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# Malware Investigation

This report analyses 3 different malware types and plays a role in incident reporting. This report has been created using Sumologic for lab purposes. Previously parsed logs have been used to run the scripts. Considering a role of an SOC analyst, a report has been prepared for malwares – Silenttrinity, OrangeWorm and BackOff along with business implications.

## Malware 1: Silenttrinity

As an SOC analyst, to analyse this kind of malware, I would first filter out all HTTP requests to understand in detail. This would mean looking at their connection type, their status codes, the headers, file data and payloads. Additionally, I would look if there were an .xml file containing code to gather data or any kind of illegal characters that can be found in these details. The analysis tool also provided an HTTP analysis to filter by host, and I would check all requests for the suspicious host. We could also follow the HTTP stream to check the HTTP details in the PCAP file and then use a ladder diagram to understand the conversation that has been established. For this alert, I would set a criticality of **high** for the reason that if the malware convinces the person to click the phishing link, and gets access to the network, it could be undetected for a long period of time and serve as an APT slowly stealing all information from the servers. The dashboards that that can be useful to monitor this alert would be endpoint security dashboard to view endpoint activity incase a user clicks on a phishing link, and maybe a threat intelligence dashboard that can be used to get an idea about IOC's for this kind of threat.

For the business, a detection of multiple HTTP requests with a value for file data and payloads can mean exfiltration or infiltration of data. This could mean the business could be impacted with loss of data or loss of trust in customers. Short-term risks involve complete downtime to resolve the issue, or replacement of hardware systems. The long-term risks involve loss of business and loss of financial money if the hardware systems must be replaced completely. This could also raise multiple concerns amongst the users and employees in the long run.

To remediate this incident, first there should be a thorough forensic analysis done on the systems affected, and for any other things that have been noticed as malicious. After this, the systems affected can be replaced or restored, by removing the malware, and then improving security controls that exist currently. Apart from these steps, the incident response plan should be implemented and improvised further by thorough analysis of this malware and other similar versions of the malware, which use similar methods. Employees should be trained and made aware of the malware and how to look out for it and not fall prey to it.

## Malware 2: OrangeWorm

As an SOC analyst investigating the OrangeWorm alert, I would start by analysing the TCP results that have been generated by applying filters around tcp. The packets can be then investigated to check for a specific pattern in their communications that may be depictive of the Orangeworm. A pattern like tcp rst/ack packets sent from random port numbers to known port numbers could be one. Additionally, the payloads length could be viewed in this pattern that may be visible. Another thing that could be done would be to evaluate the DNS requests made, by using the dns filter and checking the resolved DNS names to identify random domain names or weird looking ones with extra characters within them. It should be one goal to identify the C2 server to understand the communications more detailed. For this alert, the criticality I would save would be **high** because it affects mainly health institutions which hold very important health information about patients, and even the fact that once it is in the network it spreads quickly onto other devices. One of the dashboards that can be very useful for this investigation can be a traffic analysis dashboard. The one which filters each request by protocol and methods used, along with payload information and traffic trends obtained from the packet capture.

The business implications for this could be very harsh on the whole organization. Since orangeworm aims at healthcare and high-level institutions, the short-term risks could be associates with identity theft, change and alteration of patient data, or stealing of login credentials. These risks extend onto the short-term risks and then will be higher in case as long-term risks which would be death of patients incase of alterations of data, huge financial losses, complete network reset resulting in operational downtime, as well as reputational damage.

For remediation, all the systems should be completed shut down and resetted with proper formatting to ensure the complete removal of the malware after complete analysis of the threat. All credentials for the organization should be changed ensuring a minimum character requirement. Outsourcing can be done to ensure that all systems are patched properly to their latest version, avoiding any open doors for them.

## Malware 3: Backoff

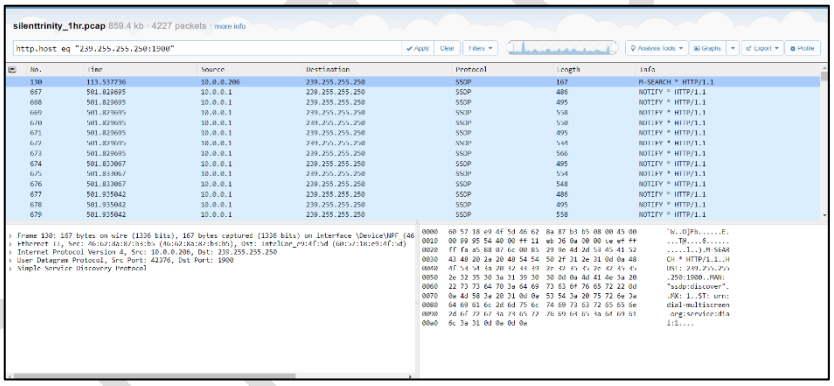
An an SOC analyst, the first thing to do would be to have a quick glimpse of the different kinds of packets and protocols being used in the PCAP and then analyze them according to the traits that the backoff malware followed. We can first filter out ARP requests, which can show us that the either the attacker is trying to gather information about active targets on the network or using lateral movement tactics to move through the network. Another thing to do is to filter out HTTP requests to view if there are any malicious user-agent strings or cache-control. The connection status would also tell us that the attacker is trying to "keep-alive" to avoid sending too many requests. Additionally, UDP packets can be filtered for specify LLMNR or MDNS requests which are used to resolve names further in case the DNS resolver can't do it. The criticality assigned to this even as per the Threat Analysis is **high**. The malware spreads easily onto other computers into a network and must be prevented from entering the network. The dashboards that can be useful to detect the backoff malware can be a DNS based dashboard to show the correctly resolved DNS and other related things. This would reduce the confusion with other requests that come into the tool.

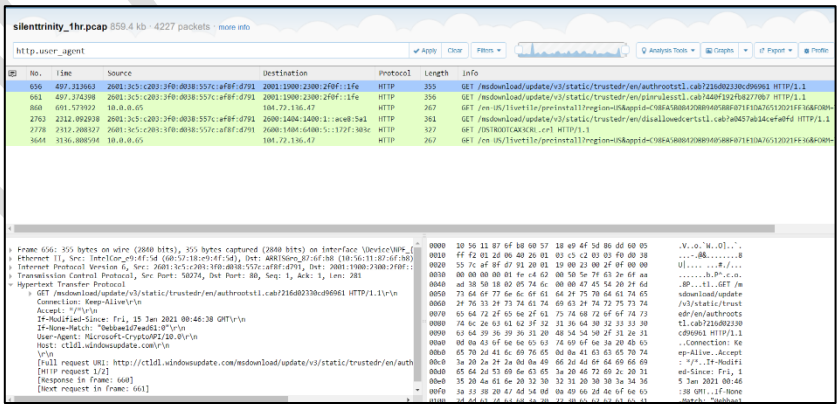
The short-term risks associated with the backoff malware can be a huge data breach which includes financial number or personal identification numbers or sensitive data like age, race, sex of people and then result in financial or customer confidential information. The long-term risk would be legal consequences of not implementing the correct required tools to avoid this and chances of the malware going undetected for long periods of time, thereby turning to almost an APT, coming with financial losses and increased security costs to the organization.

To remediate this, a honeypot can be set up, which completely allows an attacker to believe it is the correct website they have reached and then use it to learn about the techniques and amount of hackers trying to attack the system. Network segmentation can be implemented, and a DMZ can be used to separate communications as per the organizational structure. Backup and recovery servers should be set up and kept off any kind of internet communications except the time of backing up the important data.

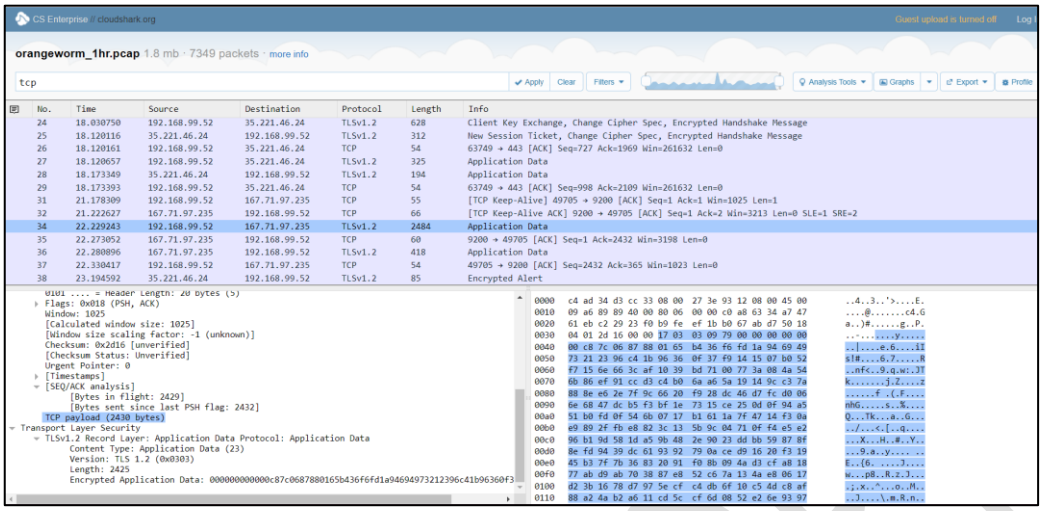
# Appendix

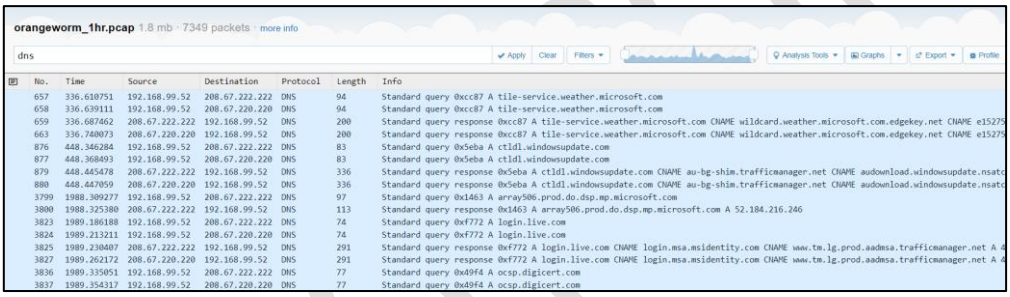
## Malware 1: Silenttrinity

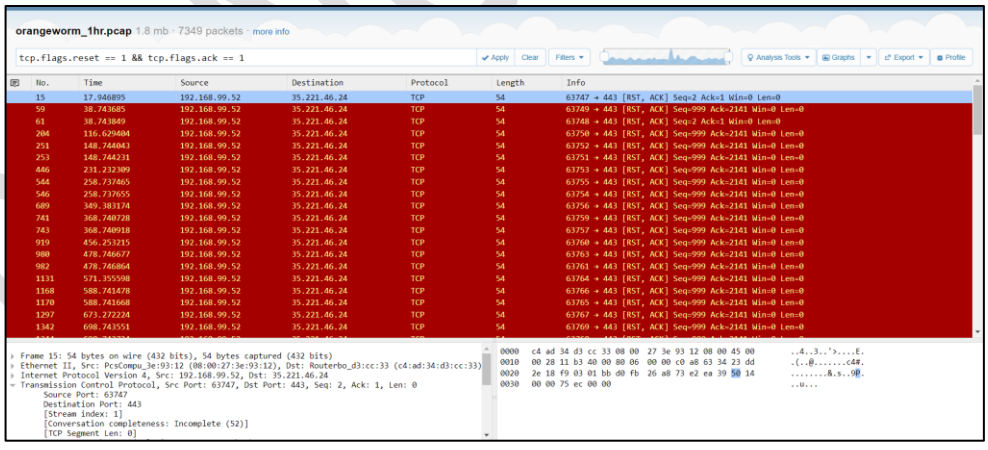



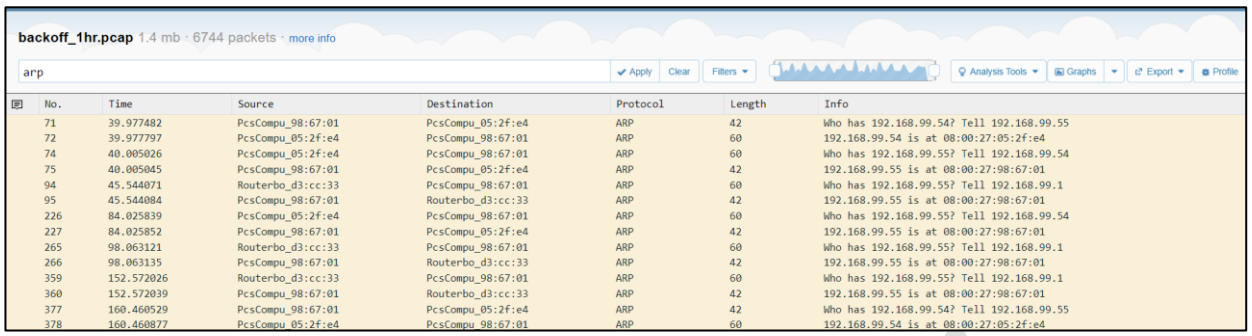
**Malware: OrangeWorm**



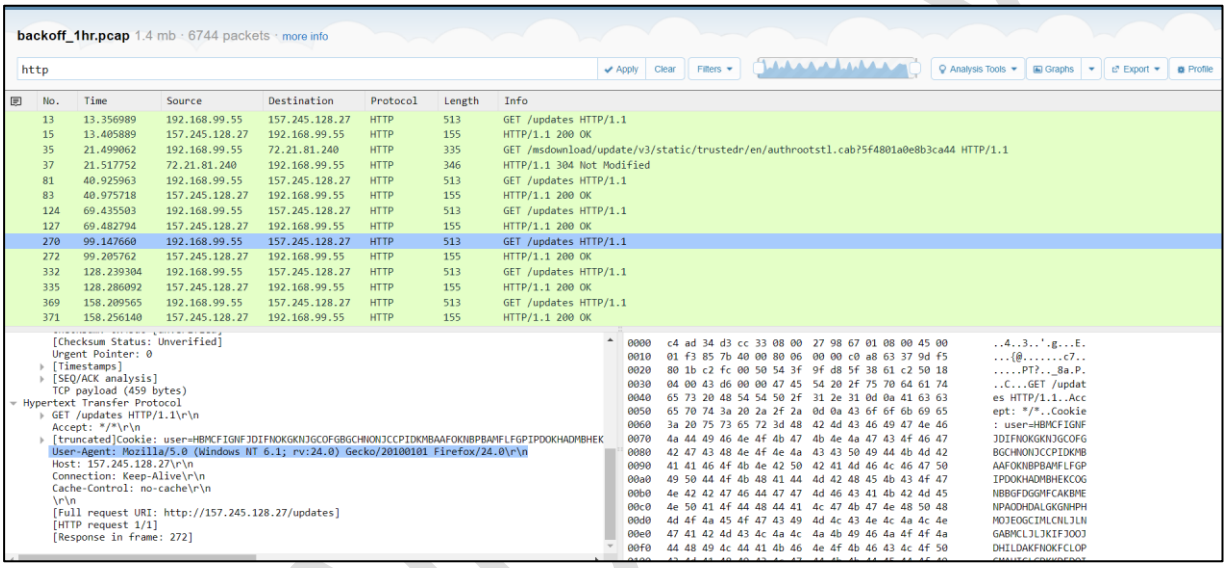
**Malware: Backoff**



backoff_1hr.pcap 1.4 mb · 6744 packets · more info

arp

| No. | Time | Source | Destination | Protocol | Length | Info |
|---|---|---|---|---|---|---|
| 71 | 39.977482 | PcsCompu_98:67:01 | PcsCompu_05:2f:e4 | ARP | 42 | Who has 192.168.99.54? Tell 192.168.99.55 |
| 72 | 39.977797 | PcsCompu_05:2f:e4 | PcsCompu_98:67:01 | ARP | 60 | 192.168.99.54 is at 08:00:27:05:2f:e4 |
| 74 | 40.005026 | PcsCompu_05:2f:e4 | PcsCompu_98:67:01 | ARP | 60 | Who has 192.168.99.55? Tell 192.168.99.54 |
| 75 | 40.005045 | PcsCompu_98:67:01 | PcsCompu_05:2f:e4 | ARP | 42 | 192.168.99.55 is at 08:00:27:98:67:01 |
| 94 | 45.544071 | Routerbo_d3:cc:33 | PcsCompu_98:67:01 | ARP | 60 | Who has 192.168.99.55? Tell 192.168.99.1 |
| 95 | 45.544084 | PcsCompu_98:67:01 | Routerbo_d3:cc:33 | ARP | 42 | 192.168.99.55 is at 08:00:27:98:67:01 |
| 226 | 84.025839 | PcsCompu_05:2f:e4 | PcsCompu_98:67:01 | ARP | 60 | Who has 192.168.99.55? Tell 192.168.99.54 |
| 227 | 84.025852 | PcsCompu_98:67:01 | PcsCompu_05:2f:e4 | ARP | 42 | 192.168.99.55 is at 08:00:27:98:67:01 |
| 265 | 98.063121 | Routerbo_d3:cc:33 | PcsCompu_98:67:01 | ARP | 60 | Who has 192.168.99.55? Tell 192.168.99.1 |
| 266 | 98.063135 | PcsCompu_98:67:01 | Routerbo_d3:cc:33 | ARP | 42 | 192.168.99.55 is at 08:00:27:98:67:01 |
| 359 | 152.572026 | Routerbo_d3:cc:33 | PcsCompu_98:67:01 | ARP | 60 | Who has 192.168.99.55? Tell 192.168.99.1 |
| 360 | 152.572039 | PcsCompu_98:67:01 | Routerbo_d3:cc:33 | ARP | 42 | 192.168.99.55 is at 08:00:27:98:67:01 |
| 377 | 160.460529 | PcsCompu_98:67:01 | PcsCompu_05:2f:e4 | ARP | 42 | Who has 192.168.99.54? Tell 192.168.99.55 |
| 378 | 160.460877 | PcsCompu_05:2f:e4 | PcsCompu_98:67:01 | ARP | 60 | 192.168.99.54 is at 08:00:27:05:2f:e4 |



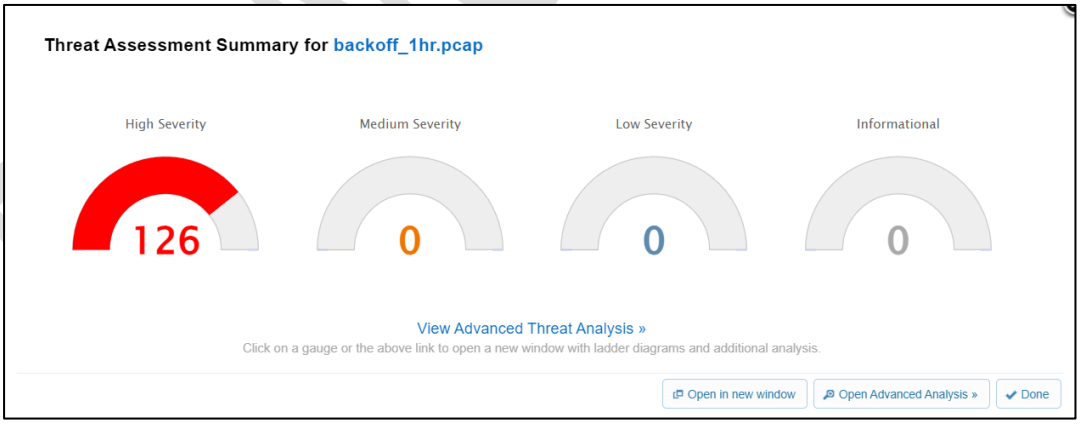
backoff_1hr.pcap 1.4 mb · 6744 packets · more info

http

| No. | Time | Source | Destination | Protocol | Length | Info |
|---|---|---|---|---|---|---|
| 13 | 13.356989 | 192.168.99.55 | 157.245.128.27 | HTTP | 513 | GET /updates HTTP/1.1 |
| 15 | 13.405889 | 157.245.128.27 | 192.168.99.55 | HTTP | 155 | HTTP/1.1 200 OK |
| 35 | 21.499062 | 192.168.99.55 | 72.21.81.240 | HTTP | 335 | GET /msdownload/update/v3/static/trustedr/en/authrootstl.cab?5f4801a0e8b3ca44 HTTP/1.1 |
| 37 | 21.517752 | 72.21.81.240 | 192.168.99.55 | HTTP | 346 | HTTP/1.1 304 Not Modified |
| 81 | 40.925963 | 192.168.99.55 | 157.245.128.27 | HTTP | 513 | GET /updates HTTP/1.1 |
| 83 | 40.975718 | 157.245.128.27 | 192.168.99.55 | HTTP | 155 | HTTP/1.1 200 OK |
| 124 | 69.435503 | 192.168.99.55 | 157.245.128.27 | HTTP | 513 | GET /updates HTTP/1.1 |
| 127 | 69.482794 | 157.245.128.27 | 192.168.99.55 | HTTP | 155 | HTTP/1.1 200 OK |
| 270 | 99.147660 | 192.168.99.55 | 157.245.128.27 | HTTP | 513 | GET /updates HTTP/1.1 |
| 272 | 99.205762 | 157.245.128.27 | 192.168.99.55 | HTTP | 155 | HTTP/1.1 200 OK |
| 332 | 128.239304 | 192.168.99.55 | 157.245.128.27 | HTTP | 513 | GET /updates HTTP/1.1 |
| 335 | 128.286092 | 157.245.128.27 | 192.168.99.55 | HTTP | 155 | HTTP/1.1 200 OK |
| 369 | 158.209565 | 192.168.99.55 | 157.245.128.27 | HTTP | 513 | GET /updates HTTP/1.1 |
| 371 | 158.256140 | 157.245.128.27 | 192.168.99.55 | HTTP | 155 | HTTP/1.1 200 OK |

```
    [Checksum Status: Unverified]
    Urgent Pointer: 0
  ▸ [Timestamps]
  ▸ [SEQ/ACK analysis]
    TCP payload (459 bytes)
▾ Hypertext Transfer Protocol
  ▸ GET /updates HTTP/1.1\r\n
    Accept: */*\r\n
  ▸ [truncated]Cookie: user=HBMCFIGNFJDIFNOKGKNJGCOFGBGCHWONJCCPIDKMBAAFOKNBPBAMFLFGPIPDOKHADMBHEK
    User-Agent: Mozilla/5.0 (Windows NT 6.1; rv:24.0) Gecko/20100101 Firefox/24.0\r\n
    Host: 157.245.128.27\r\n
    Connection: Keep-Alive\r\n
    Cache-Control: no-cache\r\n
    \r\n
    [Full request URI: http://157.245.128.27/updates]
    [HTTP request 1/1]
    [Response in frame: 272]
```

```
0000  c4 ad 34 d3 cc 33 08 00  27 98 67 01 08 00 45 00   ..4..3..'.g...E.
0010  01 f3 85 7b 40 00 80 06  00 00 c0 a8 63 37 9d f5   ...{@.......c7..
0020  80 1b c2 fc 00 50 54 3f  9f d8 5f 38 61 c2 50 18   .....PT?.._8a.P.
0030  04 00 43 d6 00 00 47 45  54 20 2f 75 70 64 61 74   ..C...GET /updat
0040  65 73 20 48 54 54 50 2f  31 2e 31 0d 0a 41 63 63   es HTTP/1.1..Acc
0050  65 70 74 3a 20 2a 2f 2a  0d 0a 43 6f 6f 6b 69 65   ept: */*..Cookie
0060  3a 20 75 73 65 72 3d 48  42 4d 43 46 49 47 4e 46   : user=HBMCFIGNF
0070  4a 44 49 46 4e 4f 4b 47  4b 4e 4a 47 43 4f 46 47   JDIFNOKGKNJGCOFG
0080  42 47 43 48 4e 4f 4e 4a  43 43 50 49 44 4b 4d 42   BGCHWONJCCPIDKMB
0090  41 41 46 4f 4b 4e 42 50  42 41 4d 46 4c 46 47 50   AAFOKNBPBAMFLFGP
00a0  49 50 44 4f 4b 48 41 44  4d 42 48 45 4b 43 4f 47   IPDOKHADMBHEKCOG
00b0  4e 42 42 47 46 44 47 47  4d 46 43 41 4b 42 4d 45   NBBGFDGGMFCAKBME
00c0  4e 50 41 4f 44 48 44 41  4c 47 4b 47 4e 48 50 48   NPAODHDALGKGNHPH
00d0  4d 4f 4a 45 4f 47 43 49  4d 4c 43 4e 4c 4a 4c 4e   MOJEOGCIMLCNLJLN
00e0  47 41 42 4d 43 4c 4a 4c  4a 4b 49 46 4a 4f 4f 4a   GABMCLJLJKIFJOOJ
00f0  44 48 49 4c 44 41 4b 46  4e 4f 4b 46 43 4c 4f 50   DHILDAKFNOKFCLOP
```



**Threat Assessment Summary for backoff_1hr.pcap**

| High Severity | Medium Severity | Low Severity | Informational |
|---|---|---|---|
| 126 | 0 | 0 | 0 |

View Advanced Threat Analysis »

Click on a gauge or the above link to open a new window with ladder diagrams and additional analysis.

Open in new window | Open Advanced Analysis » | Done

**References**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2. https://blog.f-secure.com/hunting-for-silenttrinity/
3. https://symantec-enterprise-blogs.security.com/blogs/threat-intelligence/orangeworm-targets-healthcare-us-europe-asia
4. https://symantec-enterprise-blogs.security.com/sites/default/files/2018-04/Orangeworm%20IOCs.pdf
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