Network Protection for Energy Control Systems

CSP004_C_E

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Acknowledgement

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Network Protection for Energy Control Systems

Overview

- Topic-1: Introduction to Energy Control Network Protection
- Topic-2: Common Security Weaknesses and Attacks in Energy Control Networks
- Topic-3: Essential Protection for Energy Control Networks
- Topic-4: Advanced Protection for Energy Control Networks

Agenda

01. Security Monitoring

02. SIEM Information Sources

03. SIEM Functionality

04. Example SIEM Solutions

05. Elasticsearch and Kibana

Objectives

At the end of this session, you should be able to …

1. Describe the **different types** of security **information** and **events**
2. **Associate** the different **types** of security **information** and **events** with the **tools** that generate them (e.g. attack **detection alerts** originate from an **IDS**, etc.)
3. Explain the **challenges** of security **information** and **event management** and how **SIEM solutions** address these **challenges**, i.e. describe their **purpose**
4. **Describe** the **functionality SIEM solutions** typically provide
5. List the main **SIEM solutions** that are **available** on the **market** (**commercial** and **open-source**) and their features

Security Monitoring

- **Monitoring** is **necessary** to **determine** if a breach in security has **occurred** or if a **control** has been **circumvented.**

- Security **controls** can provide indicators of **potential threat** agent activity.

- The following can provide **these indicators**:
  - Anti-Virus Systems (AVS)
  - Syslog
  - Firewall Logs
  - Network Intrusion Systems (NIDS)
  - Host Intrusion Detection Systems (HIDS)

- **Continuous** security **monitoring** is essential to the protection of **critical** systems.

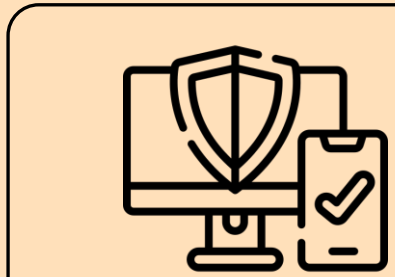
A Major Security Challenge: Data Overload

- We are drowning in security data:
  - System logs
  - Proxy logs
  - Application logs
  - Firewall logs
  - Antivirus logs
  - NIDS events
  - HIDS events
  - Packet captures
- No single **indicator** is useful by **itself** when **determining** whether an **asset** is **compromised.**

Managing Security Information and Events

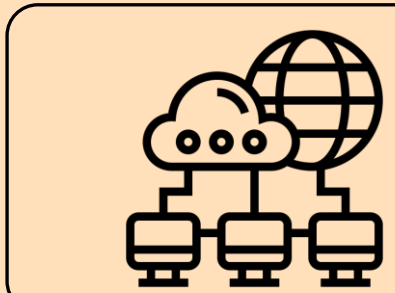
- **S**ecurity **I**nformation and **E**vent **M**anagement (**SIEM**) **solutions** can help to **mitigate** data **overload.**
- A **SIEM solution** is an integrated suite of **security tools** used to **manage multiple** security **applications** and **devices.**
- SIEM **applications** present a holistic view into the relative **state** of security across a network or enterprise.
- SIEMs have the **capability** to **normalize** logging data.

SIEM Information Sources



Security Devices

- Network Intrusion Detection Systems (NIDS)
- Host Intrusion Detection Systems (HIDS)
- Intrusion Prevention Systems (IPS)
- Antivirus Software
- Honeypots
- Firewalls

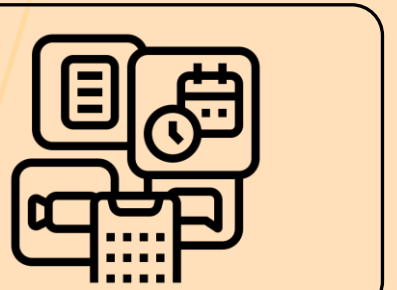


Network Devices

- Routers
- Switches
- Wi-Fi Access Points
- VPN Gateways
- Network Taps

Server

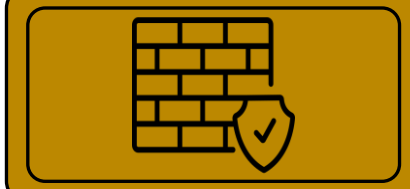
- Web Severs
- Mail Servers
- Application Servers
- Databases
- Cloud Servers



Applications

- Intranet Applications
- Web Applications

TechnologIes and Data



Firewall

- Log data

HIDS, NIDS, IPS

- Alerts

Routers, Network Taps

- Full packet captures
- Flow data

Servers, Workstations

- System logs
- Monitoring agents

SIEM Functionality

Asset **discovery** and inventory

Vulnerability **assessment**

Network **analysis**, full packet capture

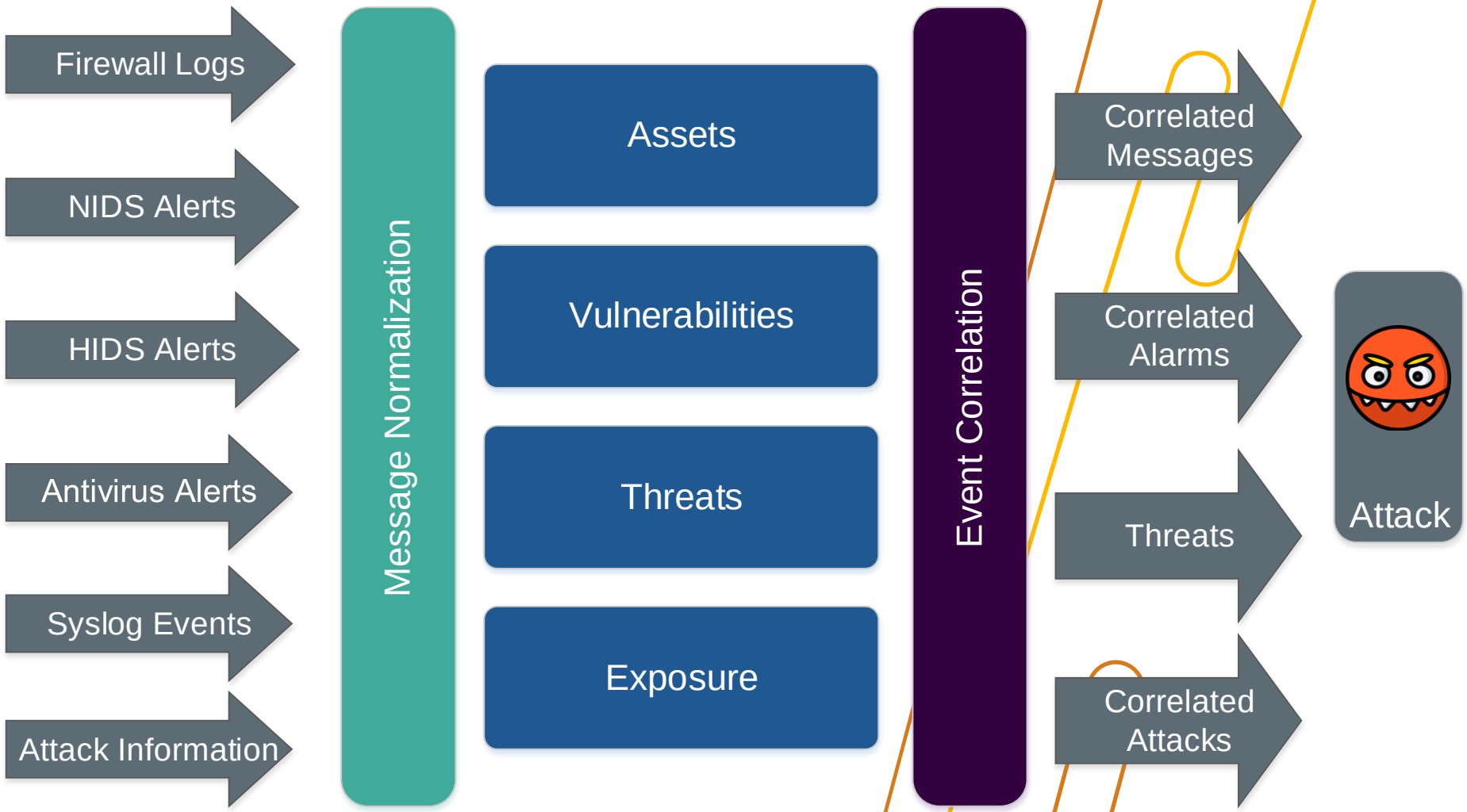
Host-based Intrusion Detection System (HIDS)

Network based Intrusion Detection System (NIDS)

File **integrity monitoring**

Log management

SIEM Process



Example SIEM Solutions

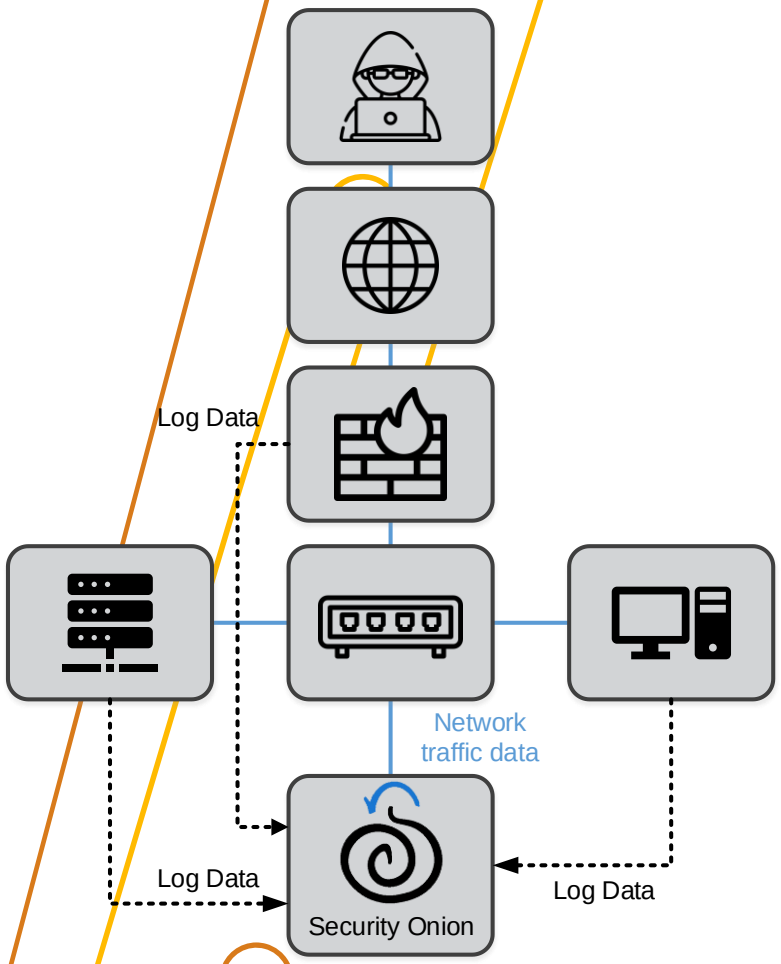
- **Commercial**
  - Micro Focus ArcSight Enterprise Security Manager (ESM)
  - AlienVault Unified Security Management USM
  - Splunk
  - SolarWinds Security Event Manager
  - Elastic SIEM
- **Open Source**
  - **Security Onion**
    - https://securityonionsolutions.com
  - Open Source Security Information Management (OSSIM)
    - https://www.alienvault.com/products/ossim

Security Onion

- **Free** and **open platform** for **Network Security Monitoring** (**NSM**) and **Enterprise Security Monitoring** (**ESM**)

- The **NSM** is monitoring the network for security related events
  - **Proactive**: identify **expiring** SSL certificates
  - **Reactive**: **incident response** and network **forensics**
  - Provides context, **intelligence**, and situational **awareness** of your network

- The **ESM** adds endpoint **visibility** and **other telemetry**



Network Security Monitoring

Intrusion detection

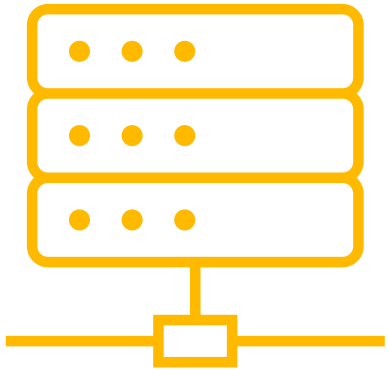
NIDS (**Network Intrusion Detection System**) **monitors** network **traffic** and **uses** attack **fingerprints** and **identifiers** to **detect suspicious activities**
Suricata can be used as a **NIDS**

Network metadata

Logs of **connections** and **standard protocols** like DNS, HTTP, FTP, SMTP, SSH, and SSL.
Visibility of the context of **data** and **events**

Full packet capture

Records all **data** on the network
Provides **information** about **when**, **where,** and **what**



Enterprise Security Monitoring

- Provides **endpoint** visibility and can **collect logs** from a wide **variety** of **devices** like **firewalls** and **routers.**
- For **endpoint** detection **Kibana** is providing an **Wazuh** plugin
  - **Wazuh** is a **free**, **open source HIDS** (**Host Intrusion Detection System**) for different **operating systems.**
  - The **Wazuh** agent **provides** visibility of network **endpoints.**
  - Supports **real-time alerting**, **file integrity checking**, **log file analysis**, **policy monitoring**, **rootkit detection**, and **active response.**
- The **correlation** of **host-** and **network-based events** can improve **incident detection capabilities significantly**.
- Collect **information** also from other **endpoint** agents like **osquery.**
- Use standard **Syslog** in **cases** where agents are not **available** or can not be **installed** for other reasons.

OSSIM

- **OSSIM** is the **Open Source Security Information Management**
- OSSIM provides **log analysis**, **asset** and **vulnerability management** and **detection systems** using other open-source software security components
- Browser-based user interface for graphical analysis

- **OSSIM** includes:
  - Asset discovery
  - Vulnerability assessment
  - Intrusion detection
  - Behavioral monitoring

Elasticsearch and Kibana

- **Elasticsearch** is a distributed **RESTful search** and **analytics engine** that enables fast **searching**, **indexing**, and **analyzing of data**.
- **Kibana** is an open-source **data visualization dashboard** for **Elasticsearch**, which provides **visualization** capabilities on top of the **content indexed** on an **Elasticsearch cluster**.
- Users can create **bar**, **line**, and **scatter** plots or **pie charts** and **maps** on top of **large volumes** of data.
- In the **SIEM** context, **Kibana** enables users to **investigate**, **analyze**, **filter**, and **visualize different** network aspects (**system states**, **events**, **traffic**, etc.).

Functions Overview

- The **Elastic platform** offers a variety of **search**, **filtering**, and **visualization** functions for **analyzing diverse system data sets**. The most important functions are
- **Kibana**
  - **display** and **share** a **collection** of visualizations
  - interactively **explore data** by **querying** and **filtering** documents
  - create **visualizations** and **aggregate** data **stores** in **Elasticsearch** indices
- **Observability**
  - **monitor** and **react** to events happening within the **entire environment**
- **Security**
  - explore **security metrics** and **logs** for **events** and **alerts**
- **Wazuh plugin**
  - security information management
  - threat detection and response
  - auditing and policy monitoring

What Is Kibana?

- Kibana **offers** comprehensive and **well-structured** overviews of Elastic Stack data by providing the following key **functions**:

  •An **analytics** and **visualization** platform for user-tailored **filtering** and **visualizations** of **Elasticsearch** data

  •A user **interface** for **Elastic Stack management** (security **settings**, user **roles**, **snapshots**, etc.)

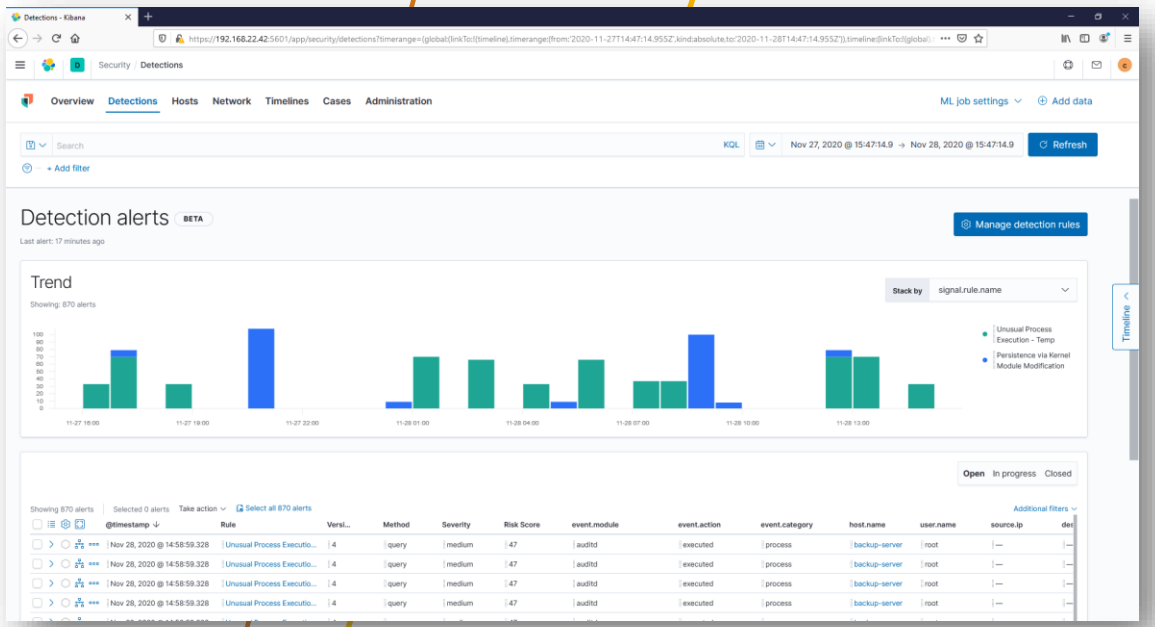
  •A **centralized hub** for accessing Elastic's **solutions**, from document **discovery** to **SIEM** functions

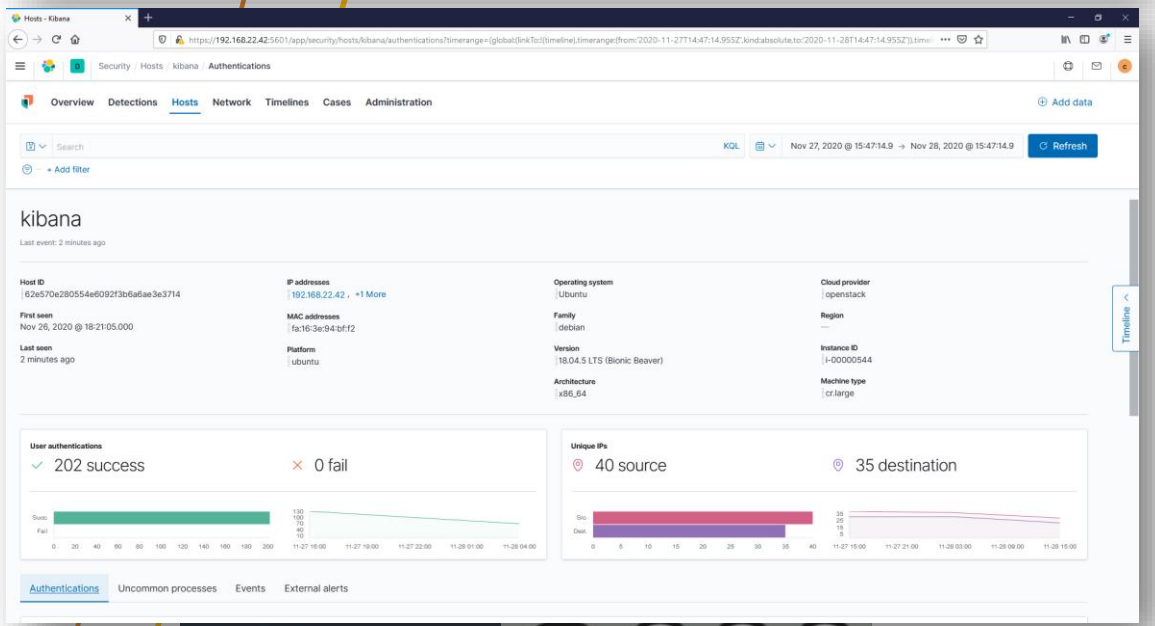
Elastic Security

- **Elastic Security** offers **threat detection** features, endpoint prevention, and response **capabilities**, including:
  - A detection **engine** to **identify** attacks and system **misconfiguration.**
  - A workspace for **event triage** and **investigations.**
  - Interactive **visualizations** to **investigate** process **relationships.**
  - **Embedded** case **management** and **automated actions.**
  - Detection of **signatureless** attacks with prebuilt **machine-learning anomaly** jobs and detection rules.

Security Views 1/2

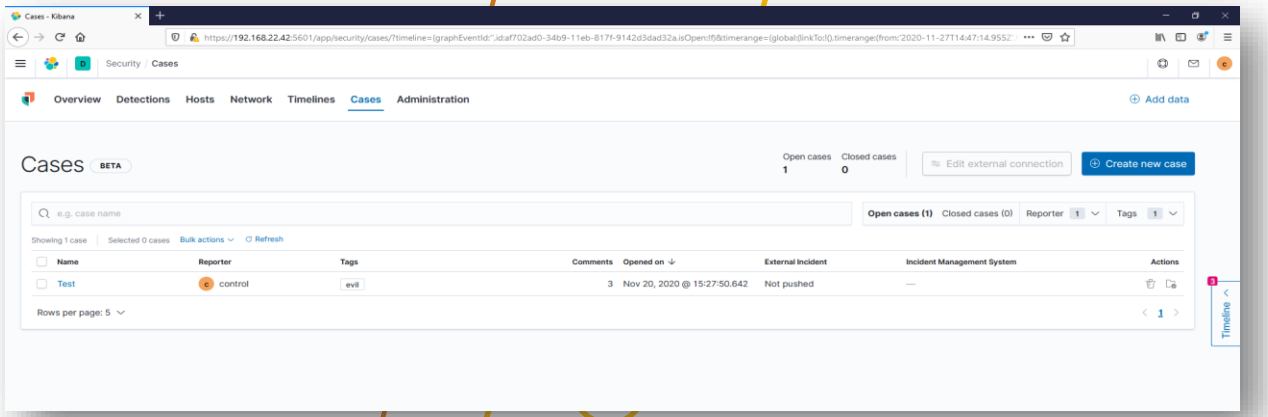
- Security **views** are **accessed** through the **sidebar** menu under the "**Security**" keyword. Central views of Security covered in this manual are the Detections, Hosts, Network, Timelines and Cases views.
- **Detections View**
  - The **Detections** feature **searches** for **threats** and creates **alerts** when they are **detected**.
  - **Alerts** are **created** based on **conditions** defined by **detection** rules.
- **Hosts View**
  - Key **metrics** regarding **host-related** security events.
- **Network View**
  - Overview of **key network** activity **metrics** in an **interactive** map and **event tables**

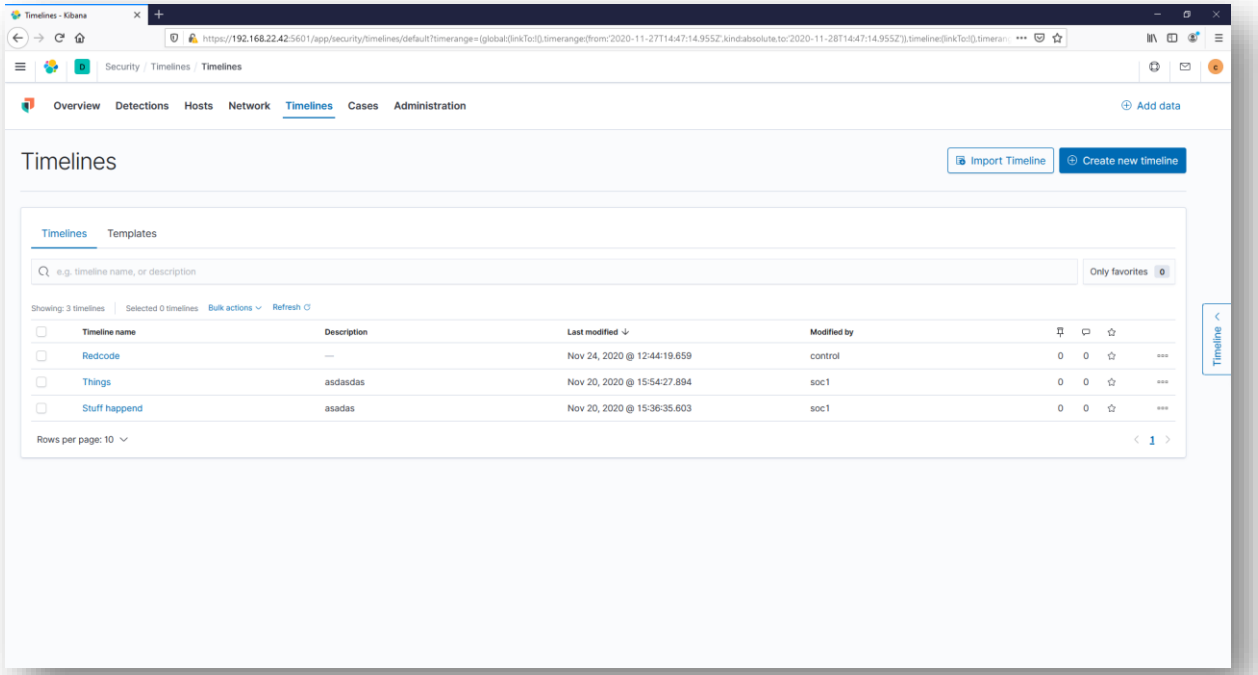




Security Views 2/2

- **Timeline View**
  - **Workspace** for **alert investigations** and **threat discovery** in the network.
  - Interesting **objects** can be **dragged** and **dropped** objects of interest (e.g., IP addresses) into the **Timeline Event Viewer**





- **Cases View**
  - The **Cases view** is used to open and track security **issues**. Descriptions of **cases**, as well as **comments**

Wazuh Kibana Plugin

- **Wazuh** provides a **host-based security** visibility using **lightweight** agents
- It is an **open-source** project supporting **detection**, **visibility**, and **compliance**.
- The **Wazuh plugin** allows for visualization and analysis of Wazuh alerts **stored** in **Elasticsearch**. It provides the following **features**:
  - Search and filter alerts
  - View and edit the Wazuh manager configuration
  - Manage ruleset (rules, decoders, CDB lists)
  - Manage groups of agents
  - Check the status and logs of the Wazuh cluster
  - Manage agents, their configuration, and data inventory
  - Explore and interact with the Wazuh API through the Dev Tools

Fleet and OSQUERY

- Fleet is an **open-source** device management tool using **osquery.**
- **osquery** is an agent for **operating system monitoring**, and analytics framework.
- **osquery** can query **running processes**, load kernel **modules**, open network **connections**, browser **plugins**, **hardware** events, **file hashes**, etc.
- Run live **queries** against **all** or a **subset** of hosts.

Summary

- There is a **deluge** of **security information** and **events** that can be used to support security operations
- A major **challenge** is data overload because of the **vast quantities** of security information from a multitude of **sources**
- **Security Information and Event Management** (**SIEM**) **solutions** are intended to address this **challenge**
- **SIEM solutions** ingest data of various **sorts**, **normalize** it, and provide **visualization** and **analysis tools** to support **security operations**
- Several **commercial** and **open-source** solutions **exist**

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Thank you

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