ntopng: Traffic Analysis and Flow Collection

News and Updates

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Agenda

- ntopng: What's changed
  - Anomalies & Behavior Analysis
  - Score indicator
  - Alerts Development, Find the problem
  - Checks Extended, Road to Cybersecurity
  - Endpoints
  - ...
- ntopng: Towards Dynamic UX

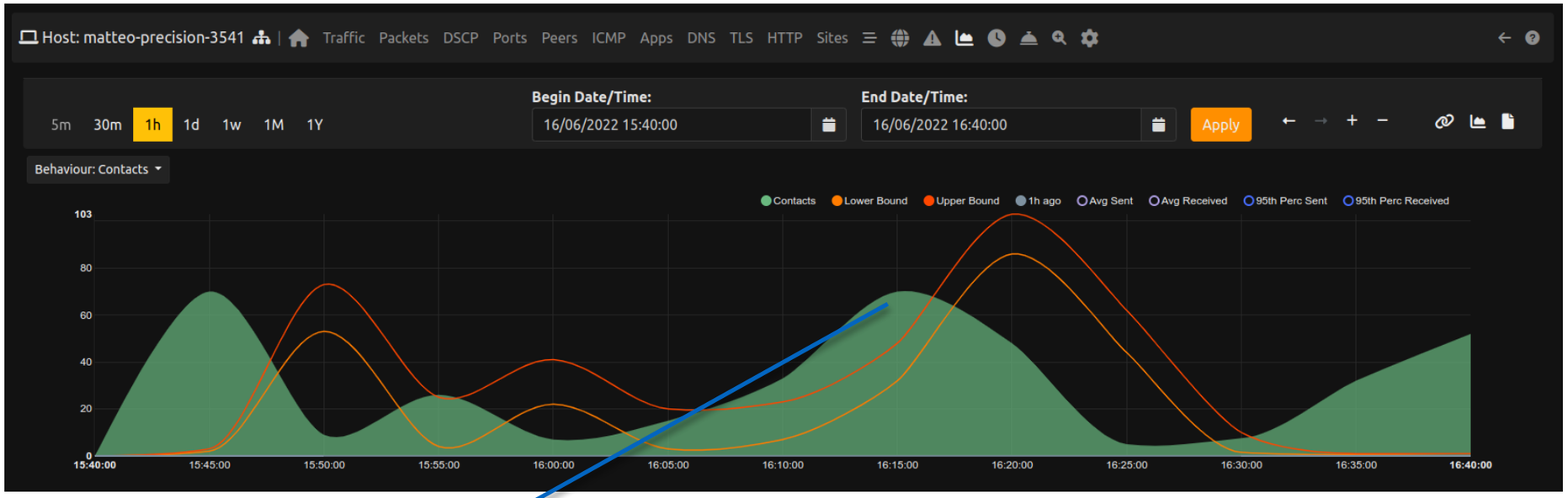
Anomalies & Behavior Analysis

Anomalies & Behavior Analysis [1/6]

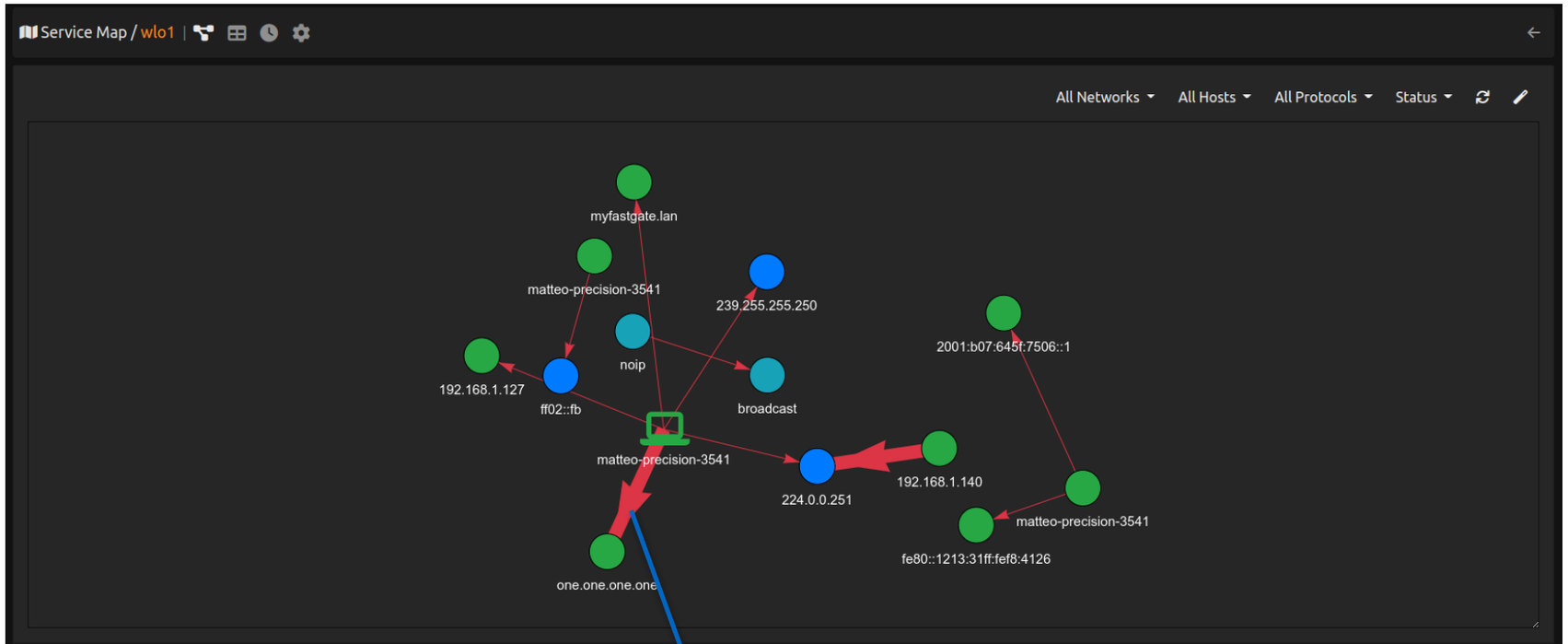
- Analyze the current behavior of Hosts and try to find anomalies in it's future behavior -> Prevention

- Analyze the current behavior of Hosts and understand if unwanted (malicious) traffic is seen on an interface

Anomalies & Behavior Analysis [2/6]



Anomaly!



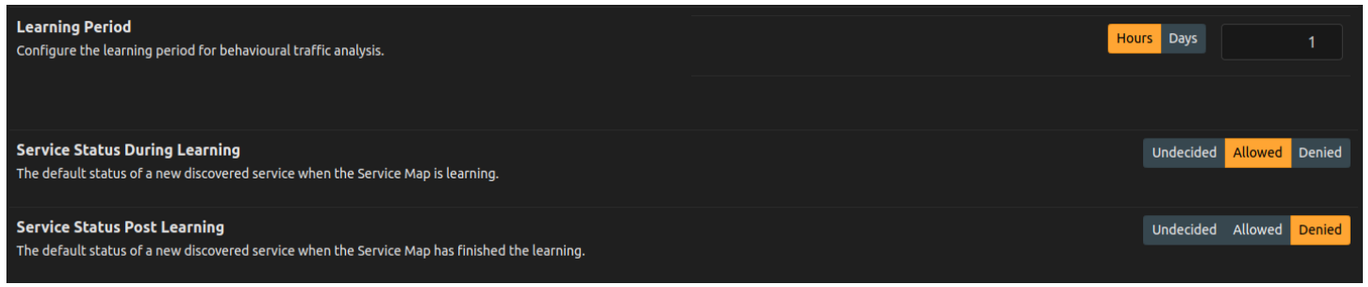
Unexpected Behavior!

Anomalies & Behavior Analysis [3/6]

- Two new ways to analyze unwanted traffic:
    - Service Map: analyze local traffic to find unwanted local services (Lateral Movements)
    - Periodicity Map: analyze traffic to find unwanted periodic flows (e.g. BotNet)

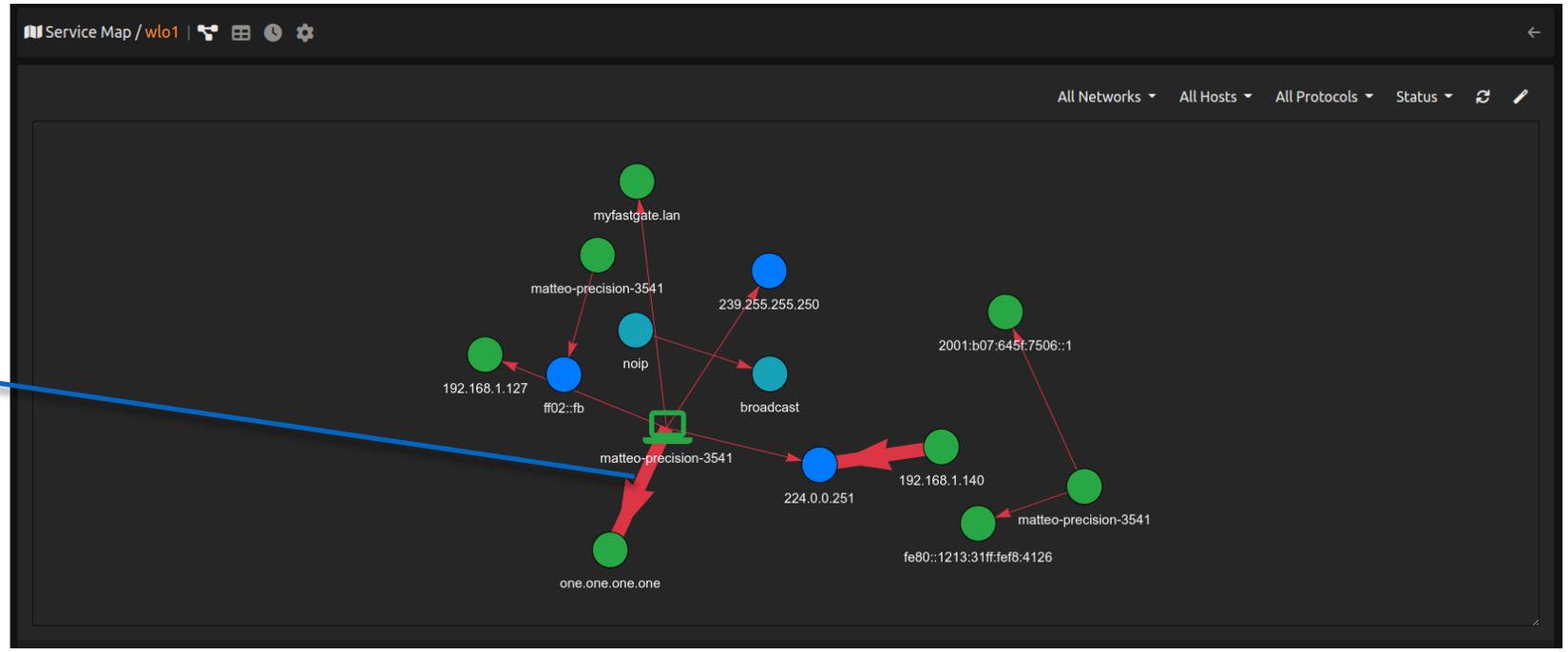
Anomalies & Behavior Analysis - Service Map [4/6]

- Learning Period in order to decide which local services are right and which not



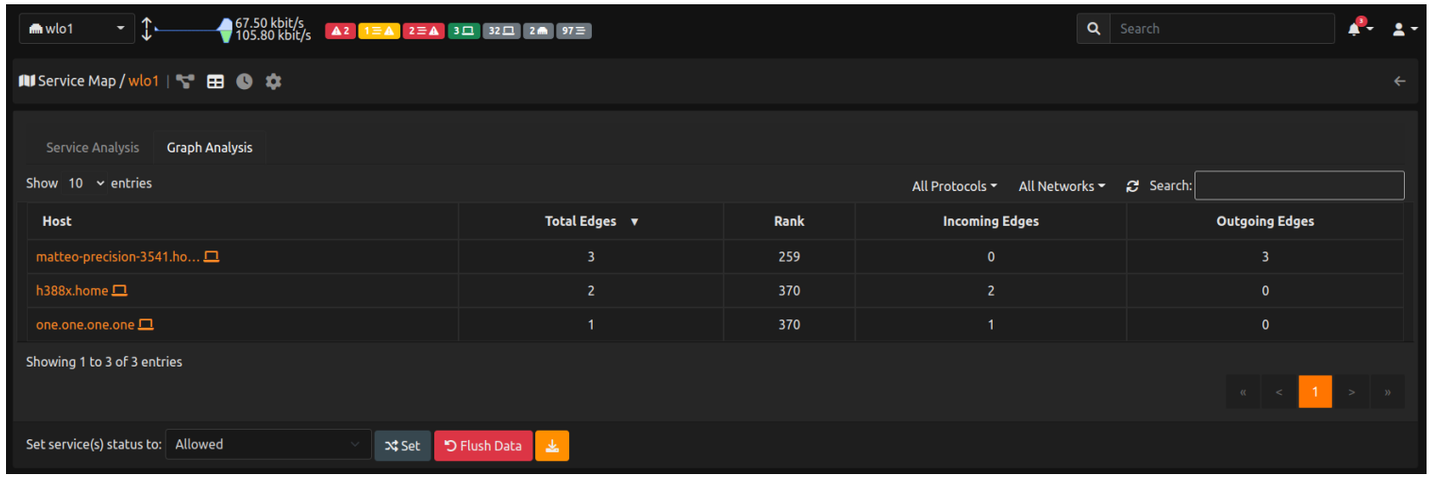
- Trigger an alert if non-right services are seen from ntopng

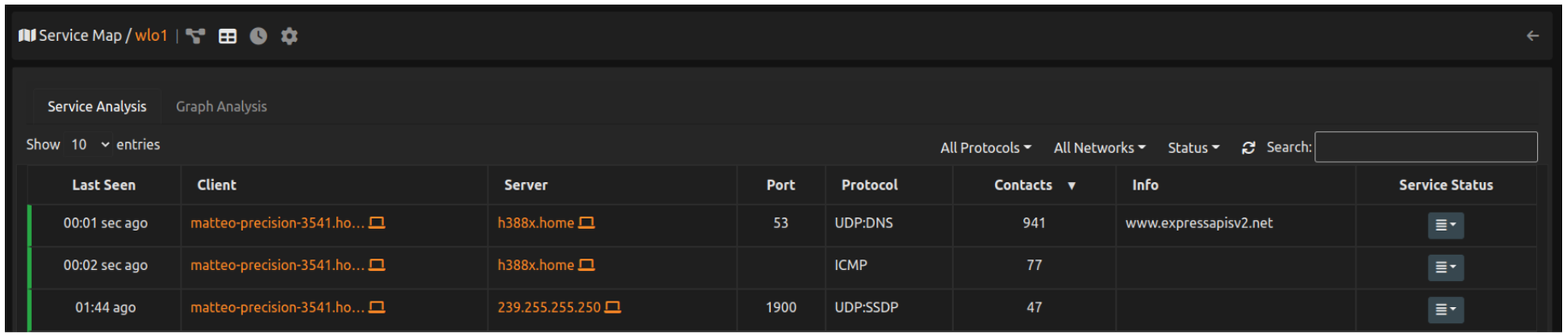
Unwanted Traffic!



Anomalies & Behavior Analysis - Service Map [5/6]

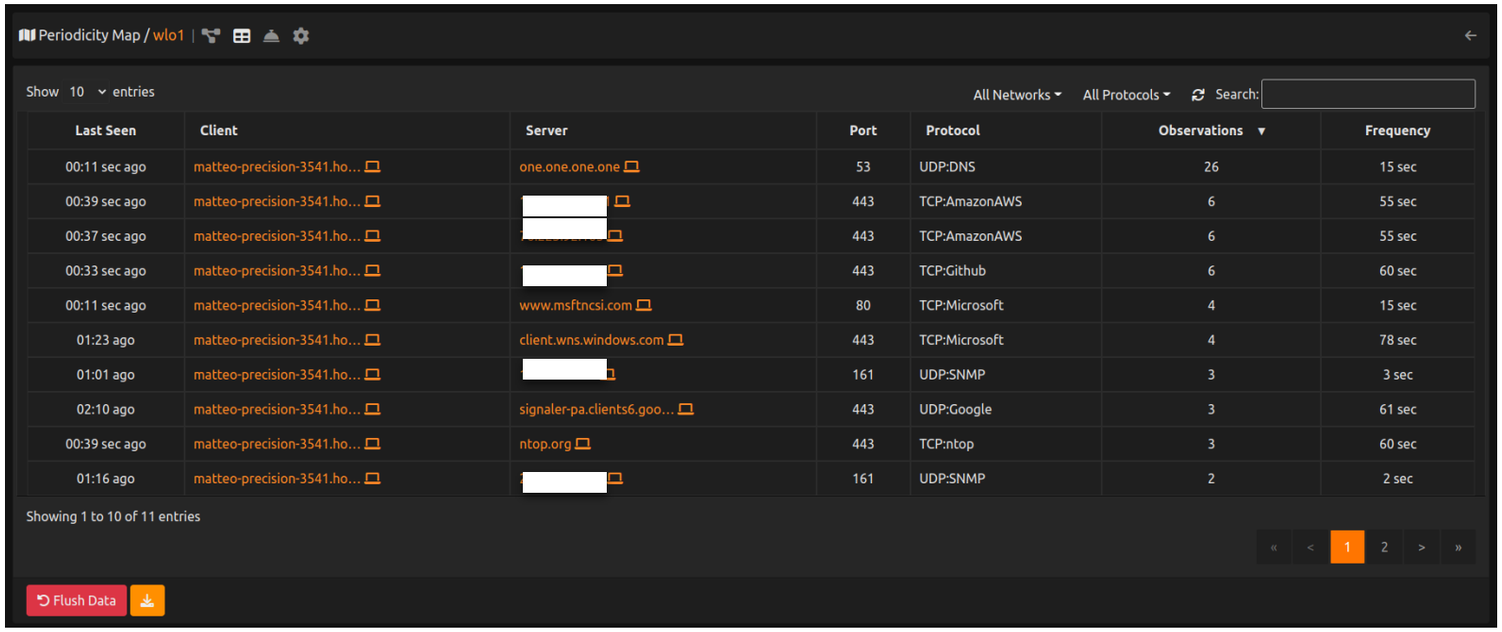
- Analyze the Degree - number of connections it has to other node: is it alright to have that number of Edges? Why is this Host in the local services?





Anomalies & Behavior Analysis - Periodicity Map [6/6]

- Analyze periodic flows:
  - "Is it normal to have the same flow every 20 seconds?"
  - "Is it normal to have seen the same flow for over 500 times?"



Last Seen	Client	Server	Port	Protocol	Observations	Frequency
00:11 sec ago	matteo-precision-3541.ho...	one.one.one.one	53	UDP:DNS	26	15 sec
00:39 sec ago	matteo-precision-3541.ho...	[redacted]	443	TCP:AmazonAWS	6	55 sec
00:37 sec ago	matteo-precision-3541.ho...	[redacted]	443	TCP:AmazonAWS	6	55 sec
00:33 sec ago	matteo-precision-3541.ho...	[redacted]	443	TCP:Github	6	60 sec
00:11 sec ago	matteo-precision-3541.ho...	www.msftncsi.com	80	TCP:Microsoft	4	15 sec
01:23 ago	matteo-precision-3541.ho...	client.wns.windows.com	443	TCP:Microsoft	4	78 sec
01:01 ago	matteo-precision-3541.ho...	[redacted]	161	UDP:SNMP	3	3 sec
02:10 ago	matteo-precision-3541.ho...	signaler-pa.clients6.goo...	443	UDP:Google	3	61 sec
00:39 sec ago	matteo-precision-3541.ho...	ntop.org	443	TCP:ntop	3	60 sec
01:16 ago	matteo-precision-3541.ho...	[redacted]	161	UDP:SNMP	2	2 sec

Score Indicator

Score [1/2]

- The score is a numerical indicator that when non-0 it indicates that some kind of issue is present: the higher is the score the worst is the problem:
  - The **flow score** that indicates how bad is this flow
  - The **host score** is computed as the sum of all active flow scores (either as client or server) plus additional scores eventually found on the host

Score [2/2]

Date/Time	Score ▼	Duration	Alert	Host	Description
17:01:41	250	01:10	Score Threshold Exceeded		Score exceeded b s Client [10905 > 5000]

Date/Time	Score ▼	Application	Alert
16:32:15	150	UDP:DNS DPI	Suspicious DNS Traffic

Probably Attacked/er!

Host: matteo-precision-3541 | Traffic Packets DSCP Ports Peers ICMP Apps DNS TLS HTTP Sites

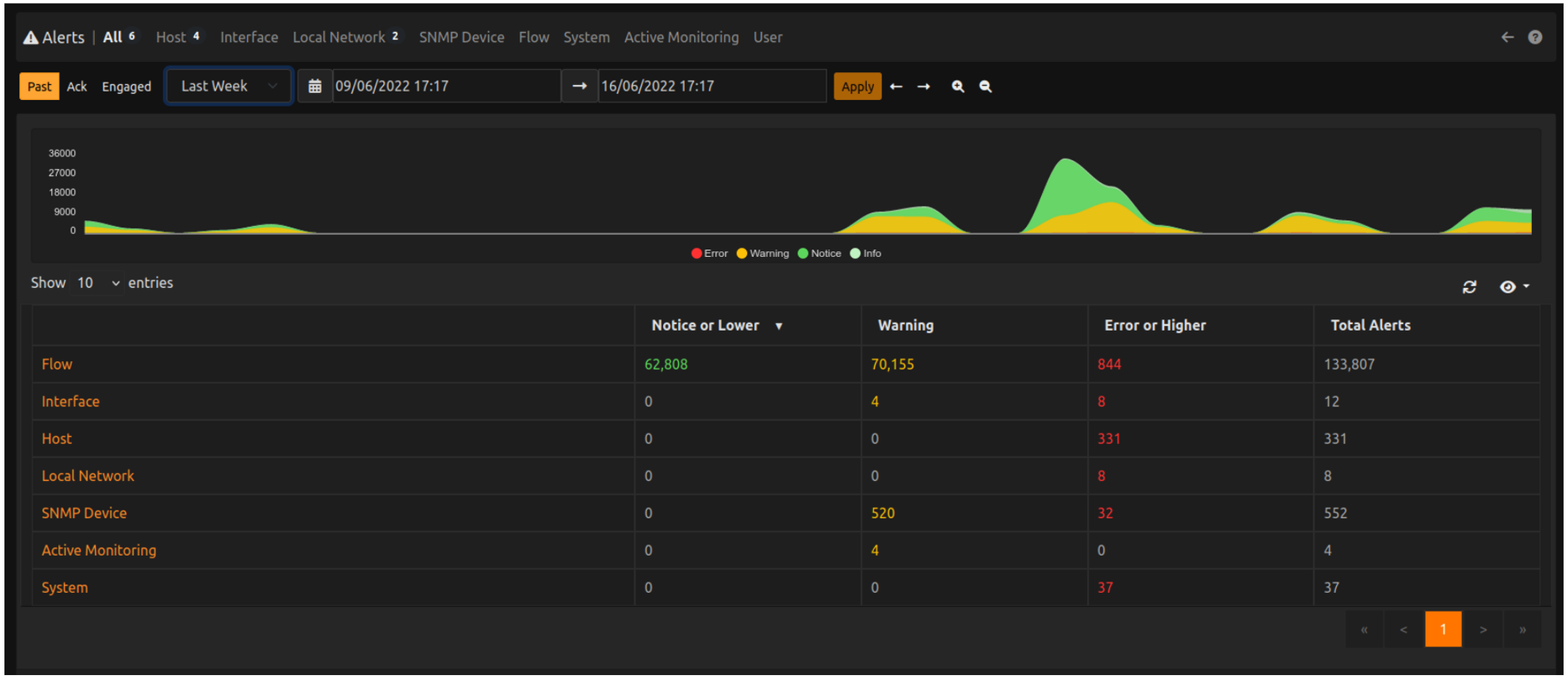
(Router/AccessPoint) MAC Address	E4:5E:37:AF:C9:E0	Computer
IP Address	192.168.1.75 [192.168.1.0/24]	Host Pool: Jailed Hosts
Name	matteo-precision-3541 L P	
Engaged Alerts	4 —	
Score	Client	Server
	901 — Network Cybersecurity	10 — Network Cybersecurity

Alerts Development, Find the problem

Alerts Development, Find the problem [1/3]

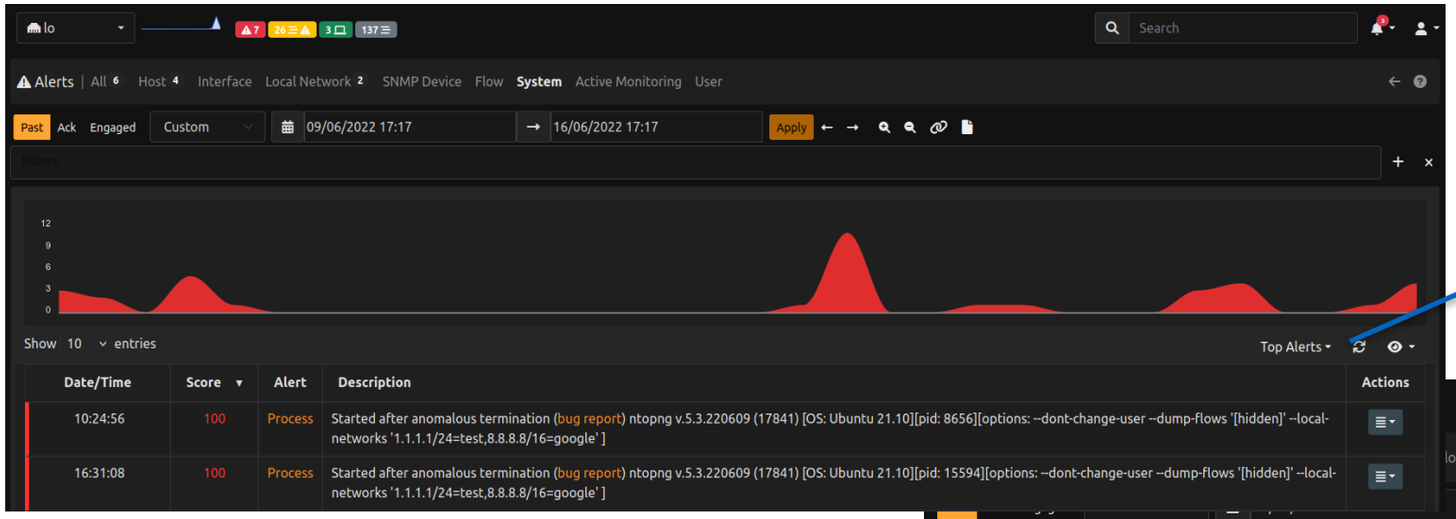
- Analyze the traffic to find problems in a few click!

- Analyze live flows and other to trigger alerts based on different anomalous metrics and classify them based on the severity of the problem

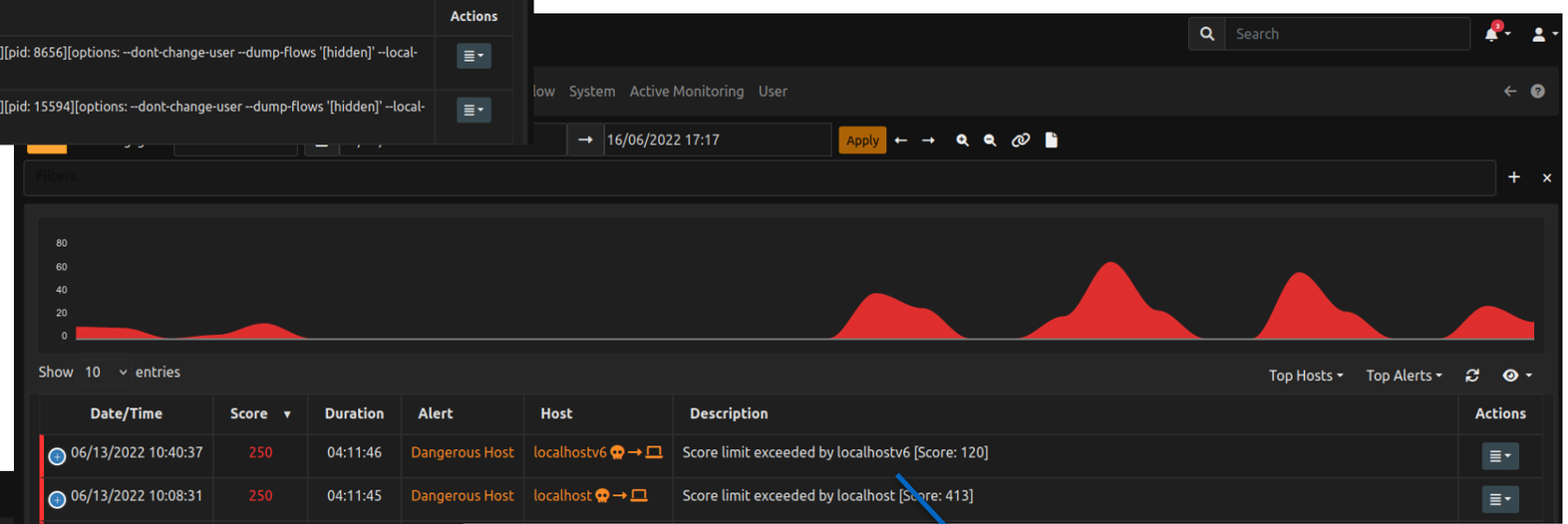


	Notice or Lower	Warning	Error or Higher	Total Alerts
Flow	62,808	70,155	844	133,807
Interface	0	4	8	12
Host	0	0	331	331
Local Network	0	0	8	8
SNMP Device	0	520	32	552
Active Monitoring	0	4	0	4
System	0	0	37	37

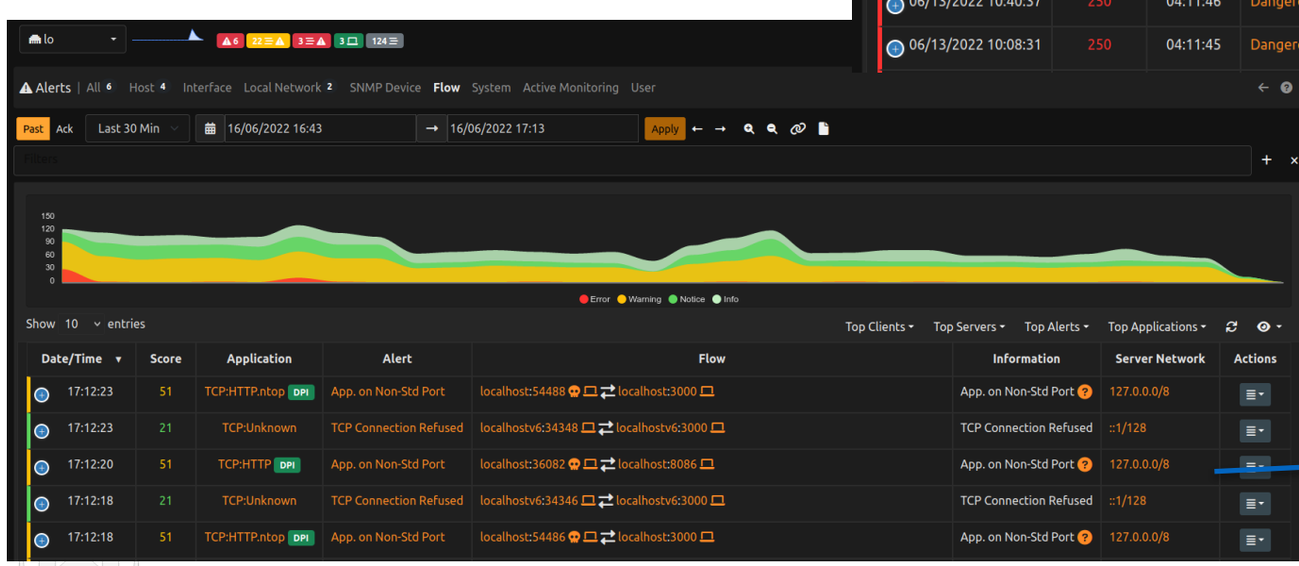
Alerts Development, Find the problem [2/3]



System



Host

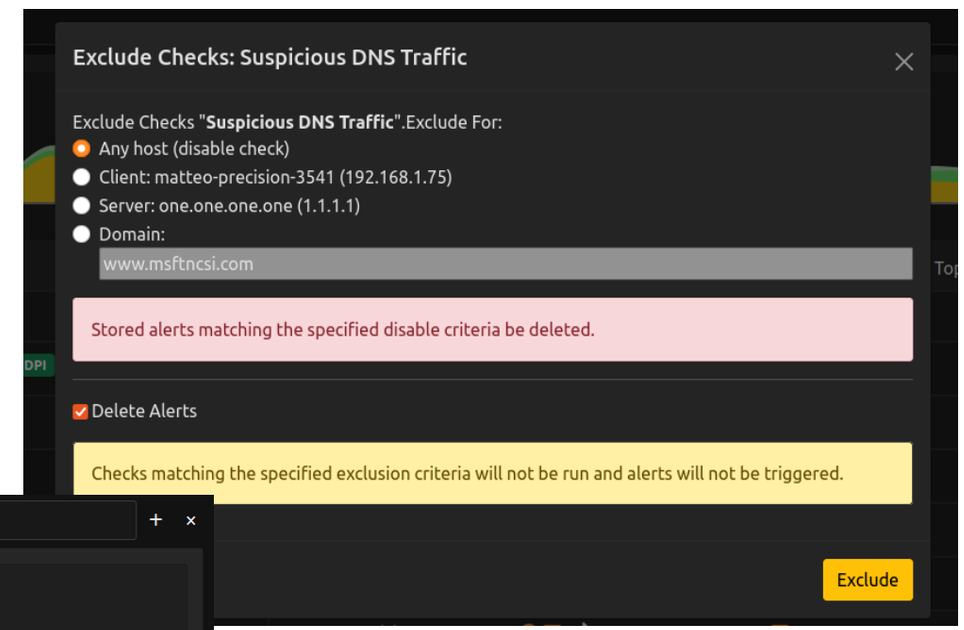


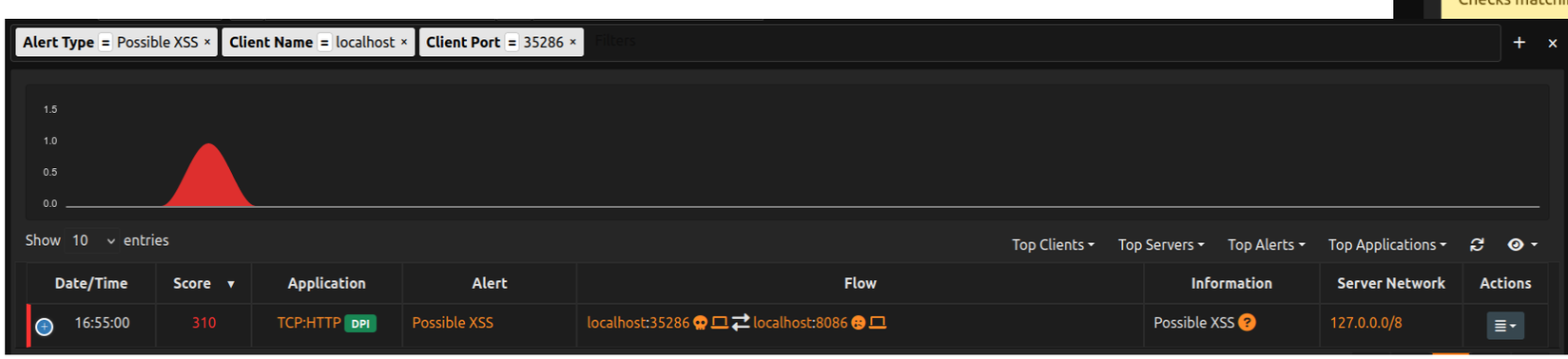
Flows

Alerts Development, Find the problem [3/3]

- Find the problems you are interested in, by filtering the records

- Remove the "False positive" from your system





Checks Extended, Road to Cybersecurity

Checks Extended, Road to Cybersecurity [1/4]

- What is a Check? A check is a part of a verification process integrated in Ntopng that is able to detect a certain condition, like an host/network anomaly or device malfunctioning. Once seen the deviation, the references are passed in order to create an alert.

- But how an alert is created?

    - When a threshold is crossed (More traffic then expected, Score higher then expected, ...)

    - When an anomalous situation is detected on the packets (Malformed packets, Suspicious contents, ...)

    - When a scan is detected (ICMP, SYN, ...)

    - When unwanted traffic is detected (Bot, Binary Transfers, ...)

    - When unexpected Hosts are detected in a network (DNS Servers, NTP Servers, ...)

Checks Extended, Road to Cybersecurity [2/4]

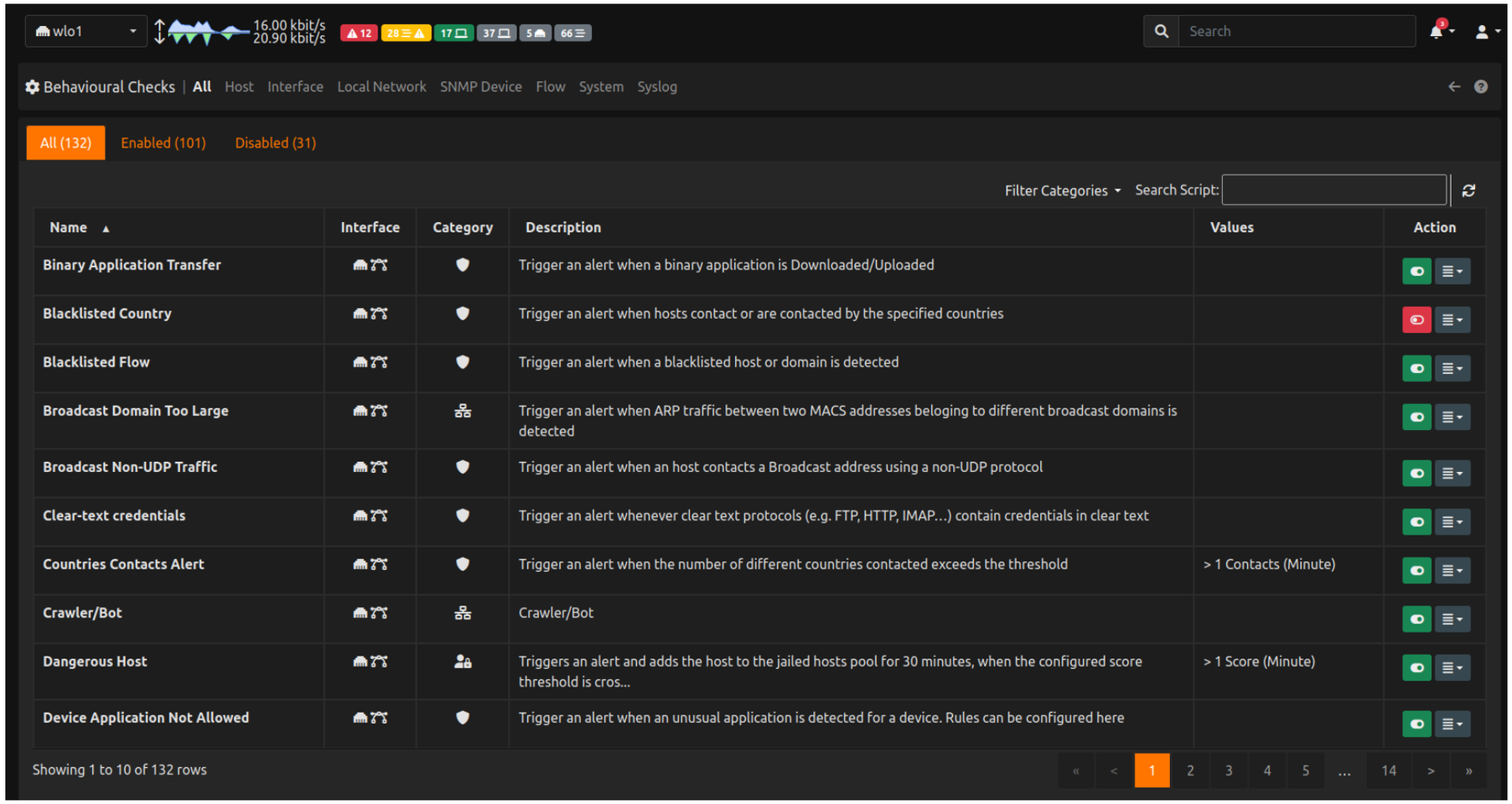
- Alerts are divided by families; there are different alert families in ntopng, each one detecting a different type of alert:
    - Host (IPv4 or IPv6 address)
    - Interface (hardware attached to devices to allow them to communicate over a network)
    - Local Network
    - SNMP Device (Enterprise License)
    - Flow
    - System (The system on top of which ntopng is running; e.g, disk space and load)
    - Syslog (They are not real checks but rather are triggered whenever a syslog entry is received from another device, e.g. firewall logs)

Checks Extended, Road to Cybersecurity [3/4]

- Other then families we have categories. An alert could be an alert related to a Local Network but it could be even a Cybersecurity alert!
- An alert has two classification: an Alert Family and a Category
- Categories:
    - Active Monitoring
    - Intrusion Prevention and Detection
    - Internals
    - Network
    - Cybersecurity
    - SNMP
    - System

Checks Extended, Road to Cybersecurity [4/4]

- More then 100 available checks!
- Check the documentation for more info: https://www.ntop.org/guides/ntopng/alerts/host_checks.html



Endpoints: Integration with External Tools

Endpoints

- Extended the possibility to export Alerts to external tools:
    - Discord
    - ElasticSearch (Pro License)
    - E-Mail
    - Fail2Ban (Pro License)
    - Shell Script
    - Slack
    - Syslog
    - MS Teams (Pro License)
    - Telegram
    - Webhook

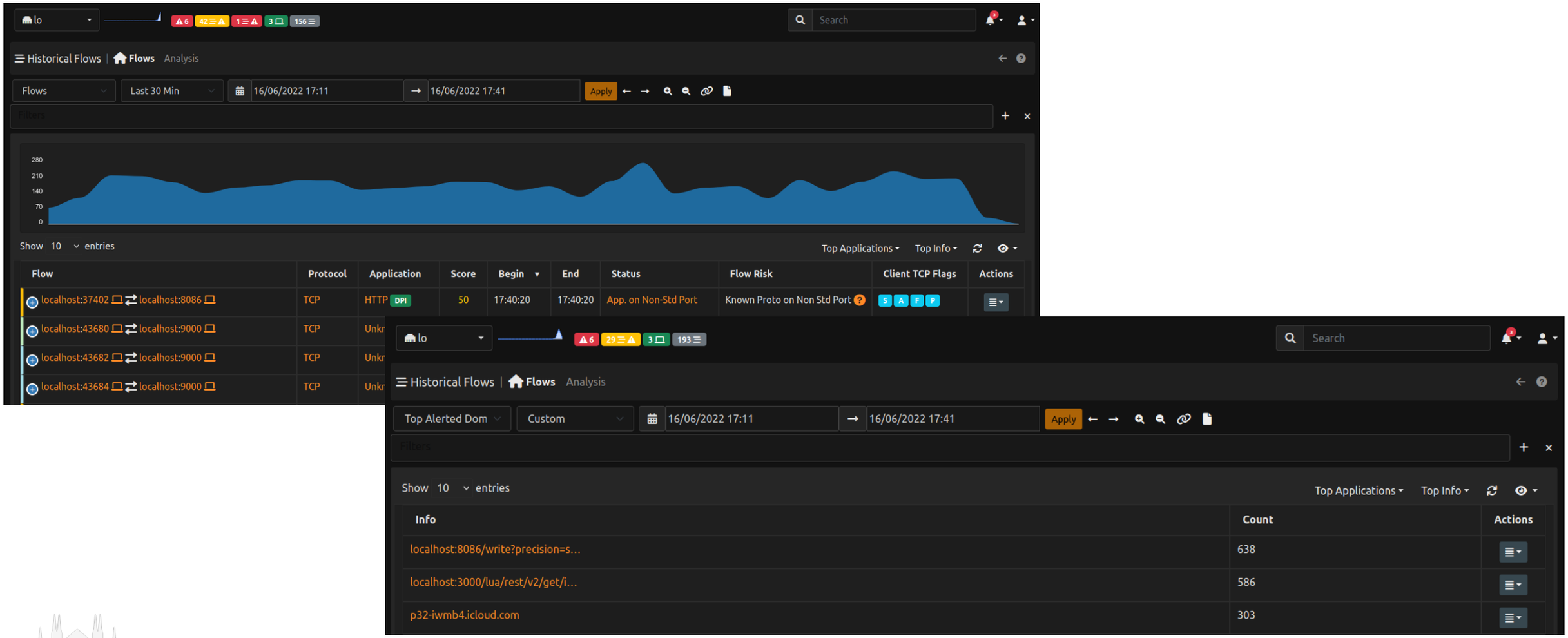
ClickHouse

ClickHouse [1/3]

- New Support to a DB: ClickHouse (Enterprise License)
- High Speed Relational DataBase
- Used to store both Alerts and Flows
  - Historical Flow page -> Ability to navigate the records and find various data:
    - Top Talkers
    - Top Clients
    - Top Applications
    - ...

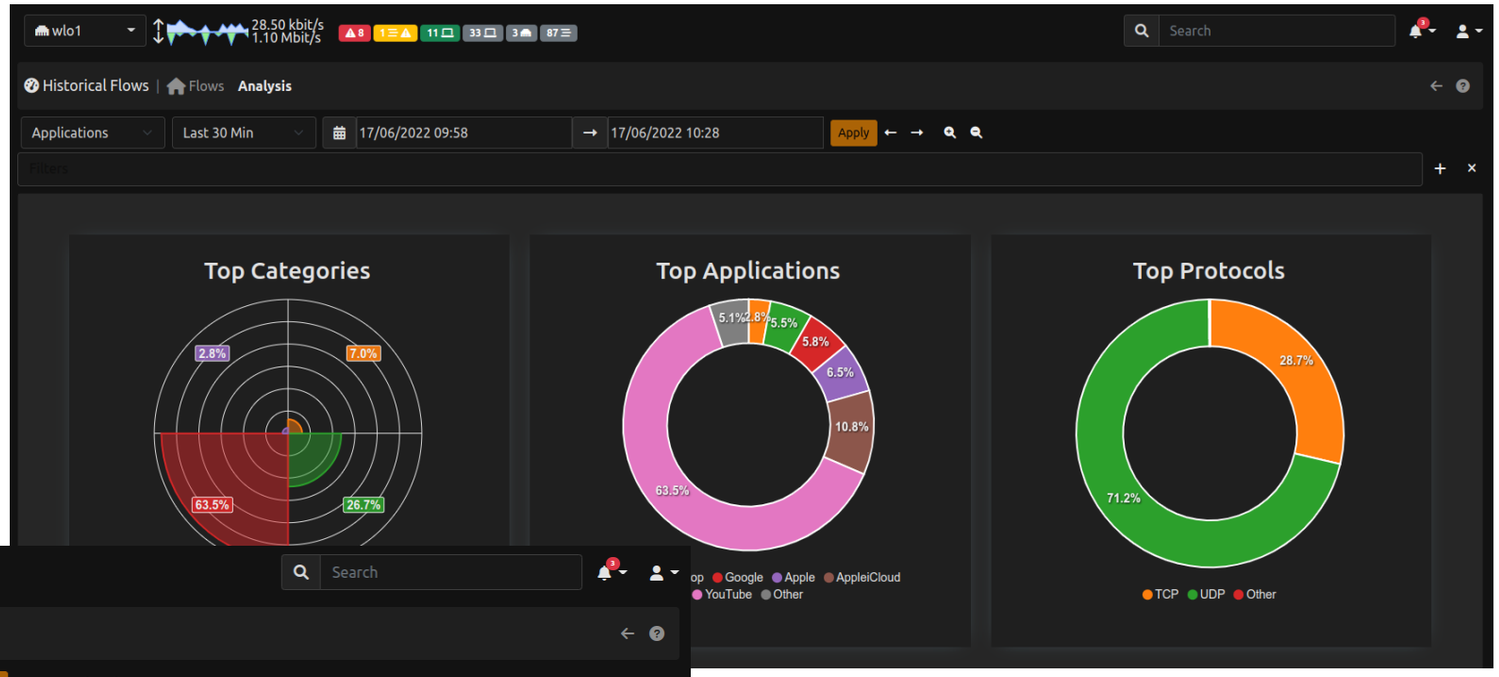
ClickHouse [2/3]

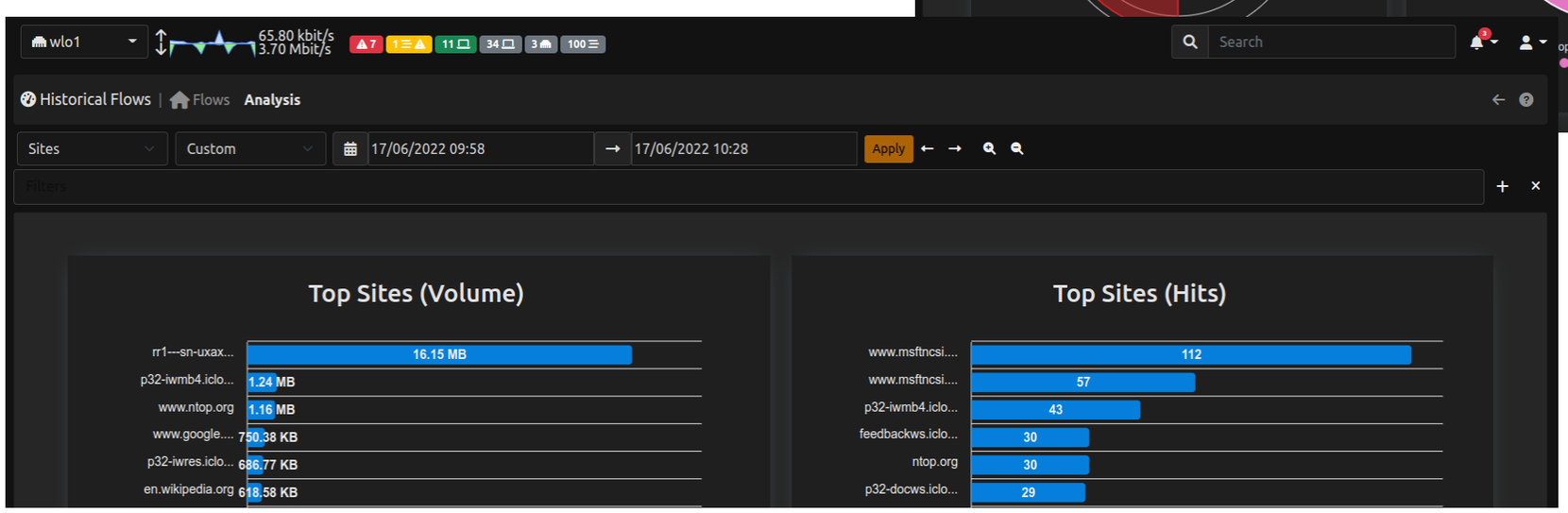
- Navigate the Historical Flows, find the problems and strange traffic, by filtering them and using the aggregated data we provide (Enterprise License)



ClickHouse [3/3]

- Find the problems by starting from less granular data then tables!





Find the problem
From the great to the small

Find the problem [1/2]

Alerts

Analyze problems starting from the alerts:
Why is there this alert?

↓

Historical Flows

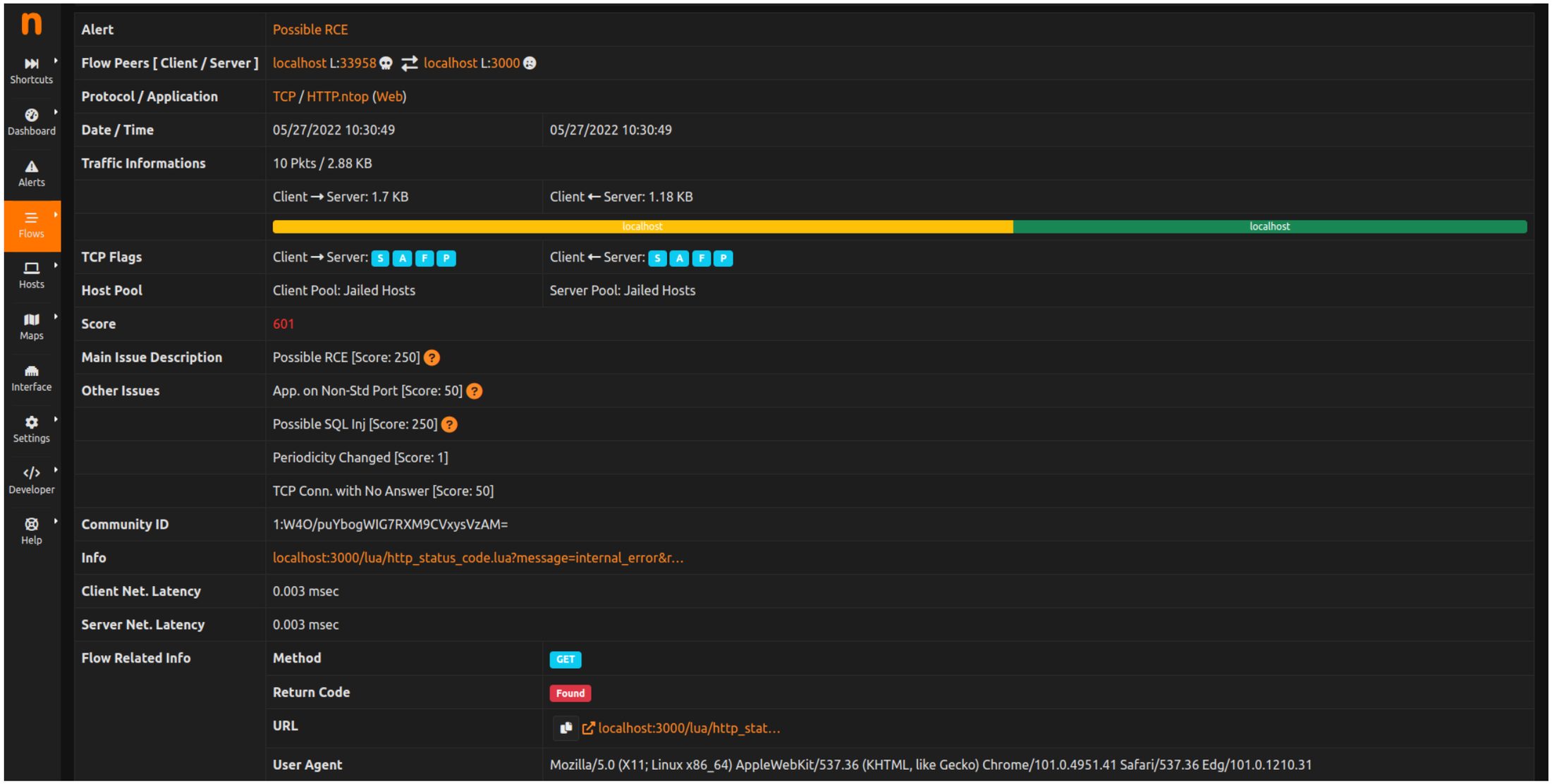
Find the problematic flow:
Who caused the problem?
Is there someone else creating the same problem?
Which type of traffic is this Host doing?

↓

Granular analysis

Find the problem [2/2]

- Analyze the Flow in details and find the problem!

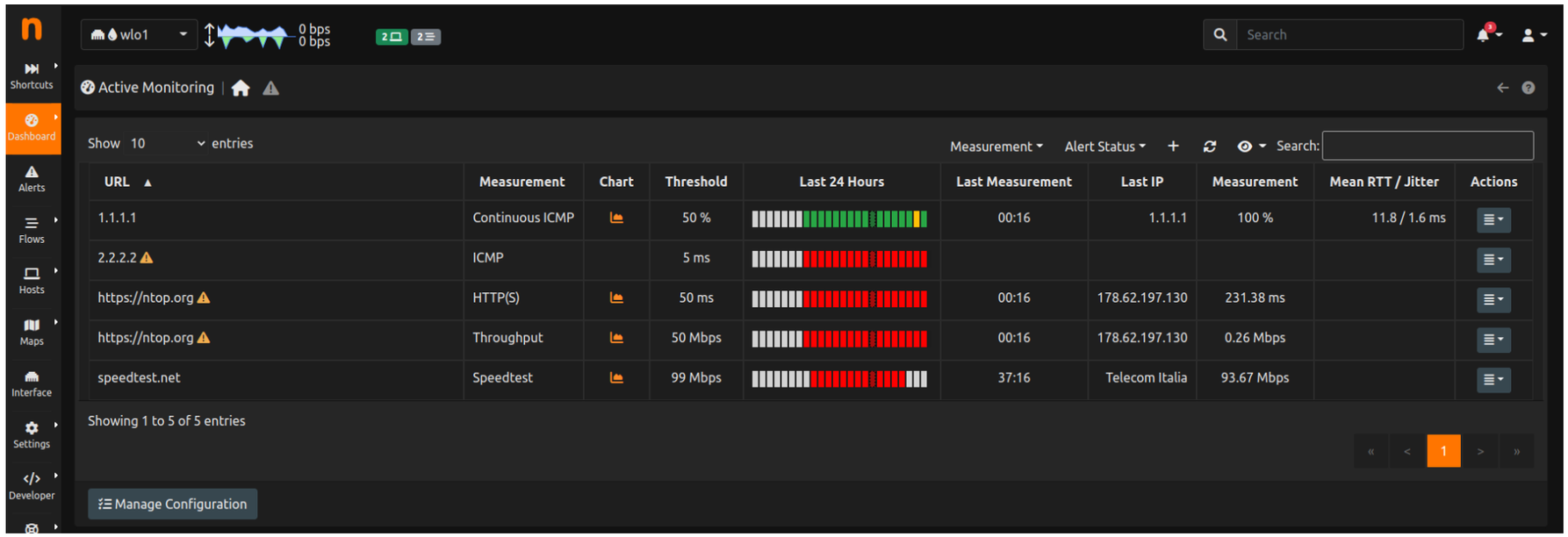


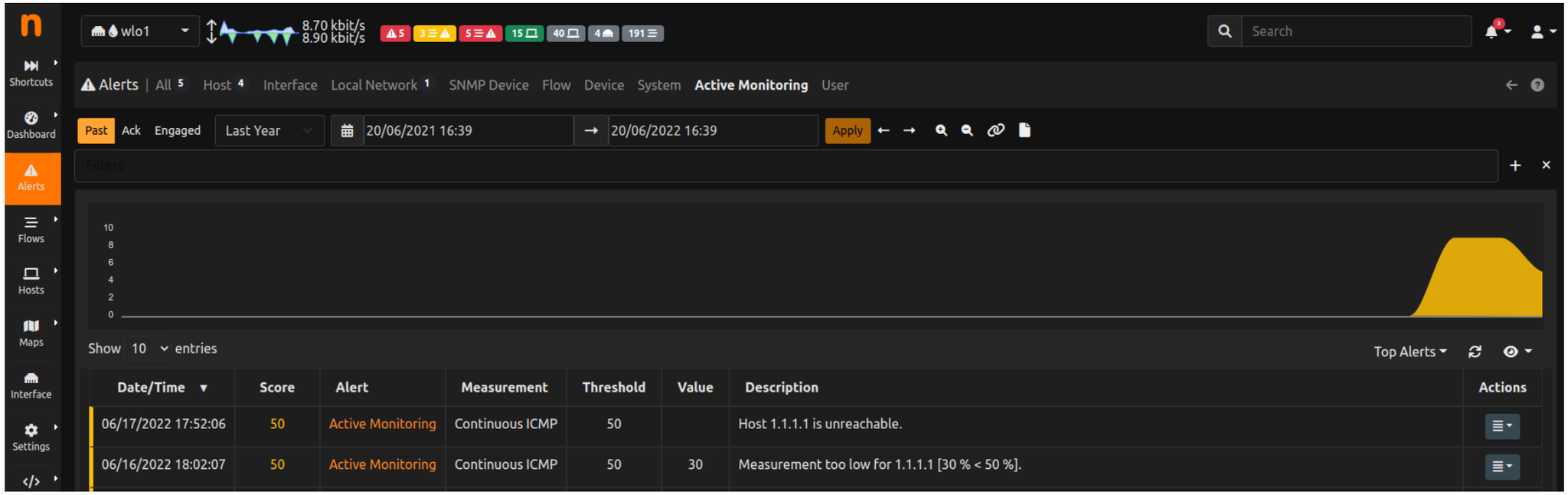
Active Monitoring

Active Monitoring [1/2]

- ntopng is not just a passive monitoring tool!
- Various types of active monitoring:
    - ICMP
    - Continuous ICMP
    - HTTP
    - HTTPS
    - Throughput
    - Speedtest
    - SNMP

Active Monitoring [2/2]





ntopng: SNMP

SNMP: Analysis

- Neighbouring information allows to discover adjacencies and this the topology (Enterprise License).

- This information is present in the data link layer (layer 2).

- Vendors have their own protocols (e.g. Cisco has CDP Cisco Discovery Protocol) but the standard is LLDP Link Layer Discovery Protocol (RFC 2922)

- LLDP periodically send LLDP packets with multicast. Information on neighbour devices can be read using SNMP (LLDP-MIB).

SNMP Devices / swStorageAccessB7-2 (172.16.67.210) | Interfaces **Topology** MAC Addresses

Topology

10

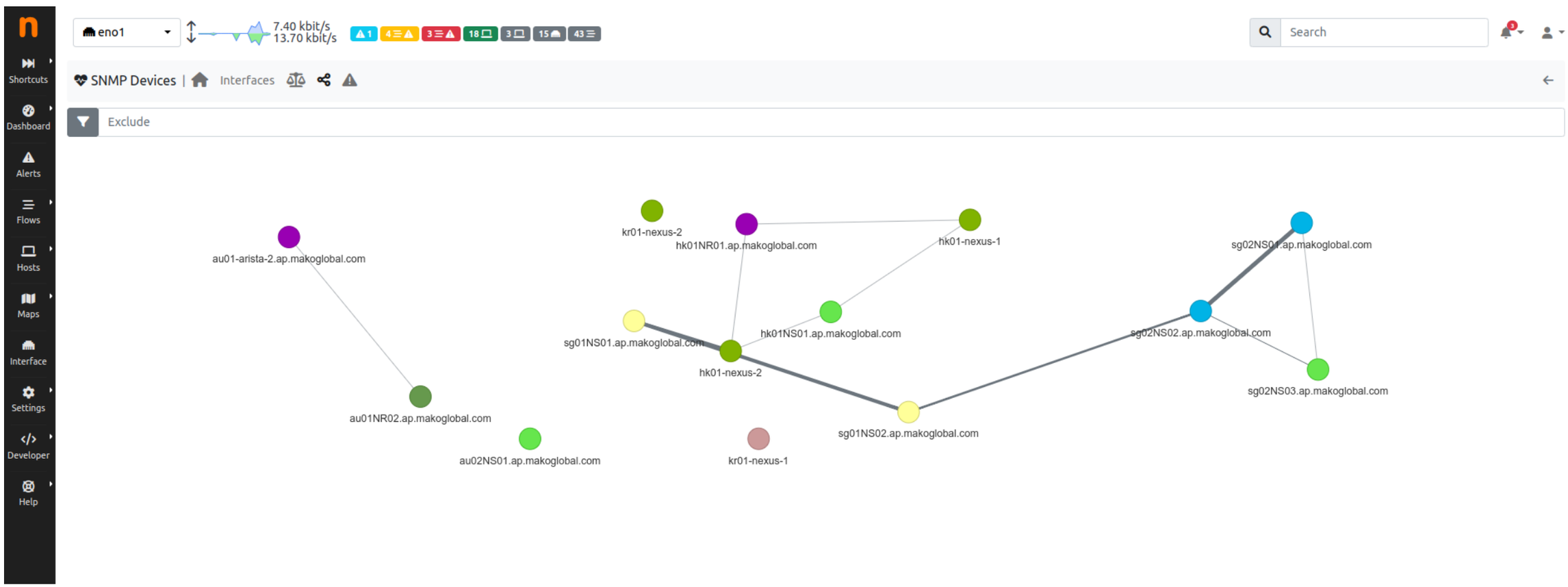
Index	Interface Name	Speed	Status	Remote Device	Remote Port Description	Remote System Name	Remote System Description
2103300	TenGigabitEthernet 1/49 LLDP	10 Gbit	Up	TenGigabitEthernet 1/49	TenGigabitEthernet 1/49	swStorageAccessB7-1	Dell EMC Real Time Opera...
2103428	TenGigabitEthernet 1/50 LLDP	10 Gbit	Up	TenGigabitEthernet 1/50	TenGigabitEthernet 1/50	swStorageAccessB7-1	Dell EMC Real Time Opera...
2103556	TenGigabitEthernet 1/51 LLDP	10 Gbit	Up	TenGigabitEthernet 1/2	TenGigabitEthernet 1/2	swStorageLeaf1-1	Dell Real Time Operating...
2103684	TenGigabitEthernet 1/52 LLDP	10 Gbit	Up	TenGigabitEthernet 1/2	TenGigabitEthernet 1/2	swStorageLeaf1-2	Dell Real Time Operating...
9437185	ManagementEthernet 1/1 LLDP	1 Gbit	Up	42	42	swOobManagementB5-2	ProCurve J9022A Switch 2...

SNMP: Bridge MIB

- Useful for controlling the status of L2/L3 switches. Do not make the common mistake to believe that it is is used only on bridges
- It somehow complementary to the MIB II as it provides information the hosts connected to the switch ports
- Common uses of the bridge MIB:
    - To know the MAC address of a host connected to the port X/unit Y of the switch
    - The MAC/port association is the base for detecting the physical location of a host (good method for know who's where!)
    - It keeps track of the "previous" MAC address (and the time) connected to a port so it is possible to track users as they move from a room to another
    - It can be used for detecting ports with associated multiple MAC addresses (trunk) hence to detect users with multiple MACs (e.g. VM and PC infected by a virus/worm)

SNMP: Map

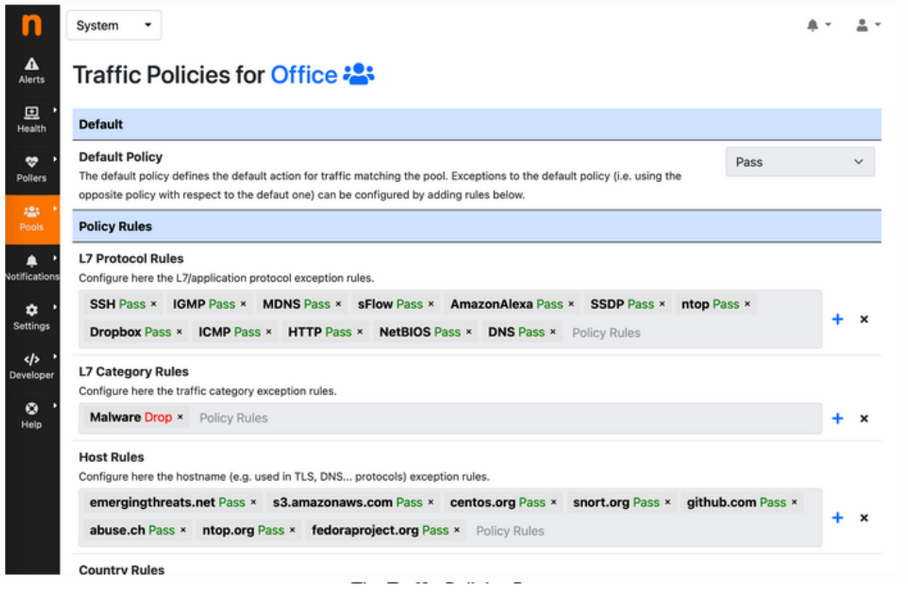
- With all this information we can create Maps:
  - Who's talking with who?
  - Where are they located?



ntopng and nProbe

ntopng and nProbe: IPS Mode

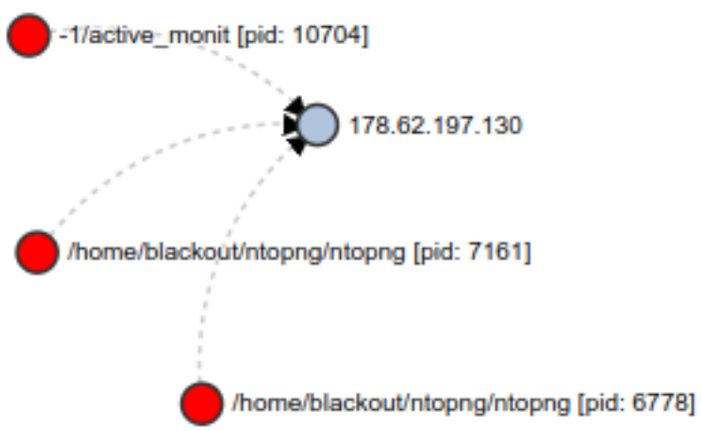
- ntopng can be used to enforce traffic policies and report them, when ntopng is used in combination with nProbe in IPS mode
- Traffic policies are automatically exported to nProbe after a change to the policies configuration. Rules that can be used to configure exceptions are:
  - L7 Application Protocol Rules
  - L7 Category Rules
  - Host Rules to configure hostnames used in TLS and DNS protocols for instance
  - Country Rules
  - Continent Rules
  - Risk Rules to apply policies based on the Flow Risk computed by nDPI



ntopng and nProbe: Processes

- ntopng can be used in combination with nProbe in Agent Mode to understand which processes the nProbe host machine is running

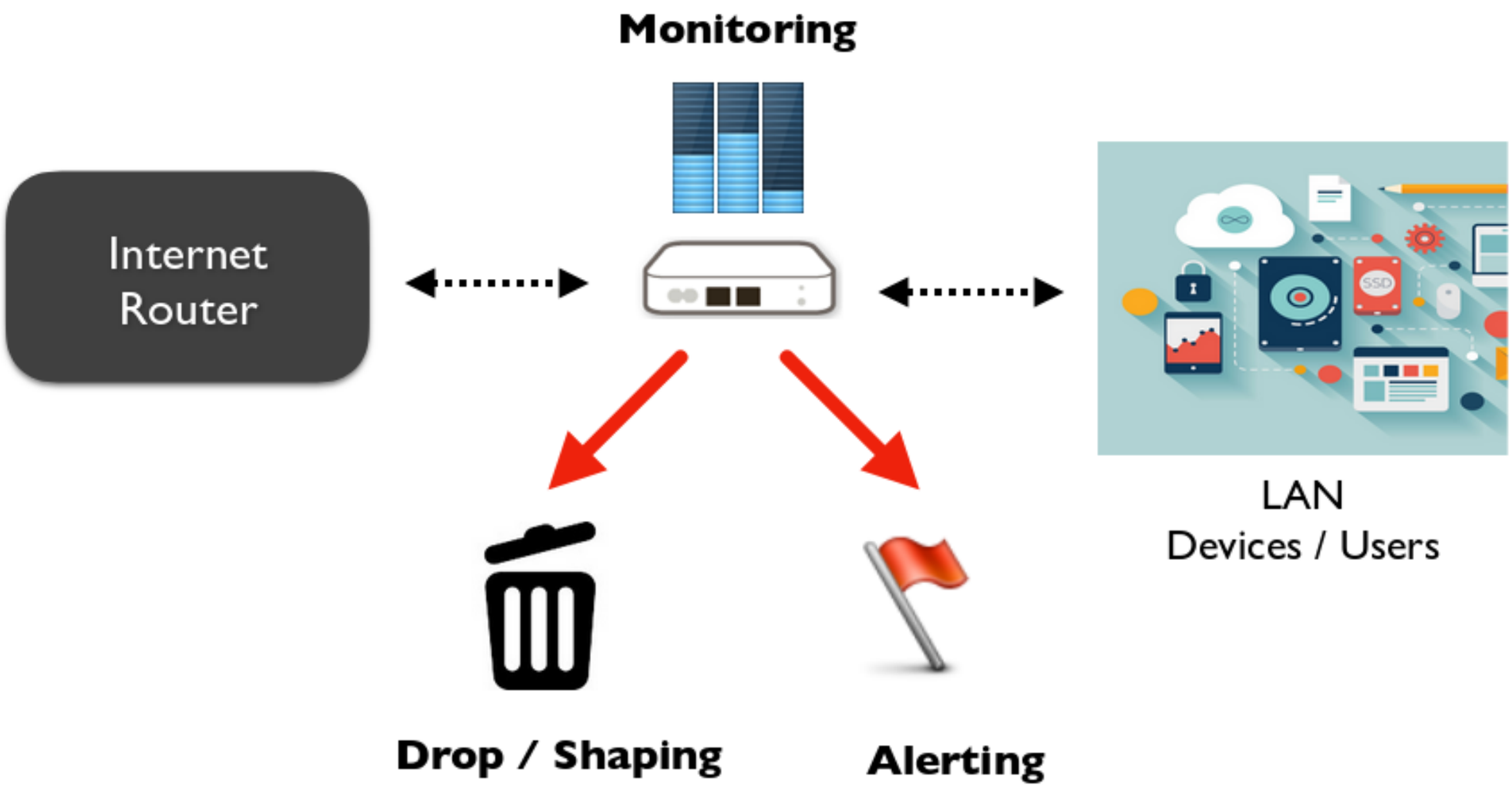
- Find the compromised machine and who's the culprit!



ntopng Edge

Protects all of your digital assets and online activities

ntopng nEdge



ntopng nEdge

- Support for latest Ubuntu Server 22 LTS
- Improvements for multi-WAN environments for gateway selection (e.g. connectivity provider with 3G, WiFi, SAT)

ntopng: Towards Dynamic UX

ntopng GUI

- We have news even from the Web Interface!
- We are renewing the front-end by moving to a dynamic GUI:
    - Better Performances even from the Web Interface
    - Possibility to export our components into external tools

ntopng: Dynamic UI

- With the help of Vue.js we are trying to:
    - Have lesser loading, by loading only the needed components (from static to dynamic UI) -> better performances and user experience
    - Create bundles that other tools could import and use our components into their own page -> Create your custom dashboard!

https://github.com/ntop/ntopng