Welcome to

# Network Traffic Inspection

## PROSA September 2025

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Slides are available as PDF, kramse@Codeberg

prosa-network-traffic-inspection-2025.tex in the repo security-courses

# Contact information

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- Run a small network for fun AS57860

You are welcome to drop me an email

# Code of Conduct

I subscribe to having a Code of Conduct for events, we need them still! Usually I say the BornHack code of conduct apply whenever I teach! https://bornhack.dk/conduct/

Today we talk about networking, so I recommend this also: RIPE Code of Conduct Publication date: 05 Oct 2021

Rationale Our goals in having this Code of Conduct are:

- **To help everyone feel safe and included.** Many people will be new to our community. Some may have had negative experiences in other communities. We want to set a clear expectation that harassment and related behaviours are not tolerated here. If people do have an unpleasant experience, they will know that this is neither the norm nor acceptable to us as a community.
- **To make everyone aware of expected behaviour.** We are a diverse community; a CoC sets clear expectations in terms of how people should behave.

Source: https://www.ripe.net/publications/docs/ripe-766

# Time schedule

- 17:00 - 17:40 Introduction and basics for the subject
- 17:40 - 18:05 Exercise in groups:
- 30min break Eat with your family if you like, I will be around most of the break, available for questions
- 18:45 - 19:30 Further teaching and exercises in the subject for the evening
- 15min break Stretch your legs, get some more water
- 19:45 - 20:30 Further teaching and exercises in the subject for the evening, questions and more
- 20:30 - 21:00 May contain exercises to be done on your own, with input from me

I will try to keep this plan for all evenings! So you hopefully can plan family life better

Will also try to make smaller breaks/exercises during the slidesshows, check for questions etc.

# Modul 2: Traffic inspection (Onlinemodul 2 af 3)

## Hvordan kan vi overvåge netværk effektivt?

Det får I svaret på i dette oplæg. Vi starter med at se på nogle simple eksempler som TCP forbindelse, HTTPS request og DNS. Dernæst peger underviseren på eksempelværktøjer som igennem mere end 25 år har automatiseret netværksovervågning som Zeek. Vi vil også tale om sessionslogning, firewall logning, Netflow. Og du får en præsentation af Suricata IDS som eksempel på et andet værktøj, der kan bruges til Intrusion Detection eller som central rolle i blokering af DNS traffik, IP negativ lister m.v.

Keywords: CIA modellen, CVE sårbarheder, switch, router, firewall, ACL, DoS/DDoS, VLAN, segmentering, **logning, monitoring, Netflow, Zeek, Suricata**, Nmap, Elasticsearch, IEEE 802.1x, IPv4, IPv6, NTP, DNS

- Vi skal dykke ned i netværkspakker
- Man kan godt følge med uden at lave øvelser
- Alle værktøjer der præsenteres er veldokumenterede mange steder – inkl videoer

# Goals for today

- 

# What is a Secure Network

A controlled environment with a purpose and goal which is designed, implemented and monitored to be sufficiently secure – according to the policies and wishes of the owner and operator

Example networks

- Home network – should support a *family typically*
- Factory network – should support machines, robots, production of things
- Office network – should be available for employees and without malware and data leaks

# Network Security as a Holistic Approach

**holistic** adjective

1 : of or relating to holism

2 : relating to or concerned with wholes or with complete systems rather than with the analysis of, treatment of, or dissection into parts
holistic medicine attempts to treat both the mind and the body
holistic ecology views humans and the environment as a single system

Source: https://www.merriam-webster.com/dictionary/holistic

- The network spans the whole organisation and we use *the network* – the Internet for many things
- Network security affects the whole organisation
- When improving network security, we often improve overall security

# Best Current Practice

Lets get this out of the way immediately, you should already be doing

- Network segmentation and filtering – we could write a book about this! 🚩
- **Monitor your network – both bandwidth, error, netflow etc.** 🚩
- Take control of your network, no more admin/admin logins on core devices 🚩
- Turn on authentication for protocols – routing protocols but also any http service within your org 🚩
- Configure host-based firewalls 🚩
- **Control DNS – internally and externally, recursive, authoritative etc.** 🚩

This goes for IPv4-only, IPv6-only, and mixed networks!

# 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

# Crafting the InfoSec Playbook

This book will help you to answer common questions:

- How do I find bad actors on my network?
- How do I find persistent attackers?
- How can I deal with the pervasive malware threat?
- How do I detect system compromises?
- How do I find an owner or responsible parties for systems under my protection?
- How can I practically use and develop threat intelligence?
- How can I possibly manage all my log data from all my systems?
- How will I benefit from increased logging—and not drown in all the noise?
- How can I use metadata for detection?

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

# MITRE ATT&CK framework

MITRE ATT&CK™ is a globally-accessible knowledge base of adversary tactics and techniques based on real-world observations. The ATT&CK knowledge base is used as a foundation for the development of specific threat models and methodologies in the private sector, in government, and in the cybersecurity product and service community.

With the creation of ATT&CK, MITRE is fulfilling its mission to solve problems for a safer world — by bringing communities together to develop more effective cybersecurity. ATT&CK is open and available to any person or organization for use at no charge.

ATT&CK™

Source: https://attack.mitre.org/ Great resource for attack categorization

# Indicators of Compromise and Signatures

An IOC is any piece of information that can be used to objectively describe a network intrusion, expressed in a platform-independent manner. This could include a simple indicator such as the IP address of a command and control (C2) server or a complex set of behaviors that indicate that a mail server is being used as a malicious SMTP relay.

When an IOC is taken and used in a platform-specific language or format, such as a Snort Rule or a Zeek-formatted file, it becomes part of a signature. A signature can contain one or more IOCs.

Source: Applied Network Security Monitoring Collection, Detection, and Analysis, 2014 Chris Sanders

# Networks are Built from Components


Photo by Eugen Str on Unsplash

## Knowledge and insight

- Networks have end-points and conversations on multiple layers
- Wireshark is advanced, try right-clicking different places
- Name resolution includes low level MAC addresses, and IP - names

- Tcpdump format, built-in to many network devices
- Remote packet dumps, like `tcpdump -i eth0 -w packets.pcap`
- Story: tcpdump was originally written in 1988 by Van Jacobson, Sally Floyd, Vern Paxson and Steven McCanne who were, at the time, working in the Lawrence Berkeley Laboratory Network Research Group https://en.wikipedia.org/wiki/Tcpdump

Great network security comes from knowing networks!

# Exercises

Exercises are completely optional

- Try ping and traceroute
- See your own IP settings
- Connect to a switch or router – most have web interfaces

Linux is a toolbox I will use and participants are free to use whatever they feel like Photo by Eugen Str on Unsplash

# Course Materials

- This material is in multiple parts:
- Kickstart document – basic information `kickstart-prosa-secure-network.pdf`
- Slide show - the presentation - this file `prosa-secure-network-2025.pdf`
- Exercise for today: example secure network `exercise-secure-network-example.pdf`
- Exercise/inspiration for today: `kickstart-2-opal-router.pdf`
- Exercise booklet – large PDF with many exercises, stuff to do if you want to learn networks on your own `prosa-secure-network-2025-exercises.pdf`
- `prosa-network-traffic-inspection-2025.pdf`
- Additional resources from the internet like `firewall-book-10-DRAFT-PROSA.pdf`
- Later, next times:

# Baseline Skills

- Threat-Centric Security, NSM, and the NSM Cycle
- TCP/IP Protocols
- Common Application Layer Protocols
- Packet Analysis
- Windows Architecture
- Linux Architecture
- Basic Data Parsing (BASH, Grep, SED, AWK, etc)
- IDS Usage (Snort, Suricata, etc.)
- Indicators of Compromise and IDS Signature Tuning
- Open Source Intelligence Gathering
- Basic Analytic Diagnostic Methods
- Basic Malware Analysis

Source: *Applied Network Security Monitoring Collection, Detection, and Analysis*, Chris Sanders and Jason Smith

# Data Analysis Skills

Although we could spend an entire book creating an exhaustive list of skills needed to be a good security data scientist, this chapter covers the following skills/domains that a data scientist will benefit from knowing within information security:

- Domain expertise—Setting and maintaining a purpose to the analysis
- Data management—Being able to prepare, store, and maintain data
- Programming—The glue that connects data to analysis
- Statistics—To learn from the data
- Visualization—Communicating the results effectively

It might be easy to label any one of these skills as the most important, but in reality, the whole is greater than the sum of its parts. Each of these contributes a significant and important piece to the workings of security data science.

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

# Anatomy of an Auditing System

Sample logs from login with Secure Shell (SSH) and performing `sudo su -`

```
Jun  5 11:53:15 pumba sshd[64505]: Accepted publickey for hlk from 79.142.233.18 port 43902
 ssh2: ED25519 SHA256:l8OJMcywyBcraJiCWJ06uZ2yzHfu0VuiArqVvlVyfEI

Jun  5 11:53:19 pumba sudo:      hlk : TTY=ttyp2 ; PWD=/home/hlk ; USER=root ; COMMAND=/usr/bin/su -
```

Example systems: Unix syslog, IBM main frame RACF and Windows Event Logs service

*swatchdog* is an old skool, but simple tool that works

Logs should be protected and considered confidential information

# Anatomy of an Auditing System

When data has been gathered it should be analyzed.

**Logger functions** - collect

**Analyzer** - analyze it, creating dashboard can provide some insights

**Notifier** - report results by email or other means

Example systems Windows Event Logs service can inform of successful and failed logins, both should be collected

Logs should be protected and considered confidential information, by sending it to a centralized system with a high security level protects it

Modern systems exist to take all data from logging and provide high capacity storage, searching and sorting.

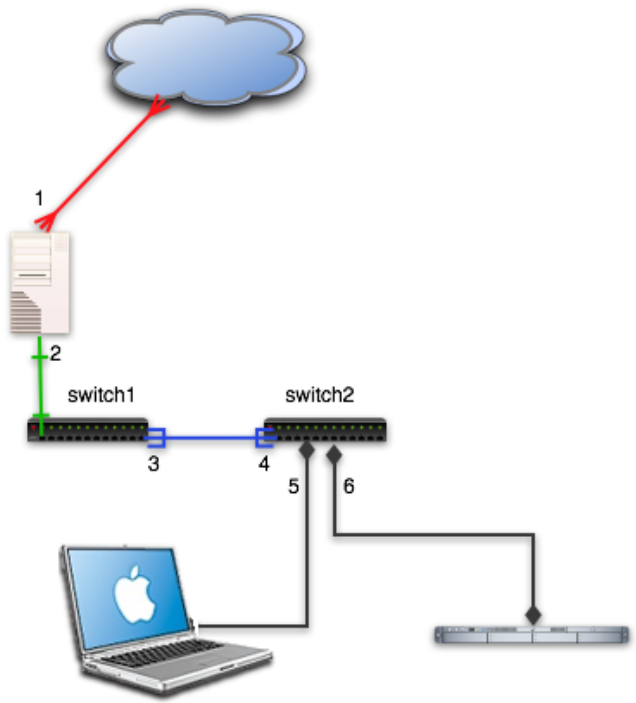
# Your Network

.

I have a home network which has the following systems:

- OpenBSD router
- Juniper and small TP-Link switches
- UniFi wireless access-point

Due to online remote teaching - we will investigate other networks and scan across the internet to *my servers*!



# Data-Driven Security: Analysis, Visualization ...

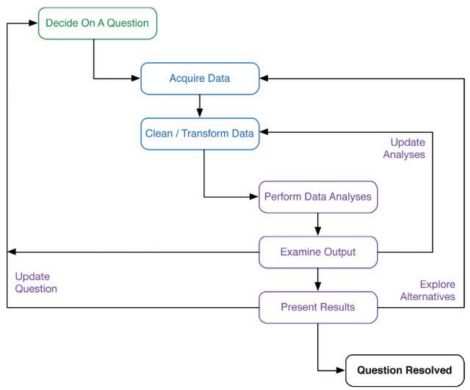



FIGURE 12-2 *The data science workflow*

- Find and Collect Relevant Data
- Learn through Iteration
- Find Statistics

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

# Data-Driven Security, continued

**Building a Real-Life Security Data Science Team**
... a clear goal: Given an IP address (or IP/Port combination), **search across all our perimeter devices in less than five minutes.**

Three core principles focused the team.

- First, explore the open source versions of tools before engaging vendors. If you don't know how the sausage is being made, you really have no idea what's being done, and this is vital when working with real data.
- Second, follow the mantra of "no single tool; no single database; and, no single approach to solving a problem." Do not put blinders on because you are either comfortable with certain technologies or have an affinity for a certain tool.
- Third, failure is expected, but you must learn from each journey down the wrong path. Continuous adaptation and adjustment is the name of the game.

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

# Lab Networks

- When learning and investigating it is nice to have a *lab network* – make changes, play with settings, break things
- If you live alone, and are not in a remote meeting – play with you own network!
- I recommended the small GL-Inet Opal (GL-SFT1200) Wireless Travel Router
  https://store.gl-inet.com/products/opal-gigabit-wireless-pocket-sized-openwrt-ipv6-sft1200
- It has 2 LAN ports for connecting, 1 WAN port for Internet or can act as a Wi-Fi client. All powered by USB-C etc.
- Manual and documentation https://docs.gl-inet.com/router/en/4/user_guide/gl-sft1200/

# Well-Known Port Numbers


IANA maintains a list of magical numbers in TCP/IP

Lists of protocl numbers, port numers etc.

A few notable examples:

- Port 25/tcp Simple Mail Transfer Protocol (SMTP)
- Port 53/udp and 53/tcp Domain Name System (DNS)
- Port 80/tcp Hyper Text Transfer Protocol (HTTP)
- Port 443/tcp HTTP over TLS/SSL (HTTPS)

Source: http://www.iana.org

# Unencrypted data protocols

Examples

- TFTP use UDP and is unencrypted
- TFTP still used for configuration files and firmwares
- FTP sends data in cleartext
  **USER username**
  **PASS password**
  Stop using FTP on the internet!
- DNS sending unencrypted on UDP and TCP
  Use DNS over HTTPS (DoH) or DNS over TLS (DoT)

# Person in the middle attacks

ARP spoofing, ICMP redirects, the classics

Used to be called Man in The Middle (MiTM)

- ICMP redirect
- ARP spoofing
- Wireless listening and spoofing higher levels like airpwn-ng https://github.com/ICSec/airpwn-ng

Usually aimed at unencrypted protocols or redirecting clients to wrong sites

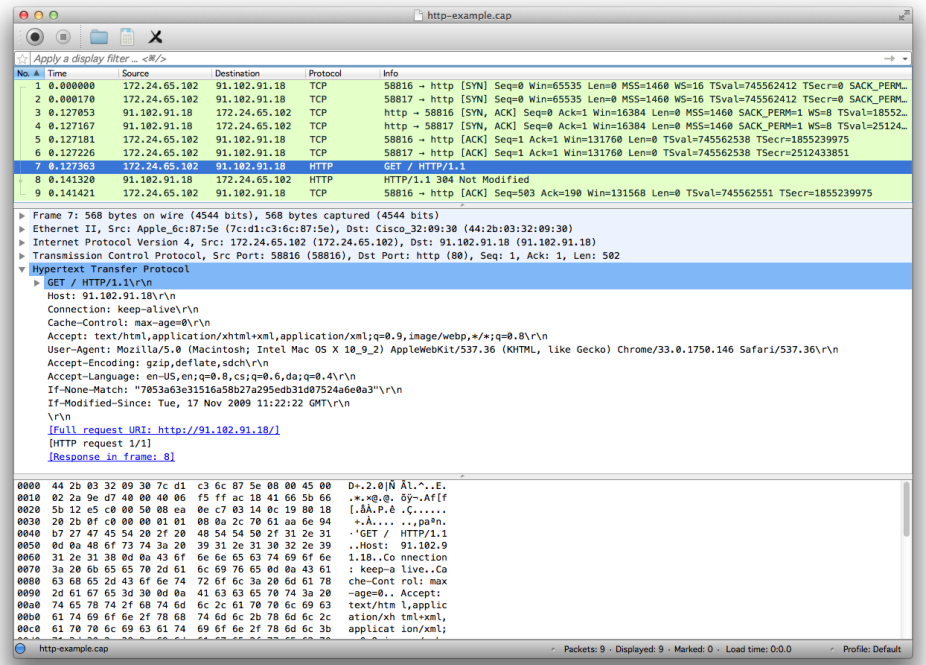
# Recommended Reading

So to get started in network security I recommend learning the basics:

- Chapter 1: Packet Analysis and Network Basics
- Chapter 2: Tapping into the Wire
- Chapter 3: Introduction to Wireshark

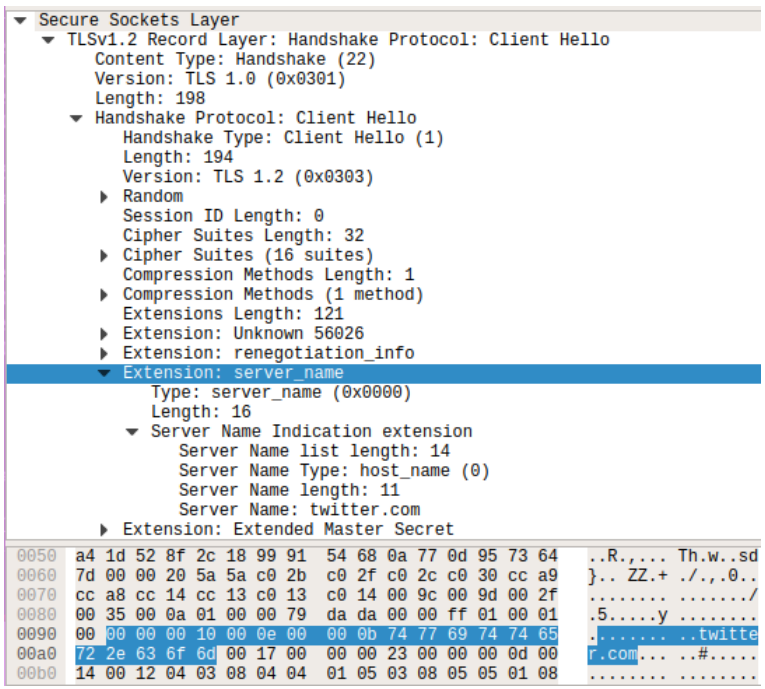
*Practical Packet Analysis, Using Wireshark to Solve Real-World Network Problems* by Chris Sanders, 3rd Edition

# Using Wireshark




Capture - Options

# What about encrypted traffic




Current TLS version 1.2 used in HTTPS show the name!

# Ping and port sweep

Scans across the network are named sweeps

Ping sweeps using ICMP Ping probes

Port sweep trying to find a specific service, like port 80 web

Quite easy to see in network traffic:

- Selecting two IP-adresser not in use
- Should not see any traffic, but if it does, its being scanned
- If traffic is received on both addresses, its a sweep – if they are a bit apart it is even better, like 10.0.0.100 and 10.0.0.200

Pro tip: a Great network intrusion detection engine (IDS), is Suricata suricata-ids.org

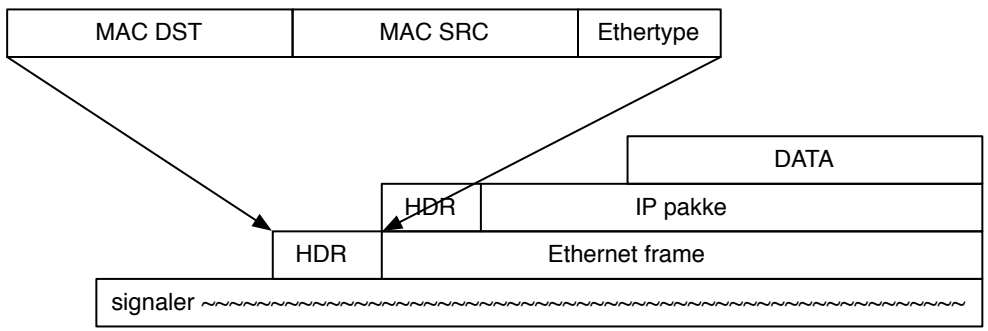
# Nmap port sweep for web servers

```
root@cornerstone:~#  nmap -p80,443 172.29.0.0/24

Starting Nmap 6.47 ( http://nmap.org ) at 2015-02-05 07:31 CET
Nmap scan report for 172.29.0.1
Host is up (0.00016s latency).
PORT    STATE    SERVICE
80/tcp  open     http
443/tcp filtered https
MAC Address: 00:50:56:C0:00:08 (VMware)

Nmap scan report for 172.29.0.138
Host is up (0.00012s latency).
PORT    STATE  SERVICE
80/tcp  open   http
443/tcp closed https
MAC Address: 00:0C:29:46:22:FB (VMware)
```

# Network Data is Data




We can find existing programs that decode packets

- Wireshark – GUI program
- Tcpdump – command line
- Zeek – engine for decoding network packets into data
- Suricata – Intrusion Detection System (IDS)

What output format do we want

# JSON and jq

- jq is a lightweight and flexible command-line JSON processor https://jqlang.org/

# Data overview JSON

> JavaScript Object Notation (JSON, pronounced / d e sən/; also / d e  s n/[note 1]) is an open-standard file format or data interchange format that uses **human-readable text** to transmit data objects consisting of attribute–value pairs and array data types (or any other serializable value). It is a very common data format, with a diverse range of applications, such as serving as replacement for XML in AJAX systems.[6]

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

- I like JSON much better than XML
- Many web services can supply data in JSON format

# JSON example

```
{
  "first name": "John",
  "last name": "Smith",
  "age": 25,
  "address": {
    "street address": "21 2nd Street",
    "city": "New York",
    "state": "NY",
    "postal code": "10021"
  },
  "phone numbers": [
    {
      "type": "home",
      "number": "212 555-1234"
    },
  ],
}
```

- This is a basic JSON document, new data attribute-value pairs can be added
  Source: https://en.wikipedia.org/wiki/JSON

# Start programming

Example program, reading from HTTP, into Python, out using JSON

```
#!/usr/bin/env python
import requests
r = requests.get('https://api.github.com/events')
print (r.json());
```

- Think of programing in this course as as reading, processing and outputting data
- Read in any format
- Process with any function
- Output in any format
- And reuse existing software

# The Zeek Network Security Monitor

Together with firewalls – The Zeek Network Security Monitor is not a single tool, more of a powerful network analysis framework

**The Zeek Network Security Monitor**

> While focusing on network security monitoring, Zeek provides a comprehensive platform for more general network traffic analysis as well. Well grounded in more than 15 years of research, Zeek has successfully bridged the traditional gap between academia and operations since its inception.

Zeek is the tool formerly known as Bro, changed name in 2018. https://www.zeek.org/

# Suricata IDS/IPS/NSM


Together with firewalls – Suricata is a high performance Network IDS, IPS and Network Security Monitoring engine.

https://suricata.io https://openinfosecfoundation.org

# Commercial Support

You can and should use updated rulesets for Suricata.

I Recommend the Emerging Threats ET Pro ruleset

# Processing data with Zeek

Simple example of reading a file with a few packets

# Get Started with Zeek

- To run in “base” mode:
  `zeek -r traffic.pcap`
- To run in a “near zeekctl” mode:
  `zeek -r traffic.pcap local`
- To add extra scripts:
  `zeek -r traffic.pcap myscript.zeek`

# Zeek demo: Run

// Use the deploy command to initialize and start zeek first

```
debian:~ root# zeekctl

Welcome to ZeekControl 1.5
Type "help" for help.

[ZeekControl] > install
creating policy directories ...
installing site policies ...
generating standalone-layout.zeek ...
generating local-networks.zeek ...
generating zeekctl-config.zeek ...
generating zeekctl-config.sh ...
...
debian:etc root# grep eth0 node.cfg
interface=eth0
```

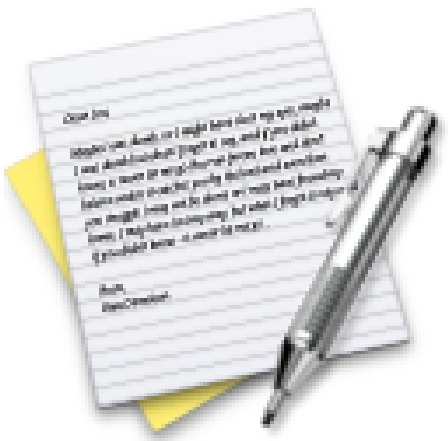
Our Zeek node.cfg is in/opt/zeek/etc

# Zeek demo: Run Zeek

```
[ZeekControl] > start
... starting zeek
// Exit using ctrl-d and then look at logs
debian:zeek root# cd /opt/zeek/logs/current
debian:zeek root# pwd
/opt/zeek/logs/current
debian:current root# tail -f dns.log
```

More examples at:
https://www.zeek.org/sphinx/script-reference/log-files.html

# Exercise

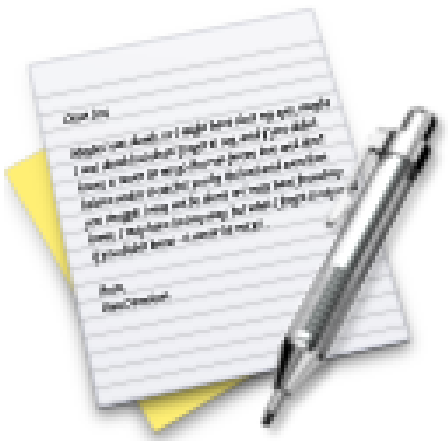


Now lets do the exercise

## Zeek on the web 10min

which is number 23 in the exercise PDF.

# Exercise



Now lets do the exercise

## ⚠ Zeek DNS capturing domain names – 15min

which is number **24** in the exercise PDF.

# Exercise

Now lets do the exercise

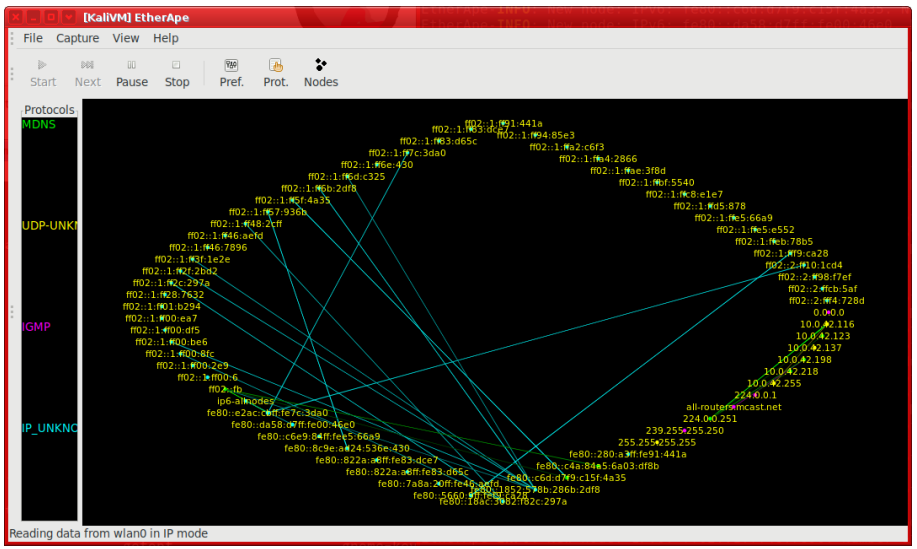
## ⚠ Zeek TLS capturing certificates – 15min

which is number **25** in the exercise PDF.

# Graphics

Example graphs plots from earlier

# Example tools and graphs




- Etherape shown, see https://etherape.sourceforge.io/

# Parallel coordinate plots

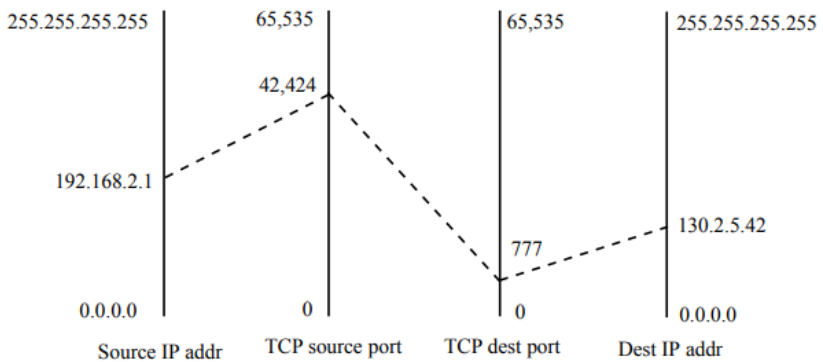



**Figure 7:** Parallel coordinate plot for a TCP packet from 192.168.1.1:42424 to 130.2.5.42:777.

Source: image from Network Security Visualization Keith Fligg and Genevieve Max https://www2.cs.arizona.edu/~collberg/Teaching/466-566/2013/Resources/presentations/2012/topic13-final/report.pdf

- https://en.wikipedia.org/wiki/Parallel_coordinates
- Nice for explaining connections, but not used much in real life systems

# DNS logging

Since most malware uses DNS today, to be able to switch to new command and control endpoints, we can leverage that to our advantage.

Domain Name System (DNS) depends on a query from the client, and a server that resolves this to a value.

- We can log any DNS traffic into a database
- We can look up if any clients have done a lookup for a specific name or IP during incident handling
- This can confirm if a client has ever *visited* a malicious site, because first it needs to lookup the name to IP address before it can make the TCP/HTTP connection, or send data

# Unbound and NSD

Unbound is a validating, recursive, caching DNS resolver. It is designed to be fast and lean and incorporates modern features based on open standards.

To help increase online privacy, Unbound supports DNS-over-TLS which allows clients to encrypt their communication. In addition, it supports various modern standards that limit the amount of data exchanged with authoritative servers.

https://www.nlnetlabs.nl/projects/unbound/about/

My preferred local DNS server.

Also check out uncensored DNS and his DNS over TLS setup!
Even has pinning information available:
https://blog.censurfridns.dk/blog/32-dns-over-tls-pinning-information-for-unicastcensurfridnsdk/

# Demo and exercises

# Discussion

Where do we want to log DNS?

From the network directly with Zeek and Suricata?

From the DNS servers – query log?

## Collect Network Evidence from the network

Network Flows – Netflow and Session Logging

Netflow sampling is vital information - 123Mbit, but what kind of traffic

Detecting DoS/DDoS and problems is essential

Cisco standard NetFlow version 5 defines a flow as a unidirectional sequence of packets that all share the following 7 values:

- Ingress interface (SNMP ifIndex)
- IP protocol, Source IP address and Destination IP address
- Source port for UDP or TCP, 0 for other protocols
- Destination port for UDP or TCP, type and code for ICMP, or 0 for other protocols
- IP Type of Service

today Netflow version 9 or IPFIX

sFlow, short for "sampled flow", is an industry standard for packet export at Layer 2 of the OSI model,

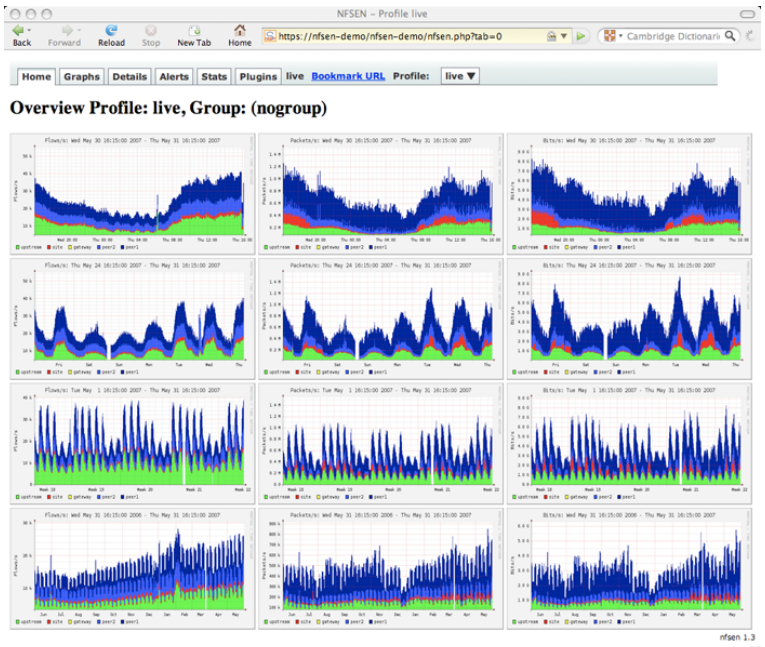
## Sources:

https://en.wikipedia.org/wiki/NetFlow

https://en.wikipedia.org/wiki/IP_Flow_Information_Export

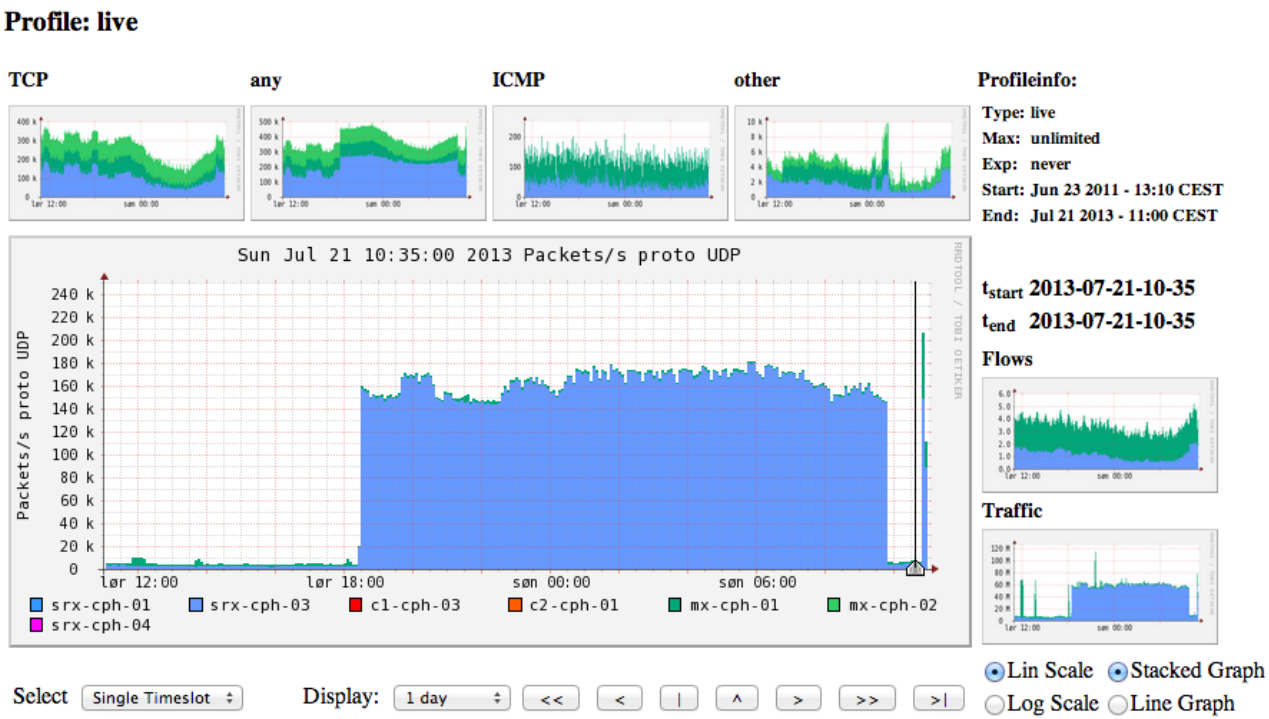
https://en.wikipedia.org/wiki/SFlow

# Netflow using NFSen



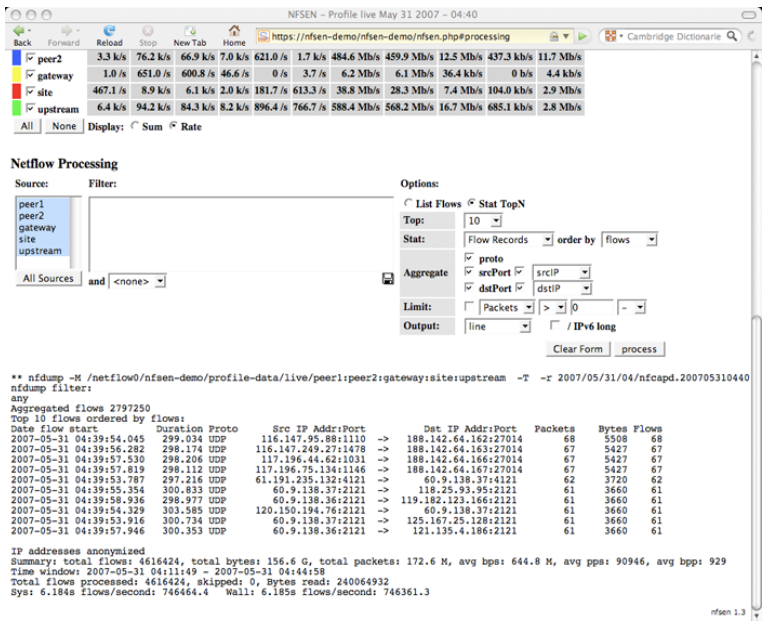

I do not recommend using NfSen anymore, but netflow processing has been around for decades!
https://nfsen.sourceforge.net/

# Netflow NFSen




An extra 100k packets per second from this netflow source (source is a router)

# Netflow processing from the web interface



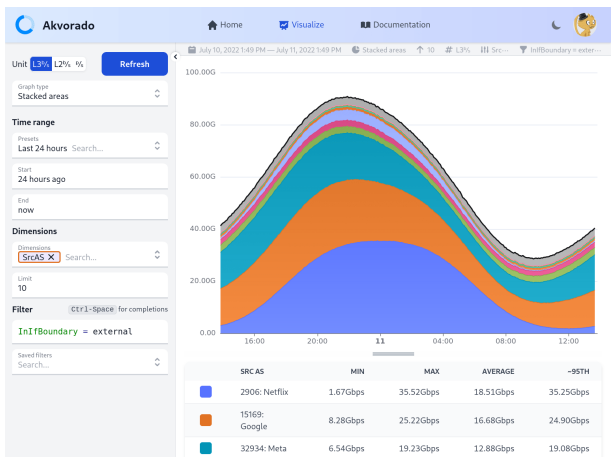

- Bringing the power of the command line forward
- Extremely easy to get top 10 lists pr destination, packets per second etc.

# ElastiFlow – Elasticsearch based


ElastiFlow™ provides network flow data collection and visualization using the Elastic Stack (Elasticsearch, Logstash and Kibana). It supports Netflow v5/v9, sFlow and IPFIX flow types (1.x versions support only Netflow v5/v9).

Source: Picture and text from https://github.com/robcowart/elastiflow

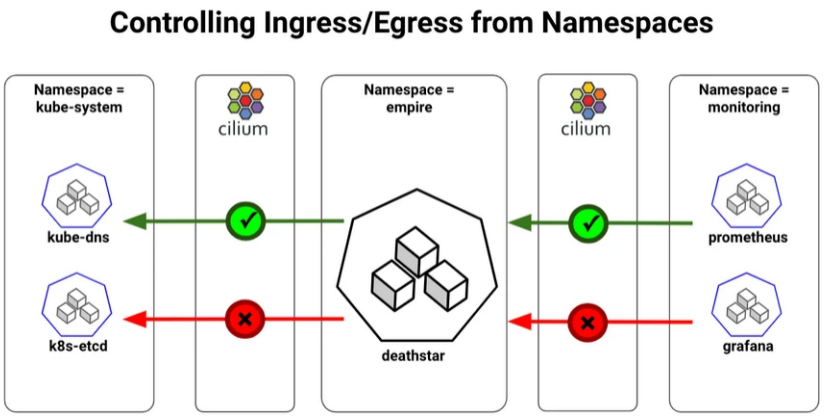
# Akvorado: flow collector, enricher and visualizer




This program receives flows (currently Netflow/IPFIX and sFlow), enriches them with interface names (using SNMP), geo information (using IPinfo.io), and exports them to Kafka, then ClickHouse. It also exposes a web interface to browse the collected data.

Source: Picture and text from https://github.com/akvorado/akvorado

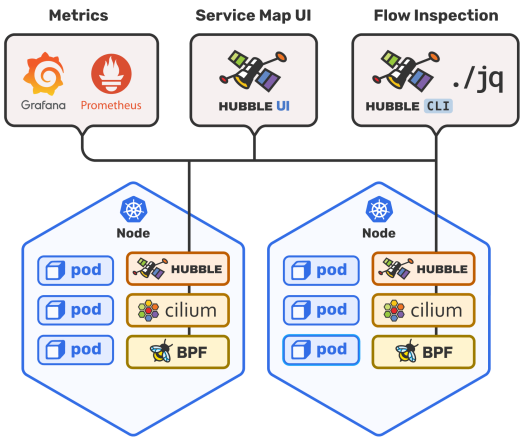
# Cloud Network Security: Cilium overview




Kubernetes provides Network Policies for controlling traffic going in and out of the pods. Cilium implements the Kubernetes Network Policies for L3/L4 level and extends with L7 policies for granular API-level security for common protocols such as HTTP, Kafka, gRPC, etc

Source: picture and text from https://cilium.io/blog/2018/09/19/kubernetes-network-policies/

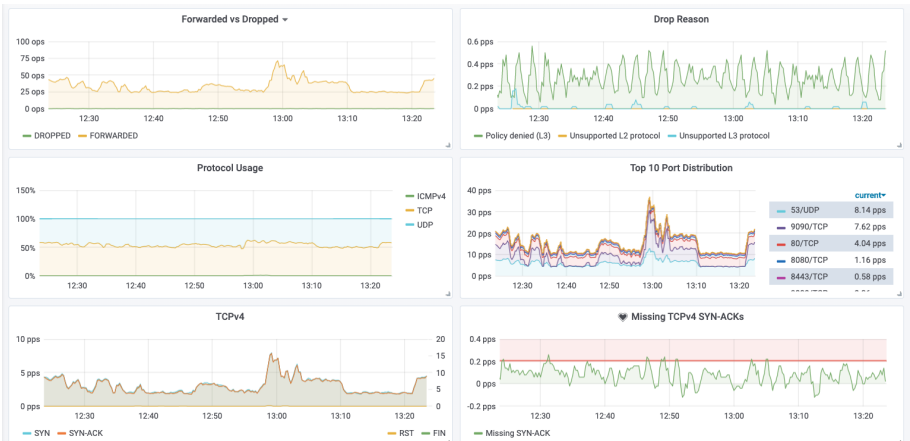
# Cloud Network Security: Cilium Hubble




The Linux kernel technology eBPF is enabling visibility into systems and applications at a granularity and efficiency that was not possible before. It does so in a completely transparent way, without requiring the application to change or for the application to hide information.

Source: picture and text from https://github.com/cilium/hubble/

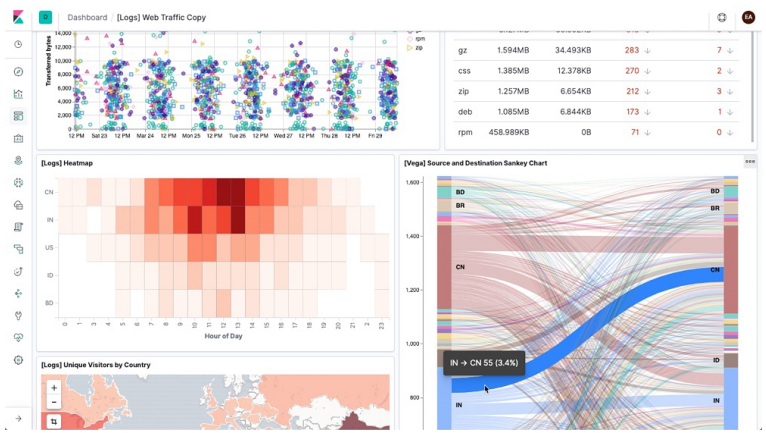
# Cloud Network Security: Cilium overview




The metrics and monitoring functionality provides an overview of the state of systems and allow to recognize patterns indicating failure and other scenarios that require action. The following is a short list of example metrics, for a more detailed list of examples, see the Metrics Documentation.

Source: picture and text from https://github.com/cilium/hubble/

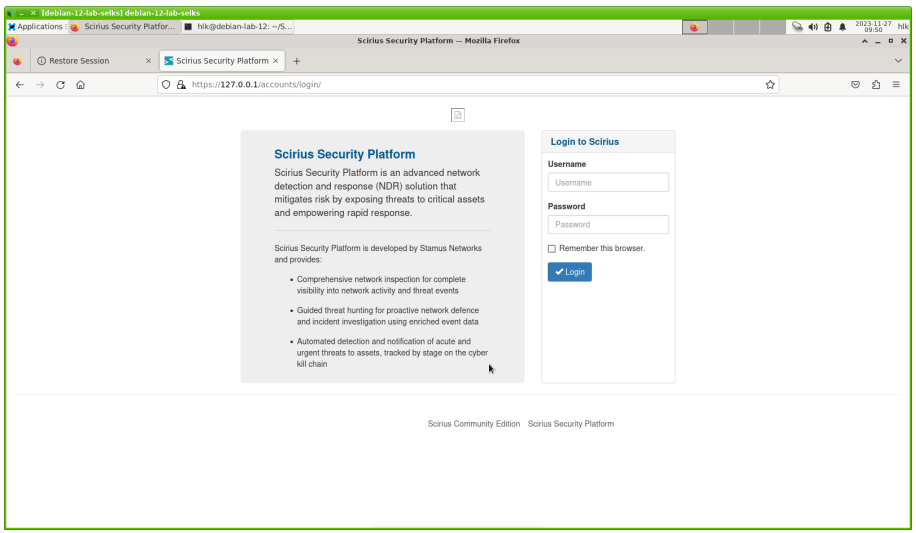
# Big Data tools: Elasticsearch and Kibana




Elasticsearch is an open source distributed, RESTful search and analytics engine capable of solving a growing number of use cases.

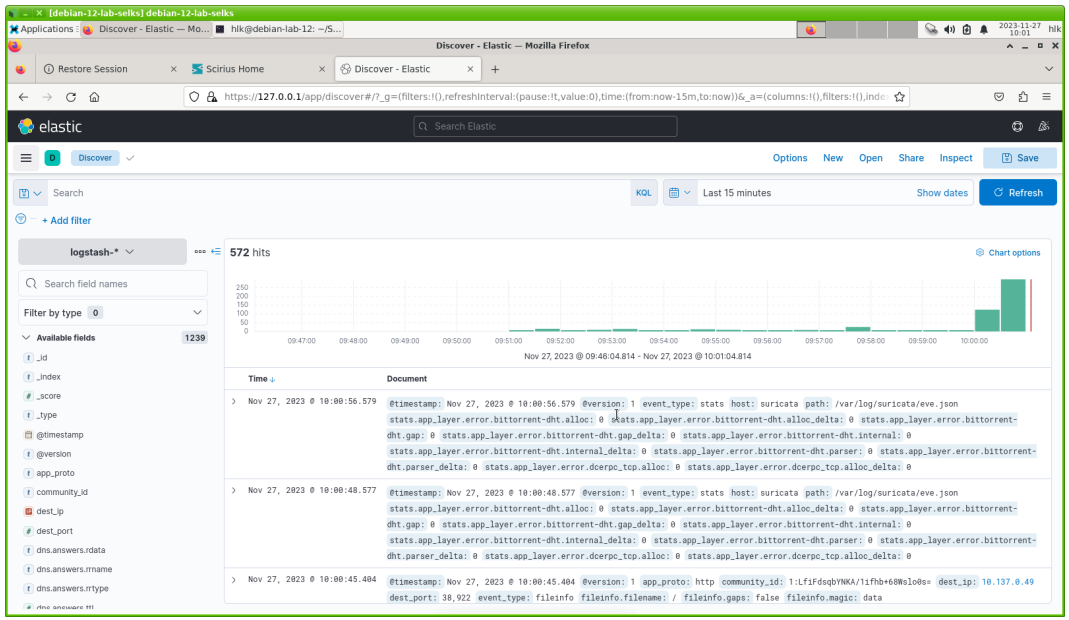
https://www.elastic.co

# Scirius Security Platform




- Description for this setup is in the Kickstart 2 document
- Using Docker we can turn up a full installation of Elasticsearch with data in minuts!
- https://github.com/StamusNetworks/SELKS

# Dashboards and Searching



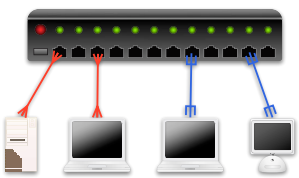

- Some of the most important parts of a SIEM is searching and dashboards

# Reading Summary, False Positives

- True Positive (TP). An alert that has correctly identified a specific activity. If a signature was designed to detect a certain type of malware, and an alert is generated when that malware is launched on a system, this would be a true positive, which is what we strive for with every deployed signature.Indicators of Compromise and Signatures
- False Positive (FP). An alert has incorrectly identified a specific activity. If a signature was designed to detect a specific type of malware, and an alert is generated for an instance in which that malware was not present, this would be a false positive.
- True Negative (TN). An alert has correctly not been generated when a specific activity has not occurred. If a signature was designed to detect a certain type of malware, and no alert is generated without that malware being launched, then this is a true negative, which is also desirable. This is difficult, if not impossible, to quantify in terms of NSM detection.
- False Negative (FN). An alert has incorrectly not been generated when a specific activity has occurred.

Source: Applied Network Security Monitoring Collection, Detection, and Analysis, 2014 Chris Sanders

# Reputation-Based Detection



- The most basic form of intrusion detection is reputation-based detection
- Similar concept to block lists for SMTP spam relays
- I often recommend https://github.com/stamparm/maltrail as a source of lists
- Other sources are lists like RIPE NCC delegated, which IP prefixes are handed out in different countries
  https://ftp.ripe.net/pub/stats/ripencc/delegated-ripencc-extended-latest
  `ripencc|DK|ipv4|185.129.60.0|1024|20151130|allocated|`
- Tool often mentioned are Argus and SiLK https://tools.netsa.cert.org/silk/
  If we end up having time today, or another day, we should look into this tool chain also!
- Old and mature tools have been proven to work

# Metadata – enrichment

| Metadata | Metacategory: Data |
|---|---|
| The DNS lookup occurred at a certain time. | Timestamp: 278621182 |
| The internal host sent a DNS PTR request. | Network protocol: DNS PTR |
| The internal host had a hostname. | Location: Desktop subnet |
| | Source IP Address: 1.1.1.2 |
| | Hostname: windowspc22.company.com |
| The internal host resolved an external host. | Location: External |
| | Destination IP Address: 255.123.215.3 |
| | Hostname: dgf7adfnkjhh.com |
| The external host was hosted by a dynamic DNS provider. | Network: Shady DDnS Provider Inc. |
| | ASN: SHADY232 |
| | Reputation: Historically risky network |
| The remote hostname appeared randomly generated. | Hostname: dgf7adfnkjhh.com |
| | Category: Unusual, nonlinguistic |

Source: picture from Crafting the InfoSec Playbook, CIP

Metadata + Context

# IP reputation

Zeek documentation Intel framework
https://docs.zeek.org/en/stable/frameworks/intel.html

Suricata reputation support
https://suricata.readthedocs.io/en/latest/reputation/index.html

# Conclusion

- Implement firewalls – take control over network packets
- Start monitoring with available data feed, sources, netflow, firewall logging, DNS queries etc.
- Start from the bottom and from client ports, or from server ports if you like
- Learn some Linux and use open source projects, really, will save you thosands of USD/EUR/DKK

# Referencer: netværksbøger

- Stevens, Comer,
- Network Warrior
- TCP/IP bogen på dansk
- KAME bøgerne
- O'Reilly generelt IPv6 Essentials og IPv6 Network Administration
- O'Reilly cookbooks: Cisco, BIND og Apache HTTPD
- Cisco Press og website
- Firewall bøger, Radia Perlman: IPsec,

# Bøger om IPv6

*IPv6 Network Administration* af David Malone og Niall Richard Murphy - god til real-life admins, typisk O'Reilly bog

*IPv6 Essentials* af Silvia Hagen, O'Reilly 2nd edition (May 17, 2006) god reference om emnet

*IPv6 Core Protocols Implementation* af Qing Li, Tatuya Jinmei og Keiichi Shima

*IPv6 Advanced Protocols Implementation* af Qing Li, Jinmei Tatuya og Keiichi Shima

- flere andre