Client-Side Attacks and Detection
Analysis Exercise

Overview

Students will apply their existing analysis knowledge and tool skills (i.e., FireSIGHT and Wireshark) along with additional concepts from this module to analyze a client-side attack. An Ubuntu desktop is demonstrated for tool access and analysis. The lab mimics analysis scenarios often performed in the real world. While other tools may be used in operational environments, the same analysis concepts can be applied to them.

Situation

Several users in your organization received a potential phishing email between **1600 and 1659 UTC on April 15, 2020**. The email links to a news story at IP address 10.167.197[.]38, which is located in China according to WHOIS.

Review FireSIGHT alerts to begin your analysis. Consider if anyone clicked on the link and what the potential consequences may be.

Pivot within FireSIGHT's events to derive likely hypotheses. Correlate these possibilities with lab1.pcap in Wireshark to strengthen your analysis and determine the most likely hypothesis.

Objectives

Follow along with the video demonstration to identify the following information:

- Adversary
  - IP Address: _____
- Victim
  - IP Address: _____
  - Port Exploited (e.g., 80/TCP): _____
  - Protocol Exploited (e.g., HTTP): _____
- Stage 2 Infrastructure
  - IP Address: _____
  - Port Used (e.g., 80/TCP): _____
  - Protocol Used (e.g., HTTP): _____
  - File Provided (e.g., malware.7z): _____
- C2 Infrastructure
  - IP Address: _____
  - Port Used (e.g. 80/TCP) _____
  - Protocol Used (e.g., HTTP): _____

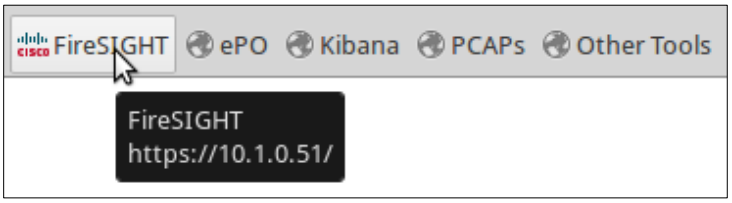
ANALYSIS PROCESS
Follow along with the video as it goes through the following steps of analysis.

This section provides answers and a method of solving each of the lab questions. Note that there may be more than one way to arrive at the correct answer. You may discover a different solution to the same problem.

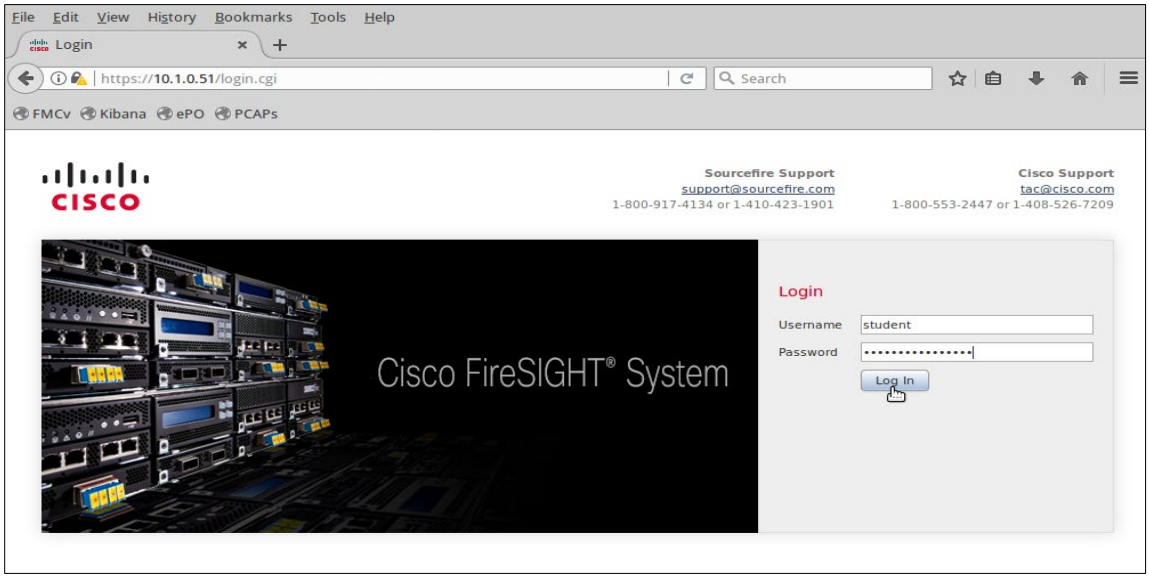
Note: Potential Indicators of Compromise (IoC), such as IP addresses and domain names, should be "de-fanged" as a best practice. De-fanging simply involves the insertion of a character into the IoC that is otherwise invalid in the IoC's context, so that copying/pasting/clicking the IoC won't inadvertently put readers at risk. In this lab, brackets are used to de-fang. When you are asked to enter a value into a field, such as when performing a search, remove any de-fanging characters to ensure the search will properly execute. For example, if you are instructed to enter "256.256.256[.]256", you would enter "256.256.256.256" (removing the brackets).

Step 1: Searching within FireSIGHT

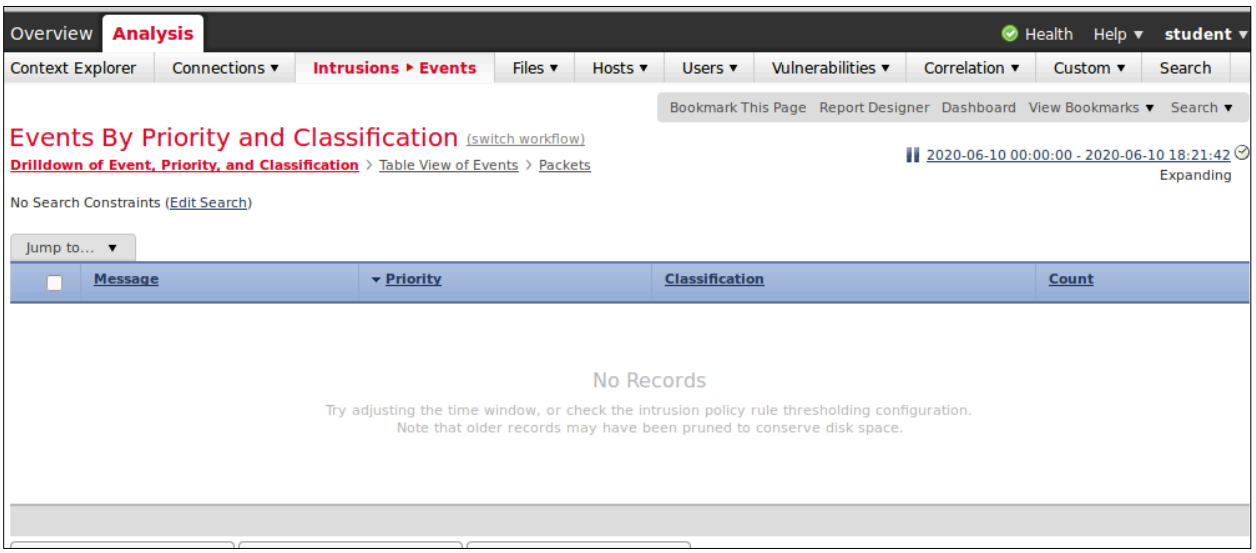
1. Select the **FireSIGHT** bookmark in the open **Mozilla Firefox** web browser.



2. Enter username "Student" and password "12qwaszx!@QWASZX" and then click "Log In".



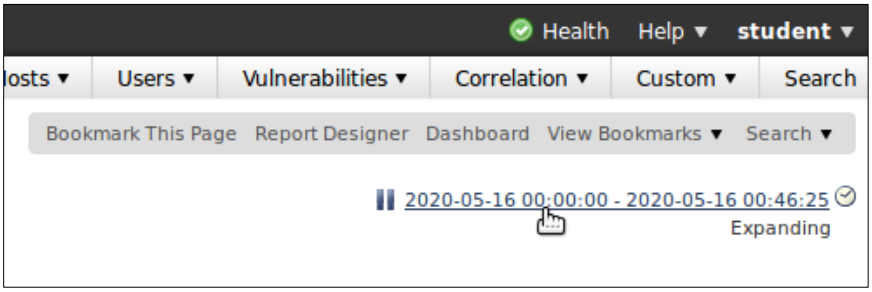
FireSIGHT displays the intrusion events screen by default. Notice no events are listed.



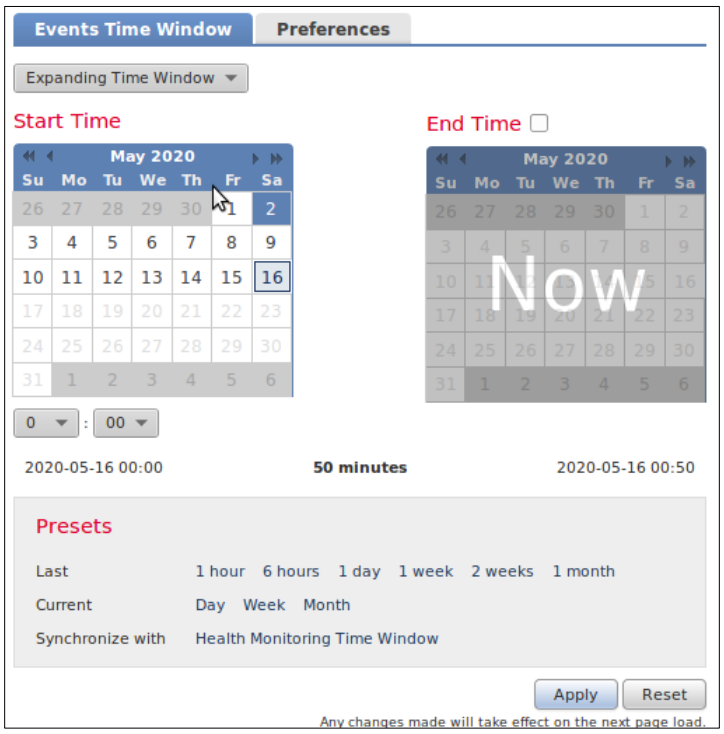
By default, FireSIGHT displays events from midnight of the current day to the current time. One common reason for listing unexpected or no displayed events is forgetting to change this default to the correct timeframe.

Tip: If you need to return to the intrusion events area later, select Analysis >> Intrusions > > Events from the main menu.

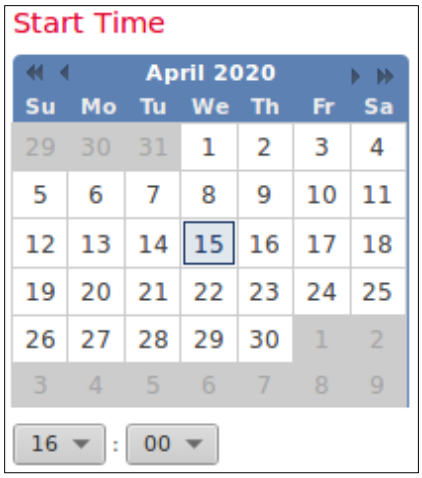
3. Begin configuring the correct timeframe mentioned in the instructions by selecting the date/time range near the top-right corner of the window.



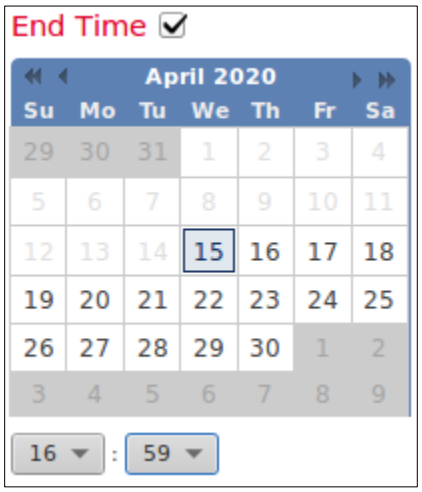
A date picker pop-up opens. Ensure the "Events Time Window" tab is selected.



4. Configure the start and stop times to **April 15, 2020 between 1600 and 1659 UTC**. Under "Start Time" use the arrows within the calendar to choose "April 15, 2020". Select "16" and "00" from the hour and minute drop-down menus below the calendar.

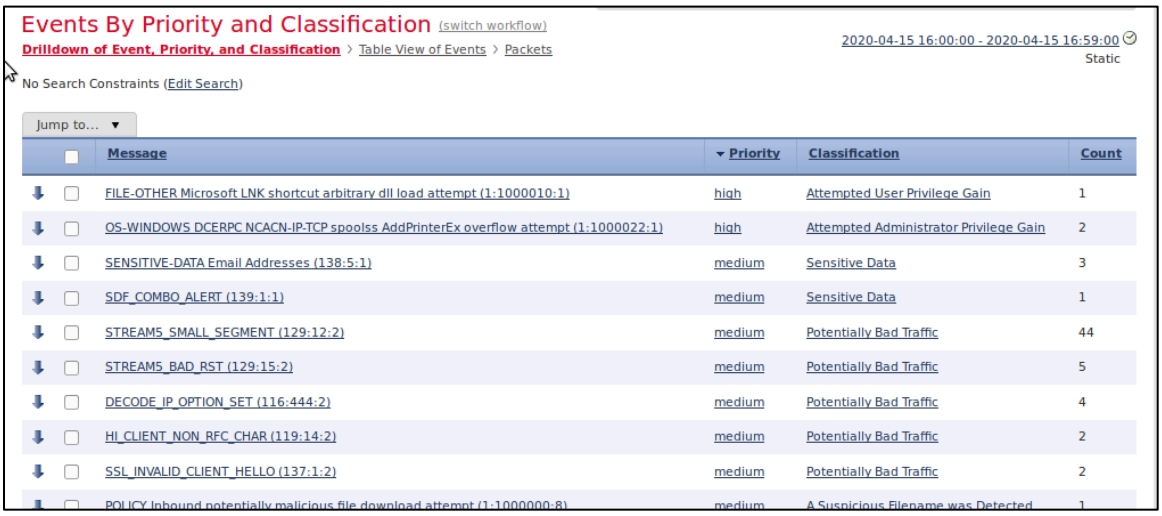


5. Next to "End Time", ensure the checkbox is checked. Use the arrows within the calendar to choose "April 15, 2020." Select "16" and "59" from the hour and minute drop-down menus below the calendar.



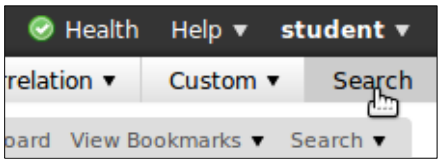
6. Verify the start and stop times displayed directly above the "Presets" heading are correct. Click "Apply" when finished.

FireSIGHT populates with events from the specified timeframe. Notice there seem to be a lot of events for such a short time period.

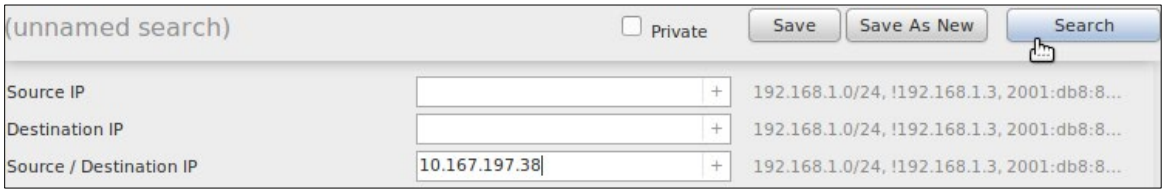


A common method of narrowing in on the more important events is to filter with searches on known indicators.

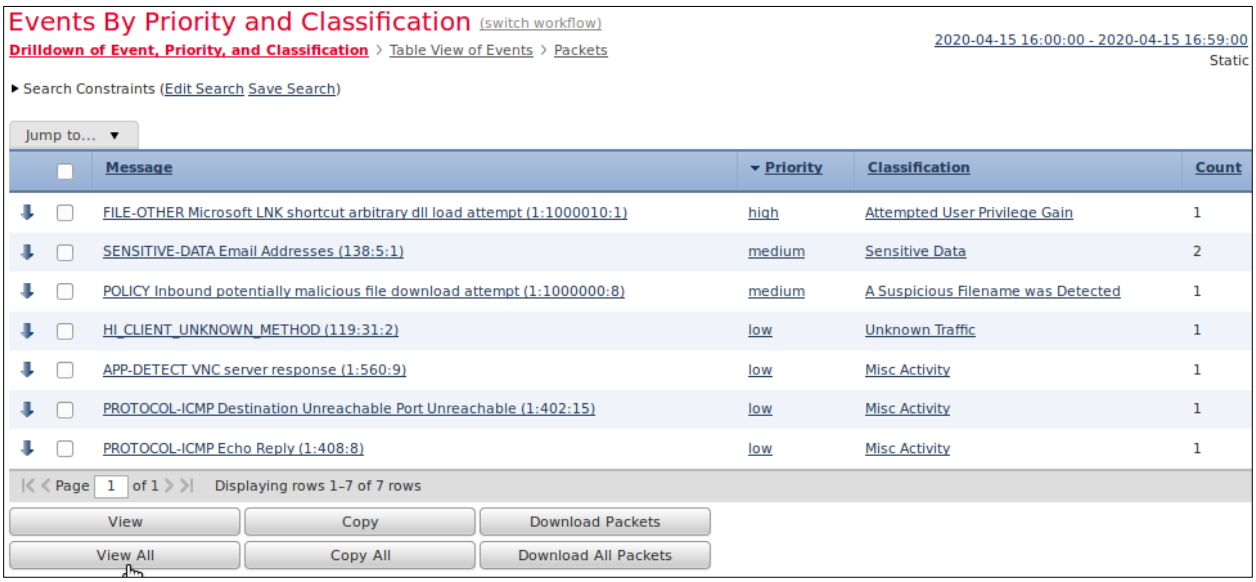
7. Search on the IP address used in the news links of the phishing email. Select "Search" in the Analysis menu to view FireSIGHT's search options.



8. Scroll down to the "Networking" section, enter "10.167.197[.]38" in the "Source/Destination IP" field, and then click "Search".

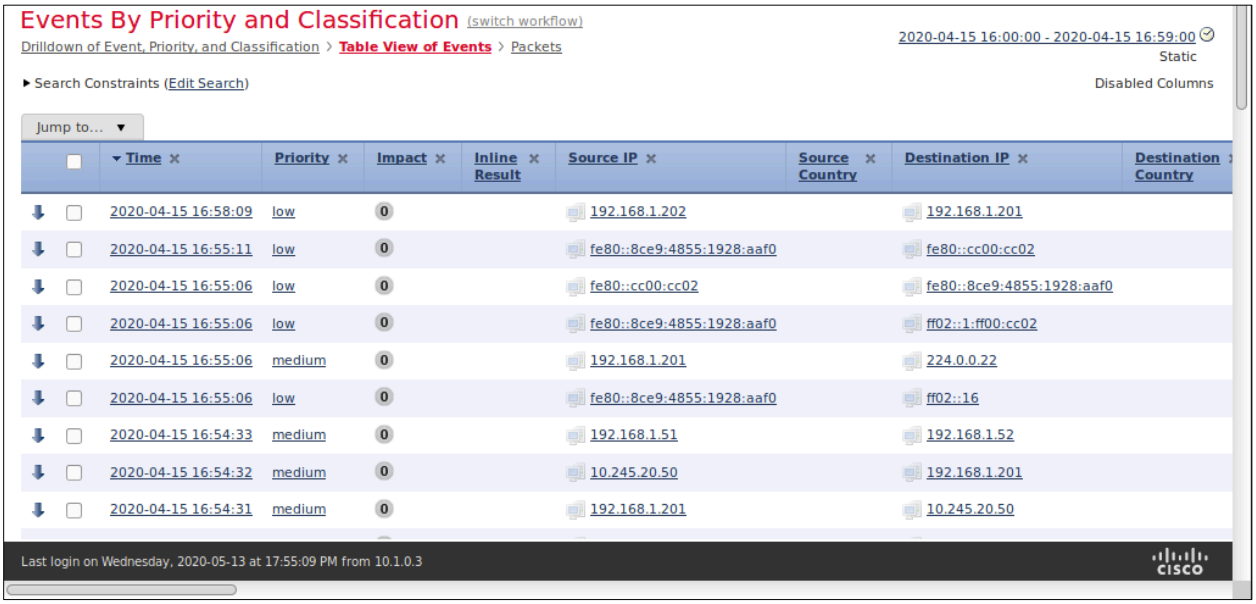


FireSIGHT returns a list of grouped events in a tabular format.



Step 2: Viewing Event Details

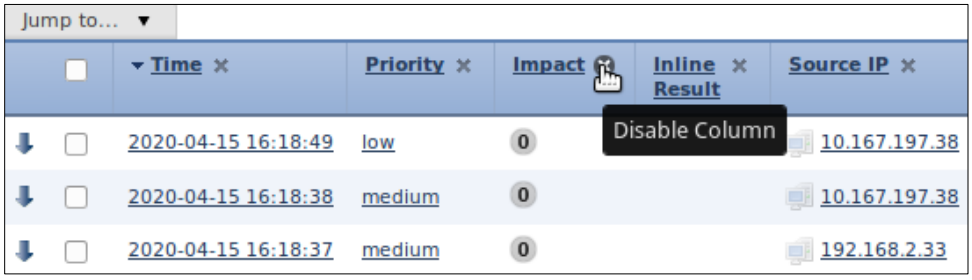
1. Click "View All" beneath the search results to display additional details. FireSIGHT displays all individual events instead of grouping them together. Notice it shows useful columns like Time, Source IP, and Destination IP in the current view but is missing others such as the Message field. Scroll horizontally right to view the Message column, but now the first few useful fields are obscured.



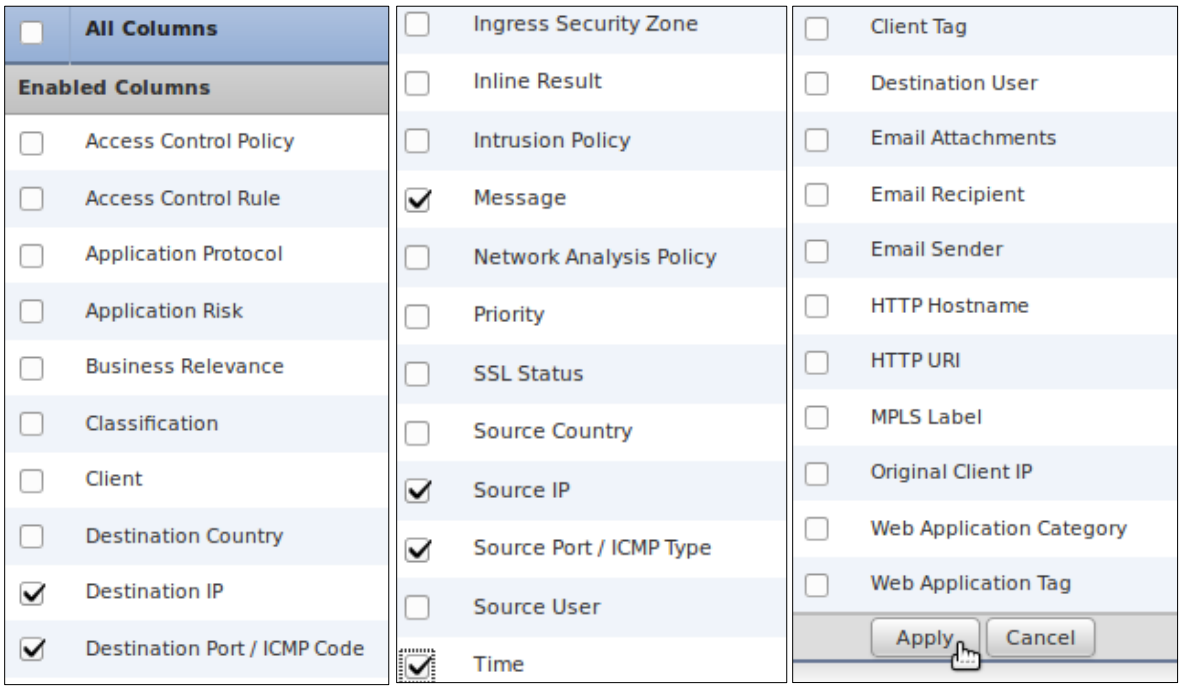
By default, FireSIGHT displays all event fields. This prevents viewing of just the most useful columns on a one or two screens. One common work-around is to reduce the number of fields displayed.

2. To remove any unnecessary columns, select the "X" next to the header of any column (e.g., Impact).

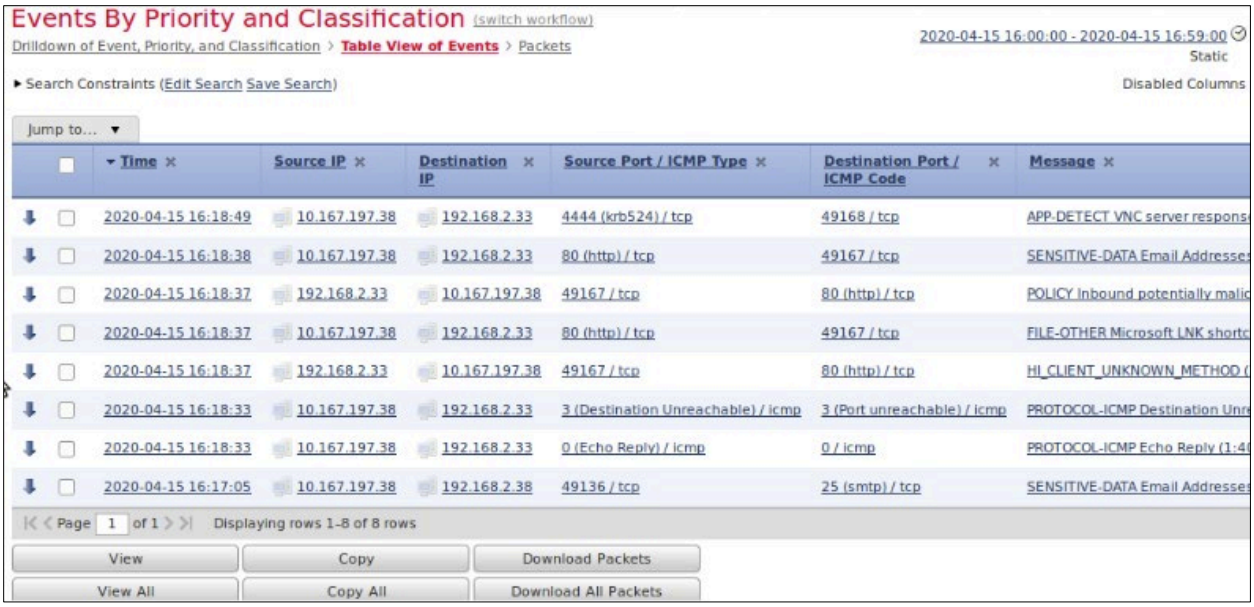
Note: The remaining CDA exercises assume you will perform a column cleanup in the same manner as this lab.



A menu showing all selectable columns appears. Due to the number of columns displayed by default, the easiest approach is to disable all columns and then enable just the needed ones. To do this uncheck "All Columns" at the top of the menu and check those as illustrated in the picture below (e.g., "Destination IP" and "Destination Port/ICMP Code").

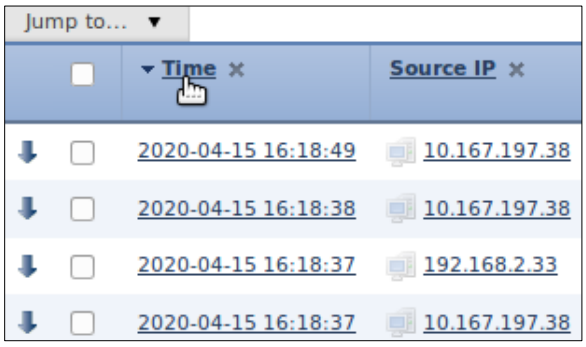


Scroll down and click "Apply" when finished. FireSIGHT displays the same results but with a limited number of columns.



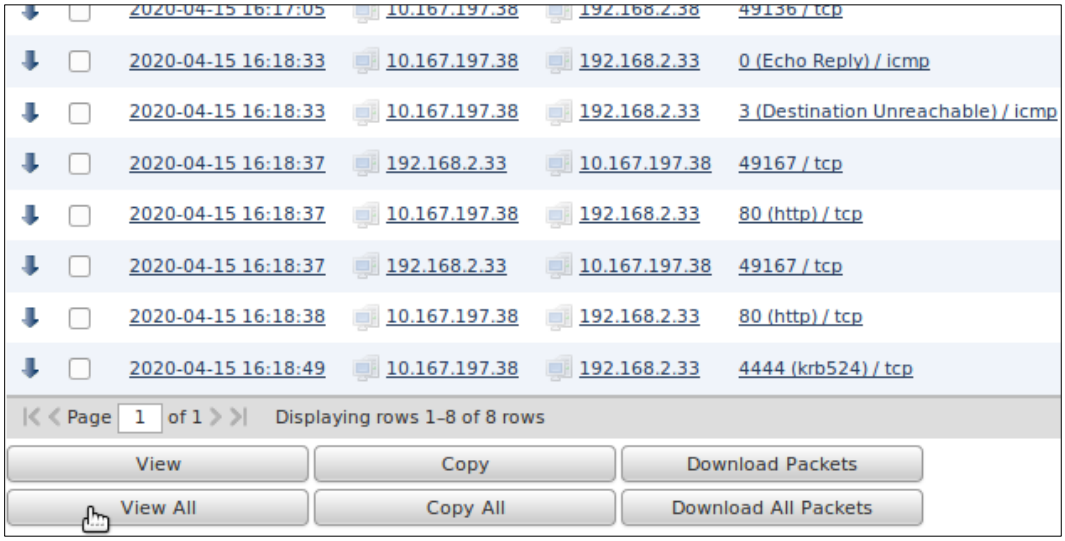
3. Another useful analysis adjustment is to reorder the events. By default, FireSIGHT orders events by newest-to-oldest chronologically. Changing the order to oldest-to-newest lists events in a more conventional top-down timeline.

Reverse the order of 10.167.197[.]38's logged events from oldest-to-newest by selecting the "Time" heading. (Selecting "Time" again changes ordering back to FireSIGHT's default).

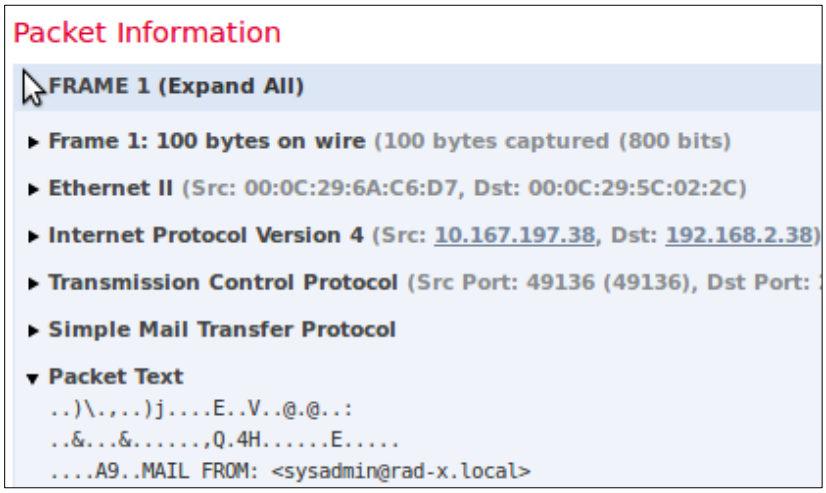


As shown below, the events are now ordered from oldest-to-newest.

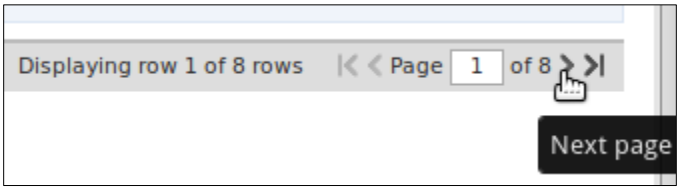
4. Now, it is time to analyze the details of each event. Click "View All" to display the details of the first event.



5. Review the information in the "Event Information" section of this event. Scroll down to the "Packet Information" section, and then select "Packet Text" to view its payload.

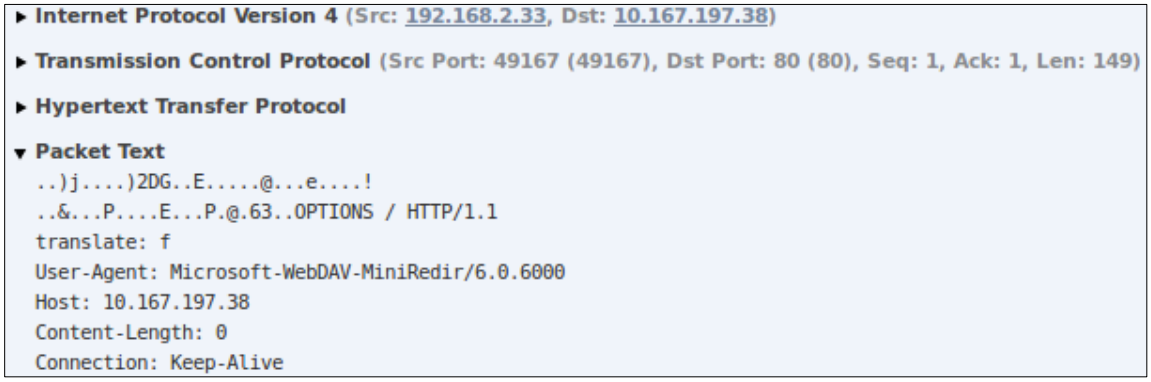


Click ">" to move to the next event.



6. Review each of the subsequent events in a similar manner as above until you come to one triggered by a rule with a "HI_CLIENT_UNKNOWN_METHOD" message.

7. Select "Packet Text" to view its payload. Notice an "HTTP OPTIONS" request was sent from 192.168.2[.]33 to the potential adversary at 10.167.197[.]38 on TCP port 80.



8. Click ">" to proceed to the next packet. Observe the event name, the HTTP URI field "/pPmusTKFGRW/qHHoL.lnk," and the reference in the rule pointing to MS10-046 and MS15-020.

Event	FILE-OTHER Microsoft LNK shortcut arbitrary dll load attempt (1:1000010:1)
Timestamp	2020-04-15 16:18:37
Classification	Attempted User Privilege Gain
Priority	high
Ingress Security Zone	Passive
Device	192.168.1.52
Ingress Interface	eth1
Source IP	**10.167.197.38**
Source Port / ICMP Type	80 (http) / tcp
Destination IP	**192.168.2.33**
Destination Port / ICMP Code	49167 / tcp
HTTP Hostname	Not Available
HTTP URI	/pPmusTKFGRW/qHHoL.lnk
Intrusion Policy	RaD-X-1
Access Control Policy	Default Access Control
Access Control Rule	RaD-X
Rule	alert tcp $EXTERNAL_NET any -> $HOME_NET any (sid:1000010; gid:1; flow:established,to_client; file_data; content:"|4C 00 00 00 01 14 02 00 A2 DD 08 00 2B 30 30 9D|"; distance:0; metadata:policy max-detect-ips drop, policy security-ips drop, service ftp-data, service http, service ima reference:url,technet.microsoft.com/en-us/security/bulletin/ms10-046; reference:url,technet.microsoft.com/en-us/security/bulletin/ms15-020;

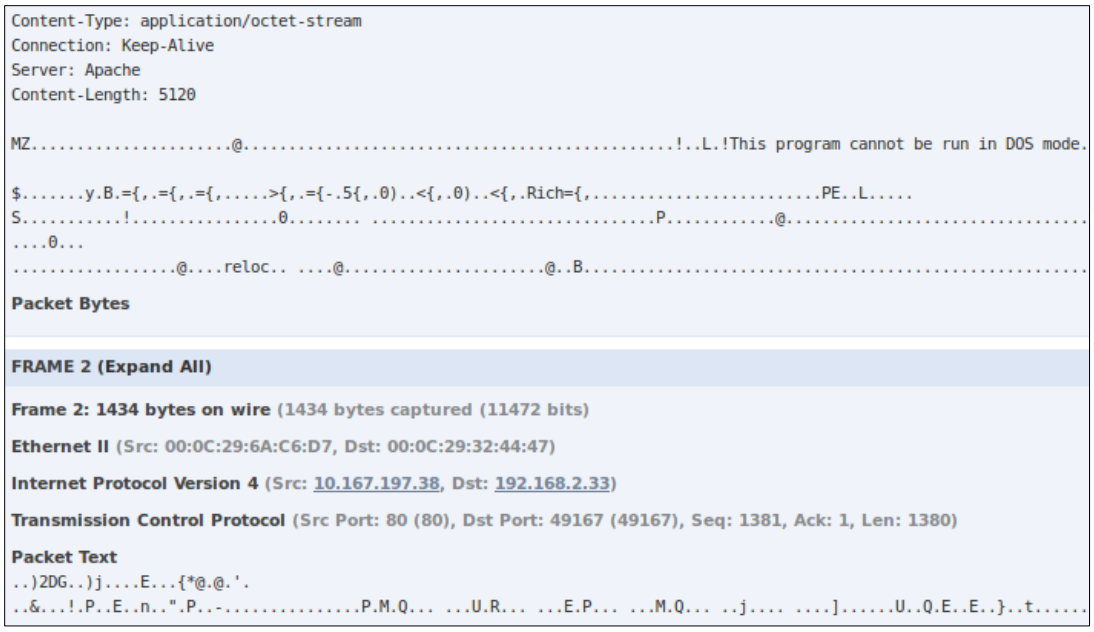
Based on this information, it is very likely the adversary's IP address was 10.167.197[.]38 and the victim's IP address was 192.168.2[.]33. The victim appears to have been initially compromised using the HTTP protocol over TCP port 80 via a downloaded LNK file.

9. Expand "Packet Text" and slowly scroll to the right to view all of its content. Note the LNK shortcut points to a DLL file located on the adversary's machine.

```
.\.\.1.0...1.6.7...1.9.7...3.8.\.p.P.m.u.s.T.K.F.G.R.W.\.N.f.I.z.L.H.Z.F...d.l.l.......
```

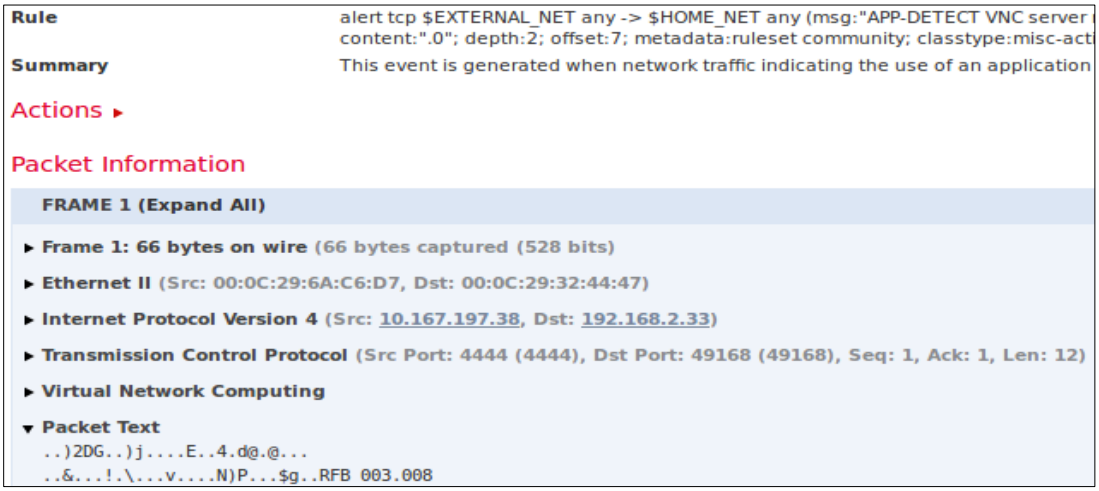
10. Go to the next event and review its contents. In "Packet Text", note the victim subsequently made the above HTTP GET request for "/pPmusTKFGRW/NfIzLHZF.dll" to the same 10.167.197[.]38 using the HTTP protocol over TCP port 80. The execution of the original LNK file in the previous packet likely caused this stage 2 download request for NflzLHZF.dll.

11. Continue on to the next event and review its contents. This one includes multiple frames within one event. Open "Packet Text" for the Frame 1 and note the indications of a Windows executable file being downloaded (i.e., "MZ" and "!This program cannot be run in DOS mode.").



The message for this event, "SENSITIVE-DATA Email Addresses (138:5:1)" is not too useful but ended up providing valuable information. The "@" symbols in Frame 2 likely cause this rule to fire.

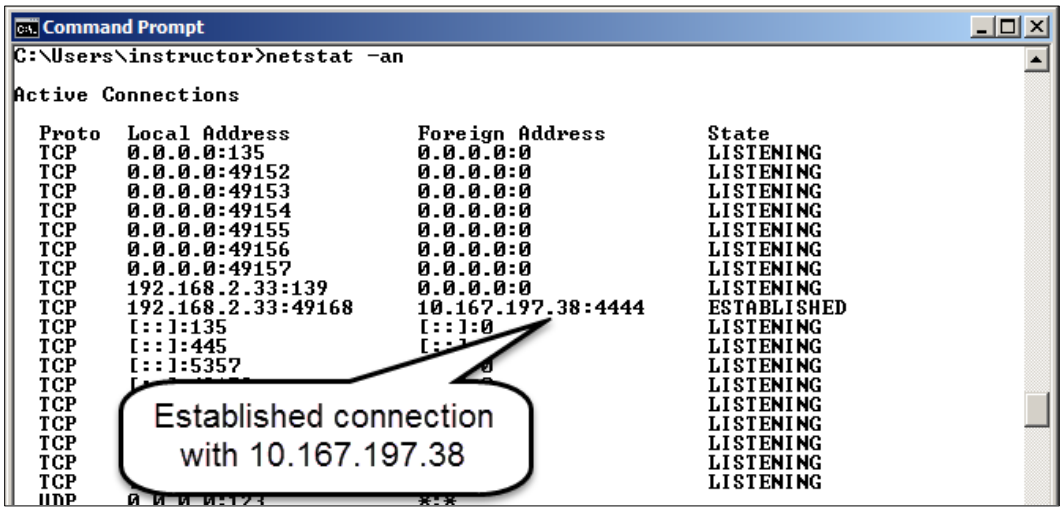
12. Proceed to the final packet. Note the use of the Virtual Network Computing (VNC) protocol over TCP port 4444 from the adversary at 10.167.197[.]38 to the victim for C2.



What happened?

We know an email was sent from an attacking host in China and a user clicked on the link contained within it. FireSIGHT generated a client-side .lnk alert, then a VNC alert followed.

Our next steps may include scrubbing the victim system to investigate scope of the compromise. The attack may also be confirmed by checking the host directly. Tools such as “netstat” can be helpful. Per your request, a technician sends the following netstat output from the suspect host.



These results confirm one of our hosts established a separate outbound TCP connection to China, which correlates with the VNC alert. The attacker may now have GUI access to the user’s desktop. The totality of evidence confirms the incident and we must now mitigate it.

The compromised host will most likely become a "zombie" in a malicious bot army. In this role, the host may be used to attack other devices, send spam, launch denial-of-service attacks, exfiltrate information stored on the device, or log keystrokes. Attackers may also "pivot" through the compromised host to attack other hosts "behind" the firewall.

The attacker social engineered the user into clicking on the malicious link and thereby exploited a known Microsoft Windows vulnerability. Social engineering attempts to trick people into taking specific actions. The linked website exploited a vulnerability in Windows .lnk files.

The Windows LNK exploit was patched with MS10-046. This exploited a vulnerability in "Windows Shell" that could allow remote code execution (2286198; http://technet.microsoft.com/en-us/security/bulletin/MS10-046).
MS10-046 was the same vulnerability exploited by Stuxnet, but it remained unpatched for several years. The attack required no user interaction; simply visiting a malicious site with Internet Explorer was enough to infect a system.

Prevention techniques against this attack include security awareness with emphasis on educating users not to click on anything in unsuspected emails. Obviously, patching Windows and keeping all software up to date would have eliminated this exploit from working altogether as well.

ANSWERS

- Adversary
  - IP Address: **10.167.197[.]38**
- Victim
  - IP Address: 192.168.2[.]33
  - Port Exploited (e.g., 80/TCP): 80/TCP
  - Protocol Exploited (e.g., HTTP): **HTTP**
- Stage 2 Infrastructure
  - IP Address: 10.167.197[.]38
  - Port Used (e.g., 80/TCP): 80/TCP
  - Protocol Used (e.g., HTTP): HTTP
  - File name: **NflzLHZF.dll**
- C2 Infrastructure
  - IP Address: 10.167.197[.]38
  - Port Used (e.g. 80/TCP) 4444/TCP
  - Protocol Used (e.g., HTTP): **VNC**
  -