

ACTIVE | COUNTERMEASURES



Network Threat Hunter Training

Level 1

Thank you to our sponsors!

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You'll need the class VMs

You only need one of these!

They are all the same, just tweaked for different platforms.

Hash is SHA256

VirtualBox

<https://thunt-level1.s3.amazonaws.com/vbox-thunt-L1-202308.zip>

5CF82AAEA859F9297CB33569BCFDC5023CAB87E78BD7605C82844D65BB41B899

Generic OVF

<https://thunt-level1.s3.amazonaws.com/ovf-thunt-L1-202308.zip>

D210F54CDC3E425E10C8FF66AE7F9B1EF0AC5924CE6A5543E1DDDC765252F992

VMware

<https://thunt-level1.s3.amazonaws.com/vmware-thunt-L1-202308.zip>

57E63852D10BC3C0D9F5B86E369FEFA555D8BF6B6ADA5D31A3E175F9B5109144

If you can't download the VM

- ▷ We have a new online option
- ▷ Public facing AC-Hunter server
- ▷ Read only access
- ▷ **You cannot:**
 - Add/delete databases
 - Add/delete safelists
 - Work at the command line
- ▷ Older version so experience is slightly different
- ▷ VM preferred but better than no option
- ▷ See the FAQ in #acm-webcast-content

VM versus online

VM

search for internal ip

Hosts [1]	Network Name	Threat Score
192.168.99.51	Unknown Private	138.70



Online

Hosts [6]	Network Name	Threat Score
192.168.99.51	Unknown Private	128.76
192.168.99.10	Unknown Private	0.00
192.168.99.54	Unknown Private	0.00
192.168.99.55	Unknown Private	0.00

Threat Intel Average Bytes	0 B	0.00
Too Many FQDNs Per Domain	2074	5.19
Unexpected Protocol on Well Known Port	0	0.00

VMWare/VirtualBox host access

- ▶ VMWare VM accessed via IP address
 - Originally set to 192.168.149.128
 - Example: ssh threat@192.168.149.128
 - Point host browser at <https://192.168.149.128>
- ▶ VirtualBox VM accessed via loopback
 - You must setup port forwarding & reboot!
 - Example: ssh threat@127.0.0.1:10022
 - Point host browser at <https://127.0.0.1:10443>

Logging in

- ▷ Using the class VM to do the labs
 - Console & UI login info
 - Name: threat
 - Pass: hunting
 - Same login info when using SSH
 - Web browser interface to ACH CE
 - Name: threat@activecountermeasures.com
 - Pass: hunting2
- ▷ Public servers have Web UI only
- ▷ Q&A in Discord

VMWare Troubleshooting

- ▷ Guest will not start
- ▷ Error "VM using a hardware version that is not supported"
- ▷ Right click VM
 - Manage → Change hardware compatibility
 - Follow Wizard → Pick your VMWare product

<https://www.augmastudio.com/2023/02/05/fix-virtual-machine-is-using-a-hardware-version-that-is-not-supported/>

VMWare troubleshooting (2)

- ▷ Problem: On VMWare, I can't connect to the IP address in the slide
- ▷ Root cause: Sometimes VMware changes the host portion of the address
- ▷ Open terminal and run this command:

```
ip address | grep 192.168.149
```

VMWare generic problems

- ▷ VMWare loves to consume memory
- ▷ VMWare loves to consume vCPUs
- ▷ Feed the beast!
- ▷ This seems to fix a lot of problems

VirtualBox troubleshooting

- ▷ Can't connect to VM from host via loopback address
- ▷ Possible IP change when imported
- ▷ Open terminal and run this command:

```
ip address | grep 10.0.2
```

- ▷ Follow these instructions but using IP you saw when running the above command

<https://www.activecountermeasures.com/port-forwarding-with-virtualbox/>

Which ACH CE database to load?

AC-Hunter Settings

Database	<input type="radio"/> winlab-agent	10/01/20 16:06 -- 10/02/20 14:36	×
Safelist	<input type="radio"/> vsagent	02/23/18 01:59 -- 02/24/18 01:59	×
Themes	<input type="radio"/> open-connections	01/30/18 13:14 -- 01/31/18 13:13	×
About	<input type="radio"/> gcat	02/16/18 01:59 -- 02/17/18 01:59	×
Upgrade	<input type="radio"/> empire	03/12/18 01:59 -- 03/13/18 01:59	×
	<input type="radio"/> dnscat2-ja3-strobe-agent	01/30/18 13:14 -- 01/31/18 13:13	×
	<input type="radio"/> dnscat2-ja3-strobe	01/30/18 13:14 -- 01/31/18 13:13	×
	<input checked="" type="radio"/> dnscat2-ja3	01/30/18 13:14 -- 01/31/18 13:13	×

Database Removal

Delete All By Age

Confirm

<shameless_plugs>

New bash scripting class!

- ▶ Authored by the ONE... the ONLY... Bill Stearns
- ▶ Getting comfortable with Linux command line
- ▶ Bash scripting
- ▶ Managing Linux systems with it
- ▶ Automating tasks
- ▶ Available on-demand

<https://www.antsyphontraining.com/on-demand-courses/bash-scripting-for-server-administration-w-bill-stearns/>

Classes I'm teaching

- ▷ Intro to Packet Decoding
 - IP headers from a security perspective
 - April 23rd - 26th
 - <https://www.antsyphontraining.com/live-courses-catalog/getting-started-in-packet-decoding-chris-brenton/>
- ▷ Advanced Threat Hunting
 - Next step up from this course, mostly C2 labs
 - May 21st - 24th, then Aug 13th - 16th
 - <https://www.antsyphontraining.com/advanced-network-threat-hunting-w-chris-brenton/>
- ▷ Security Compliance and Leadership
 - Getting funded, C level communications, team management
 - Aug 22nd & 23rd, to be announced on Antisyphon site
 - <https://www.antsyphontraining.com/live-courses-catalog/security-leadership-and-management-w-chris-brenton/>
- ▷ Next run of this class is...TBD

</shameless_plugs>

Logistics

- ▷ 10 minute break at top of each hour
- ▷ 20 minute break at 3 hour point
- ▷ Use the Discord channel for discussion
 - #acm-webcast-chat channel
- ▷ The team is monitoring for your questions

Help with command line syntax

- ▷ We'll be working at the command line
- ▷ Some are nested commands

`<command> | <command> | <command>`

- ▷ I'll explain what's going on
- ▷ Try adding one command at a time to observe how it changes the output

<https://www.explainshell.com/>

Goals for this class

- ▷ Define "cyber threat hunting"
- ▷ Identify how to perform a threat hunt
- ▷ Define and identify connection persistency
- ▷ Learn how to investigate endpoints
- ▷ Hands on lab time running down real C2 channels used in the wild

What is threat hunting?

- ▷ Actively searching your environment for compromised systems
- ▷ Triggered by time or process, not by alerts
- ▷ Validate the integrity state of every system
 - Not just desktops and servers
 - Not just systems submitting logs to your SIEM
 - Not just the patterns you can hypothesise
- ▷ Output is a compromise assessment

Are we getting better at detection?

- ▶ Interesting Mandiant M-Trends nuggets
 - External detection at 6 year high
 - 55% in US, 74% in EMEA
 - 67% of ransomware goes undetected
- ▶ Dwell time down to less than 30 days
 - But ***drop shows no correlation to breach impact***
 - Skewed by Ransomware at 5 days
 - This questions if detection is actually improving

<https://inthecloud.withgoogle.com/mandiant-m-trends-2023/download.html>

But I hunt my SIEM...

- ▷ You don't see everything
- ▷ Using data from compromised host
- ▷ Do you spend your time "hunting" or tuning the SIEM?
- ▷ Most security frameworks require SIEM
- ▷ And yet we are seeing no improvement
- ▷ Not the silver bullet we thought it was

<https://www.activecountermeasures.com/check-the-stats-your-threat-hunting-is-probably-broken/>

But AI will fix it, right?

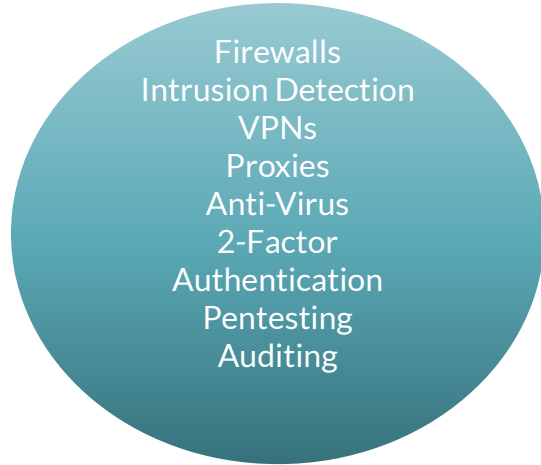
- ▷ AI is vaporware and just a marketing term
- ▷ What we really have is machine learning
 - Machines do not always "learn" what we want
 - Unexpect bias in the datasets due to lack of real intelligence
 - Neural network AI is extremely challenging to troubleshoot
- ▷ Deployment is exceeding our ability to improve
 - Results are not always [logical](#) (black and asian nazis)
 - [Sometimes they lie a lot](#) (will make up data and news)
 - Write haiku's [flaming](#) their owners (can be lead astray)
 - Run over and [drag](#) pedestrians (yes this has happened)
 - Run [polls](#) to guess the cause of [death](#) (no real intelligence means no empathy)
 - Need to remove features to not be [racist](#) (this is just sad)
 - Teach kids how to make their disorder [worse](#)
 - Diagnose tuberculosis based on [age of MRI](#) machine
- ▷ If it fails in security, how long before you can tell?

Disclaimer - This is new territory

- ▷ Threat hunting has no industry standards
- ▷ You are getting in on the ground floor! ;-)
- ▷ We are still working out best processes
- ▷ This content is based on our experiences
 - Literally thousands of threat hunts
 - Scales through various environment sizes
 - Identifying new attacks that other processes miss
 - Thus this content will change over time

The Purpose of Threat Hunting

Protection



Dwell time between infiltration and detection



Threat Hunting should reduce the gap between protection failure and response as much as possible!

Response



Start with the network

- ▷ The network is the great equalizer
 - You see everything, regardless of platform
 - Desktop, servers, IIoT, etc all reviewed the same
- ▷ You can hide processes but not packets
- ▷ Malware is usually controlled
 - Which makes targeting C2 extremely effective
 - Identify compromise when C2 "calls home"
 - Must be frequent enough to be useful
- ▷ Wide view so you can target from there

The threat hunting process

- ▷ Identify connection persistency
- ▷ Business need for connection?
 - Reputation check of external IP
- ▷ Abnormal protocol behaviour
- ▷ Investigation of internal IP
- ▷ Disposition
 - No threat detected = add to safelist
 - Compromised = Trigger incident handling

Start on the network

The screenshot displays the AC Hunter interface with the following components:

- RESULTS Panel (Left):** Shows a list of IP addresses (192.168.99.51) with a score of >50%. A red circle highlights a document icon in the top left.
- SRC (Source):** 192.168.99.51 (Private Network Address, network name: Unknown Private).
- DST (Destination):** 104.248.234.238 (ASN: 14061, org: DIGITALOCEAN-AS, range: 104.248.0.0/16, city: North Bergen, N.J., country: United States, location: 40.793N, -74.02...).
- AC HUNTER Header:** Includes database (PIESTA-EK-51), module (BACONS), view timestamp interval, and range (08/13/20 18:57 - 08/14/20 18:58).
- Cobalt Strike Section:** A red curved line is drawn over a bar chart showing connection counts for days 27, 28, 28, 30, and 31.
- Metric Conformity:**
 - Cumulative metric conformity: 99.30%
 - Beacon connection count: 9063
 - Individual metric conformity: Dispersion (96.66%), Data Size (99.70%), Skew (100.0%), Connections (100.0%).
- Timeline Chart (Bottom):** A bar chart showing activity over time from 20:57 to 18:58.
- Navigation Bar (Bottom):** Includes icons for dashboard, beacons, beacons fqdn, beacons proxy, strobos, long connections, threat intel, dns, client signature, cyber deception, deep dive, and logout.

THEN pivot to the system logs

Full screen Share Clone Edit

source.ip:192.168.99.52 and destination.ip:68.183.138.51 KQL Jun 13, 2020 @ 19:57:09.0 → Jun 14, 2020 @ 19:59:47.0 Refresh

+ Add filter

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Source IP

192.168.99.52

Source Hostname


DESKTOP-10ACM02

Destination IP


68.183.138.51

Top 10 Destination Ports

80



Events



Count 19

Program List

Executable	PID	User	Destination Port	Protocol	Transport	Count
C:\Windows\System32\RuntimeBroker.exe	5,044	James Kirk	80	http	tcp	2,556

Don't cross "the passive/active line"

- ▷ All threat hunting activity should be undetectable to an adversary
- ▷ Passive in nature
 - Review packets
 - Review SIEM logs
- ▷ If active techniques are required, we should trigger incident response first
 - Example: Isolating the suspect host
 - Example: Running commands on suspect host

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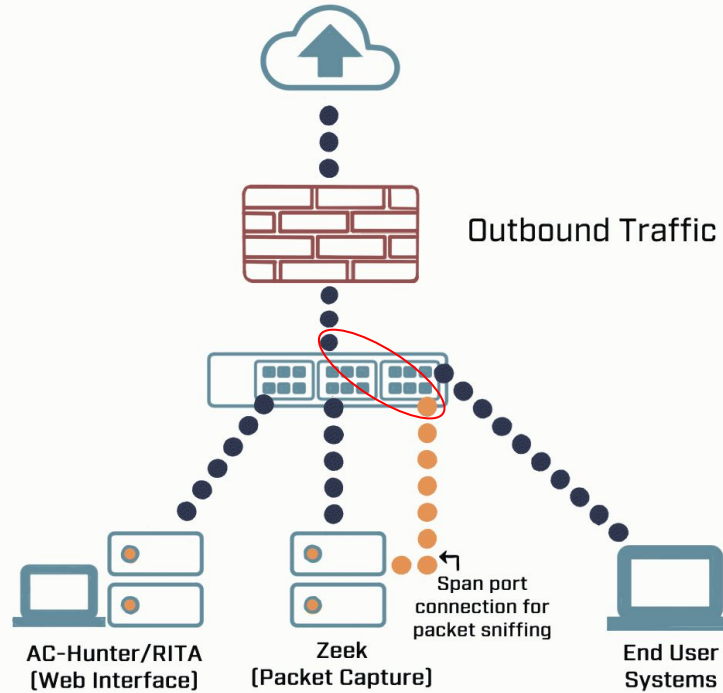


C2 Detection Techniques

Where to Start

- ▷ Traffic to and from the Internet
 - Monitor internal interface of firewall
- ▷ Packet captures or Zeek data
- ▷ Analyze in large time blocks
 - More data = better fidelity
 - Minimum of 12 hours, 24 is ideal
- ▷ Analyze communications in pairs
 - Every outbound session passing the firewall
 - Ignore internal to internal (high false positive)

Typical deployment



Does targeting C2 have blind spots?

- ▷ Attackers motivated by gain
 - Information
 - Control of resources
- ▷ Sometimes "gain" does not require C2
 - Just looking to destroy the target
 - Equivalent to dropping a cyber bomb
 - We are talking nation state at this level
- ▷ NotPetya
 - Worm with no C2 designed to seek and destroy
 - These are rare as they frequently go sideways

Start by checking persistency

- ▷ **Focus on persistent connections**
 - Internal system in constantly initiating connections with an outside "system"
 - Long connections
 - Beacons
- ▷ **Persistent connections should have an identifiable business need**
 - Checking the time
 - Checking for patches

Long connections

- ▷ You are looking for:
- ▷ Total time for each connection
 - Which ones have gone on the longest?
- ▷ Cumulative time for all pair connections
 - Total amount of time the pair has been in contact
- ▷ Can be useful to ignore ports or protocols
 - C2 can change channels

Long connection example

AC HUNTER

-- DATABASE: DNSCAT2-JA3-STRDBE
-- MODULE: LONG CONNECTIONS
-- VIEW: TOTAL DURATION ANALYSIS
-- RANGE: 01/30/18 13:14 -- 01/31/18 13:13

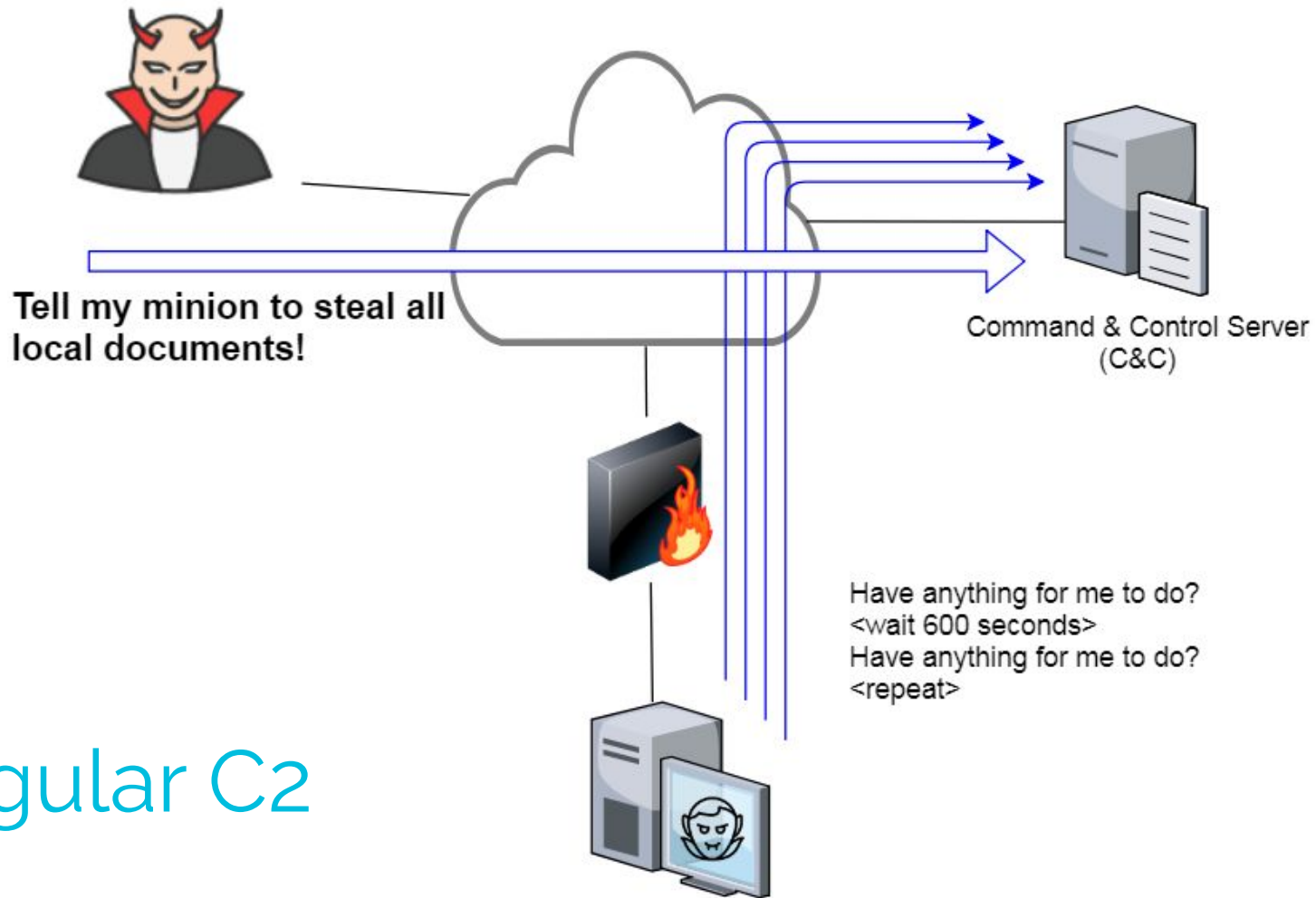
Src	Src Network Name	Dst	Dst Network Name	Port:Protocol:Service	443tcp:State	Total Bytes	Total Duration
10.55.100.100	Unknown Private	65.52.108.225	Public	443tcp:-	closed	155.09 kB	23:57:02
10.55.100.107	Unknown Private	111.221.29.113	Public	443tcp:-	closed	156.22 kB	23:57:00
10.55.100.110	Unknown Private	40.77.229.92	Public	443tcp:-	closed	115.58 kB	23:56:00
10.55.100.109	Unknown Private	65.52.108.233	Public	443tcp:ssl	closed	136.72 kB	20:02:56
10.55.100.105	Unknown Private	65.52.108.195	Public	443tcp:ssl	closed	185.26 kB	18:29:59
10.55.100.103	Unknown Private	131.253.34.243	Public	443tcp:-	closed	348.40 kB	17:58:18
10.55.100.104	Unknown Private	131.253.34.246	Public	443tcp:ssl	closed	161.01 kB	15:56:53

1 / 5

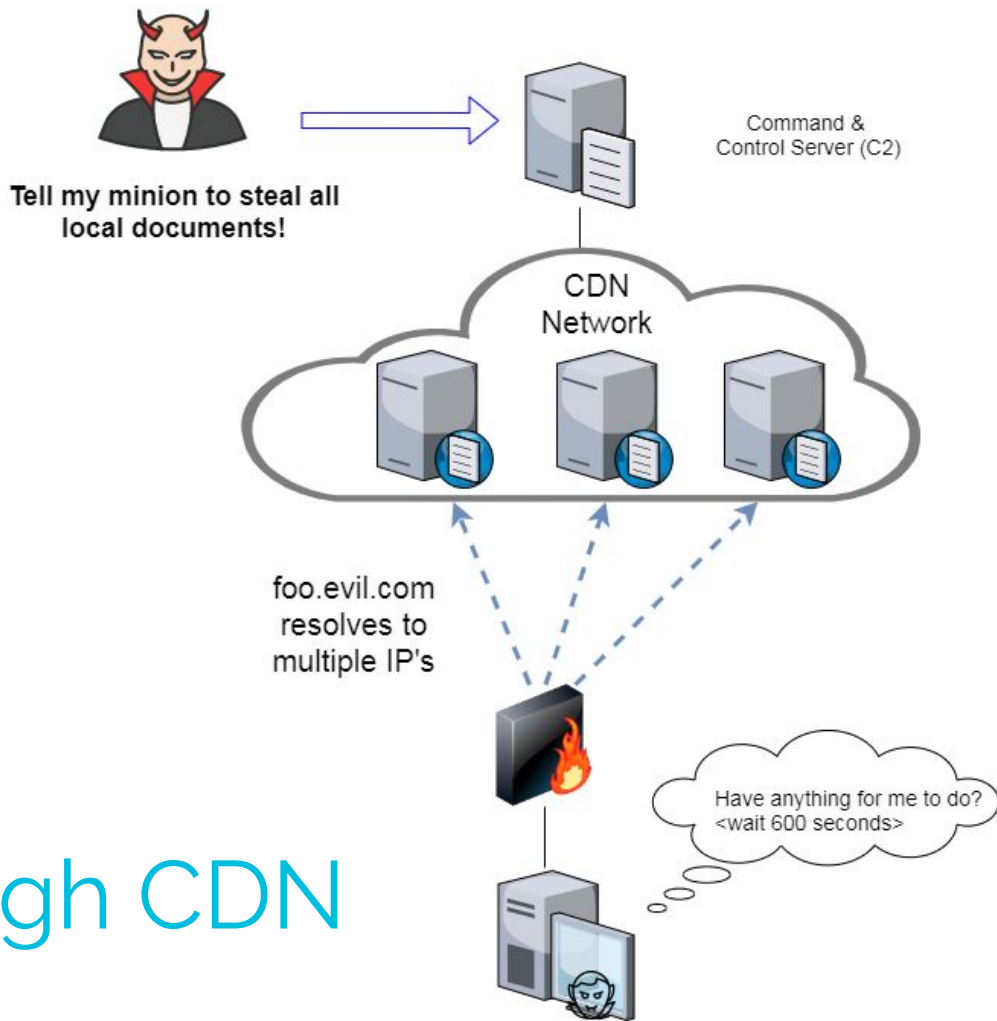
dashboard beacons beacons web beacons proxy strobes long connections threat intel dns client signature cyber deception deep dive logout

What is a beacon?

- ▷ Repetitive connection establishment between two IP addresses
 - Easiest to detect
- ▷ Repetitive connection establishment between internal IP and FQDN
 - Target can be spread across multiple IP's
 - Usually a CDN provider
 - Target IPs also destination for legitimate traffic
 - Far more difficult to detect



Regular C2

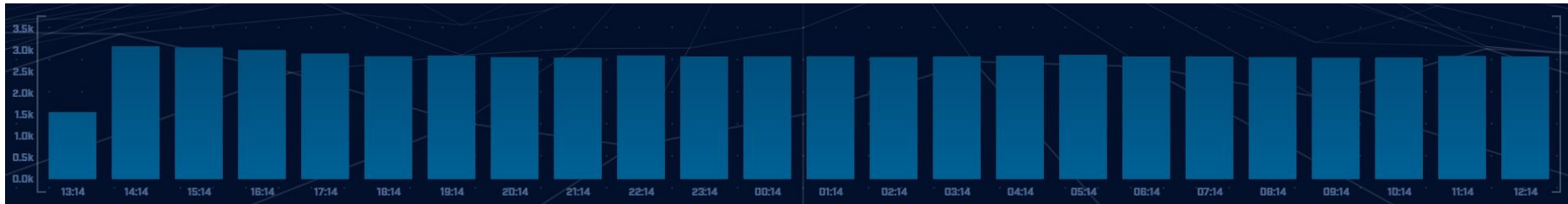


C2 through CDN

Beacon detection based on timing

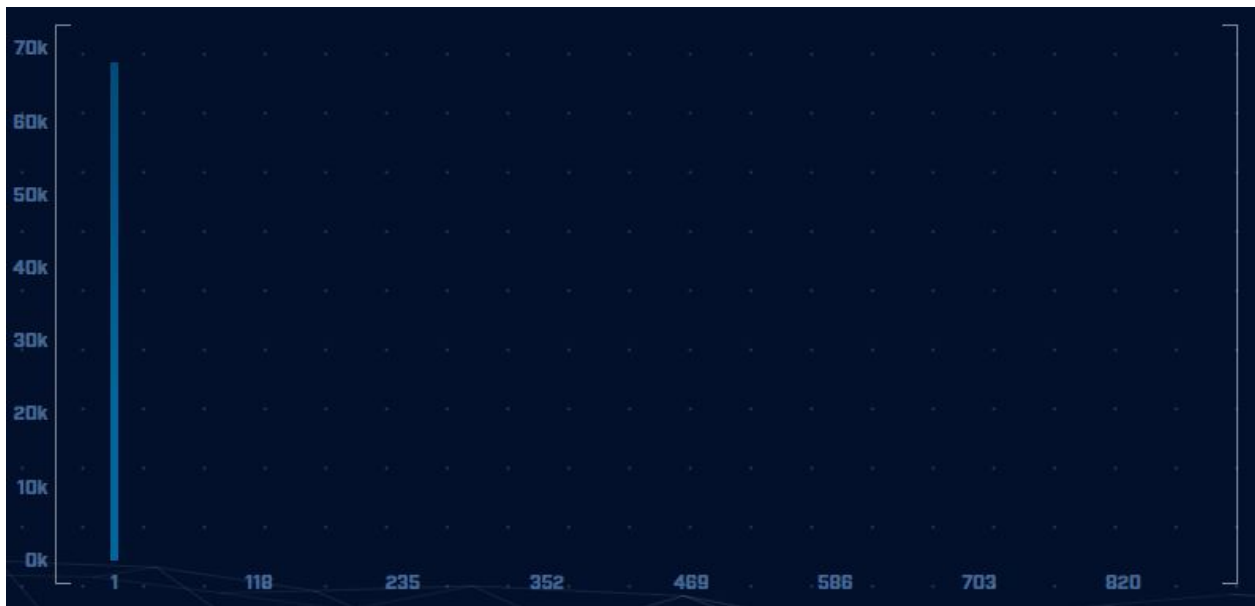
- ▷ **May follow an exact time interval**
 - Technique is less common today
 - Detectable by k-means
 - Potential false positives
- ▷ **May introduce "jitter"**
 - Vary connection sleep delta
 - Avoids k-means detection
 - False positives are extremely rare
- ▷ **Short enough delta for terminal activities**

Connection quantity VS time



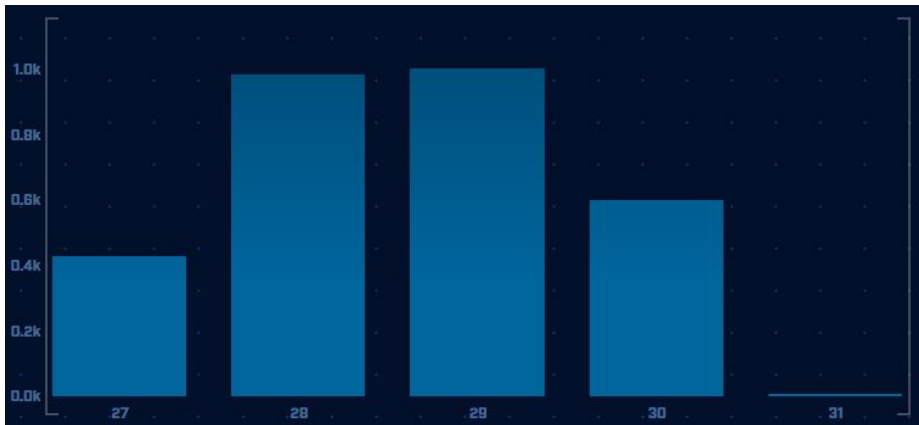
Each bar represents the number of times the source connected to the destination during that one hour time block

Connect time deltas with no jitter



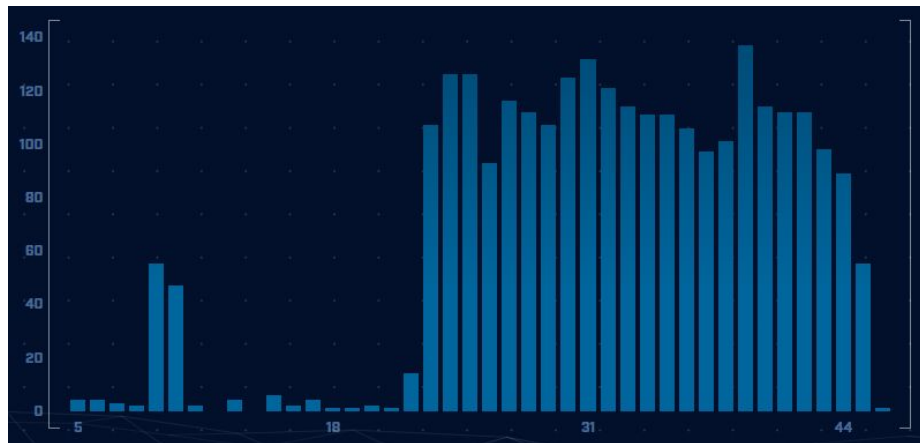
How often a specific time delta was observed

Connection time deltas with jitter



Cobalt Strike will typically produce a bell curve

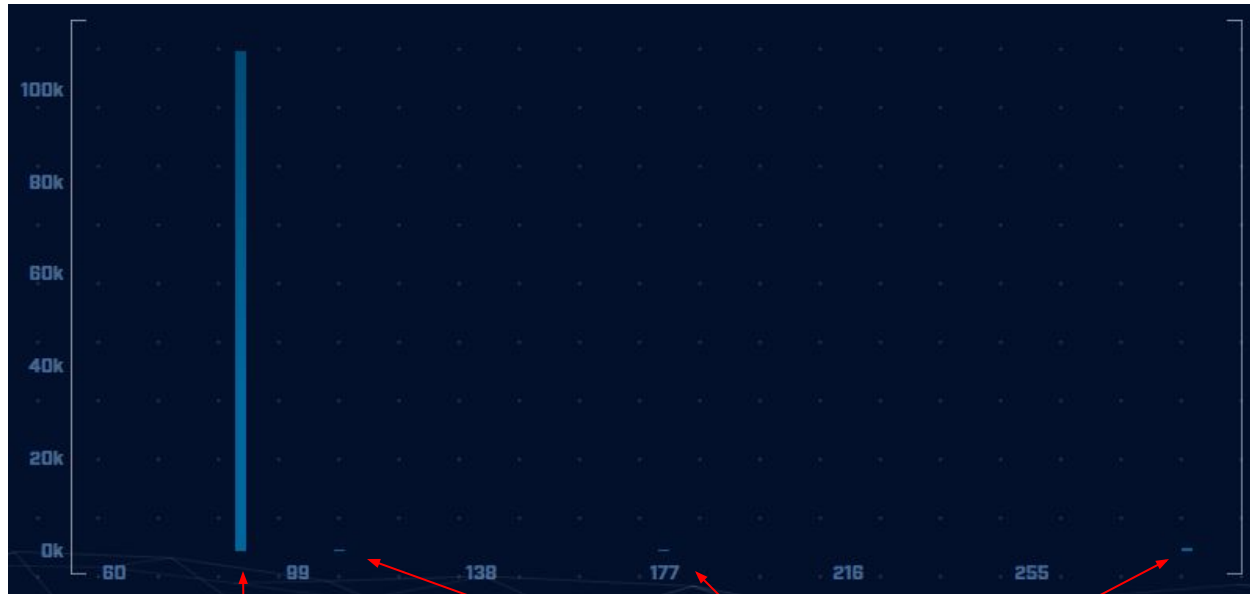
Pretty well randomized but still a small dwell time "window"



Detection based on session size

- ▷ Focuses on detection of the heartbeat
 - Useful for C2 over social media
- ▷ Variations from the heartbeat indicate activation of C2 channel
- ▷ Session size can help reveal info regarding commands being issued
- ▷ Possible to randomly pad but this is extremely rare

Session size analysis



Heartbeat

Activation

Safelisting

- ▷ Not all persistence is "evil"
- ▷ Could be part of normal operations
 - Keep computer time in sync
 - Checking for patches
 - Checking on an external service
- ▷ When business need can be identified, we should safelist the connection
 - Keep it out of future hunts
 - Don't make safelists any broader than necessary

Identifying business need

- ▶ Do you recognize the domain?
 - microsoft.com
 - windows.com
 - ntp.org
- ▶ Can you relate the services to a specific department?
- ▶ The purchasing group can be helpful
 - Find the company behind the domain
 - Are we purchasing services from them?

Check destination IP address

- ▶ **Start simple**
 - Who manages ASN?
 - Geolocation info?
 - IP delegation
 - PTR records
- ▶ **Do you recognize the target organization?**
 - Business partner or field office
 - Current vendor (active status)
- ▶ **Other internal IP's connecting?**

Some helpful links

`https://www.abuseipdb.com/check/<IP Address>`

`https://otx.alienvault.com/indicator/ip/<IP Address>`

`https://search.censys.io/hosts/<IP Address>`

`https://dns.google/query?name=<IP Address>`

`https://www.google.com/search?q=<IP Address>`

`https://www.onyphe.io/search/?query=<IP Address>`

`https://securitytrails.com/list/ip/<IP Address>`

`https://www.shodan.io/host/<IP Address>`

`https://www.virustotal.com/gui/ip-address/<IP Address>/relations`

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C2 Detection Techniques

Part 2

What next?

- ▷ You've identified connection persistence
- ▷ You can't identify a business need
- ▷ Next steps
 - Protocol analysis
 - Reputation check of external target
 - Investigate internal IP address

Unexpected app or port usage

- ▷ There should be a business need for all outbound protocols
- ▷ Research non-standard or unknown ports
 - TCP/5222 (Chrome remote desktop)
 - TCP/5800 & 590X (VNC)
 - TCP/502 (Modbus)
- ▷ TeamViewer, AnyDesk, GoToMyPC

Unknown app on standard port

- ▷ **C2 wants to tunnel out of environment**
 - Pick a port likely to be permitted outbound
 - Does not always worry about protocol compliance
- ▷ **Check standard ports for unexpected apps**
 - Indication of tunneling
 - TCP/80 and TCP/443 most common
- ▷ **Different than app on non-standard port**
 - This is sometimes done as "a feature"
 - Example: SSH listening on TCP/2222

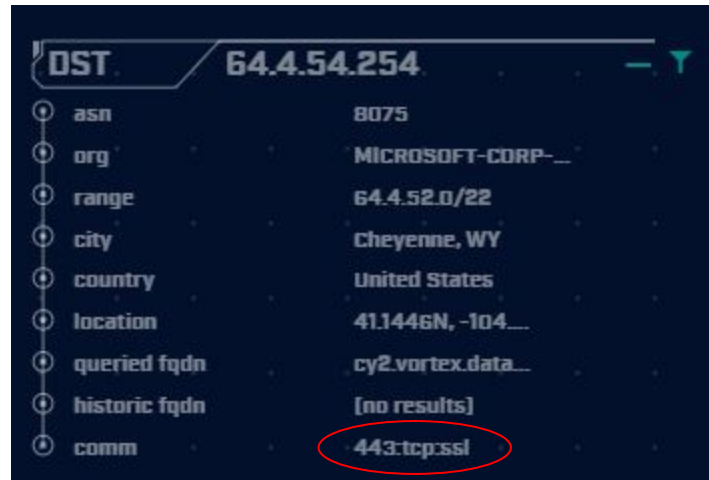
Zeek decodes many apps

- ▷ Detect over 55 applications
 - HTTP, DNS, SIP, MYSQL, RDP, NTLM, etc. etc.
- ▷ Fairly easy to add new ones
 - Example: HL7 if you are in healthcare
- ▷ Checks all analyzers for each port
- ▷ Does not assume WKP = application

Zeek example

```
thunt@thunt-labs:~/lab1$ cat conn.log | zeek-cut id.orig_h id.resp_h id.resp_p  
  proto service orig_ip_bytes resp_ip_bytes | column -t | head  
192.168.99.51      104.248.234.238  80    tcp    http    689    403  
192.168.99.51      23.223.200.136  80    tcp    -       80     40  
192.168.99.51      104.248.234.238  80    tcp    http    729    443  
192.168.99.52      224.0.0.251     5353  udp    dns     344    0  
fe80::d048:42e0:8448:187c ff02::fb        5353  udp    dns     424    0  
fe80::d048:42e0:8448:187c ff02::1:3       5355  udp    dns     81     0  
192.168.99.52      224.0.0.252     5355  udp    dns     61     0  
fe80::d048:42e0:8448:187c ff02::1:3       5355  udp    dns     81     0  
192.168.99.52      224.0.0.252     5355  udp    dns     61     0  
192.168.99.51      104.248.234.238  80    tcp    http    689    403  
thunt@thunt-labs:~/lab1$
```


AC-Hunter example



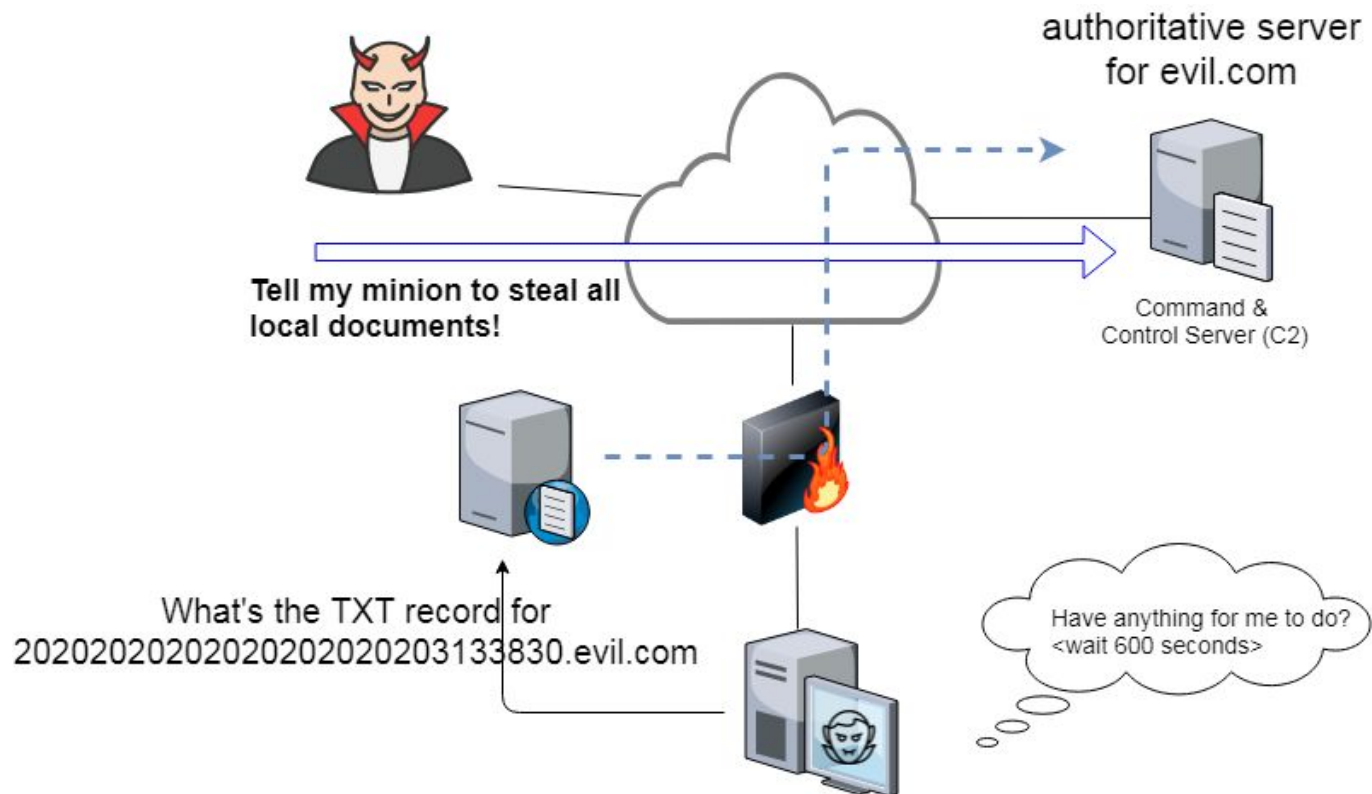
The screenshot shows the output of the AC-Hunter tool for the IP address 64.4.54.254. The output is displayed in a dark-themed interface with a list of fields and their corresponding values. The 'comm' field, which contains the value '443:tcp:ssl', is highlighted with a red circle.

Field	Value
asn	8075
org	MICROSOFT-CORP-...
range	64.4.52.0/22
city	Cheyenne, WY
country	United States
location	41.1446N, -104...
queried fqdn	cy2.vortex.data...
historic fqdn	[no results]
comm	443:tcp:ssl

Unexpected protocol use

- ▷ Attackers may bend but not break rules
- ▷ This can result in:
 - Full protocol compliance
 - Abnormal behaviour
- ▷ Need to understand "normal"
 - For the protocol
 - For your environment

C2 over DNS





Example: Too many FQDNs

- ▷ How many FQDNs do domains expose?
 - Most is < 10
 - Recognizable Internet based vendors 200 - 600
 - Microsoft
 - Akamai
 - Google
 - Amazon
- ▷ Greater than 1,000 is suspicious
- ▷ Could be an indication of C2 traffic

Detecting C2 over DNS



	FQDNs Count	Lookups	Domain
	62468	109227	r-1x.com
	62466	108911	dnsc.r-1x.com
	154	27381	akamaiedge.net
	125	13907	akadns.net

Bonus checks on DNS

- ▷ Check domains with a lot of FQDNs
- ▷ Get a list of the IPs returned
- ▷ Compare against traffic patterns
 - Are internal hosts visiting this domain?
 - Is it just your name servers?
- ▷ Unique trait of C2 over DNS
 - Lots of FQDN queries
 - But no one ever connects to these systems

Normal DNS query patten

The screenshot displays the AI HUNTER interface with a table of subdomains and a detailed view of direct connections. A red circle highlights the 'akadns.net' entry in the subdomains table and the corresponding IP addresses in the direct connections table.

Subdomain Threshold: 0

AI HUNTER
-- DATABASE: DNSCAT2-BEACON
-- MODULE: DNS
-- VIEW: DNS ANALYSIS

Subdomains	Lookups	Domain
62468	109227	r-1x.com
62466	108911	dnsc.r-1x.com
154	27381	akamaiedge.net
125	13907	akadns.net
121	7110	edgekey.net
101	13297	amazonaws.com
90	13259	elb.amazonaws.com

DNS Queries [3]

Direct Connections [13]

Host	Count
10.55.100.111	889
10.55.100.108	532
10.55.100.109	489
10.55.100.100	477
10.55.100.103	462
10.55.100.104	446
10.55.100.110	443
10.55.100.107	443
10.55.100.106	442

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Things that make you go "hummm"

The screenshot displays the AI Hunter interface for DNS analysis. The main table lists subdomains with their respective lookup counts and domains. The first row, representing `r-1x.com`, is circled in red. To the right, a detailed view for `r-1x.com` is also circled in red, showing one DNS query and one direct connection from the host `192.168.88.2` with a count of `108658`.

Subdomain Threshold: 0

AI HUNTER
-- DATABASE: DNSCAT2-BEACON
-- MODULE: DNS
-- VIEW: DNS ANALYSIS

Subdomains	Lookups	Domain
62468	109227	r-1x.com
62466	108911	dnsc.r-1x.com
154	27381	akamaiedge.net
125	13907	akadns.net
121	7110	edgekey.net
101	13297	amazonaws.com
90	13259	elb.amazonaws.com

DNS Queries [1]

Direct Connections [1]

Host	Count
192.168.88.2	108658

1 / 9680

Look for odd HTTP user agents

```
ritabeakerlab@ritabeakerlab:~/lab1$ cat http.log | zeek-cut id.orig_h id.resp_h user_agent  
| grep 10.0.2.15 | sort | uniq | cut -f 3 | sort | uniq -c | sort -rn  
    15 Microsoft-CryptoAPI/10.0  
    12 Microsoft-WNS/10.0  
     1 Mozilla/5.0 (Windows; U; MSIE 7.0; Windows NT 5.2) Java/1.5.0_08  
ritabeakerlab@ritabeakerlab:~/lab1$
```

10.0.2.15 identifies itself as:

Windows 10 when speaking to 27 different IP's on the Internet

Windows XP when speaking to one specific IP on the Internet

Unique SSL Client Hello: Zeek + JA3

SSL/TLS Hash	Seen	Requests	Sources
5e573c9c9f8ba720ef9b18e9fca2e2f7	1	clientservices.googleapis.com	10.55.182.100
bc6c386f480ee97b9d9e52d472b772d8	2	clients4.google.com, 556-amw-319.mktoresp.com	10.55.182.100
f3405aa9ca597089a55cf8c62754de84	2	builds.cdn.getgo.com	10.55.182.100
28a2c9bd18a11de089ef85a160da29e4	2	mediaredirect.microsoft.com	10.55.100.105, 10.55.182.100
08bf94d7f3200a537b5e3b76b06e02a2	4	files01.netgate.com	192.168.88.2

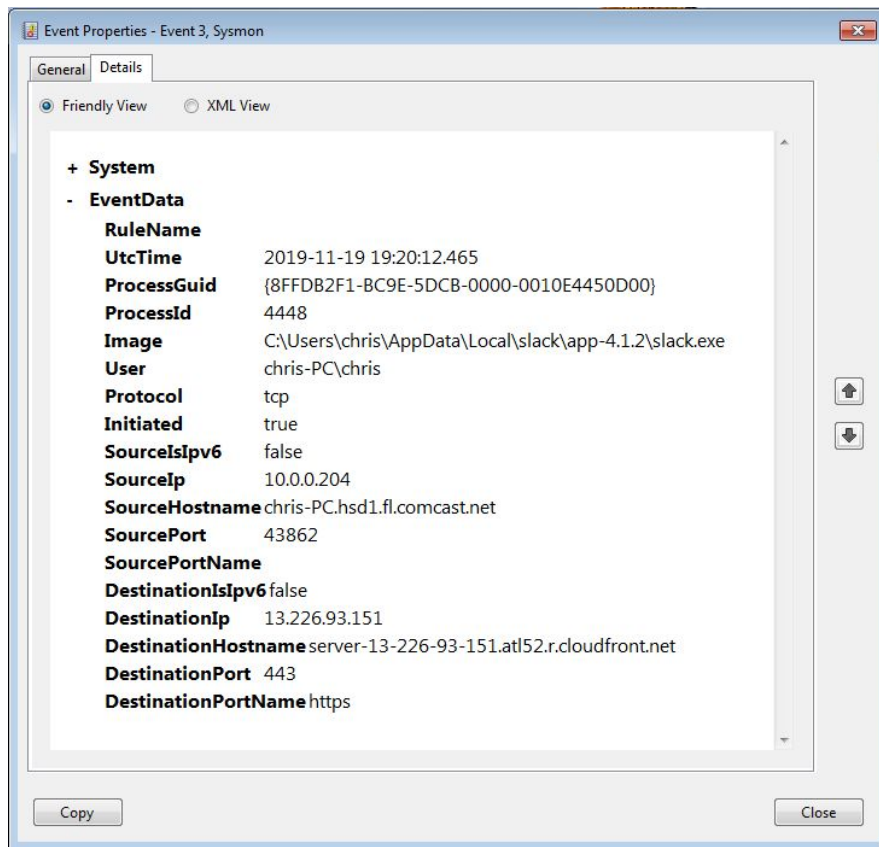
Internal system

- ▷ Info available varies greatly between orgs
- ▷ Inventory management systems
- ▷ Security tools like Carbon Black
- ▷ OS projects like BeaKer
- ▷ Internal security scans
- ▷ DHCP logs
- ▷ Login events
- ▷ Passive fingerprinting

Leverage internal host logging

- ▷ Network shows suspicious traffic patterns
- ▷ Use this data to pivot to host logs
- ▷ Filter your logs based on:
 - Suspect internal host
 - Timeframe being analyzed
- ▷ Anything stand out as unique or odd?

Sysmon Event ID Type 3's



Map outbound connections to the applications that created them.

Sysmon Type 3 + Beaker



But I have no system logs!

- ▷ Good time to start collecting them
- ▷ Full packet captures from system
- ▷ Apply additional network tools to collect more data
- ▷ Just remember, no detectable actions until we trigger incident response mode!

What next?

- ▷ **Disposition session**
 - "I think it's safe" = add to safelist
 - "I think we've detected a compromise" = Incident response mode
- ▷ **Remember to leave no footprints**
 - All actions undetectable to potential adversaries
 - Passive activities only
- ▷ **Incident response may include active tasks**

ACTIVE | COUNTERMEASURES



Network Threat Hunting Tools

capinfos

- ▷ Print summary info regarding pcaps
- ▷ For a decent hunt you want 12+ hours
- ▷ 86,400 seconds = 24 hours

```
cbrenton@guess:~/c2$ capinfos -aeu evilosx_24hr.pcap
File name:          evilosx_24hr.pcap
Capture duration:   86291.558021 seconds
First packet time: 2021-02-17 03:40:26.100491
Last packet time:  2021-02-18 03:38:37.658512
cbrenton@guess:~/c2$
```

tcpdump

- ▷ **What's it good for?**
 - Lightweight packet capturing tool
 - Cross platform support (windump on Windows)
- ▷ **When to use it**
 - Audit trail of all traffic
 - Can also filter to see only specific traffic
 - Can be fully automated
- ▷ **Where to get it**

<https://www.tcpdump.org/>

tcpdump example

- ▷ **Debian/Ubuntu**
 - Place the following in /etc/rc.local
- ▷ **Red Hat/CentOS, Fedora**
 - Place the following in /etc/rc.d/rc.local
- ▷ **Grabs all traffic and rotates every 60 min**
 - Date/time stamped and compressed

```
#Place above any "exit" line
mkdir -p /opt/pcaps
screen -S capture -t capture -d -m bash -c "tcpdump -i eth0 -G
3600 -w '/opt/pcaps/`hostname -s`.%Y%m%d%H%M%S.pcap' -z bzip2"
```

tshark

- ▷ **What's it good for?**
 - Extracting interesting fields from packet captures
 - Multiple passes to focus on different attributes
 - Combine with text manipulation tools
 - Can be automated
- ▷ **When to use it**
 - Both major and minor attributes
- ▷ **Where to get it**

<https://www.wireshark.org/>

Tshark example - DNS queries

```
$ tshark -r thunt-lab.pcapng -T fields -e dns.qry.name  
udp.port==53 | head -10
```

```
6dde0175375169c68f.dnsc.r-1x.com  
6dde0175375169c68f.dnsc.r-1x.com  
0b320175375169c68f.dnsc.r-1x.com  
0b320175375169c68f.dnsc.r-1x.com  
344b0175375169c68f.dnsc.r-1x.com  
344b0175375169c68f.dnsc.r-1x.com  
0f370175375169c68f.dnsc.r-1x.com  
0f370175375169c68f.dnsc.r-1x.com  
251e0175375169c68f.dnsc.r-1x.com  
251e0175375169c68f.dnsc.r-1x.com
```

Tshark example - user agents

```
$ tshark -r sample.pcap -T fields -e http.user_agent tcp.  
dstport==80 | sort | uniq -c | sort -n | head -10  
  2 Microsoft Office/16.0  
  2 Valve/Steam HTTP Client 1.0 (client;windows;10;1551832902)  
  3 Valve/Steam HTTP Client 1.0  
11 Microsoft BITS/7.5  
11 Windows-Update-Agent  
12 Microsoft-CryptoAPI/6.1  
104 PCU
```

Wireshark

- ▷ **What's it good for?**
 - Packet analysis with guardrails
 - Stream level summaries
- ▷ **When to use it**
 - As part of a manual analysis
 - When steps cannot be automated
- ▷ **Where to get it**

<https://www.wireshark.org/>

Useful when I have a target

The image shows a Wireshark interface with a packet capture named 'perimeter_class.cap'. The filter bar is set to 'ip.addr == 148.78.247.10'. The packet list pane shows several packets, with packet 98594 selected. The packet details pane shows the following information:

- Frame 98594: 78 bytes on wire (624 bits), 78 bytes captured (624 bits)
- Ethernet II, Src: HewlettP_ea:20:ab (00:50:8b:ea:20:ab), Dst: Computer 20:7d:e3 (00:b0:d0:20:7d:e3)
- Internet Protocol Version 4, Src: 148.78.247.10, Dst: 12.33.247.4
- Transmission Control Protocol, Src Port: 26268, Dst Port: 80, Seq: 0, Len: 0
 - Source Port: 26268
 - Destination Port: 80
 - [Stream index: 648]
 - [TCP Segment Len: 0]
 - Sequence number: 0 (relative sequence number)
 - [Next sequence number: 0 (relative sequence number)]
 - Acknowledgment number: 0
 - 1010 = Header Length: 40 bytes (10)
 - Flags: 0x002 (SYN)

The packet bytes pane shows the raw data in hexadecimal and ASCII:

```
0000 00 b0 d0 20 7d e3 00 50 8b ea 20 ab 08 00 45 00  ...}..P..-.-E-
0010 00 3c f7 29 00 00 31 06 04 14 94 4e f7 0a 0c 21  (-<)-.1.-.-N-!
0020 f7 04 66 9c 00 50 64 37 ff 9d 00 00 00 00 a0 02  --f--Pd7.....
0030 ff ff a8 97 00 00 02 04 05 b4 01 03 03 00 01 01  .....:HD...-addr
0040 08 0a 00 ec 48 44 00 00 00 00 61 64 64 72
```

Zeek

- ▷ Network recorder
- ▷ What's it good for?
 - Near real time analysis (1+ hour latency)
 - More storage friendly than pcaps
- ▷ When to use it
 - When you need to scale
 - When you know what attributes to review
- ▷ Where to get it

<https://www.zeek.org/>
sudo apt -y install zeek

Zeek example - cert check

```
$ cat ssl* | zeek-cut id.orig_h id.resp_h id.resp_p  
validation_status | grep 'self signed' | sort | uniq  
122.228.10.51    192.168.88.2    9943    self signed certificate in  
certificate chain  
24.111.1.134    192.168.88.2    9943    self signed certificate in  
certificate chain  
71.6.167.142    192.168.88.2    9943    self signed certificate in  
certificate chain
```

-d for human readable times

- ▶ Zeek-cut prints epoch time by default
- ▶ "-d" converts to human readable

```
cbrenton@cbrenton-beacon-src-test:~/foo$ cat conn.01\:00\:00-02\
:00\:00.log | zeek-cut ts id.orig h | head -8
1645578000.318671      167.172.154.151
1645578000.318784      167.172.154.151
1645578000.318841      167.172.154.151
1645578000.334906      167.172.154.151
1645578000.334948      167.172.154.151
1645578000.334977      167.172.154.151
1645578001.228742      167.172.154.151
1645578001.360749      167.172.154.151
cbrenton@cbrenton-beacon-src-test:~/foo$ cat conn.01\:00\:00-02\
:00\:00.log | zeek-cut -d ts id.orig h | head -8
2022-02-23T01:00:00+0000 167.172.154.151
2022-02-23T01:00:00+0000 167.172.154.151
2022-02-23T01:00:00+0000 167.172.154.151
2022-02-23T01:00:00+0000 167.172.154.151
2022-02-23T01:00:00+0000 167.172.154.151
2022-02-23T01:00:00+0000 167.172.154.151
2022-02-23T01:00:01+0000 167.172.154.151
2022-02-23T01:00:01+0000 167.172.154.151
cbrenton@cbrenton-beacon-src-test:~/foo$
```

zcutter.py

- ▷ zeek-cut limited to CSV format
- ▷ What if you use JSON?
- ▷ zcutter.py to the rescue!
- ▷ Like zeek-cut, but supports CSV & JSON
- ▷ Will also process multiple log files simultaneously

<https://raw.githubusercontent.com/activecm/zcutter/main/zcutter.py>

Passer

```
TC,172.1.199.23,TCP_43,open,  
TC,172.16.199.23,TCP_55443,open,  
UC,172.16.199.23,UDP_626,open,serialnumberd/clientscanner likely nmap  
scan Warnings:scan  
UC,172.16.199.23,UDP_1194,open,openvpn/client Warnings:tunnel  
UC,172.16.199.23,UDP_3386,open,udp3386/client  
UC,172.16.199.23,UDP_5632,open,pcanywherestat/clientscanner  
Warnings:scan  
UC,172.16.199.23,UDP_64738,open,shodan_host/clientscanner abcdefgh  
Unlisted host Warnings:scan  
DN,2001:db8:1001:0000:0000:0000:0000:0015,AAAA,ns3.markmonitor.com.,  
DN,fe80:0000:0000:0000:189f:545b:7d4c:eeb8,PTR,Apple  
TV._device-info._tcp.local.,model=J105aA
```

Smudge

```
.-[ 192.168.99.51/52864 -> 104.248.234.238/80 ]-  
  
|  
| client = 192.168.99.51/52864  
| os = Windows 7  
| certainty = 40%  
| dist = 0  
| raw_sig = 4:128:0:1460:65535:8:M1460,N,W8,N,N,S:df,id+,ack-,uptr+:0  
|  
|-----
```

Can run it alone or integrated with Passer

ngrep

- ▷ Pattern match on passing packets
- ▷ Like "grep" for network traffic
- ▷ Useful for quick checks
 - NIDS with signature better choice for long term
- ▷ Useful switches
 - "-q" = Don't print "#" for non-matches
 - "-I" = Read a pcap file

<https://github.com/jpr5/ngrep>
sudo apt install ngrep

ngrep example

```
cbrenton@cbrenton-lab-testing:~/pcaps$ ngrep -q -I odd.pcap Admin | head -15
```

```
input: odd.pcap
```

```
match: Admin
```

```
T 148.78.247.10:26922 -> 12.33.247.4:80 [AP]
```

```
GET /cfide/Administrator/startstop.html HTTP/1.0..Host: 12.33.247.4..User-Agent: Mozilla/5.0 [en] (Win  
95; U)..Referer: http://12.33.247.4/..X-Forwarded-For: 148.64.147.168..Cache-Control: max-stale=0..Pra  
gma: no-cache.....Cv
```

```
T 12.33.247.4:80 -> 148.78.247.10:26922 [AP]
```

```
HTTP/1.1 404 Not Found..Date: Tue, 25 Jun 2002 00:34:58 GMT..Server: Apache..Connection: close..Conten  
t-Type: text/html; charset=iso-8859-1...<!DOCTYPE HTML PUBLIC "-//IETF//DTD HTML 2.0//EN">.<HTML><HEA  
D>.<TITLE>404 Not Found</TITLE>.</HEAD><BODY>.<H1>Not Found</H1>.<P>The requested URL /cfide/Administrato  
r/startstop.html was not found on this server.</BODY></HTML>.....
```

```
T 12.33.247.4:80 -> 148.78.247.10:26922 [AFP]
```

```
cbrenton@cbrenton-lab-testing:~/pcaps$ _
```

RITA

- ▶ **What's it good for?**
 - Beacon & long conn at scale
 - Some secondary attributes
- ▶ **When to use it**
 - Can better organize Zeek data
 - Good when you are comfortable scripting
 - Will scale but can be time consuming
- ▶ **Where to get it**

<https://github.com/activecm/rita>

RITA example - beacons

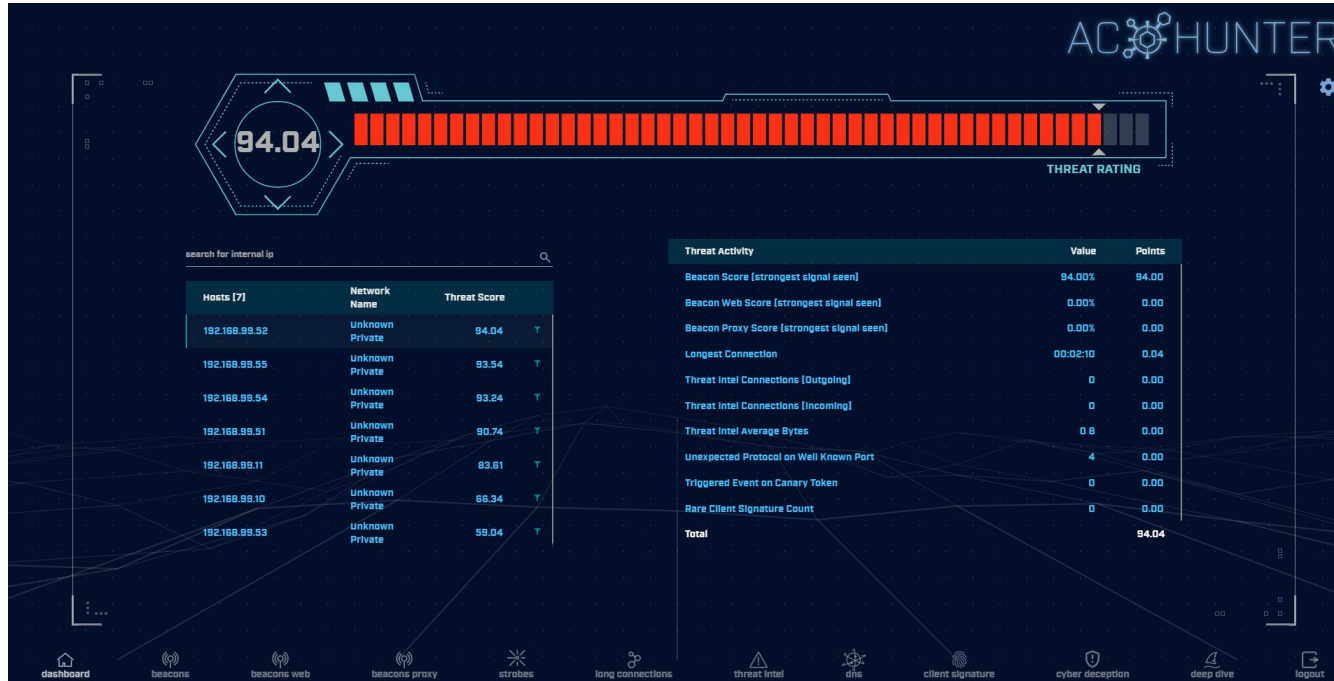
```
cbrenton@cb-lab:~/lab1$ rita show-beacons lab1 | head
Score,Source IP,Destination IP,Connections,Avg. Bytes,Intvl Range,Size Range,Top
Intvl,Top Size,Top Intvl Count,Top Size Count,Intvl Skew,Size Skew,Intvl Dispersi
on,Size Dispersion,Total Bytes
1,10.55.100.111,165.227.216.194,20054,92,29,52,1,52,7774,20053,0,0,0,0,1845020
0.838,10.55.200.10,205.251.194.64,210,308,29398,4,300,70,109,205,0,0,0,0,64850
0.835,10.55.200.11,205.251.197.77,69,308,1197,4,300,70,38,68,0,0,0,0,21313
0.834,10.55.100.111,34.239.169.214,34,1259,5,14388,1,156,15,30,0,0,0,0,42831
0.834,192.168.88.2,13.107.5.2,27,198,2,33,12601,73,4,15,0,0,0,0,5370
0.833,10.55.100.107,23.52.161.212,24,5404,43235,52,1800,505,19,21,0,0,0,0,129717
0.833,10.55.100.107,23.52.162.184,24,2397,43356,52,1800,467,18,18,0,0,0,0,57540
0.833,10.55.100.111,23.52.161.212,27,5379,37752,92,1800,505,17,20,0,0,0,0,145256
0.833,10.55.100.109,23.52.161.212,26,5417,39646,52,1800,505,21,20,0,0,0,0,140848
cbrenton@cb-lab:~/lab1$ _
```

Scale is 0 - 1 with 1.0 being a perfect beacon score

RITA can also check

- ▷ Beacons based on HTTP/host or TLS/SNI
- ▷ Beacons based on FQDN
- ▷ Beacons through SOCKS server
- ▷ Long connections
- ▷ Still open (not yet logged) connections
- ▷ C2 over DNS
- ▷ Matches against your threat intel list

AC-Hunter (Community & Enterprise)

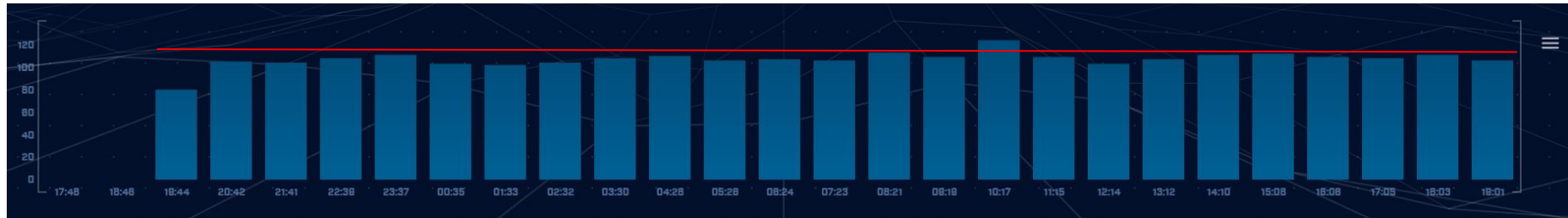


Score ranking on the left, breakdown of scores on the right

Beacon screen

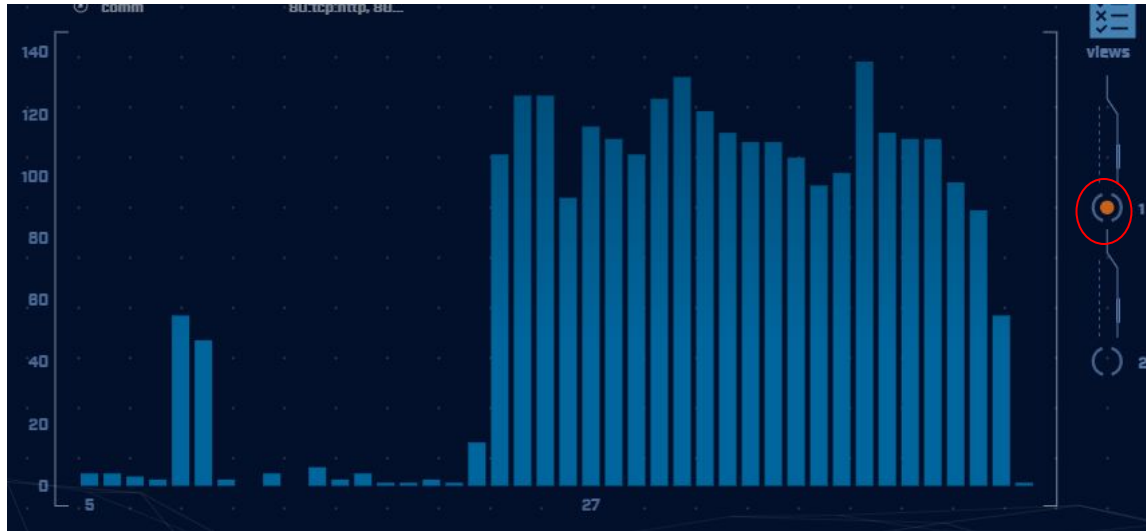


Beacon analysis - 24 hour graph



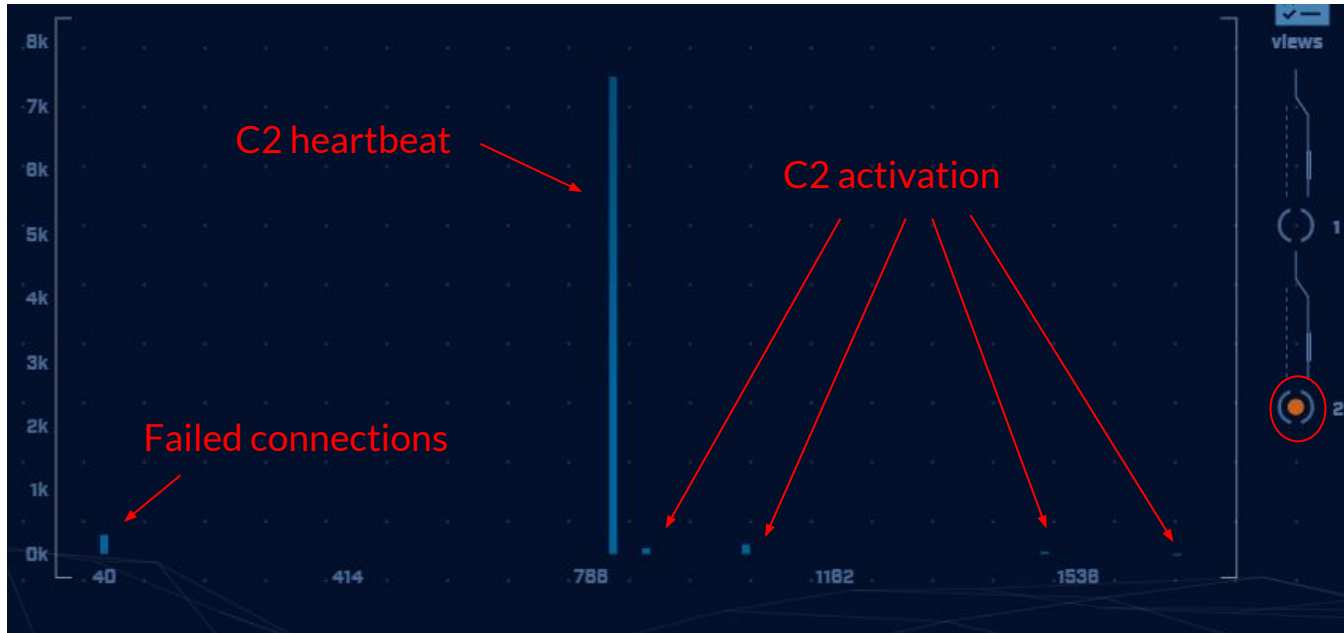
Multiple hours showing the same number of connections

Time interval count



Frequency of a specific time delta between connections
Varied timing like this indicates jitter

View 2 = Session size analysis



Target investigation

DST 68.183.138.51	
asn	14061
org	DIGITALOCEAN-AS...
range	68.183.0.0/16
city	North Bergen, N...
country	United States
location	40.793N, -74.02...
queried fqdn	[no results]
historic fqdn	[no results]
comm	80:tcp:http, 80...

Click IP to open Web investigation options

Click to add to safelist

Generic location info

What did the user query via DNS before connecting to this IP address?

Protocol data

Beacon Web analysis

A screenshot of a network analysis tool interface. At the top, it shows 'DST' and 'site.api.espn.c...' with a minus sign and a triangle icon. Below this, there is a list of attributes and their values:

http servers	23.33.60.114, 2...
http ports used	80
http methods	GET
useragents	Mozilla/5.0 (Wi...
comm	80:tcp:http

Default display

A screenshot of the same network analysis tool interface, but with the 'http servers' attribute expanded to show multiple IP addresses:

http servers	23.33.60.114, 23.222.74.91, 23.79.198.132,
http ports used	23.63.176.172, 23.222.113.45, 23.52.162.178,
http methods	23.63.200.225, 23.52.166.178
http methods	GET
useragents	Mozilla/5.0 (Wi...
comm	80:tcp:http

Mouse over first HTTP server's IP address
C2 connecting to multiple IPs via CDN

ACH - Long connections

AC HUNTER
-- DATABASE: VSAGENT
-- MODULE: LONG CONNECTIONS
-- VIEW 1: TOTAL DURATION ANALYSIS
-- RANGE: 02/23/18 01:58 -- 02/24/18 01:58

SRC 10.55.100.104
-- Private Network Address
-- network name: Unknown Private

DST 13.89.187.212
-- asn: 8075
-- org: MICROSOFT-CORP-...
-- range: 13.84.0.0/11
-- city: Des Moines, IA
-- country: United States
-- location: 41.6021N, -93.6...
-- queried fqdn: (no results)
-- historic fqdn: dm3p.wms.notify...
-- conn: 443:tcp:ssl, 44...

Src	Src Network Name	Dst	Dst Network Name	Port:Protocol:Service	State	Total Bytes	Total Duration
10.55.100.104	Unknown Private	13.89.187.212	Public	443:tcp:ssl, 443:tcp:-	closed	756.70 kB	37:13:28
10.55.100.105	Unknown Private	13.89.184.238	Public	443:tcp:ssl, 443:tcp:-	closed	741.56 kB	37:03:02
10.55.100.111	Unknown Private	13.89.187.212	Public	443:tcp:ssl, 443:tcp:-	closed	751.87 kB	36:59:13
10.55.100.110	Unknown Private	13.89.187.212	Public	443:tcp:ssl, 443:tcp:-	closed	749.79 kB	36:58:03
10.55.100.100	Unknown Private	13.89.184.238	Public	443:tcp:-, 443:tcp:ssl	closed	370.97 kB	36:56:46
10.55.100.108	Unknown Private	13.89.184.238	Public	443:tcp:-, 443:tcp:ssl	closed	370.32 kB	36:56:41
10.55.100.107	Unknown Private	13.89.184.238	Public	443:tcp:ssl, 443:tcp:-	closed	734.29 kB	36:56:15

1 / 5 > >|

ACH - Threat intel

Threat Intel Connections [Outgoing]	1	10.00
Threat Intel Connections [Incoming]	0	0.00
Threat Intel Average Bytes	199.58 B	0.00

- Score 10 points when a match is identified
- Monitor bytes from internal to external
- If > 5 MB, start adding in more points
- If >= 25 MB, increase score by 100 points

ACH - Cyber deception

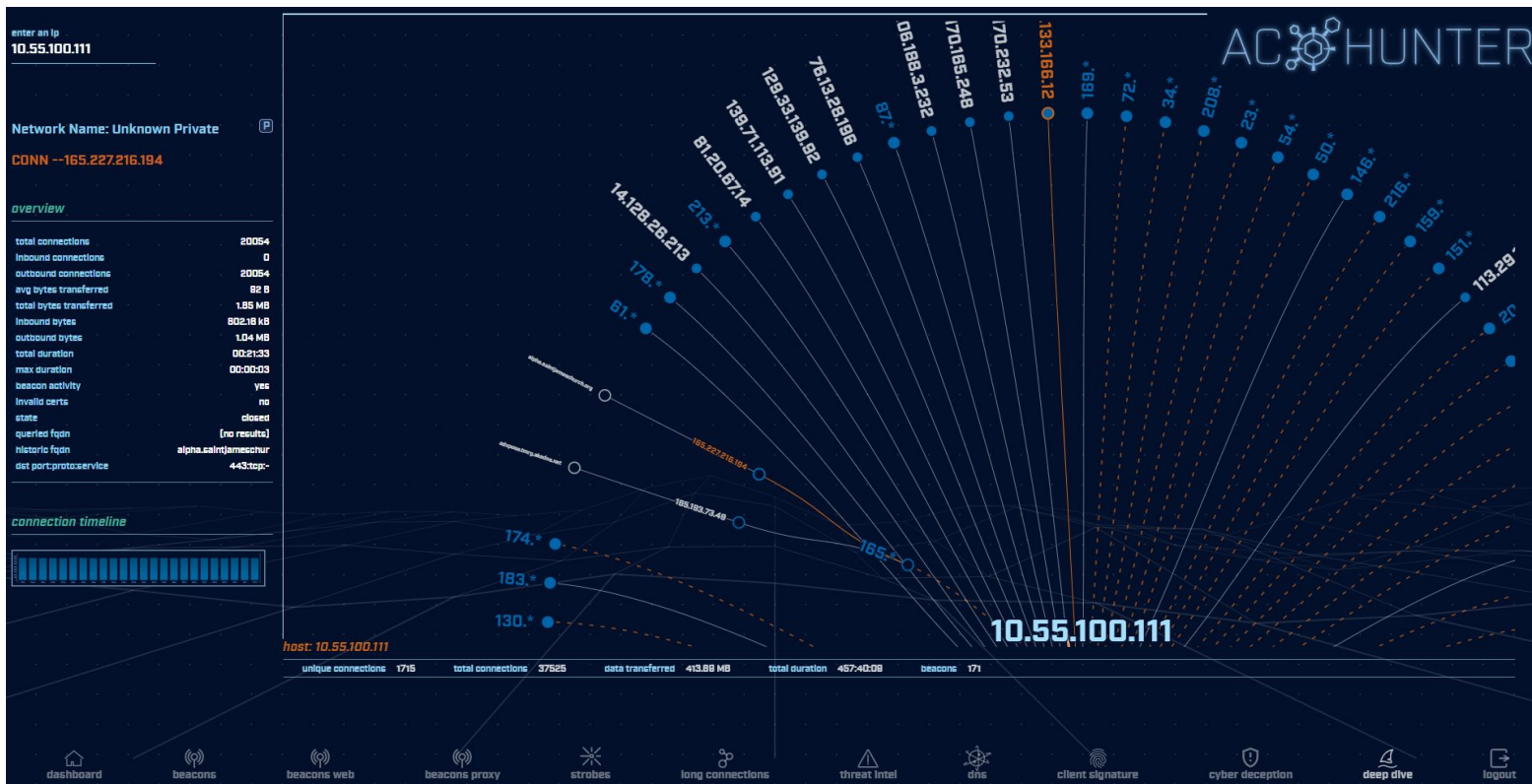
The screenshot displays a security dashboard interface. On the left, there is a sidebar with a 'CREATE TOKEN' button circled in red. Below it are expandable sections for 'Registered Agents [1]', 'Monitored Accounts [1]', and 'Monitored Files [1]'. The 'Monitored Accounts' section is expanded, showing a table with one entry: 'john.doe' in the 'Username' column, 'contoso.com' in the 'Domain' column, '01/30/18 07:33' in the 'Created' column, and 'S-1-5-21-24878...' in the 'SID' column. The 'john.doe' entry is also circled in red. On the right, the 'TRIGGERED EVENTS' section contains a table with the following data:

Resource	Event ID	Perpetrating IP	Agent Hostname	Accessed On	
john.doe	4771	192.168.88.2	dc1.contoso.com	01/30/18 10:39	T
c:\users\administrator\desktop\passwords.txt	4663	192.168.88.2	dc1.contoso.com	01/30/18 09:30	T

The 'john.doe' entry in the first row and the '192.168.88.2' IP address in the second row are circled in red. At the bottom right of the table, there are navigation arrows and a page indicator '1/1'.

Use canary tokens to create tripwires within your environment

ACH - Deep dive



Install process

```
threat@ACH:~/Downloads/achunter$ ./install_acm.sh

===== Selecting Installation Components =====
Do you wish to install AC-Hunter (Y/N)? y
What is the hostname or IP address of the system on which to install AC-Hunter (enter 127.0.0
.1 if you wish to install it on this system)
127.0.0.1
Do you wish to install Zeek (Y/N)? y
What is the hostname or IP address of the system on which to install Zeek (enter 127.0.0.1
if you wish to install it on this system)
127.0.0.1
Do you wish to install Active-Flow (Y/N)? n
Do you wish to install Beaker (Y/N)? _
```


Options:

Install from binary (above) - More time, smaller download, most flexibility

Download official VM - Pretty much ready to go with minor tweaking, larger download

VM for this class - Labs to guide learning, largest download

CE Versus Enterprise



COMMUNITY EDITION
VS
ENTERPRISE EDITION

	COMMUNITY EDITION	ENTERPRISE EDITION
Threat Hunting - Beacons	✓	✓
Threat Hunting - Long Connections	✓	✓
Threat Hunting - Proxy Analysis	✓	✓
Threat Hunting - Threat Intel	✓	✓
Threat Hunting - DNS	✓	✓
Threat Hunting - Client Signature	✓	✓
Threat Hunting - Cyber Deception	✓	✓
Threat Hunting - Deep Dive	✓	✓
Number of Sensors Supported	1	Unlimited
Daily Snapshots	X	✓
Datasets	10	Unlimited
Reporting	X	✓
Customizable Menus	X	✓
Safelist Entries	50	Unlimited
Safelist Sharing	X	✓
LDAP Login Support	X	✓
Alerting	X	Syslog and Slack
Scoring Customization	X	✓
Support	Discord Community	Live Chat, Email, Videoconferencing
Cost	Free	\$

ACTIVE | COUNTERMEASURES

Internal DNS zone transfers

- ▷ Internal host names can be more useful than IPs
- ▷ Especially in DHCP environments
- ▷ Help sync data with host based tools
- ▷ Data can be collected via regular zone transfers
 - Should sync with DHCP lease time
 - Once per hour or more usually sufficient
- ▷ Working on integrating this feature into RITA and AC-Hunter

Datamash

- ▷ **What's it good for?**
 - Similar to the R-base tools, but more extensive
 - Performing simple calculation on data
- ▷ **When to use it**
 - Performing calculations on multiple lines
 - Statistical analysis
- ▷ **Where to get it**

<https://www.gnu.org/software/datamash/>
sudo apt install datamash

Datamash

- ▷ Used for processing raw data at the command line
- ▷ Great for sifting through tabulated data
 - Like Zeek logs
- ▷ Can perform statistical analysis
 - Min, max, mean, etc.
 - Can add together values

Datamash example

```
cbrenton@cbrenton-lab-testing:~/lab3$ cat conn.log | zeek-cut
id.orig_h id.resp_h duration | sort -k3 -rn | head -5
192.168.1.105 143.166.11.10 328.754946
192.168.1.104 63.245.221.11 41.884228
192.168.1.104 63.245.221.11 31.428539
192.168.1.105 143.166.11.10 27.606923
192.168.1.102 192.168.1.1 4.190865
```

Duplicate IPs



```
cbrenton@cbrenton-lab-testing:~/lab3$ cat conn.log | zeek-cut
id.orig_h id.resp_h duration | grep -v -e '^$' | grep -v '-' | sort |
datamash -g 1,2 sum 3 | sort -k3 -rn | head -5
192.168.1.105 143.166.11.10 356.361869
192.168.1.104 63.245.221.11 73.312767
192.168.1.102 192.168.1.1 5.464553
192.168.1.103 192.168.1.1 4.956918
192.168.1.105 192.168.1.1 1.99374
```

Beacon/Threat Simulator

- ▷ Permits you to test your C2 detection setup
- ▷ Target any TCP or UDP port
- ▷ Can jitter timing
- ▷ Can jitter payload size
- ▷ Not designed to exfiltrate data!

```
beacon-simulator.sh <target IP> 80 300 10 tcp 5000
```

Connect to TCP/80 on target IP every 300 seconds, +/-10 seconds, vary payload between 0-5,000 bytes

<https://github.com/activecm/threat-tools>

What if I need specific app data?

```
#beacon-test
while :
do
    curl -A 'Mozilla/0.0001 (Atari 7800)' '$1' >/dev/null 2>&1
    sleep $(shuf -i200-350 -n1)
done
```

Then run this command with screen:

```
screen -S c2 -d -m /bin/beacon-test <Target IP or FQDN>
```

Packet crafting tools like hping3 let you define payload

Create your own scripts!

```
cbrenton@cb-lab:~/lab1$ cat /bin/fq
echo 'DNS info'
cat dns.* | zeek-cut answers query | sort | uniq | grep -Fw $1
echo 'HTTP info'
cat http.* | zeek-cut id.resp_h host user_agent | sort | uniq | grep -Fw $1
echo 'TLS info'
cat ssl.* | zeek-cut id.resp_h server name validation_status | sort | uniq | grep -Fw $1
cbrenton@cb-lab:~/lab1$ fq 69.172.216.56
DNS info
anycast.fw.adsafeprotected.com,69.172.216.56      fw.adsafeprotected.com
HTTP info
TLS info
69.172.216.56  fw.adsafeprotected.com  ok
cbrenton@cb-lab:~/lab1$
```

Example script you can create to make life easier
"fq" check dns.log, http.log and ssl.log in the local directory
Returns info on specified IP address of FQDN
Use "zcat" if logs are in compressed format

ACTIVE | COUNTERMEASURES



C2 Labs & Walkthroughs

What We Will Cover

- ▷ This section is mostly hands on labs
- ▷ Implement what you have learned
- ▷ Two formats:
 - Guided walkthrough - Just follow along
 - Labs - Try to solve the problem on your own
 - Labs have a "hints" page if you get stuck
- ▷ Walkthroughs stress familiarization
- ▷ Labs used to cement your knowledge
 - Hints provided if needed

Reminder

- ▷ **Class VM**
 - SSH login - threat
 - SSH pass - hunting
 - Web login - threat@activecountermeasures.com
 - Web pass - hunting2

Guided tour - Finding the lab files

```
threat@ACH:~$ pwd
/home/threat
threat@ACH:~$ ls
Desktop      Downloads    Music        Public       Templates
Documents    labs         Pictures     snap         Videos
threat@ACH:~$ cd labs
threat@ACH:~/labs$ ls
lab1  lab2  lab3
threat@ACH:~/labs$ cd lab1
threat@ACH:~/labs/lab1$ ls
capture_loss.log  http.log  packet_filter.log
certs-remote.pem  known_hosts.log  software.log
conn.log           known_services.log  ssl.log
dhcp.log          loaded_scripts.log  stats.log
dns.log           notice.log          x509.log
files.log         ntp.log
threat@ACH:~/labs/lab1$
```

Guided tour - Login to ACH



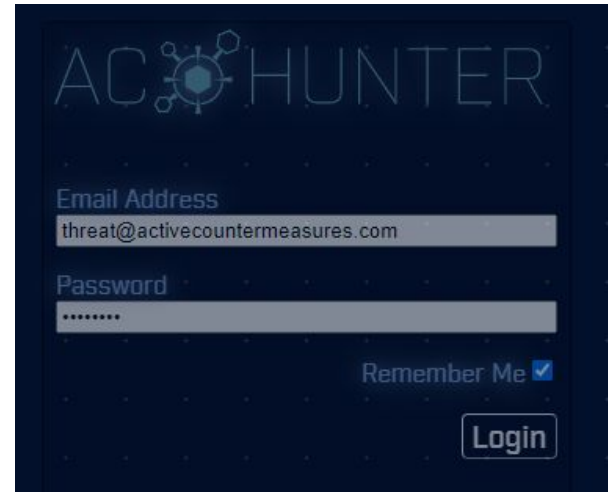
← Working from the VM desktop



← Working remote from host with VirtualBox



↑ Working remote from host with VMWare



Guided tour - First login

Database Selection

NAME	TIMESTAMP RANGE	DELETE
<input type="radio"/> localhost-rolling	07/25/23 14:20 -- 07/26/23 14:20	×
<input type="radio"/> proxy	01/04/23 13:48 -- 01/05/23 13:48	×
<input type="radio"/> winlab-agent	10/01/20 16:06 -- 10/02/20 14:36	×
<input type="radio"/> open-connections	01/30/18 13:14 -- 01/31/18 13:13	×
<input type="radio"/> gcat	02/16/18 01:59 -- 02/17/18 01:59	×
<input checked="" type="radio"/> dnscat2-ja3	01/30/18 13:14 -- 01/31/18 13:13	×

Database Removal

Delete
All

By Age

Confirm

Guided tour - What you should see

AC HUNTER
COMMUNITY EDITION

2 POTENTIAL C2 OVER DNS CASES DETECTED

100

THREAT RATING

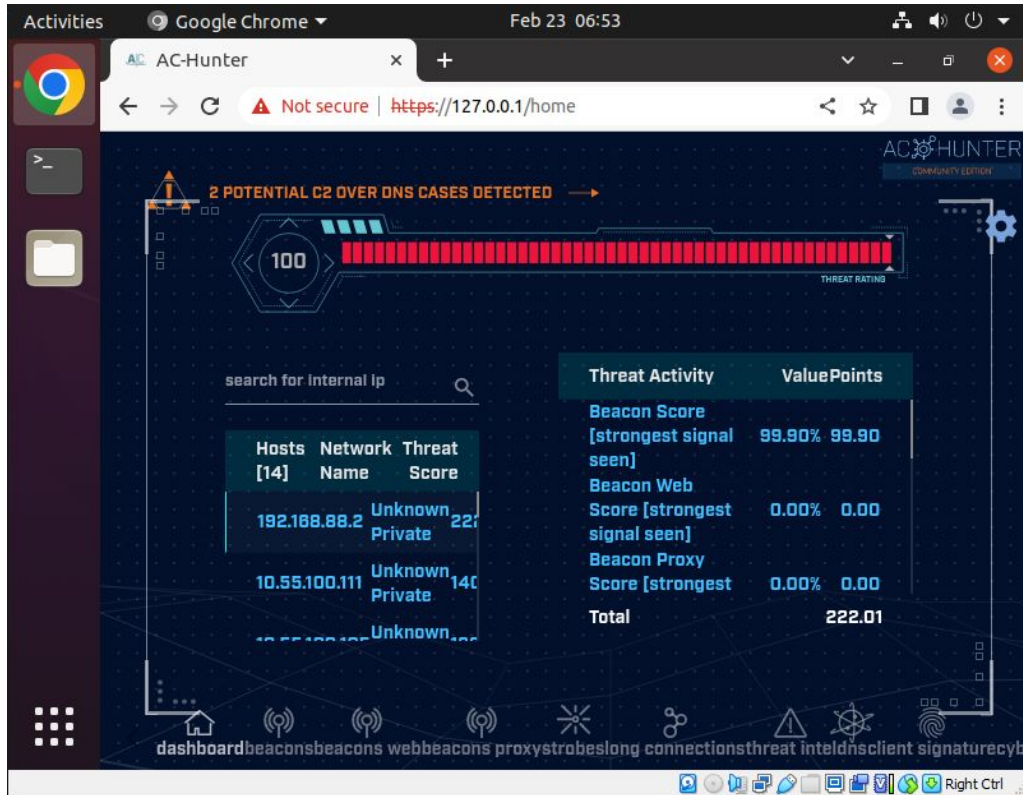
search for internal ip

Hosts [14]	Network Name	Threat Score
192.168.88.2	Unknown Private	222.01
10.55.100.111	Unknown Private	140.47
10.55.100.105	Unknown Private	132.90
10.55.100.100	Unknown Private	128.45
10.55.100.107	Unknown Private	128.45
10.55.100.110	Unknown Private	127.43
10.55.100.109	Unknown Private	124.55

Threat Activity	Value	Points
Beacon Score [strongest signal seen]	99.90%	99.90
Beacon Web Score [strongest signal seen]	0.00%	0.00
Beacon Proxy Score [strongest signal seen]	0.00%	0.00
Longest Connection	02:06:34	2.11
Threat Intel Connections [Outgoing]	1	10.00
Threat Intel Connections [Incoming]	0	0.00
Threat Intel Average Bytes	199.58 B	0.00
Unexpected Protocol on Well Known Port	0	0.00
Triggered Event on Canary Token	2	100.00
Rare Client Signature Count	1	10.00
Total		222.01

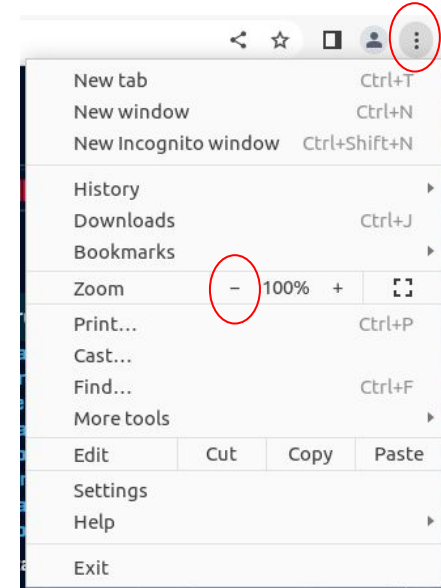
dashboard beacons beacons web beacons proxy strobos long connections threat intel dns client signature cyber deception deep dive logout

Guided tour - What if I see this?



Change VM View to full screen

Zoom out Chrome



Changing databases



AC-Hunter Settings

Database

Safelist

Themes

About

Upgrade

Database Selection

NAME	TIMESTAMP RANGE	DELETE
<input type="radio"/> localhost-rolling	02/22/23 10:42 -- 02/23/23 09:59	×
<input type="radio"/> proxy	01/04/23 13:48 -- 01/05/23 13:48	×
<input checked="" type="radio"/> dnscat2-ja3-strobe	01/30/18 13:14 -- 01/31/18 13:13	×

Database Removal

Delete All

By Age

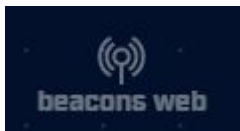
Confirm

A red arrow points from the top left of the settings page to the "Database" tab in the left sidebar.

Let's add a safelist entry

- ▷ Used when legit business need is identified
- ▷ Keep the entry from showing up in hunts
- ▷ Applied across all databases
- ▷ Does not delete data!
 - Hides from view
 - Hides from scoring
- ▷ Remove entry and data returns

Guided walkthrough - safelisting



Click "beacons web" on bottom of the dashboard

Select second IP in list

Guided walkthrough - Analyze



The screenshot shows a network analysis tool interface with a dark background. At the top, it displays 'DST' and 'config.edge.sky...'. Below this, there is a list of TLS-related metrics:

Metric	Value
tls servers	13.107.3.128
tls ports used	443
subjects	CN=edge.skype.com,
invalid certificate	no
comm	443:tcp:ssl

Traffic to skype.com with a legitimate digital certificate
Assume Skype is an approved business app

Guided walkthrough - Safelist



Click the filter icon to add this entry to the safelist

Guided walkthrough - Safelist

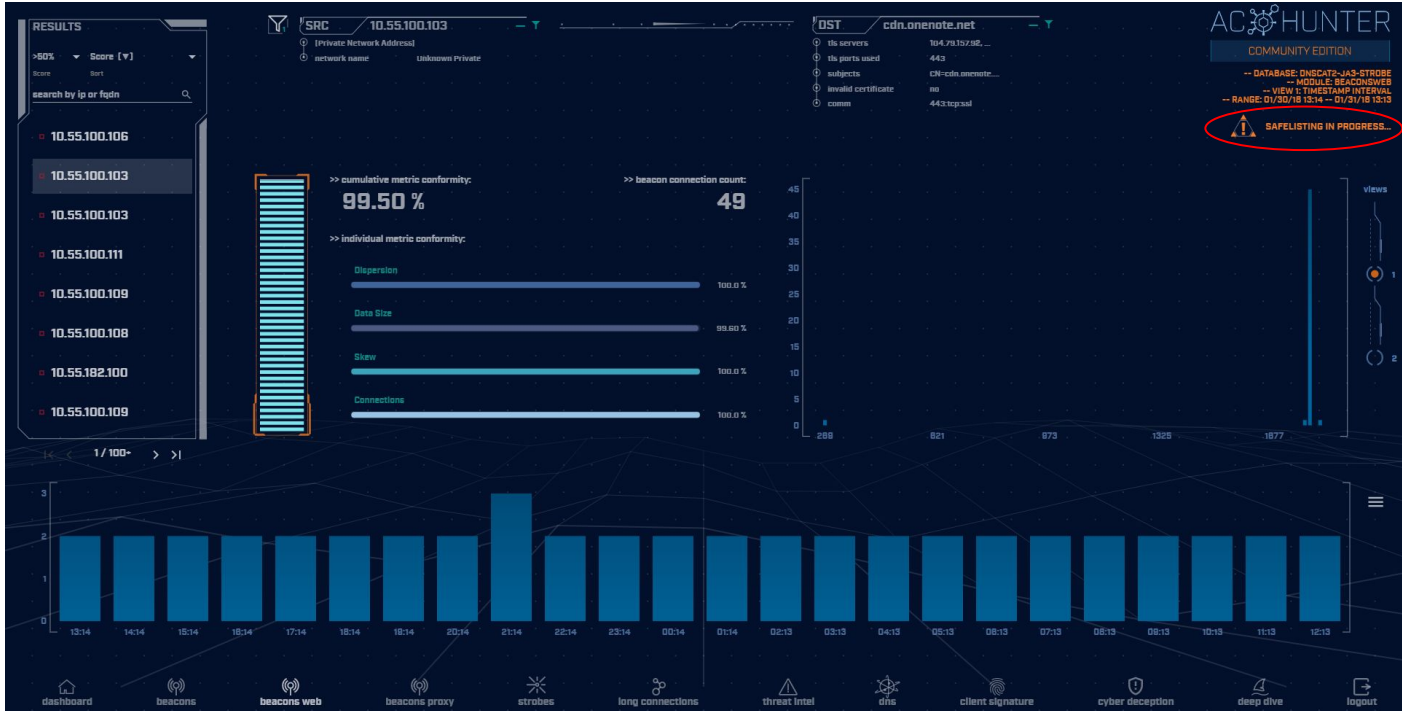
The screenshot shows a configuration window titled "Safelist this Entry?". On the left, there is a sidebar with "SRC" and "DOMAIN" tabs. The main area is titled "Safelist by Domain" and contains the following fields:

- Safelist From ...**: A radio button is selected for "Safelist FQDN for all internal hosts". Other options are "10.55.182.100" and "10.55.182.0/24".
- Select A Resolved FQDN ...**: A dropdown menu is set to "config.edge.skype.com".
- Match Type ...**: A radio button is selected for "enable wildcard".
- Safelist Pattern ...**: The text "config*.edge.skype.com" is entered, with a blue bracket highlighting the asterisk.
- Comment**: The text "Skype traffic. Created by cbrenton on 20230223" is entered.

At the bottom right of the window are "Cancel" and "Safelist" buttons. Three red circles are drawn around the "Match Type" field, the "Safelist Pattern" field, and the "Comment" field to highlight the guided steps.

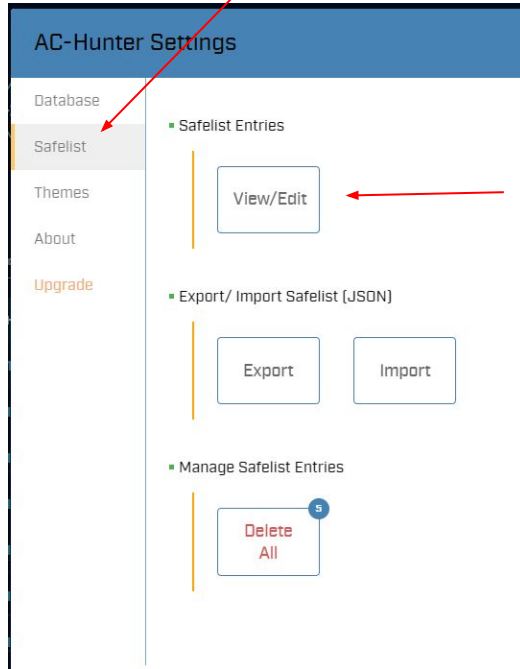
When no FQDN info, implement based on IP
Never do this by IP when target is a CDN!!!

Guided walkthrough - Entry removed



Entry is removed. Next on the list is displayed.

Guided walkthrough - Manage safelists



Return to the dashboard

Click the gear for Settings

Select "safelist"

Click "View/Edit" button

Guided walkthrough - View safelists

VIEW / EDIT GLOBAL SAFELIST

Global Safelist Entries

Search

Ex. 10.10.10.10

type

scope

▼

▼

name ↑

type

scope

comment

actions

*.edge.skype.com

domain_pattern

Skype traffic. Created by cbrenton on 20230223

▼

✕

|< < 1/1 > >|

AC-Hunter CE supports 50 safelist entries

Guided walkthrough - Investigation

Highlight first entry

Click the first entry (Beacon score)

The image shows a security dashboard with two main panels. The left panel is a table of hosts, and the right panel is a detailed view of threat activity for the first host. A red arrow points from the text 'Highlight first entry' to the first row of the hosts table. Another red arrow points from the text 'Click the first entry (Beacon score)' to the 'Beacon Score' entry in the threat activity table.

Hosts [14]	Network Name	Threat Score
192.168.88.2	Unknown Private	219.91
10.55.100.111	Unknown Private	140.47
10.55.100.105	Unknown Private	132.90
10.55.100.100	Unknown Private	128.45
10.55.100.107	Unknown Private	128.45
10.55.100.110	Unknown Private	127.43
10.55.100.109	Unknown Private	124.55

Threat Activity	Value	Points
Beacon Score [strongest signal seen]	99.90%	99.90
Beacon Web Score [strongest signal seen]	0.00%	0.00
Beacon Proxy Score [strongest signal seen]	0.00%	0.00
Longest Connection	00:00:09	0.00
Threat Intel Connections [Outgoing]	1	10.00
Threat Intel Connections [Incoming]	0	0.00
Threat Intel Average Bytes	199.58 B	0.00
Unexpected Protocol on Well Known Port	0	0.00
Triggered Event on Canary Token	2	100.00
Rare Client Signature Count	1	10.00
Total		219.91

Guided walkthrough - Investigation

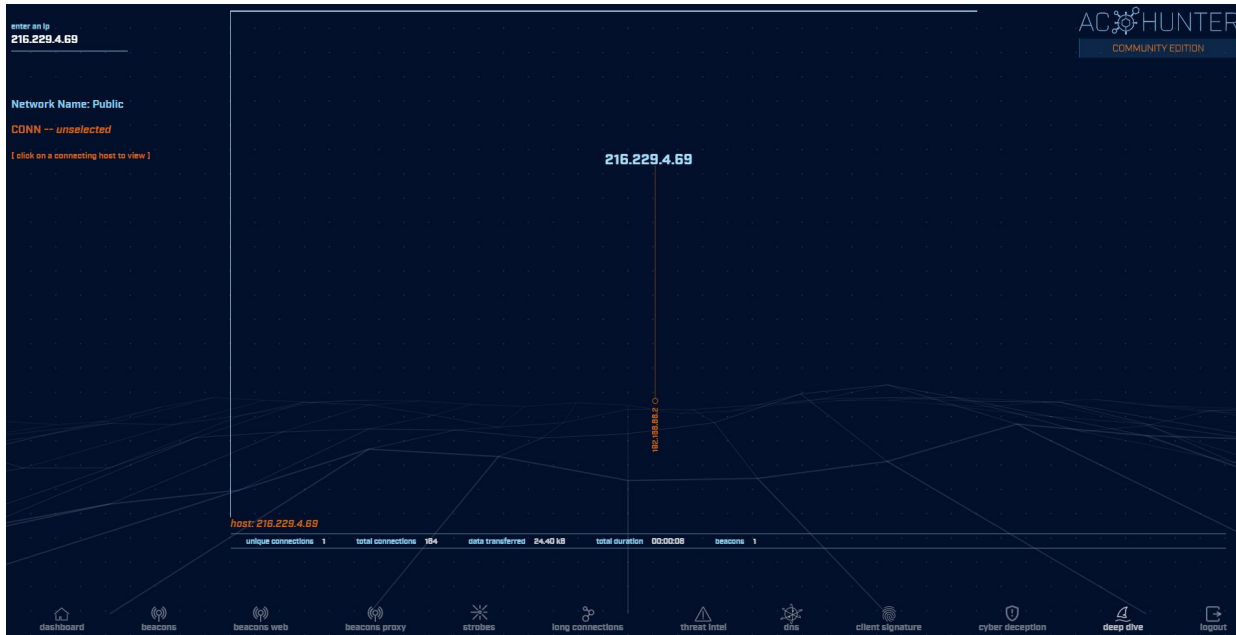


Clicking IP or FQDN opens investigation menu

Provide more data on subject

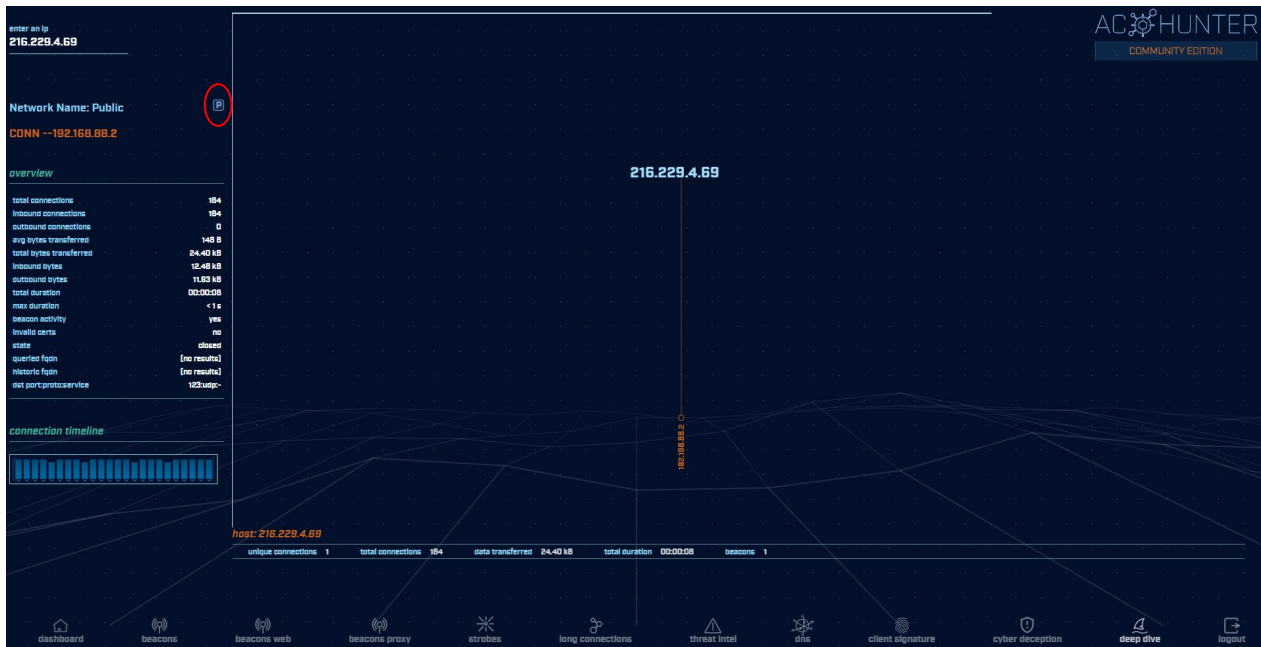
Start by clicking "deep dive"

Guided walkthrough - deep dive



Only internal host speaking to this IP

Guided walkthrough - more data

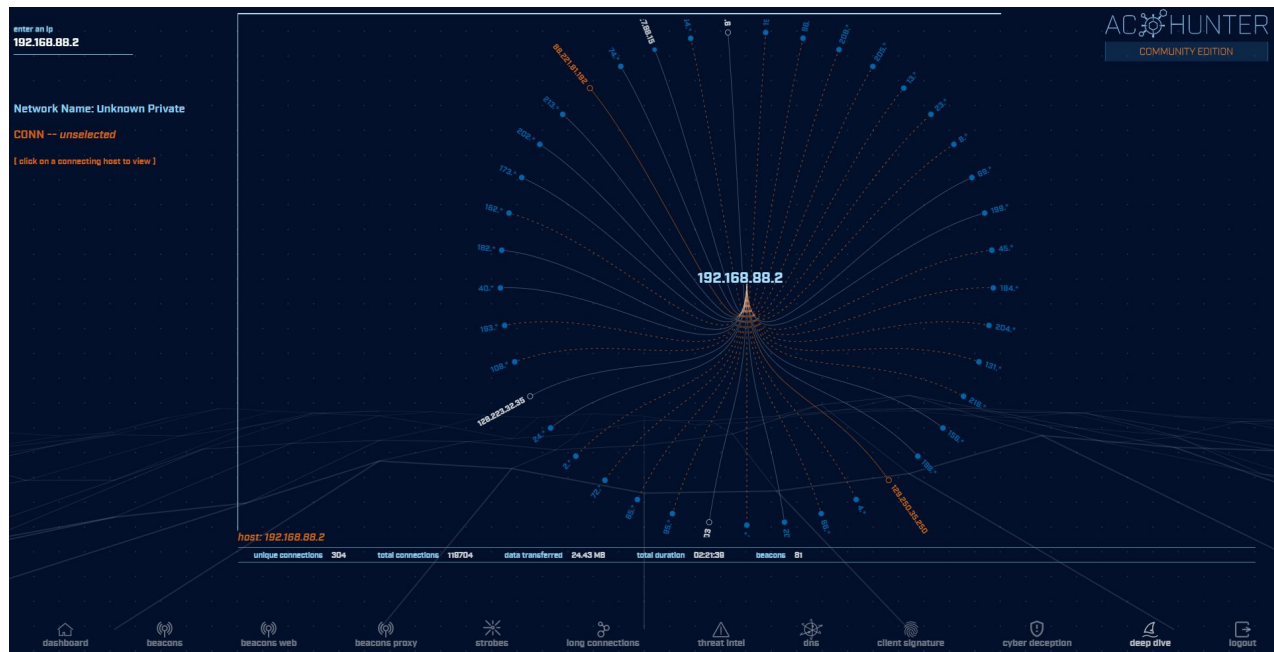


Click internal IP

Summary of comms shown

Click "P" to pivot

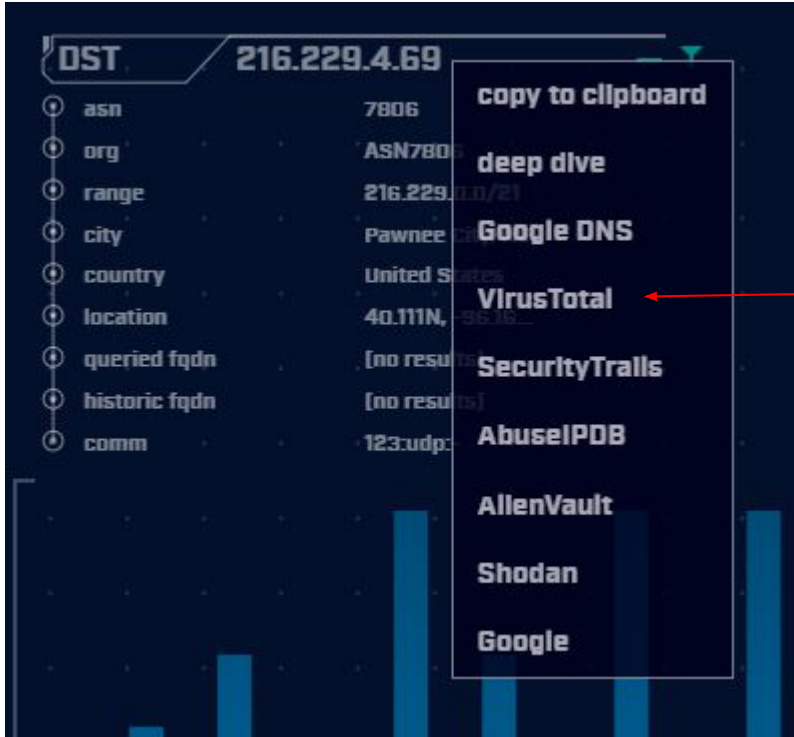
Guided walkthrough - pivot



Pivot changes view to other IP address

If you find a C2 server, use this to see if others are talking to it as well.

Guided walkthrough - Other options



Navigate back

Select VirusTotal

Guided walkthrough - Investigation



216.229.4.69



1 security vendor flagged this IP address as malicious

216.229.4.69 (216.229.0.0/21)
AS 7806 (ASN7806)

DETECTION DETAILS **RELATIONS** COMMUNITY 1

[Join the VT Community](#) and enjoy additional community insights and crowdsourced detections.

Passive DNS Replication (200)

Date resolved	Detections	Resolver	Domain
2023-02-13	0 / 87	VirusTotal	time.if.iqiyi.com
2022-12-09	0 / 87	Georgia Institute of Technology	2.almalinux.pool.ntp.org
2022-12-03	0 / 87	Georgia Institute of Technology	0.homewizard.pool.ntp.org
2022-12-01	0 / 87	Georgia Institute of Technology	1.ipfire.pool.ntp.org
2022-11-21	0 / 88	VirusTotal	3.siemens.pool.ntp.org
2022-11-19	0 / 88	Georgia Institute of Technology	2.echo360.pool.ntp.org

New tab opens

Passes IP/FQDN to external site for additional info

Guided walkthrough - Long conns



Return to dashboard



Open long connections module

Guided walkthrough - screen info

AC HUNTER
COMMUNITY EDITION
-- DATABASE: DNSCAT2-JA3-STROBE
-- MIDDLE LONG CONNECTIONS
-- VIEW 1: TOTAL DURATION ANALYSIS
-- RANGE: 01/30/18 15:14 -- 01/31/18 13:13

Src	Src Network Name	Dst	Dst Network Name	Port:Protocol:Service	State	Total Bytes	Total Duration
10.55.100.100	Unknown Private	65.52.108.225	Public	443:tcp:-	closed	155.09 kB	23:57:02
10.55.100.107	Unknown Private	111.221.29.113	Public	443:tcp:-	closed	156.22 kB	23:57:00
10.55.100.110	Unknown Private	40.77.229.82	Public	443:tcp:-	closed	115.58 kB	23:56:00
10.55.100.109	Unknown Private	65.52.108.233	Public	443:tcp:ssl	closed	138.72 kB	20:02:56
10.55.100.105	Unknown Private	65.52.108.195	Public	443:tcp:ssl	closed	185.26 kB	18:29:59
10.55.100.103	Unknown Private	131.253.34.243	Public	443:tcp:-	closed	348.40 kB	17:58:18
10.55.100.104	Unknown Private	131.253.34.246	Public	443:tcp:ssl	closed	161.01 kB	15:56:53

1 / 8

dashboard beacons beacons web beacons proxy etraces long connections threat intel dns client signature cyber deception deep dive logout

If you don't see data, check Search and Threshold. May need to clear values.

Note screen layout is similar.

Guided walkthrough - data import

- ▷ Follow along to import the data
- ▷ We have Zeek logs we want to analyze
- ▷ Let's get them imported in to ACH CE
- ▷ We'll use RITA to do the import
 - Yes, RITA is "under the hood"

Go to the lab1 directory

Navigate to the "lab1" directory

```
threat@ACH:~$ cd labs
threat@ACH:~/labs$ cd lab1
threat@ACH:~/labs/lab1$ pwd
/home/threat/labs/lab1
threat@ACH:~/labs/lab1$ ls
capture_loss.log      http.log              packet_filter.log
certs-remote.pem     known_hosts.log      software.log
conn.log              known_services.log   ssl.log
dhcp.log              loaded_scripts.log    stats.log
dns.log               notice.log            x509.log
files.log             ntp.log
threat@ACH:~/labs/lab1$ _
```

Importing Zeek logs into ACH

```
rita import <path to zeek logs> <database name>
```

```
threat@ACH:~/labs/lab1$ rita import *.log lab1
[sudo] password for threat:
Creating achunter_api_run ... done

      [+] Importing [/home/threat/labs/lab1/capture_loss.log
/home/threat/labs/lab1/conn.log /home/threat/labs/lab1/dhcp.log
```

...

```
      [-] Indexing log entries ...
      [-] Updating metadatabase ...
      [-] Done!

threat@ACH:~/labs/lab1$
```

DB should now appear in ACH CE

The screenshot displays the 'AC-Hunter Settings' interface. On the left is a sidebar with navigation links: Database, Safelist, Themes, About, and Upgrade. The main content area is titled 'Database Selection' and contains a table with the following data:

NAME	TIMESTAMP RANGE	DELETE
<input type="radio"/> localhost-rolling	02/23/23 12:00 -- 02/24/23 11:59	×
<input checked="" type="radio"/> lab1	06/04/20 12:59 -- 06/05/20 12:58	×
<input type="radio"/> proxy	01/04/23 13:48 -- 01/05/23 13:48	×
<input type="radio"/> dnscat2-ja3-strobe	01/30/18 13:14 -- 01/31/18 13:13	×

Below the table is a 'Database Removal' section with two buttons: 'Delete All' and 'By Age'. A 'Confirm' button is located in the bottom right corner of the interface.

Lab1

- ▷ Go to the beacon web module
- ▷ Six entries scored above 80
- ▷ Evaluate each of the 6
 - Spend about 60 sec max on each
 - Which entries look suspicious?
 - Which entries can be safelisted?
 - Make a list of each
- ▷ Stick with the UI
 - We'll dig into the logs in a later lab



Hints

- ▷ Go for the easiest ones first
- ▷ If you can decide in less than a minute, make a note and move to the next one
- ▷ Circle back to the hard ones after you've gone through everything

Lab1 - Answers

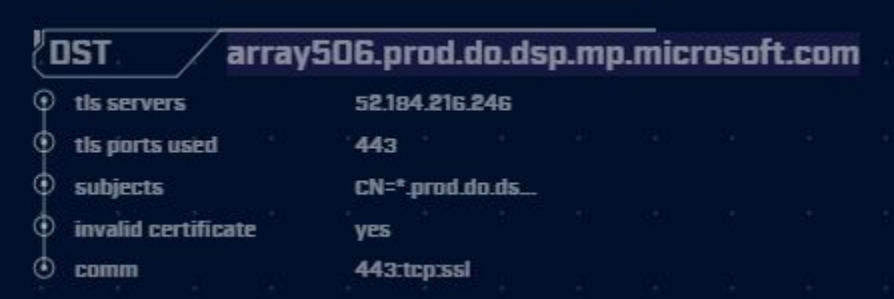


Lab1 answers - First entry

- ▷ Refer to previous slide
- ▷ Very high beacon score
- ▷ Lots of conns over 24 hours (3,011)
- ▷ Histogram is pretty flat
- ▷ User agent identifies as Windows 7
 - Could be legit but seems kind of old
- ▷ No host string
 - Should identify FQDN of Web server
- ▷ Well come back to this one

Lab1 answers - Second entry

- ▷ MS delivery optimization host
- ▷ Used in Windows for patching
- ▷ Digital cert looks legit
- ▷ We could safelist this one



DST		array506.prod.do.dsp.mp.microsoft.com
⊙	tls servers	52.184.216.246
⊙	tls ports used	443
⊙	subjects	CN=*.prod.do.ds...
⊙	invalid certificate	yes
⊙	comm	443:tcp:ssl

Lab1 answers - 3rd & 4th entry

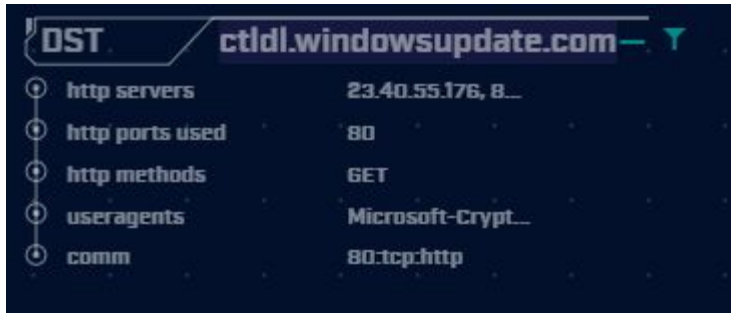
DST		tile-service.weather.microsoft.com
○	http servers	104.84.99.129, ...
○	http ports used	80
○	http methods	GET
○	useragents	Microsoft-WNS/1...
○	comm	80:tcp:http

Windows tile services
This can be safelisted

DST		array509.prod.do.dsp.mp.microsoft.com
○	tls servers	52.184.217.56
○	tls ports used	443
○	subjects	CN=*.prod.do.ds...
○	invalid certificate	yes
○	comm	443:tcp:ssl

Windows patching
Note this is similar to 2nd entry
"array509" versus "array506"
We can safelist both with a wildcard

Lab1 answers - 5th & 6th entry



A screenshot of a network tool interface showing details for the domain `ctldl.windowsupdate.com`. The interface has a dark blue background with white text. The title bar reads "DST ctldl.windowsupdate.com". Below the title bar, there is a list of five items, each with a circular icon to its left:

http servers	23.40.55.176, B...
http ports used	80
http methods	GET
useragents	Microsoft-Crypt...
comm	80:tcp:http

Both are Windows patching
Note another "array"



A screenshot of a network tool interface showing details for the domain `array503.prod.do.dsp.mp.microsoft.com`. The interface has a dark blue background with white text. The title bar reads "DST array503.prod.do.dsp.mp.microsoft.com". Below the title bar, there is a list of five items, each with a circular icon to its left:

tls servers	52.179.219.14
tls ports used	443
subjects	CN=*.prod.do.ds...
invalid certificate	yes
comm	443:tcp:ssl

Next lab - Create safelist entries

- ▶ **First entry looks suspicious**
 - We will cycle back to it
- ▶ **The rest look legit**
 - Windows patching
 - Windows desktop tile services
- ▶ **Let's safelist these last 5 entries**
- ▶ **Try this on your own**

Lab hints

- ▷ Consolidate with wildcards
- ▷ You only need 3 safelist entries to cover all five targets
- ▷ Safelisting by FQDN is preferred
 - Updates when IP changes
 - Track through CDNs as required

Creating a safelist entry

Safelist this Entry?

SRC

DOMAIN

Safelist by Domain

View/edit your full safelist in Home > Settings > Safelist.

Safelist From ...

- Safelist FQDN for all internal hosts
- 192.168.99.51
- 192.168.99.0/24

Select A Resolved FQDN ...

array506.prod.do.dsp.mp.microsoft.com

Match Type ...

enable wildcard

Safelist Pattern ...

array506*.prod.do.dsp.mp.microsoft.com

Comment

Windows patching via delivery optimization. cbrenton 202302027

Cancel Safelist

Safelist settings

Any internal system

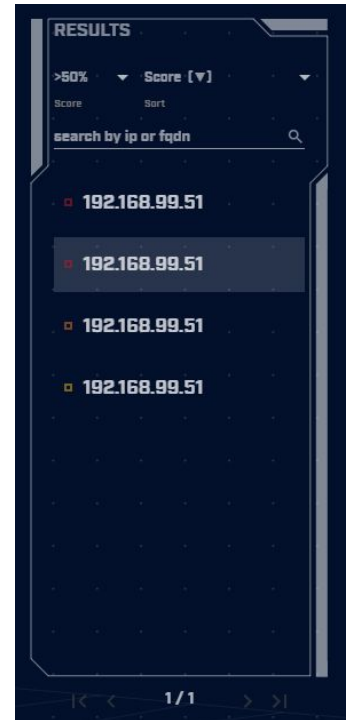
Wildcard match

Wildcard covers all "array" entries

Don't forget Comment

Did you notice?

- ▶ The 1 safelist removed 3 entries
- ▶ All were "array" entries
- ▶ The wildcard covered all 3
- ▶ Create the last two needed



View safelists when complete

VIEW / EDIT GLOBAL SAFELIST

Global Safelist Entries

Search *type* *scope*

name ↑	type	scope	comment	actions
*.edge.skype.com	domain_pattern		Skype traffic. Created by cbrenton on 20230223	▼ ✕
*.prod.do.dsp.mp.microsoft.com	domain_pattern		Windows patching via delivery optimization. cbrenton 202302027	▼ ✕
ctldl.windowsupdate.com	domain_literal		Windows checking for patches	▼ ✕
tile-service.weather.microsoft.com	domain_literal		Windows tile services	▼ ✕

|< < 1/1 > >|

Completed safelist entries

Next lab!

- ▷ Still working with "lab1" dataset
- ▷ Go to "long connections module"
- ▷ Evaluate connections lasting > 5 hours
- ▷ Spend 60 seconds max on each
- ▷ Identify
 - Which look suspect and need further investigation?
 - Which can be safelisted?

Hints

- ▷ Only two entries to work with
- ▷ Don't forget clicking an IP brings up the investigation menu
- ▷ What is known about the external IP?
- ▷ Could this host serve a legitimate business purpose?

Answers - Some basic info

- ▷ NO FQDN entry identified for either IP
- ▷ "comm" does not identify protocol
- ▷ ACH stores this data for 24 hours
 - FQDN queried via DNS
 - App protocol during initial negotiation
- ▷ After 24 hours, both labeled as unknown
- ▷ We would need to go back through the Zeek data to when the conn started

Lab answers - 1st IP

167.71.97.235

0 / 88

No security vendor flagged this IP address as malicious

167.71.97.235 (167.71.0.0/16)
AS 14061 (DIGITALOCEAN-ASN)

US

DETECTION DETAILS **RELATIONS** COMMUNITY

Join the VT Community and enjoy additional community insights and crowdsourced detections.

Passive DNS Replication (2)

Date resolved	Detections	Resolver	Domain
2022-11-16	0 / 87	VirusTotal	pisensordca63202755c.aihhosted.com
2020-09-23	0 / 89	VirusTotal	demo1.aihhosted.com

Files Referring (1)

Scanned	Detections	Type	Name
2021-10-21	0 / 57	unknown	7May2021_export_bookmark.html

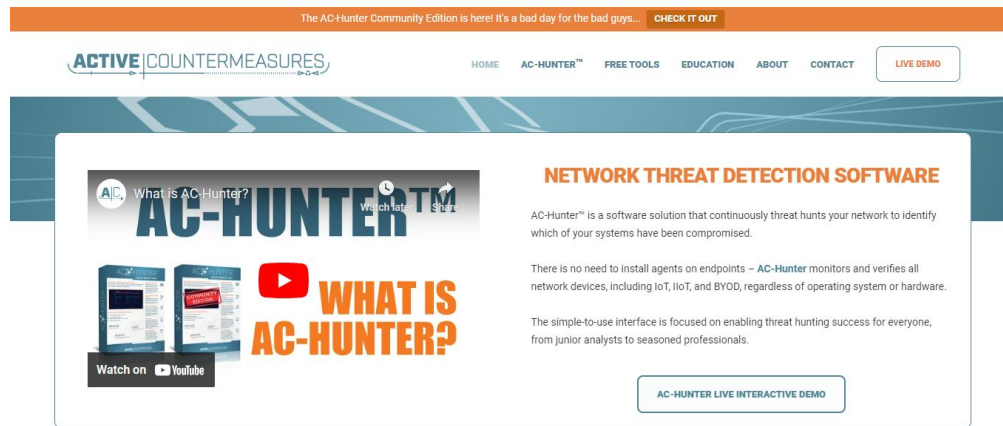
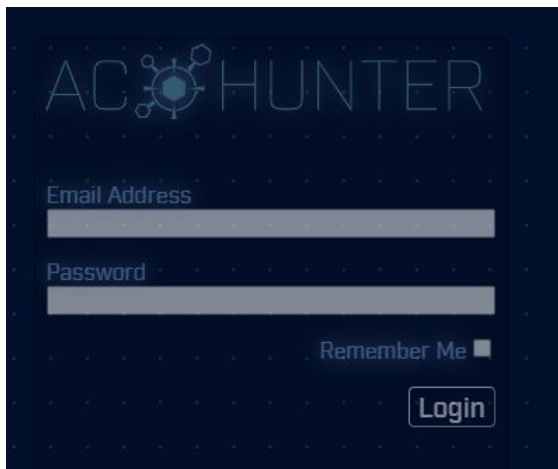
Historical Whois Lookups (3)

Last Updated	Organization	Email
+ 2021-10-21		
+ 2021-08-19		
+ 2020-06-03	DigitalOcean, LLC	abuse@digitalocean.com

Graph Summary

What if I visit this IP or domain?

Connect from a non-work related IP



Target produces an "AC-Hunter" login
www.aihhosted.com redirects to Active Countermeasures
Can we identify a business need with this tool or domain?

Answers - 2nd IP



0 / 88

No security vendor flagged this IP address as malicious

52.179.224.121 (52.160.0.0/11)
AS 8075 (MICROSOFT-CORP-MSN-AS-BLOCK)

Community Score

DETECTION DETAILS **RELATIONS** COMMUNITY

[Join the VT Community](#) and enjoy additional community insights and crowdsourced detections.

Passive DNS Replication (12)

Date resolved	Detections	Resolver	Domain
2022-04-28	0 / 88	VirusTotal	mlcssitestp1i6lq.eastus2.cloudapp.azure.com
2022-03-11	0 / 88	VirusTotal	avsrp.eastus2.avsstage.azure.com
2022-01-10	0 / 88	VirusTotal	mlcssitestn7ult5.eastus2.cloudapp.azure.com
2021-02-06	0 / 87	Georgia Institute of Technology	americas2.wns.notify.trafficmanager.net
2021-02-03	0 / 88	Offensive Security	skydrive.wns.windows.com
2021-01-31	0 / 88	Georgia Institute of Technology	wns.notify.trafficmanager.net
2021-01-24	0 / 88	Georgia Institute of Technology	bn3p.wns.notify.trafficmanager.net
2021-01-22	0 / 87	VirusTotal	vip2-bn3p.wns.notify.trafficmanager.net
2020-10-29	0 / 88	VirusTotal	client.wns.windows.com
2019-12-12	0 / 89	VirusTotal	bn3p.wns.notify.windows.com.akadns.net

Looks like Windows notification services

Standard Windows Service

Answers - Sanity check

- ▷ 1 suspect beacon
- ▷ 5 beacons with a business need
- ▷ 1 long conn that's probably OK
 - demo1.aihhosted.com
- ▷ 1 long conn that can be safelisted
 - Windows Notification Service
 - Safelist the destination IP address
- ▷ That just leaves the first beacon

Another lab - Deep dive on beacon

- ▷ The IP 104.248.234.238 is suspect
- ▷ Let's deep dive on this connection
- ▷ What can we learn about this IP?
- ▷ Anything odd about the session?
- ▷ If you are running the VM:
 - Additional data in Zeek logs
 - Anything useful?
- ▷ Determine if comms are suspect or not

Hints

- ▷ User agent says Windows 7
- ▷ Is this consistent with all other conns?
- ▷ Perform a session size analysis
 - View 2 on beacon screen
 - Does this look like C2?
- ▷ What does Zeek show for a payload?
- ▷ Any other useful info?

Answers - session size analysis



Sessions do have potential C2 attributes

Lab answers - suspect sessions

- ▷ Confirmed no FQDN query prior to connection
- ▷ This is highly suspect

```
threat@ACH:~/labs/lab1$ cat dns.log | zeek-cut query answers | grep 104.248.234.238  
threat@ACH:~/labs/lab1$
```

Answers - http analysis

Should be FQDN

```
threat@ACH:~/labs/lab1$ cat http.log | zeek-cut id.orig_h id.resp_h host uri user_agent |
sort | uniq -c | sort -rn | head -3
    3011 192.168.99.51 104.248.234.238 104.248.234.238 /rmvk30g/eghmbblnphlaefbmmnoenohho
ncmcepapefjjekpleokhjfjmmijghedkienplidbbcmgdjidbegpeemiboacnfcpnbnhlmjbpcejfpecdioiddkl
fegefcbjbcnagjclnoijpajlpkkegakmpdddojnlphegeehaacmofggdfkagpbighfkndllaamndepdanhnogedkaod
hgakiigoheminoolnaobdiiokepbgahpnghbebkepipffooljden;1;4;1 Mozilla/4.0 (Windows 7 6.1
) Java/1.7.0_11
    17 192.168.99.51 72.21.81.240 11.tlu.dl.delivery.mp.microsoft.com /filestrea
mingservice/files/b3317cef-3684-4c90-acc-aaf17f9a4670?P1=1591295507&P2=402&P3=2&P4=QaOTWB
xclTg7UNhQEI5DtHuLURn+MSdpYTdzFv1SYPL8oE8CLAGy3YGMYaemNAoY6DhO87ccDabEFt29g5oXg== Mi
crosoft-Delivery-Optimization/10.0
    13 192.168.99.51 8.252.133.254 3.tlu.dl.delivery.mp.microsoft.com /filestrea
mingservice/files/62023f49-c795-4f2c-b1ad-691785434443?P1=1591295946&P2=402&P3=2&P4=NT59Yo
uPqG4K1Xd/4Kmh1LEQdz6EKxjsXlalRGmYkfJ/oAVAnmgIZx2TXpHocIv5Fj1Ghc2FXZ7oPXeI8/8GXw== Mi
crosoft-Delivery-Optimization/10.0
threat@ACH:~/labs/lab1$
```

Usually Windows 10 but 7 in suspect connection

Answers - User agent analysis

```
threat@ACH:~/labs/lab1$ cat http.log | zeek-cut id.orig_h id.resp_h user_agent | sort | un
iq | cut -f 3 | sort | uniq -c | sort -rn
 29 Microsoft-WNS/10.0
 16 Microsoft-Delivery-Optimization/10.0
  8 Microsoft-CryptoAPI/10.0
  1 WicaAgent
  1 Mozilla/4.0 (Windows 7 6.1) Java/1.7.0_11
threat@ACH:~/labs/lab1$ _
```

Claims to be Windows 7 when speaking to this one IP

Claims to be Windows 10 for all other destination IP addresses

Answers - uri analysis

```
threat@ACH:~/labs/lab1$ cat http.log | zeek-cut id.orig_h id.resp_h uri | grep 104.248.234
.238 | sort | uniq -c | sort -rn
    3011 192.168.99.51    104.248.234.238 /rmvk30g/eghmbblnphlaefbmmnoenhoncmcepapefjjekpl
eokhjfjmmijghedkienplidbbcmgdjldbegpeemiboacnfcpnbnhlmjbpcejfpecdioiddklfegefcbcnagjcln
oijpajlpkkegakmpdddojnlphegeehaacmofggdfkagpbighfkndllaamndepdanhnogedkaodhgakiigoheminool
naobdiokpebghapnghbebkepiffooljden;1;4;1
threat@ACH:~/labs/lab1$ _
```

All 3,011 connections are this same really long string

Final answer

- ▶ Connections with 104.248.234.238 are highly suspect
 - No FQDN queries
 - 3,011 connections with strong beacon attributes
 - Shifting user agent string
 - No "host" field in HTTP header
 - Long convoluted URI string
 - Googling "rmvk30g" returns "Fiesta EK"
- ▶ All other entries can be safelisted

It's worth noting

- ▷ Capture contained 14,000+ connections
- ▷ Only one was "evil"
- ▷ We found it pretty quickly with ACH CE

Next lab!

- ▷ Let's move to the lab2 directory
- ▷ VM users will need to import the data
- ▷ After data import, select "lab2" database and hunt the data
- ▷ Use the last set of labs as a guide

```
threat@ACH:~/labs/lab1$ cd ../lab2
threat@ACH:~/labs/lab2$ rita import *.log lab2_
```

Hints

- ▷ May appear there is no results
- ▷ Check the top left of screen
- ▷ Pointing you to DNS module



Lab answers - C2 over DNS

- ▷ It looks like there is no data
- ▷ No individual IPs are listed
- ▷ Check top left of screen
- ▷ Indicates to check the DNS module
- ▷ C2 over DNS is presented differently
 - Source may be resolver, not infected client
 - Multiple src IPs if multiple resolvers are used
 - Results are consolidated for accuracy

Answers - C2 over DNS results

The screenshot shows the AC Hunter interface with the following elements:

- Top Left:** SUBDOMAIN THRESHOLD: 100, SEARCH bar.
- Top Right:** AC HUNTER COMMUNITY EDITION, DATABASE: LAB2, MODULE: DNS, VIEW: DNS ANALYSIS, RANGE: 12/31/69 19:00 -- 12/31/69 19:00.
- Table:** Columns: FQDNs Count, Lookups, Domain. Row 1: 2074 (circled in red), 2074, honestimnotevil.com.
- Right Panel:** DNS Queries [1] (Host: 172.31.28.157), Direct Connections [0] (circled in red).

More unique resource records than reasonable

No users accessing resources

Answers - drill down on DNS

Change threshold from 1,000 to 0

FQDNs Count	Lookups	Domain
2074	2074	honestimnotevil.com
21	21	...5071a0d496c751246292ec22b36bb5761c2762_5da0b7f90908be408ac43eb80a.honestimnotevil.com
21	21	5da0b7f90908be408ac43eb80a.honestimnotevil.com
7	7	...406362b70ddc5843efe182166d02ecf895312d7.60a5291b4324545e080e62a0ea.honestimnotevil.com
7	7	60a5291b4324545e080e62a0ea.honestimnotevil.com
4	4	c3d37e9c6fc2384d2379ff9f16.honestimnotevil.com
4	4	...b552c8162238aed61cea42db89d05185f96cb2cc0.c3d37e9c6fc2384d2379ff9f16.honestimnotevil.com

Host name is Hex characters

Not usually a naming convention people use

Answers - Final

- ▷ Potential C2 over DNS
- ▷ Need to check source IP
 - Is it a client system?
 - Is it a DNS resolver?
 - True source must be identified
- ▷ Looks like dnscat2

Next set of labs!

- ▷ Let's move to the lab3 directory
- ▷ VM users will need to import the data
- ▷ After data import, select the "lab3" database and hunt the data
- ▷ Use the last set of labs as a guide

```
threat@ACH:~/labs/lab3$ cd ../lab2
threat@ACH:~/labs/lab2$ cd ../lab3
threat@ACH:~/labs/lab3$ rita import *.log lab3
```

Hints

- ▷ Repeat the process we've been using
- ▷ Where do you see high scores on the dashboard?
 - Investigate highest scores first
- ▷ Remember how we identified C2 beacons

Answers - Start with beacon web



The screenshot shows a network analysis tool interface with a dark background. At the top, it displays 'DST' and the IP address 'newb02.skypetm.com.tw'. Below this, there is a list of attributes and their corresponding values:

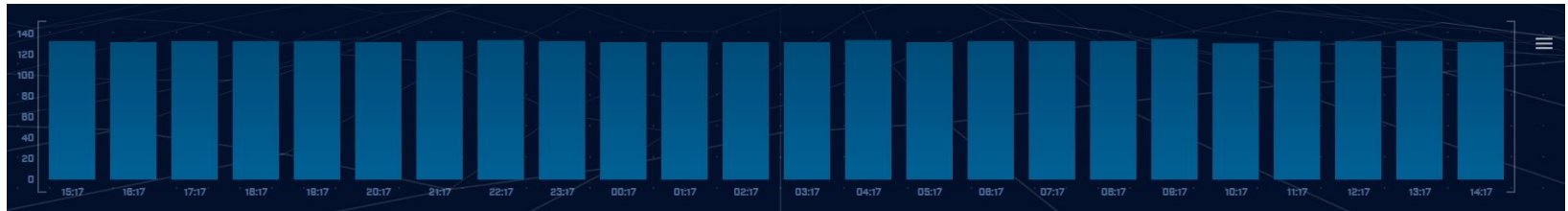
http servers	159.65.220.246
http ports used	80
http methods	GET
useragents	Microsoft Inter...
comm	80:tcp:http

That's not quite a Skype domain
Feel a bit scammy.

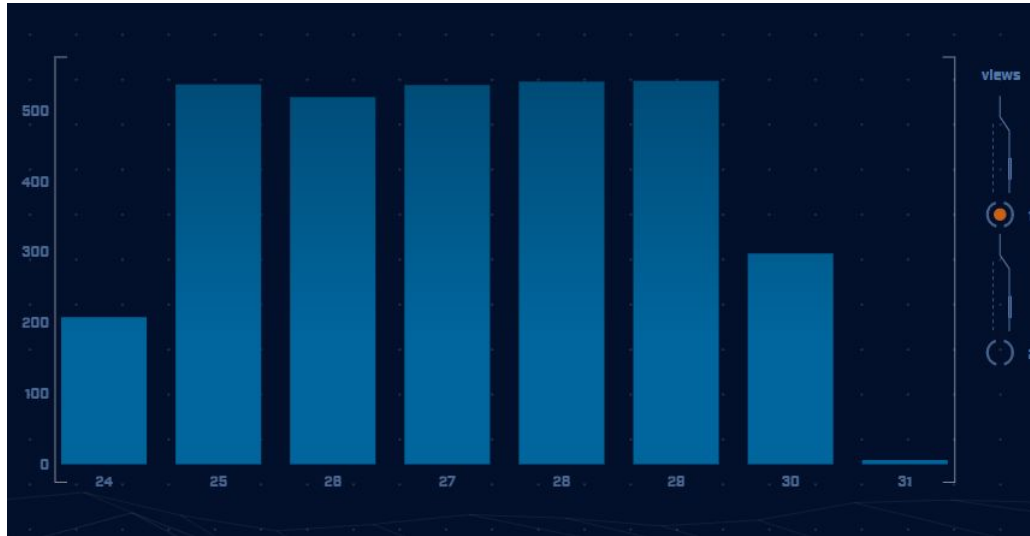
User agent is "Internet Explorer".
Not a valid user agent.

Answers - Skype like FQDN

Time histogram clearly shows a beacon



Answers - jitter



Connection dwell time is being jittered

The curve indicates Cobalt Strike

Answers - This is not good

newb02.skypetm.com.tw

6 / 88

Community Score

6 security vendors flagged this domain as malicious

newb02.skypetm.com.tw
skypetm.com.tw

bot networks, advanced malware command and control, media sharing, dga

DETECTION DETAILS RELATIONS COMMUNITY 1

[Join the VT Community](#) and enjoy additional community insights and crowdsourced detections.

Categories ⓘ

Forcepoint ThreatSeeker	bot networks, advanced malware command and control
Xcitiium Verdict Cloud	media sharing

Last DNS records ⓘ

Record type	TTL	Value
A	299	23.253.126.58
A	299	104.239.157.210
TXT	299	v=spf1 -all

Answers - Let's move on

- ▶ We clearly have an HTTP beacon
 - Histogram is flat
 - User agent looks bogus
 - FQDN looks bogus
- ▶ We have enough data to trigger an incident response on our system
- ▶ Let's check for anything else

Answers - MS Office traffic



A screenshot of a network tool interface showing TLS details for the domain self.events.data.microsoft.com. The interface has a dark background with white text. At the top, it says 'DST self.events.data.microsoft.com'. Below this, there is a list of TLS-related fields with their corresponding values. Each field has a small circular icon to its left.

DST self.events.data.microsoft.com	
tls servers	52.114.158.53, ...
tls ports used	443
subjects	CN=*.events.dat...
invalid certificate	no
comm	443:tcp:ssl

Can be safelisted if we use MS Office

Answers - OpenDNS



A screenshot of a network tool interface showing metadata for the IP address 208.67.220.220. The interface has a dark background with white text. At the top, it says 'DST 208.67.220.220'. Below this is a list of attributes with their corresponding values:

Attribute	Value
asn	36692
org	OPENDNS
range	208.67.216.0/21
country	United States
location	37.751N, -97.82...
queried fqdn	[no results]
historic fqdn	[no results]
comm	53:udp:dns

Two similar entries
DNS queries to OpenDNS

Do we use OpenDNS for DNS?
Have we purchased their security service?

If yes to the above, safelist.
If no to the above, investigate internal endpoint.

Answers - Long connections



The screenshot shows a table of network connections. The first entry is highlighted in a darker blue. The second entry is in a lighter blue. The table has columns for Source IP, Source Network Name, Destination IP, Destination Network Name, Port/Protocol/Service, State, Total Bytes, and Total Duration. There are also navigation icons at the bottom right of the table area.

Src	Src Network Name	Dst	Dst Network Name	Port:Protocol:Service	State	Total Bytes	Total Duration
192.168.99.54	Unknown Private	167.71.97.235	Public	9200:tcp:-	closed	21.85 MB	23:59:49
192.168.99.54	Unknown Private	52.177.165.30	Public	443:tcp:ssl, 443:tcp:-	closed	494.94 kB	19:49:02

These are the same entries we had in the first lab.

May not appear if you safelisted them.

If you want to keep practicing

- ▷ Check our malware of the day blog
- ▷ Skip to the bottom, download the 24 hour long pcap file
- ▷ Process the pcap with Zeek
 - `zeek -C -r <name of pcap> local`
- ▷ Import into AC-Hunter
- ▷ When done, check the blog for answers
 - Did you miss anything?

<https://www.activecountermeasures.com/?s=malware+of+the+day>

Interested in a demo?

- ▶ Enterprise version has a lot more features
- ▶ Type "demo" in Zoom chat (not Discord) to learn more
 - Or email questions@activecountermeasures.com
- ▶ Huge refresh coming out over the next few months!
 - Were you here for the sneak peek?

Closing thoughts

- ▷ Remember the process
 - Identify connection persistency
 - Identify business need if present
 - Investigate external IP
 - Investigate internal IP
- ▷ Disposition each IP
 - Pretty certain it's still pristine
 - Pretty certain it's compromised
- ▷ Don't cross the passive/active line

Classes I'm teaching

- ▷ Intro to Packet Decoding
 - IP headers from a security perspective
 - April 23rd - 26th
 - <https://www.antsyphontraining.com/live-courses-catalog/getting-started-in-packet-decoding-chris-brenton/>
- ▷ Advanced Threat Hunting
 - Next step up from this course, mostly C2 labs
 - May 21st - 24th, then Aug 13th - 16th
 - <https://www.antsyphontraining.com/advanced-network-threat-hunting-w-chris-brenton/>
- ▷ Security Compliance and Leadership
 - Getting funded, C level communications, team management
 - Aug 22nd & 23rd, to be announced on Antisyphon site
 - <https://www.antsyphontraining.com/live-courses-catalog/security-leadership-and-management-w-chris-brenton/>
- ▷ Next run of this class is...TBD

When will I get my cert?

Certs go out within 24 hours or retrieve on Gutenberg Certs
<https://myaccount.gutenbergcerts.com/dashboard>

The screenshot shows the Gutenberg Certs dashboard. At the top, there is a search bar and an 'Export' button. Below the search bar, there is a checkbox labeled 'Activate the feature to share this page via a link.' The main content area displays three certificates, each with a thumbnail image and a detailed description below it. The first certificate is from Black Hills Information Security, issued to Chris Brenton for 'How to Annoy Attackers so They Cry w/ John Strand | 1-Hour' on Jan 11, 2024. The second is from Active Countermeasures, issued to Chris Brenton for 'Level 1 - Cyber Threat Hunting Training' on Dec 04, 2023. The third is also from Active Countermeasures, issued to Faan Rossouw for 'Threat Hunting DLL-injected C2 Beacons using Memory Forensics | Faan Rossouw' on Sep 26, 2023. Each certificate card includes 'View' and 'Verify' buttons.

Gutenberg Certs | Credentials chris@activecountermeasures.com EN

My Credentials Export

Activate the feature to share this page via a link.

BLACK HILLS
Information Security
Certificate of Attendance
This is to certify that
Chris Brenton
Has attended
How to Annoy Attackers so They Cry w/ John Strand | 1-Hour
Issued: 11-Jan-2024
John Strand
Organiser: John Strand

How to Annoy Attackers so They Cry w/ John Strand | 1-Hour
Certificate of Attendance
Issue Date: 11-Jan-2024
By: BHIS & Antisyphon Training

[View](#) [Verify](#)

Active Countermeasures
Certificate of Attendance
This certificate is hereby presented to
Chris Brenton
Issued on: December 04, 2023
Level 1 - Cyber Threat Hunting Training
1-Hour
Chris Brenton | ACM

Level 1 - Cyber Threat Hunting Training
Certificate of Attendance
Issue Date: 04-Dec-2023
By: Active Countermeasures

[View](#) [Verify](#)

Active Countermeasures
Certificate of Attendance
This certificate is hereby presented to
Chris Brenton
Issued on: September 26, 2023
Threat Hunting DLL-injected C2 Beacons using Memory Forensics | Faan Rossouw
1-Hour
Chris Brenton | ACM

Threat Hunting DLL-injected C2 Beacons using Memory Forensics | Faan Rossouw
Certificate of Attendance
Issue Date: 26-Sep-2023
By: Active Countermeasures

[View](#) [Verify](#)

Thank you for attending!

- ▷ Thank you for sharing your valuable time with us today
- ▷ We hope the class has been helpful
- ▷ The team will monitor Discord for any last minute question