txt`
- Read from files `wc -l file.txt` or pipe output into input `cat file.txt | wc -l`
  `wc` is word count, and option l is count lines

Unix Manual system



It is a book about a Spanish guy called Manual. You should read it. – Dilbert

Manual system in Unix is always there!

Key word search `man -k` see also `apropos`

Different sections, can be chosen

See `man crontab` the command vs the file format in section 5 `man 5 crontab`

A manual page

```
NAME
     cal - displays a calendar
SYNOPSIS
     cal [-jy] [[month]  year]
DESCRIPTION
   cal displays a simple calendar.  If arguments are not specified, the cur-
   rent month is displayed.  The options are as follows:
   -j      Display julian dates (days one-based, numbered from January 1).
   -y      Display a calendar for the current year.

The Gregorian Reformation is assumed to have occurred in 1752 on the 3rd
of September.  By this time, most countries had recognized the reforma-
tion (although a few did not recognize it until the early 1900's.)  Ten
days following that date were eliminated by the reformation, so the cal-
endar for that month is a bit unusual.
```

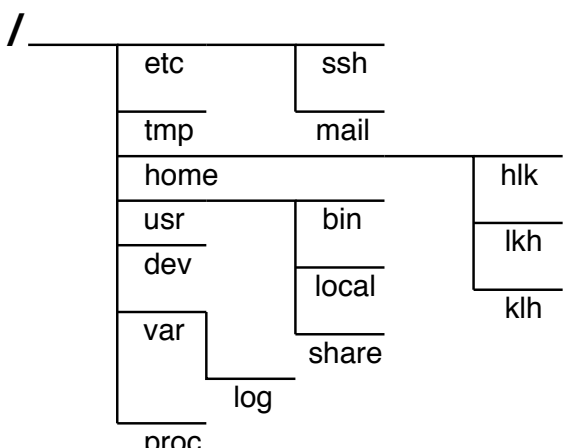
The year 1752

```
  user@Projects:$ cal 1752
...
         April                    May                    June
  Su Mo Tu We Th Fr Sa  Su Mo Tu We Th Fr Sa  Su Mo Tu We Th Fr Sa
              1  2  3  4                  1  2      1  2  3  4  5  6
   5  6  7  8  9 10 11   3  4  5  6  7  8  9   7  8  9 10 11 12 13
  12 13 14 15 16 17 18  10 11 12 13 14 15 16  14 15 16 17 18 19 20
  19 20 21 22 23 24 25  17 18 19 20 21 22 23  21 22 23 24 25 26 27
  26 27 28 29 30        24 25 26 27 28 29 30  28 29 30
                        31
          July                   August                 September
  Su Mo Tu We Th Fr Sa  Su Mo Tu We Th Fr Sa  Su Mo Tu We Th Fr Sa
              1  2  3  4                     1        1  2 14 15 16
   5  6  7  8  9 10 11   2  3  4  5  6  7  8  17 18 19 20 21 22 23
  12 13 14 15 16 17 18   9 10 11 12 13 14 15  24 25 26 27 28 29 30
  19 20 21 22 23 24 25  16 17 18 19 20 21 22
  26 27 28 29 30 31     23 24 25 26 27 28 29
                        30 31
...
```

Linux configuration in /etc

.

- Command line is a requirement in the *studieordningen* ☺
- Linux and Unix uses a single virtual file system
  https://en.wikipedia.org/wiki/Unix_filesystem
- No drive letters like the ones in MS-DOS and Microsoft Windows
- Everything starts at the root of the file system tree / - NOTE: *forward slash*
- One special directory is `/etc/` and sub directories which usually contain a lot of configuration files



Installing software in Debian – apt

```
DESCRIPTION
apt provides a high-level commandline interface for the package management system. It is intended as an end user interface
and enables some options better suited for interactive usage by default compared to more specialized APT tools like apt-
get(8)
and apt-cache(8).

update (apt-get(8))
  update is used to download package information from all configured sources. Other commands operate on this data to e.g.
  perform package upgrades or search in and display details about all packages available for installation.

upgrade (apt-get(8))
  upgrade is used to install available upgrades of all packages currently installed on the system from the sources configured
  via sources.list(5). New packages will be installed if required to satisfy dependencies, but existing packages will never
  be removed. If an upgrade for a package requires the removal of an installed package the upgrade for this package isn't performed.

full-upgrade (apt-get(8))
  full-upgrade performs the function of upgrade but will remove currently installed packages if this is needed to upgrade the
  system as a whole.
```

- Install a program using apt, for example `apt install nmap`

Ansible

From my course materials:
Ansible is great for automating stuff, so by running the playbooks we can get a whole lot of programs installed, files modified - avoiding the Vi editor.

- Easy to read, even if you don't know much about YAML
- https://www.ansible.com/ and https://en.wikipedia.org/wiki/Ansible_(software)
- Great documentation
  https://docs.ansible.com/ansible/latest/collections/ansible/builtin/apt_module.html

Ansible Dependencies

- Ansible based on Python, only need Python installed
  https://www.python.org/
- Often you use Secure Shell for connecting to servers
  https://www.openssh.com/
- Easy to configure SSH keys, for secure connections

Ansible playbooks

Example playbook content, installing software using APT:

```
apt:
    name: "{{ packages }}"
    vars:
      packages:
        - nmap
        - curl
        - iperf
        ...
```

Running it:

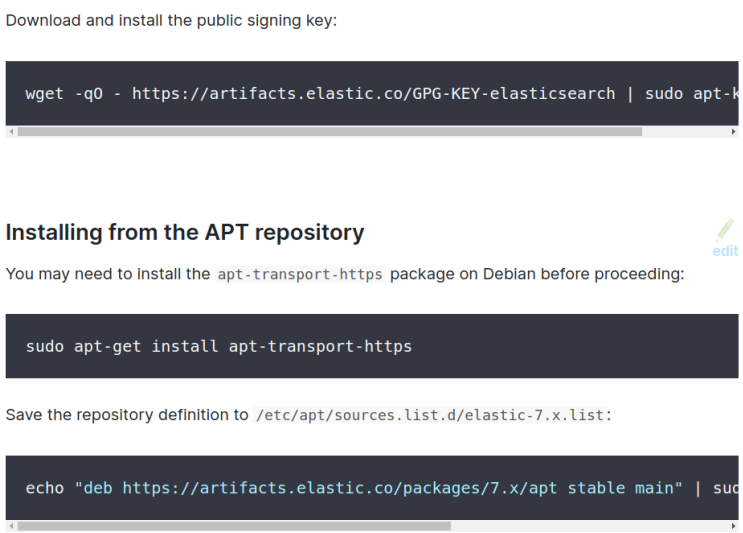
```
cd kramse-labs/suricatazeek
ansible-playbook -v 1-dependencies.yml 2-suricatazeek.yml 3-elasticstack.yml 4-configuration.yml
```

"YAML (a recursive acronym for "YAML Ain't Markup Language") is a human-readable data-serialization language."
https://en.wikipedia.org/wiki/YAML

Python and YAML – Git

- We need to store configurations
- Run playbooks
- Problem: Remember what we did, when, how
- Solution: use git for the playbooks
- Not the only version control system, but my preferred one

Alternative



Download and install the public signing key:

```
wget -qO - https://artifacts.elastic.co/GPG-KEY-elasticsearch | sudo apt-k
```

Installing from the APT repository

edit

You may need to install the `apt-transport-https` package on Debian before proceeding:

```
sudo apt-get install apt-transport-https
```

Save the repository definition to `/etc/apt/sources.list.d/elastic-7.x.list`:

```
echo "deb https://artifacts.elastic.co/packages/7.x/apt stable main" | suc
```

My playbooks allow installation of a whole Elastic stack in less then 10 minutes,

compare to:

Getting started with the Elastic Stack

https://www.elastic.co/guide/en/elastic-stack-get-started/current/get-started-elastic-stack.html

Git getting started

Hints:
Browse the Git tutorials on https://git-scm.com/docs/gittutorial
and https://guides.github.com/activities/hello-world/

- What is git
- Terminology

Note: you don't need an account on Github to download/clone repositories, but having an acccount allows you to save repositories yourself and is recommended.

Demo: Ansible, Python, Git!

Running Git will allow you to clone repositories from others easily. This is a great way to get new software packages, and share your own.

Git is the name of the tool, and Github is a popular site for hosting git repositories.

- Go to https://github.com/kramse/kramse-labs
- Lets explore while we talk

Demo: output from running a git clone

```
user@Projects:tt$  git clone https://github.com/kramse/kramse-labs.git
Cloning into 'kramse-labs'...
remote: Enumerating objects: 283, done.
remote: Total 283 (delta 0), reused 0 (delta 0), pack-reused 283
Receiving objects: 100% (283/283), 215.04 KiB | 898.00 KiB/s, done.
Resolving deltas: 100% (145/145), done.

user@Projects:tt$  cd kramse-labs/

user@Projects:kramse-labs$  ls
LICENSE  README.md  core-net-lab  lab-network  suricatazeek  work-station
user@Projects:kramse-labs$ git pull
Already up to date.
```

for reference at home later

Exercise CHAOS: Don't Panic – have fun learning

> "It is said that despite its many glaring (and occasionally fatal) inaccuracies, the Hitchhiker's Guide to the Galaxy itself has outsold the Encyclopedia Galactica because it is slightly cheaper, and because it has the words 'DON'T PANIC' in large, friendly letters on the cover."

Hitchhiker's Guide to the Galaxy, Douglas Adams

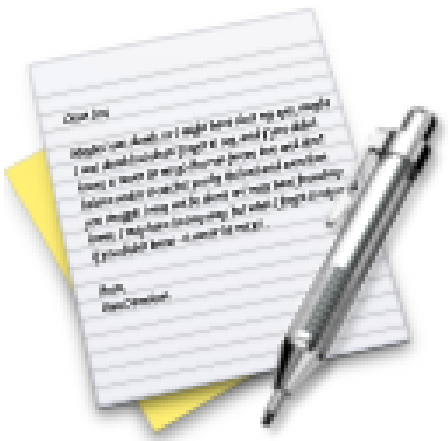
Your lab setup

- Go to GitHub, Find user Kramse, click through kramse-labs
- Look into the instructions for the Virtual Machine – Debian only
- Get the lab instructions, from

  https://github.com/kramse/kramse-labs/tree/master/suricatazeek

Yes, reusing instruction for the Suricata Zeek workshop - tested and working!

Exercise

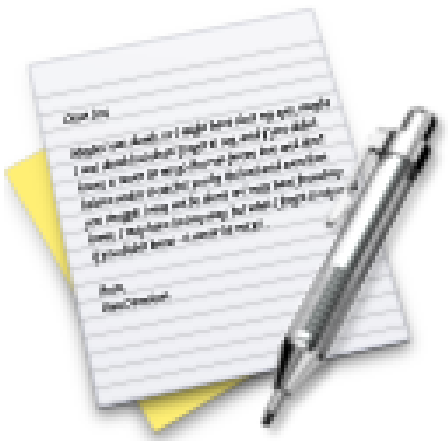


Now lets do the exercise

Download Debian Administrator's Handbook – 10 min

which is number 1 in the exercise PDF.

Exercise

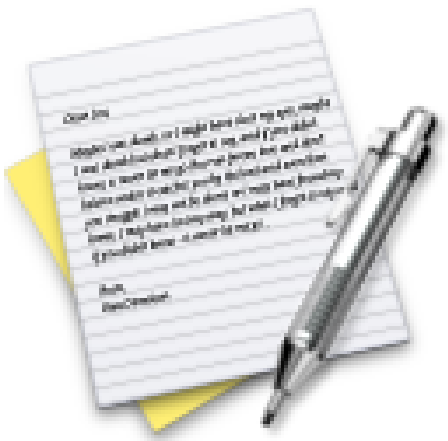


Now lets do the exercise

Check your Debian VM – 10min

which is number 2 in the exercise PDF.

Exercise

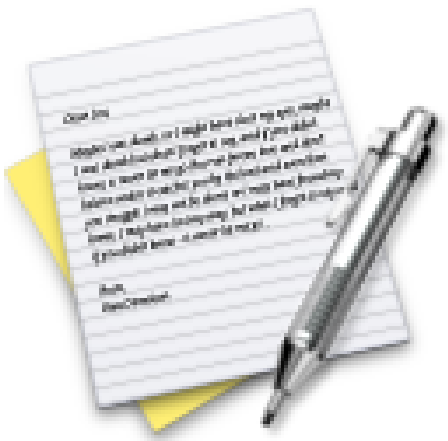


Now lets do the exercise

Investigate /etc – 10min

which is number 3 in the exercise PDF.

Exercise

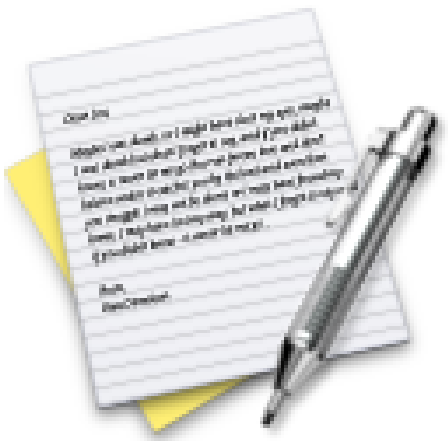


Now lets do the exercise

Enable UFW firewall – 10min

which is number **4** in the exercise PDF.

Exercise

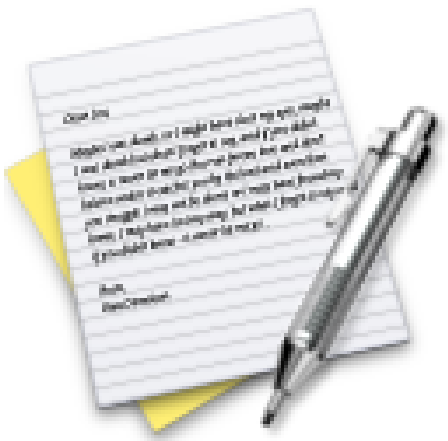


Now lets do the exercise

Postman API Client – 20min

which is number **5** in the exercise PDF.

Exercise

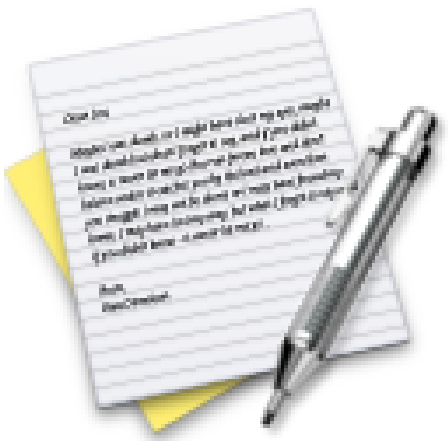


Now lets do the exercise

Git tutorials – 15min

which is number **6** in the exercise PDF.

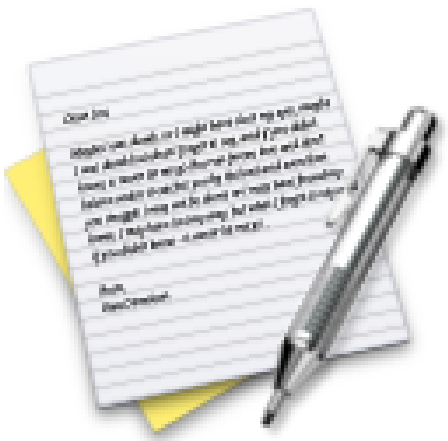
Exercise



Now lets do the exercise

Getting started with the Elastic Stack – 60min

which is number **7** in the exercise PDF.

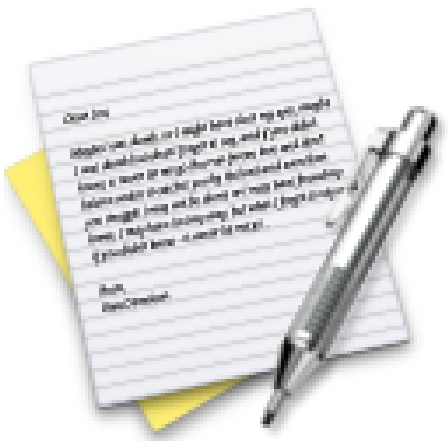


Now lets do the exercise

Use Ansible to install programs – 10-60min

which is number **8** in the exercise PDF.

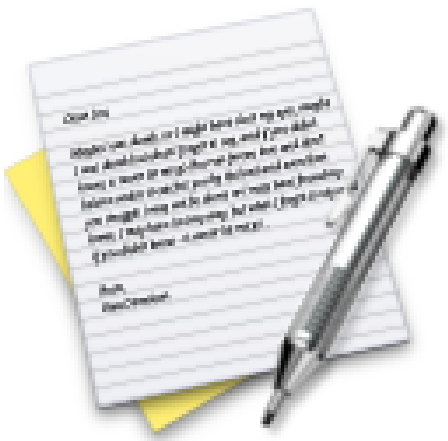
Exercise



Now lets do the exercise

Install JupyterLab – up to 30min

which is number 9 in the exercise PDF.

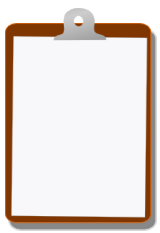


Now lets do the exercise

Making requests to Elasticsearch – 15-75min

which is number **10** in the exercise PDF.

For Next Time



Think about the subjects from this time, write down questions

Check the plan for chapters to read in the books

Visit web sites and download papers if needed

Retry the exercises to get more confident using the tools

Buy the books! Create your VMs