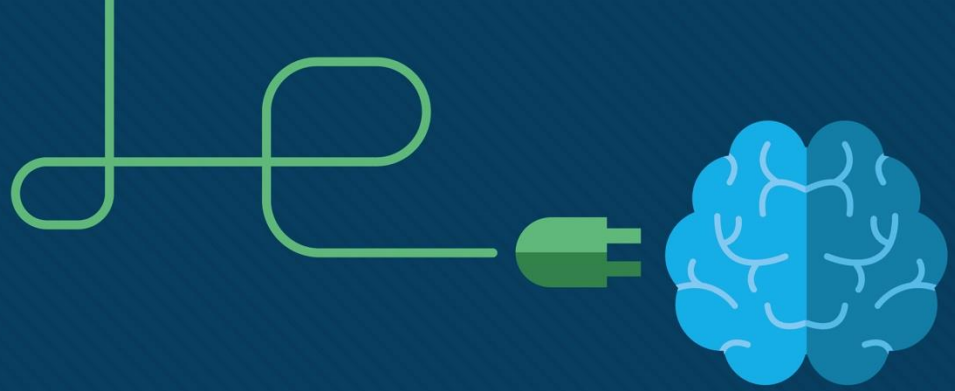


Module 27: Working with Network Security Data

CyberOps Associate v1.0

Module Objectives

Module Title : Working with Network Security Data

Module Objective: Interpret data to determine the source of an alert.

Topic Title	Topic Objective
A Common Data Platform	Explain how data is prepared for use in a Network Security Monitoring (NSM) system.
Investigating Network Data	Use Security Onion tools to investigate network security events.
Enhancing the Work of the CyberSecurity Analyst	Describe network monitoring tools that enhance workflow management.

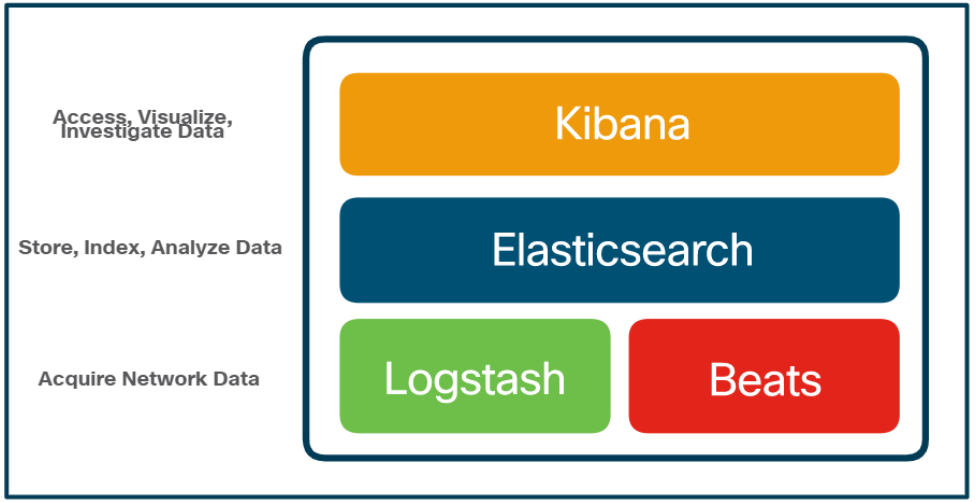
27.1 A Common Data Platform

ELK

Security Onion includes Elastic Stack that consists of Elasticsearch, Logstash, and Kibana (ELK).

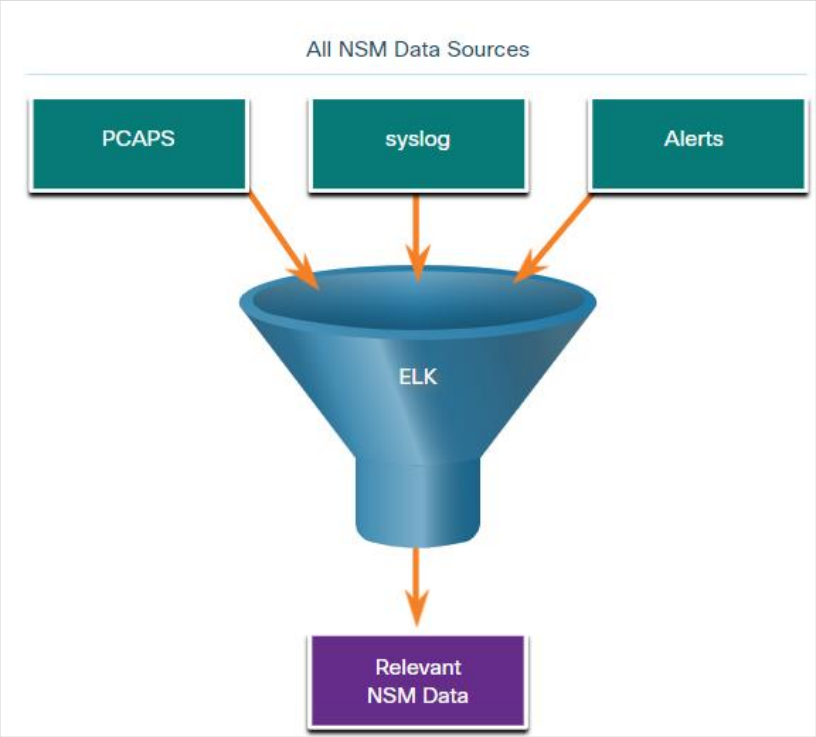
Core Components of ELK:

- **Elasticsearch**: An open-core platform for searching and analyzing an organization's data in near real time.
- **Logstash**: Enables collection and normalization of network data into data indexes that can be efficiently searched by Elasticsearch.
- **Kibana**: Provides a graphical interface to data that is compiled by Elasticsearch.
- **Beats**: Series of software plugins that send different types of data to the Elasticsearch data stores.



Data Reduction

- To reduce data, it is essential to identify the network data that should be gathered and stored to reduce the burden on systems.
- By limiting the volume of data, tools like Elasticsearch will be far more useful.



Data Normalization

- Data normalization is the process of combining data from a number of sources into a common format.
- A common schema will specify the names and formats for the required data fields.
- For example, IPv6 addresses, MAC addresses, and date and time can be represented in varying formats:

IPv6 Address Formats	Mac Formats	Date Formats
2001:db8:acad:1111:2222::33	A7:03:DB:7C:91:AA	Monday, July 24, 2017 7:39:35pm
2001:DB8:ACAD:1111:2222::33	A7-03-DB-7C-91-AA	Mon, 24 Jul 2017 19:39:35 +0000
2001:DB8:ACAD:1111:2222:0:0:33	A70.3DB.7C9.1AA	2017-07-24T19:39:35+00:00

- Data normalization is also required to simplify searching for correlated events.

Data Archiving

- Retaining Network Security Monitoring (NSM) data indefinitely is not feasible due to storage and access issues.
- The retention period for certain types of network security information may be specified by compliance frameworks.
- Sguil alert data is retained for 30 days by default. This value is set in the **securityonion.conf** file.
- Security Onion data can always be archived to external storage by a data archive system, depending on the needs and capabilities of the organization.

***Note**: The storage locations for the different types of Security Onion data will vary based on the Security Onion implementation.*

Lab - Convert Data into a Universal Format

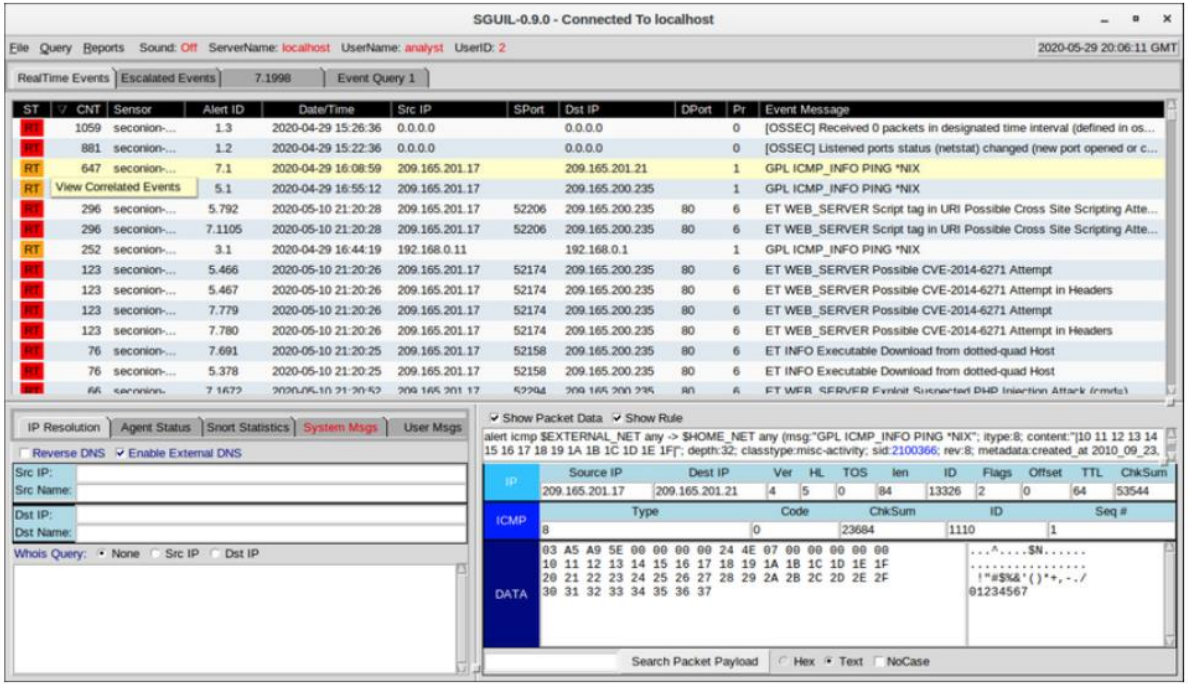
In this lab, you will complete the following objectives:

- **Part 1**: Use command line tools to manually normalize log entries.
- **Part 2**: The timestamp field must be normalized.
- **Part 3**: The IPv6 field requires normalization.

27.2 Investigating Network Data

Working in Sguil

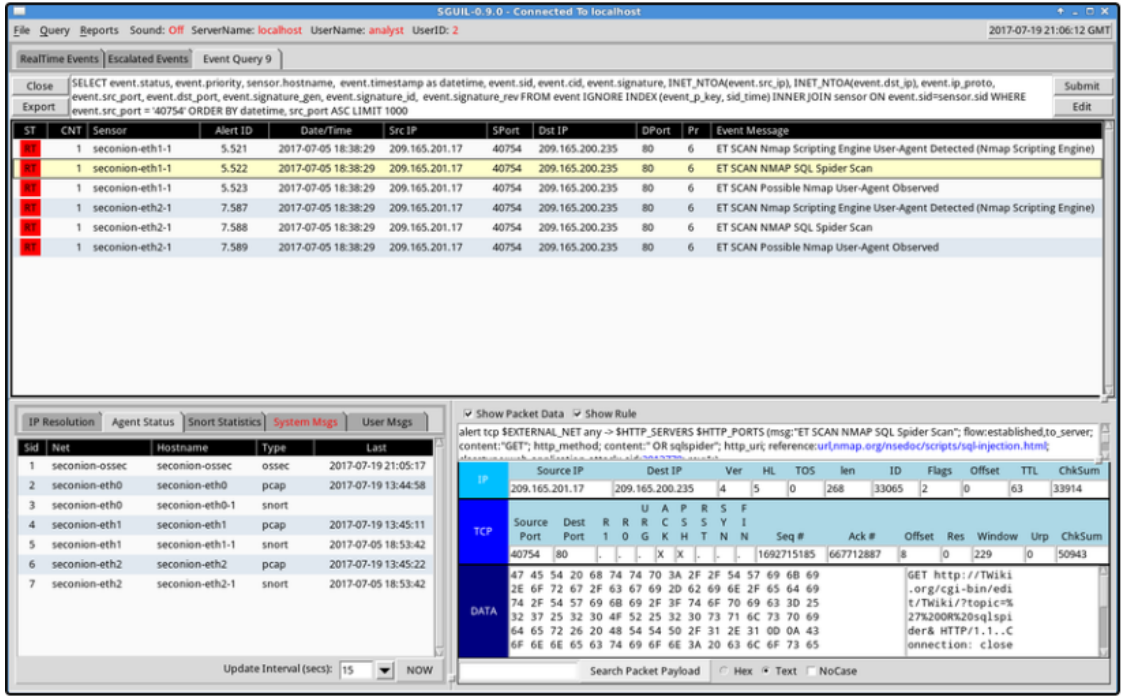
- In Security Onion, the first place that a cybersecurity analyst will go to verify alerts is Sguil.
- Sguil automatically correlates similar alerts into a single line and provides a way to view correlated events represented by that line.
- To understand what is happening in the network, it may be useful to sort the **CNT** column to display the alerts with the highest frequency.



Sguil Alerts Sorted on CNT

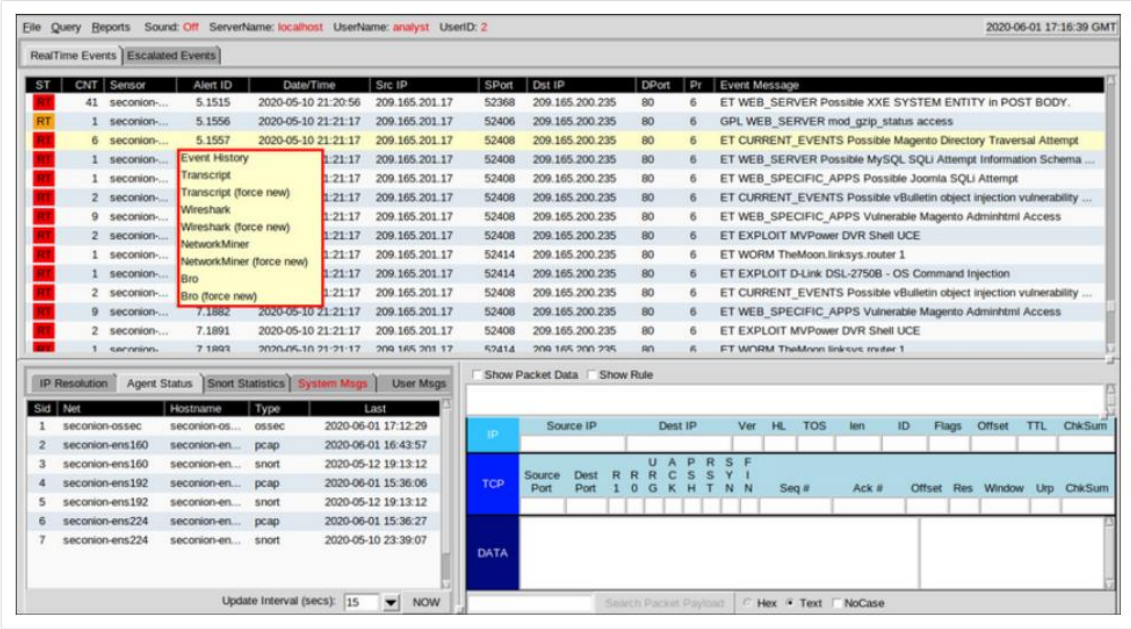
Sguil Queries

- Queries can be constructed in Sguil using the Query Builder. It simplifies constructing queries to a certain degree.
- Cybersecurity analyst must know the field names and some issues with field values to effectively build queries in Sguil.
- For example, Sguil stores IP addresses in an integer representation.



Pivoting from Sguil

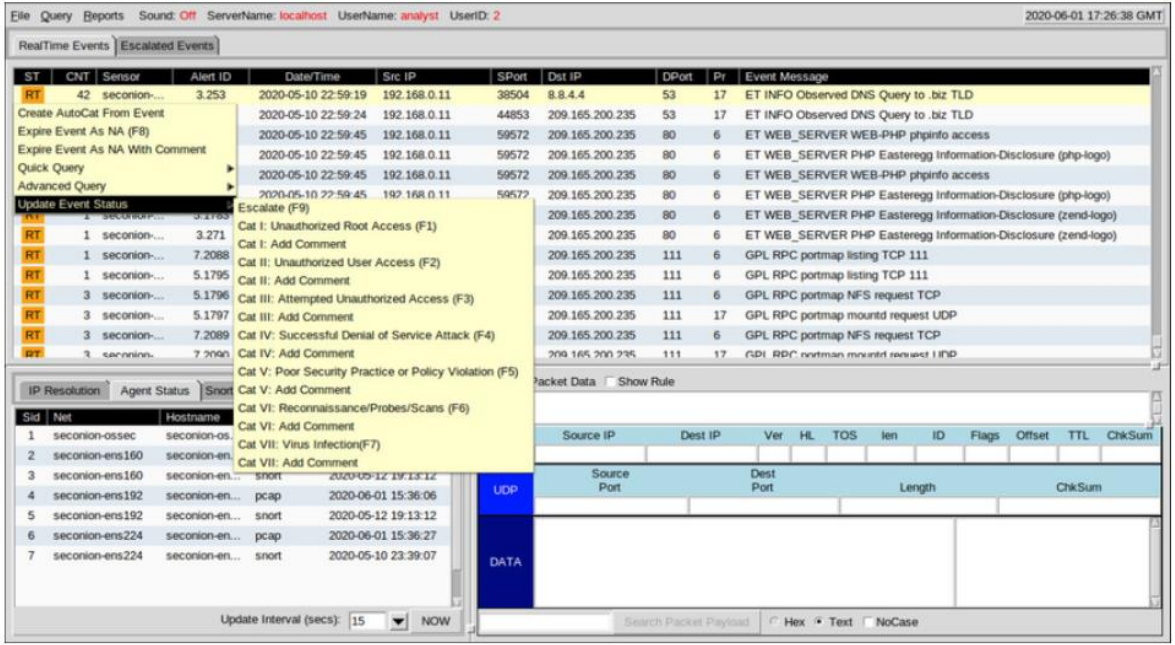
- Sguil provides the ability for the cybersecurity analyst to pivot to other information sources and tools.
- Log files are available in Elasticsearch.
- Relevant packet captures can be displayed in Wireshark.
- Sguil can provide pivots to Passive Real-time Asset Detection System (PRADS) and Security Analyst Network Connection Profiler (SANCP) information.



***Note**: The Sguil interface refers to PADS instead of PRADS.*

Event Handling in Sguil

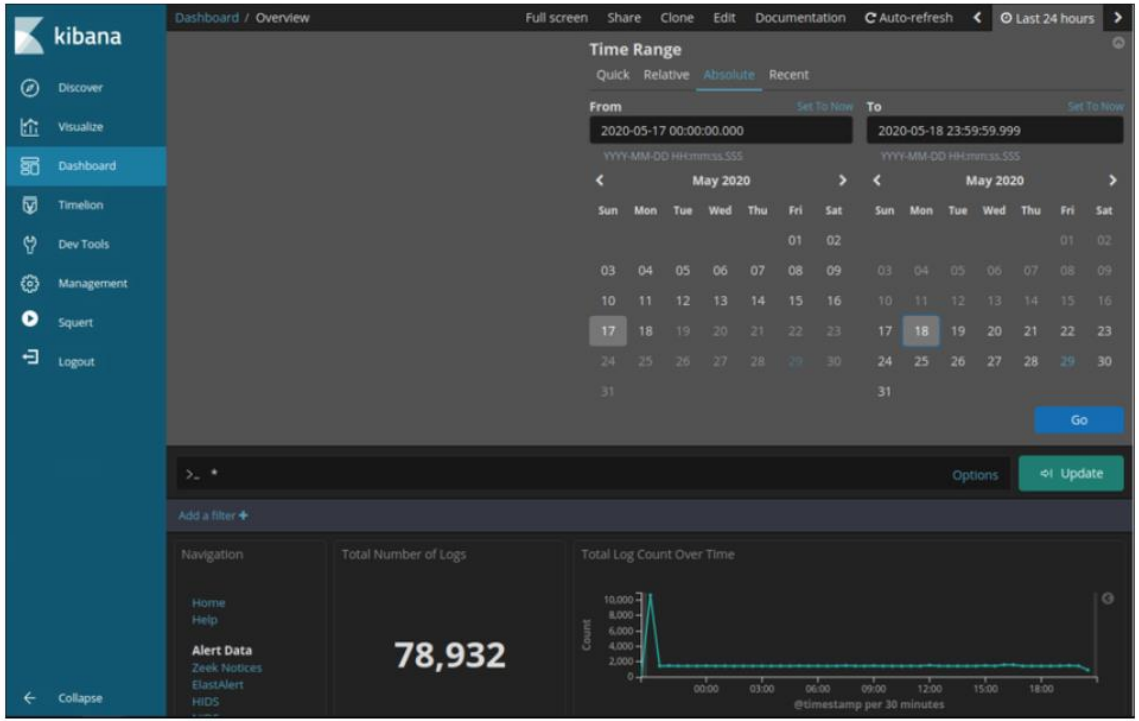
- Sguil is a console that enables a cybersecurity analyst to investigate, verify, and classify security alerts.
- Three tasks can be completed in Squil to manage alerts:
  - Alerts that have been found to be false positives can be expired.
  - An event can be escalated by pressing the F9 key.
  - An event can be categorized.



- Sguil includes seven pre-built categories that can be assigned by using a menu or by pressing the corresponding function key.

Working in ELK

- Logstash and Beats are used for data ingestion in the Elastic Stack.
- Kibana, which is the visual interface into the logs, is configured to show the last 24 hours by default.
- Logs are ingested into Elasticsearch into separate indices or databases based on a configured range of time.
- The best way to monitor the data in Elasticsearch is to build customized visual dashboards.



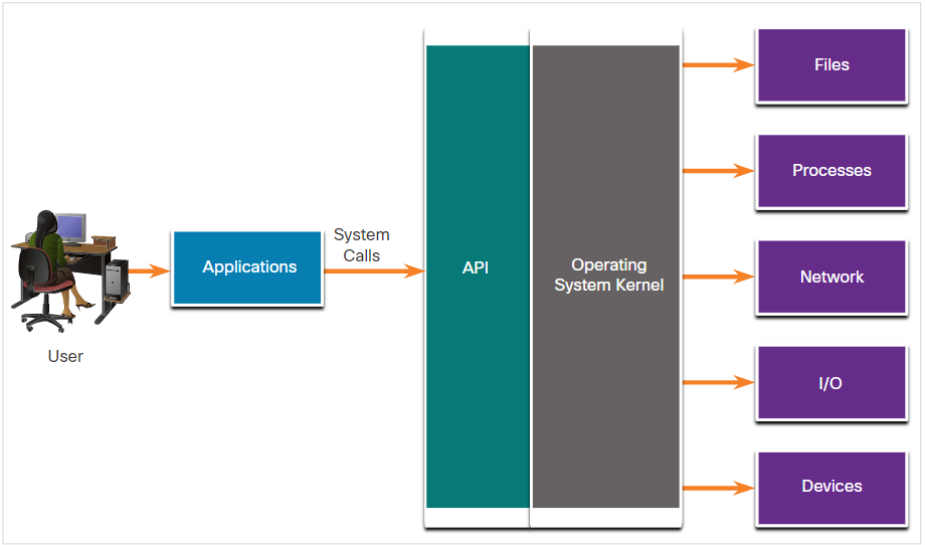
Queries in ELK

- Elasticsearch is built on Apache Lucene, an open-source search engine software library featuring full text indexing and searching capabilities.
- Using Lucene software libraries, Elasticsearch has its own query language based on JSON called Query Domain Specific Language (DSL).
- Along with JSON, Elasticsearch queries make use of elements such as Boolean operators, Fields, Ranges, Wildcards, Regex, Fuzzy Search, and Text Search.
- Elasticsearch was designed to interface with users using web-based clients that follow the HTTP REST framework.
- Methods used for executing the queries are URI, cURL, JSON and Dev Tools.

***Note**: Advanced Elasticsearch queries are beyond the scope of this course. In the labs, you will be provided with the complex query statements, if necessary.*

Investigating Process or API Calls

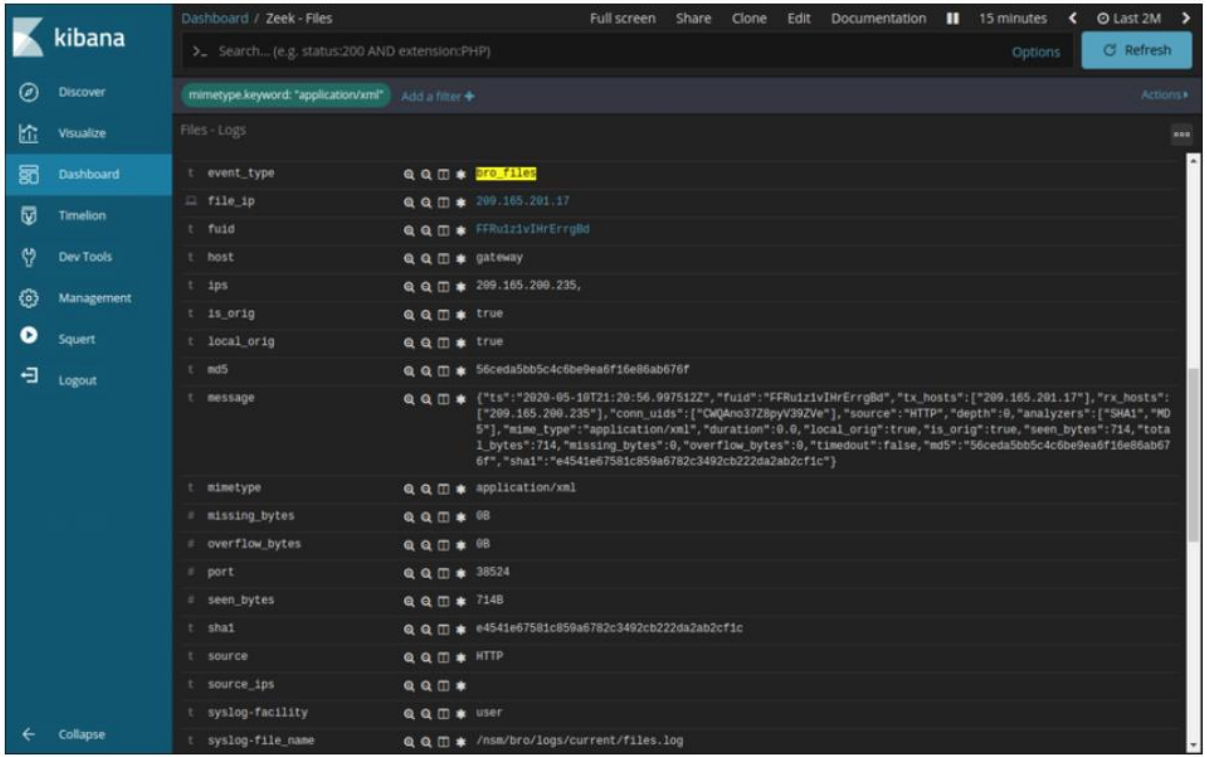
- Applications interact with an Operating System (OS) through system calls to the OS Application Programming Interface (API).
- If malware can fool an OS kernel into allowing it to make system calls, many exploits are possible.
- OSSEC rules detect changes in host-based parameters.
- OSSEC rules will trigger an alert in Sguil.
- Pivoting to Kibana on the host IP address allows you to choose the type of alert based on the program that created it.



- Filtering for OSSEC indices results in a view of the OSSEC events that occurred on the host, including indicators that malware may have interacted with the OS kernel

Investigating File Details

- In Sguil, if the cybersecurity analyst is suspicious of a file, the hash value can be submitted to an online site to determine if the file is a known malware.
- In Kibana, Zeek Hunting can be used to display information regarding the files that have entered the network.
- Note that in Kibana, the event type is shown as **bro_files**, even though the new name for Bro is Zeek.



Lab - Regular Expression Tutorial

In this lab, you will complete the following objectives:

- Use an online tutorial to explore regular expressions.
- Describe the information that matches given regular expressions.

Lab - Extract an Executable from a PCAP

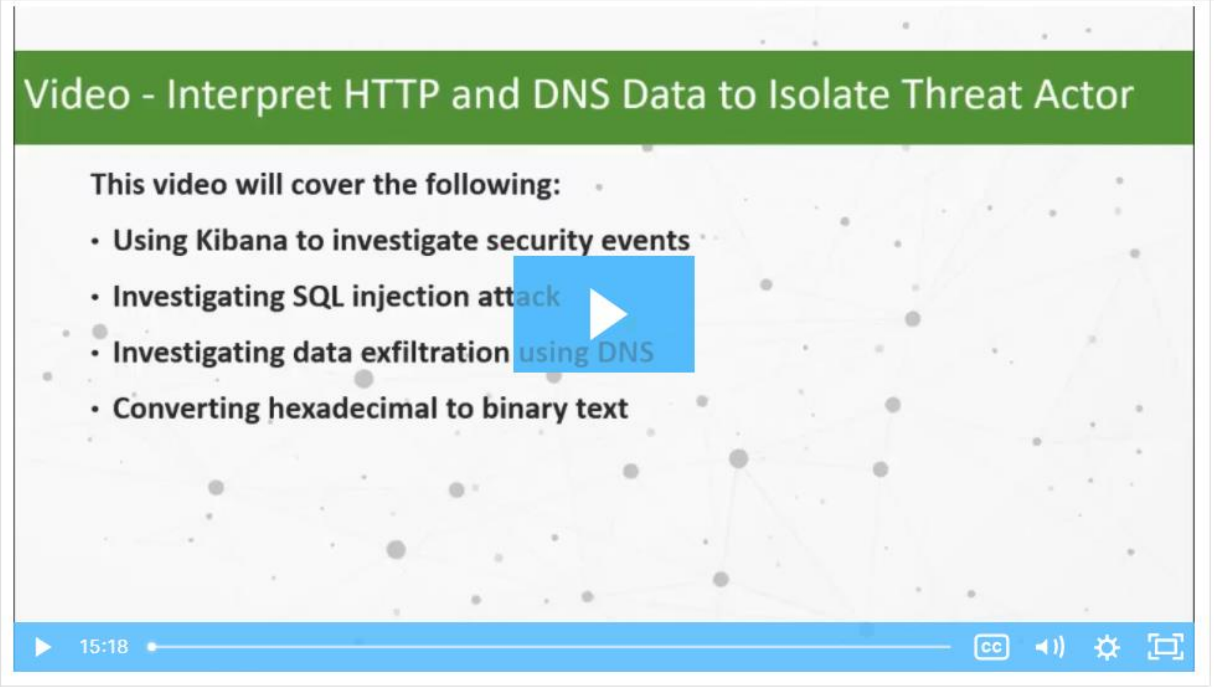
Looking at logs is very important, but it is also important to understand how network transactions happen at the packet level.

In this lab, you will complete the following objective:

- Analyze the traffic in a previously captured pcap file and extract an executable file from the traffic.

Video - Interpret HTTP and DNS Data to Isolate Threat Actor

Watch the video to view a walkthrough of the Security Onion Interpret HTTP and DNS Data to Isolate Threat Actor lab.



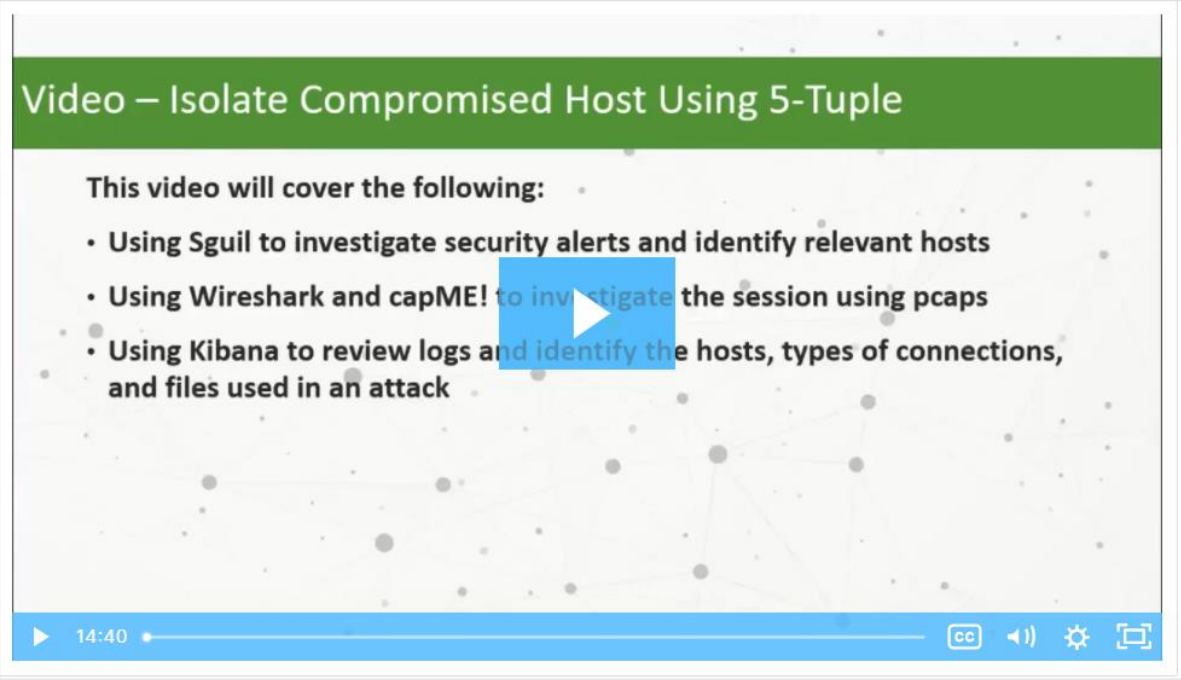
Lab - Interpret HTTP and DNS Data to Isolate Threat Actor

In this lab, you will complete the following objective:

- Investigate SQL injection and DNS exfiltration exploits using Security Onion tools.

Video - Isolate Compromised Host Using 5-Tuple

Watch the video to view a walkthrough of the Security Onion Isolate Compromised Host Using 5-Tuple lab.



Lab - Isolate Compromised Host Using 5-Tuple

In this lab, you will complete the following objective:

- Use Security Onion tools to investigate an exploit.

Lab - Investigate a Malware Exploit

In this lab, you will complete the following objective:

- Use Security Onion to investigate a more complex malware exploit the uses an exploit kit to infect hosts.

Lab - Investigating an Attack on a Windows Host

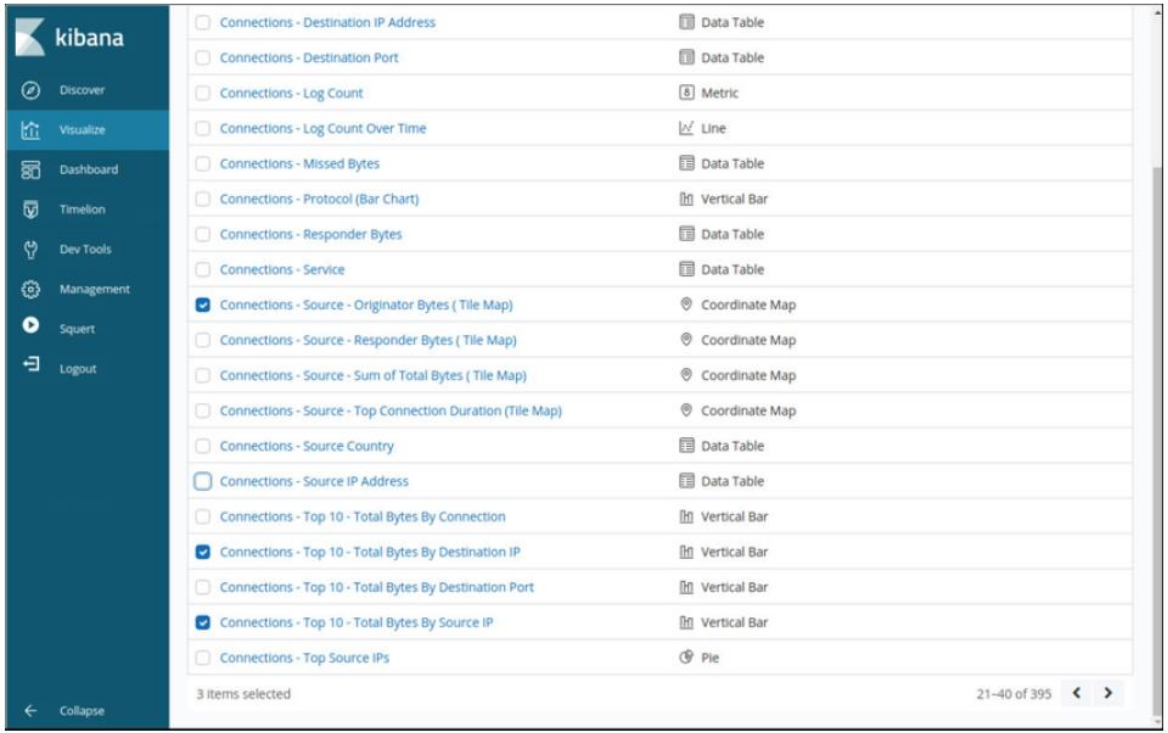
In this lab, you will complete the following objectives:

- Investigate an attack on a Windows host.
- Use Sguil, Kibana, and Wireshark in Security Onion to investigate the attack.
- Examine exploit artifacts.

27.3 Enhancing the Work of the Cybersecurity Analyst

Dashboards and Visualizations

- Dashboards provide a combination of data and visualizations which allows cybersecurity analysts to focus on specific details and information.
- Dashboards are usually interactive.
- Kibana includes the capability of designing custom dashboards.
- In addition, tools such as Squert in Security Onion provide a visual interface to NSM data.



Workflow Management

- Workflows are the sequence of processes and procedures through which work tasks are completed.
- Managing the SOC workflows:
  - Enhances the efficiency of the cyberoperations team
  - Increases the accountability of the staff
  - Ensures that all potential alerts are treated properly
- Sguil provides a basic workflow management but not a good choice for large operations. There are third party systems available that can be customized.
- Automated queries add efficiency to the cyberoperations workflow. These queries automatically search for complex security incidents that may evade other tools.

27.4 Working with Network Security Data Summary

What Did I Learn in this Module?

- A network security monitoring platform such as ELK or Elastic Stack must unite the data for analysis.
- ELK consists of Elasticsearch, Logstash, and Kibana with components, Beats, ElastAlert, and Curator.
- Network data must be reduced so that only relevant data is processed by the NSM system.
- Network data must also be normalized to convert the same types of data to consistent formats.
- Sguil provides a console that enables a cybersecurity analyst to investigate, verify, and classify security alerts.
- Kibana visualizations provide insights into NSM data by representing large amounts of data formats that are easier to interpret.
- Workflow management adds efficiency to the work of the SOC team.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