Full Packet Capture for the Masses

CoRIIN 2018 - Xavier Mertens

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<![CDATA[
www.truesec.be
blog.rootshell.be
isc.sans.edu
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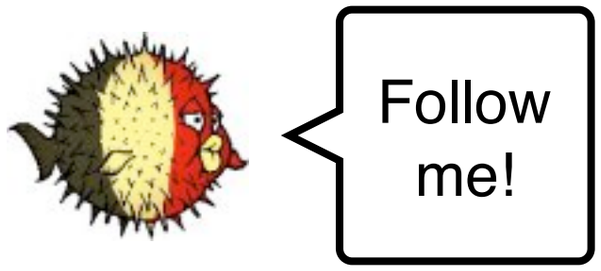
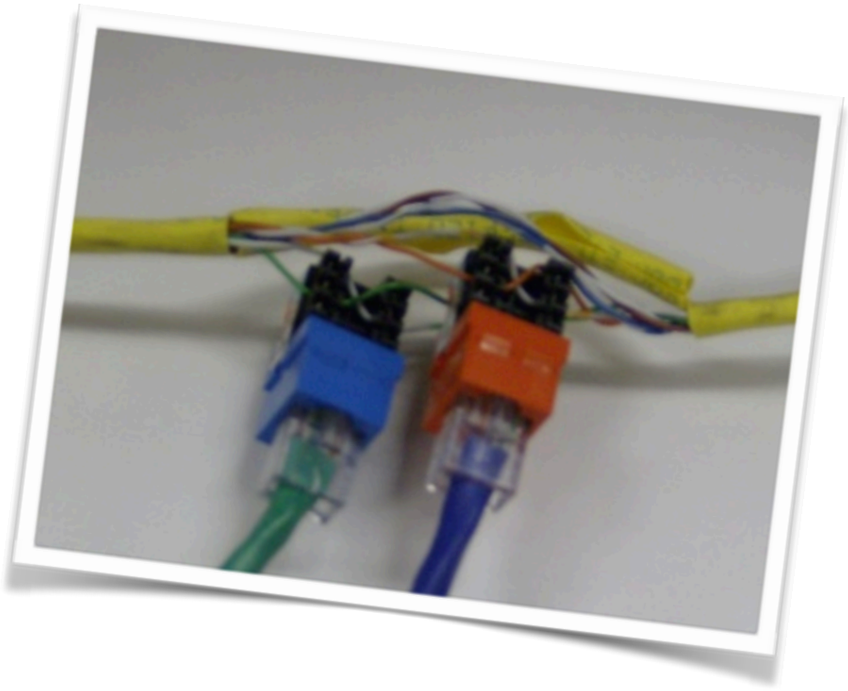


#BalanceTonPCAP

The Issue…

"Who's talking?"

Knowing who's talking on your network
is a key requirement when you have to investigate a security incident



L3 or L7?

Layer 3	timestamp:src_ip:src_port:dst_ip:dst_port	Firewall Logs, Netflow, Basic Packet Capture
Layer 7	timestamp:src_ip:src_port:dst_ip:dst_port + headers, payloads	“NG” Firewall Logs, Full Packet Capture

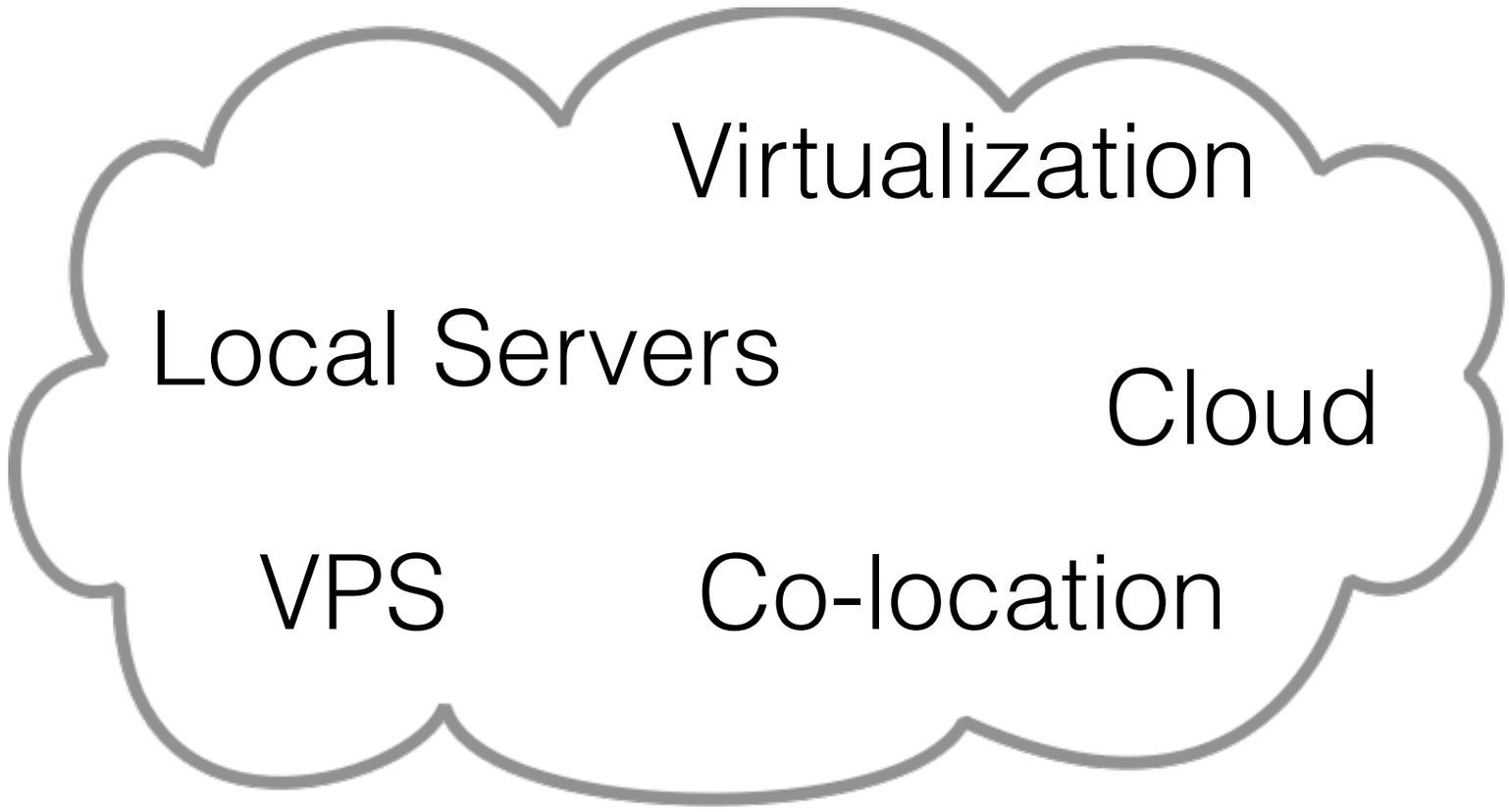
L3 or L7?

	Pro	Con
Flows	Easy setup Limited storage	Lack of visibility
FPC	“Full view” Extract artefacts Replay Evidences	Retention (storage) Privacy Performance Sensors required

Full Packet Capture

```
/usr/sbin/tcpdump \
    -n -Z nobody \
    -i eth0 \
    -s 0 \
    -G 50 -W 100 \
    -w /data/dump-%Y%m%d%H%M.pcap \
    not port 22 and not port 1194
```

Modern Infrastructure



Solution

Collect data from multiple locations and centralise all data for better retention

Requirements

Must be ~~free~~ open
Easy to deploy on different OS
Can be deployed on device not directly connected to the central repository (easy data transfer)

Moloch

Moloch is (IMHO) the best complete FPC framework.
Developed by Andy Wick & Eoin Miller (AOL CERT).
Powerful, Scalable.

Moloch

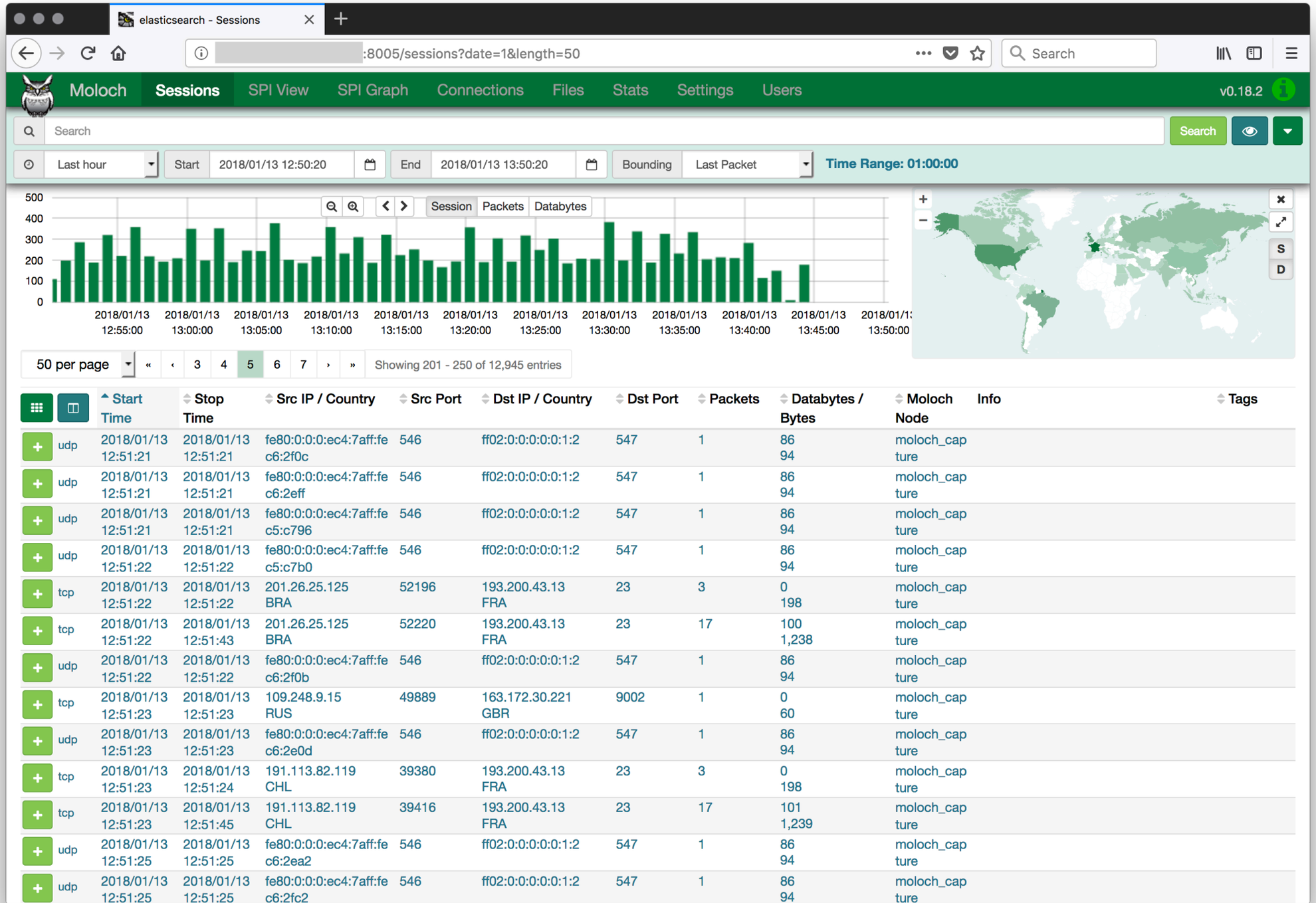
Components:

- Capturer (online / offline)
- DB (ElasticSearch)
- Viewer (Web GUI)

Multiple architecture available (*)

(*) https://github.com/aol/moloch/wiki/Architecture)

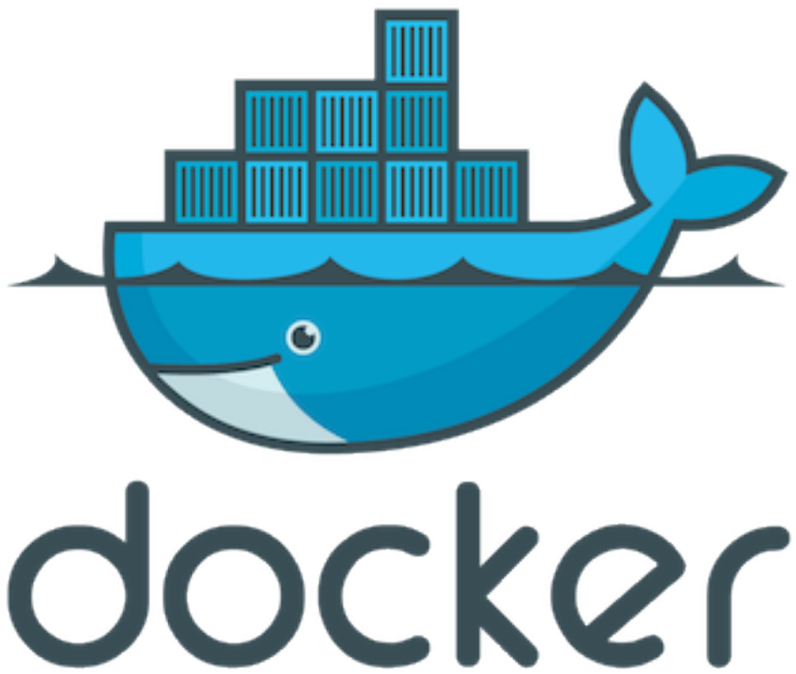
Moloch



Start Time	Stop Time	Src IP / Country	Src Port	Dst IP / Country	Dst Port	Packets	Databytes / Bytes	Moloch Node	Info	Tags
udp	2018/01/13 12:51:21	2018/01/13 12:51:21	fe80:0:0:0:ec4:7aff:fec6:2f0c	546	ff02:0:0:0:0:0:1:2	547	1	86 94	moloch_capture	
udp	2018/01/13 12:51:21	2018/01/13 12:51:21	fe80:0:0:0:ec4:7aff:fec6:2eff	546	ff02:0:0:0:0:0:1:2	547	1	86 94	moloch_capture	
udp	2018/01/13 12:51:21	2018/01/13 12:51:21	fe80:0:0:0:ec4:7aff:fec5:c796	546	ff02:0:0:0:0:0:1:2	547	1	86 94	moloch_capture	
udp	2018/01/13 12:51:22	2018/01/13 12:51:22	fe80:0:0:0:ec4:7aff:fec5:c7b0	546	ff02:0:0:0:0:0:1:2	547	1	86 94	moloch_capture	
tcp	2018/01/13 12:51:22	2018/01/13 12:51:22	201.26.25.125 BRA	52196	193.200.43.13 FRA	23	3	0 198	moloch_capture	
tcp	2018/01/13 12:51:22	2018/01/13 12:51:43	201.26.25.125 BRA	52220	193.200.43.13 FRA	23	17	100 1,238	moloch_capture	
udp	2018/01/13 12:51:22	2018/01/13 12:51:22	fe80:0:0:0:ec4:7aff:fec6:2f0b	546	ff02:0:0:0:0:0:1:2	547	1	86 94	moloch_capture	
tcp	2018/01/13 12:51:23	2018/01/13 12:51:23	109.248.9.15 RUS	49889	163.172.30.221 GBR	9002	1	0 60	moloch_capture	
udp	2018/01/13 12:51:23	2018/01/13 12:51:23	fe80:0:0:0:ec4:7aff:fec6:2e0d	546	ff02:0:0:0:0:0:1:2	547	1	86 94	moloch_capture	
tcp	2018/01/13 12:51:23	2018/01/13 12:51:24	191.113.82.119 CHL	39380	193.200.43.13 FRA	23	3	0 198	moloch_capture	
tcp	2018/01/13 12:51:23	2018/01/13 12:51:45	191.113.82.119 CHL	39416	193.200.43.13 FRA	23	17	101 1,239	moloch_capture	
udp	2018/01/13 12:51:25	2018/01/13 12:51:25	fe80:0:0:0:ec4:7aff:fec6:2ea2	546	ff02:0:0:0:0:0:1:2	547	1	86 94	moloch_capture	
udp	2018/01/13 12:51:25	2018/01/13 12:51:25	fe80:0:0:0:ec4:7aff:fec6:2fc2	546	ff02:0:0:0:0:0:1:2	547	1	86 94	moloch_capture	

Docker

Easy way to deploy software across multiple platforms



1st Approach

GIAC Gold Paper by Mauricio Espinosa Gomez

https://www.sans.org/reading-room/whitepapers/cloud/full-packet-capture-infrastructure-based-docker-containers-36977

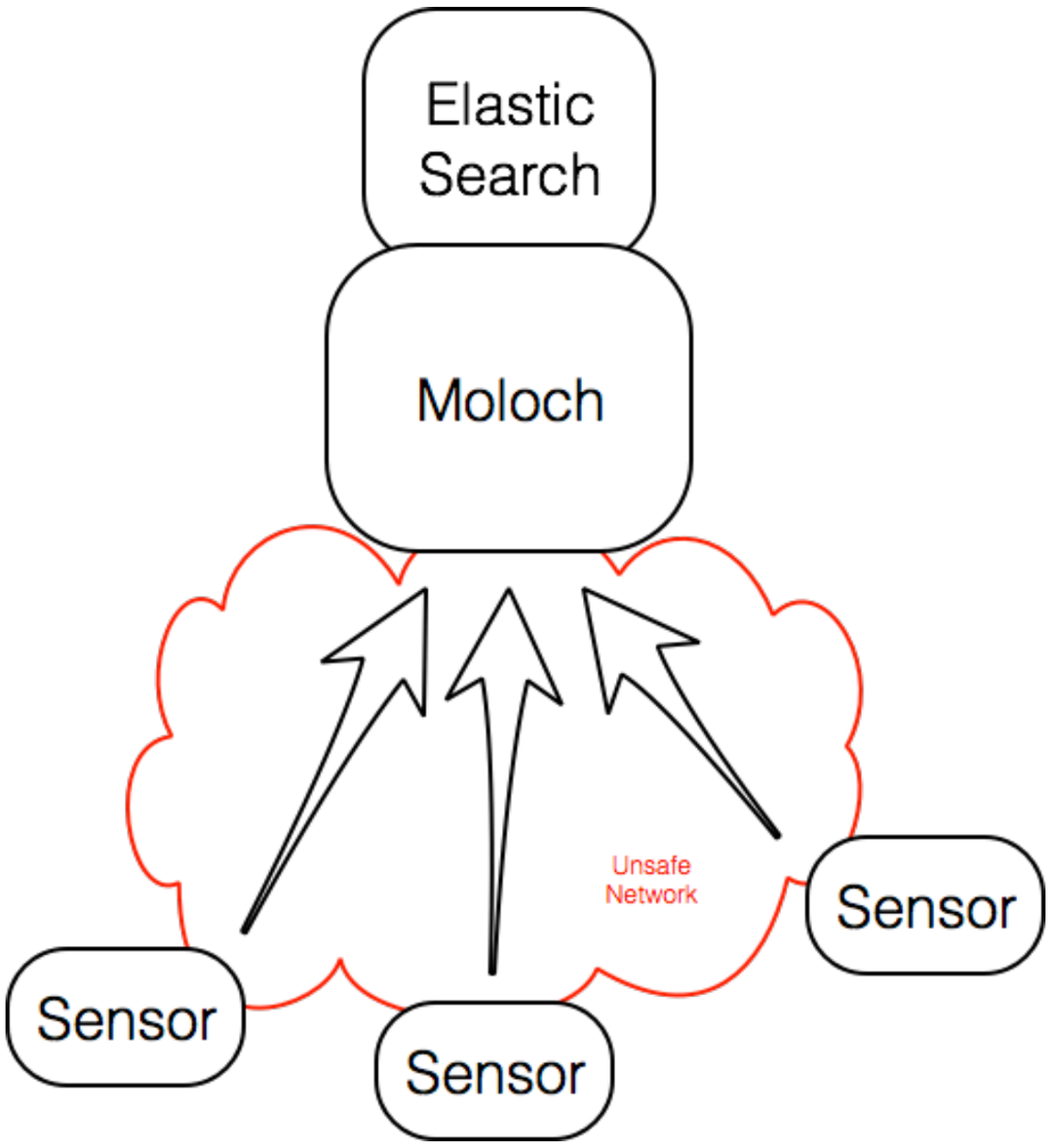
1st Approach

Pro	Con
Full automated deployment via Puppet Multiple nodes in Moloch Real-time indexing Good for internal networks	Multiple Moloch instances deployed ElasticSearch must be reachable from sensors

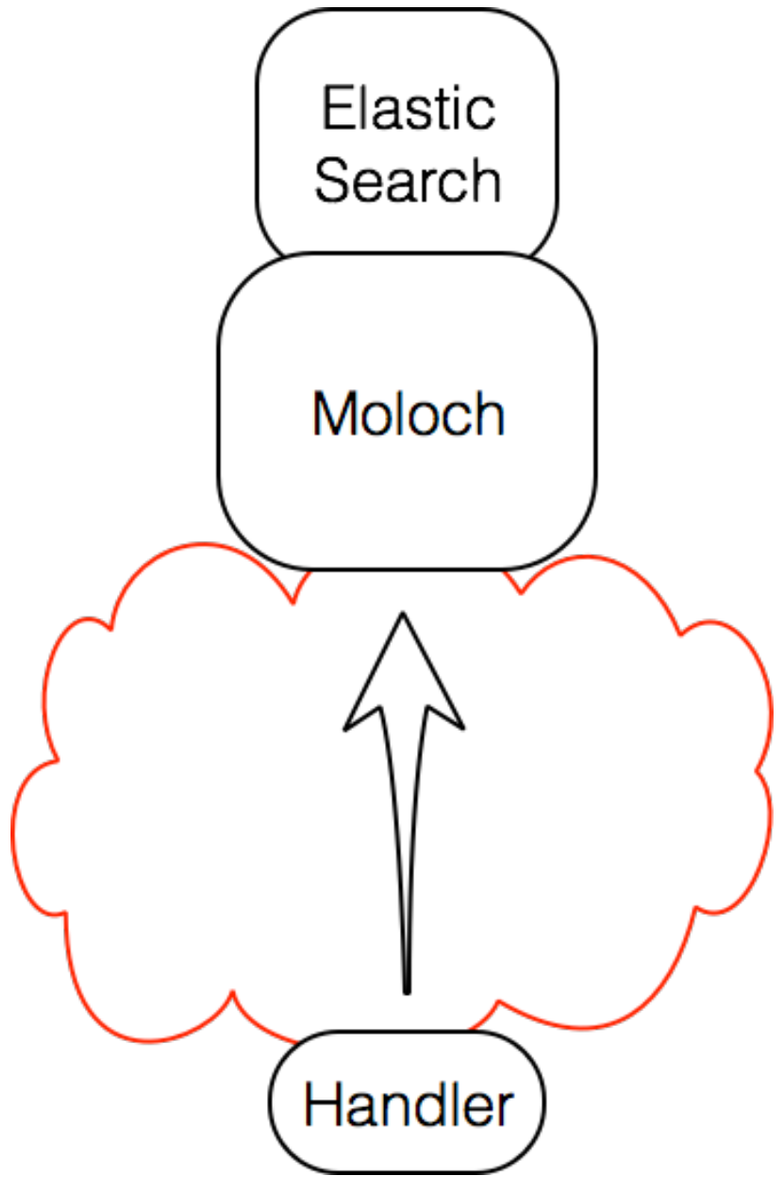
My Approach

Deploy a very small Docker container as sensor
(only based on tcpdump & scp)
PCAP files are synchronised with Moloch at regular intervals

My Approach


Elastic
Search
Moloch
Unsafe
Network
Sensor
Sensor
Sensor

My Approach



Moloch Server

There exist good Docker containers but without good data persistence support!

Forked one(*) and added some stuff:

- persistence: config & raw data
- automatic indexing of PCAP files (no live mode)

(*) https://hub.docker.com/r/danielguerra/docker-moloch/

Moloch Server

```
/data/moloch/bin/moloch-capture \
    -m \
    -R /data/pcap \
    --copy \
    --delete \
    --flush
```

Moloch Server

```
version: "2"

services:
  moloch_elasticsearch:
    image: elasticsearch:5.2.2-alpine
    restart: always
    hostname: moloch_elasticsearch
    container_name: moloch_elasticsearch
    volumes:
      - /etc/localtime:/etc/localtime:ro
      - /data/moloch/elasticsearch:/usr/
share/elasticsearch/data
    network_mode: bridge
```

```
moloch_capture:
    build: ./docker-moloch
    image: danielguerra/docker-moloch
    restart: always
    hostname: moloch_capture
    container_name: moloch_capture
    depends_on:
      - moloch_elasticsearch
    links:
      - moloch_elasticsearch:elasticsearch
    volumes:
      - /etc/localtime:/etc/localtime:ro
      - /data/moloch/core/etc:/data/moloch/etc:rw
      - /data/moloch/core/raw:/data/moloch/raw:rw
      - /data/tcpdump:/data/pcap:rw
    ports:
      - ‘8005:8005'
    network_mode: bridge
```

Moloch Server

docker-compose up

https://moloch:8005

Sensor

Run a tcpdump to dump packets to files

Scp files to moloch

Sensor Deployment

```
# git clone \
  https://github.com/xme/moloch/sensor.git
# cd sensor
# docker build -t sensor .
```

Sensor Deployment

```
PCAP_INTERFACE=eth0
PCAP_CAPTURE_SIZE=0
PCAP_FILE_SIZE=50
PCAP_FILE_ROTATE=100
PCAP_BPF_FILTER=not port 22 and not port 1194
PCAP_SENSOR_NAME=boogey
SCP_TARGET=xavier@moloch:/data/tcpdump
SCP_ARGUMENTS=-P 65522 -o
StrictHostKeyChecking=no
```

Sensor Kick Off

```
# docker run -d --rm --env-file=env.txt --net=host --name sensor sensor1
Please use this key to allow PCAP files transfert via scp:
--- Cut Here ---
ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAACAQDdBKW+43IJ5 … MUKOKMyQ== root@sensor1
--- Cut Here ---
2018-01-12 09:55:10,026 CRIT Supervisor running as root (no user in config file)
2018-01-12 09:55:10,034 INFO supervisord started with pid 14
2018-01-12 09:55:11,037 INFO spawned: 'pcap_cron' with pid 17
2018-01-12 09:55:11,039 INFO spawned: 'pcap_tcpdump' with pid 18
2018-01-12 09:55:12,111 INFO success: pcap_cron entered RUNNING state, process has
stayed up for > than 1 seconds (startsecs)
2018-01-12 09:55:12,112 INFO success: pcap_tcpdump entered RUNNING state, process
has stayed up for > than 1 seconds (startsecs)
```

--net=host

⚠️WARNING⚠️

To allow the container access to the interfaces, docker network isolation is disabled

Tips

Use BPF filters to reduce the noise!

Moloch has an interesting feature:

```
dontSaveBPFs=port 22:10;port 65522:10;port 65523:10;port 1194:10
```

Tips

Do NOT use ‘any’ interface in the tcpdump config!

```
$ file *.pcap
cooked_sample.pcap: tcpdump capture file (little-endian) - version 2.4 (Linux "cooked", capture length 262144)
sample.pcap:        tcpdump capture file (little-endian) - version 2.4 (Ethernet, capture length 262144)
```

So?

Pro	Con
No footprint on the sensor Runs on any system SSH transfer is safe Easy to tune / adapt to your $ENV	Not realtime processing Small risk of broken flows Cannot search packets based on the node

Wanna Test?

https://github.com/xme/fpc/

```
10:55:17.578190 00:00:00:00:00:00 > 00:00:00:00:00:00, ethertype IPv4 (0x0800), \
   length 77: 127.0.0.1.38048 > 127.0.0.1.7777: Flags [P.], seq 1:12, ack 1, \
   win 342, options [nop,nop,TS val 1437796971 ecr 1437795587], length 11
        0x0000:  4500 003f 189c 4000 4006 241b 7f00 0001  E..?..@.@.$.....
        0x0010:  7f00 0001 94a0 1e61 97cd 1d9a b8d8 37b8  .......a......7.
        0x0020:  8018 0156 fe33 0000 0101 080a 55b3 0a6b  ...V.3......U..k
        0x0030:  55b3 0503 5468 616e 6b20 596f 7521 0a    U...Thank.You!.
```

@xme | xavier@rootshell.be