MikroTik Traffic Flow

Network Monitoring / PRTG

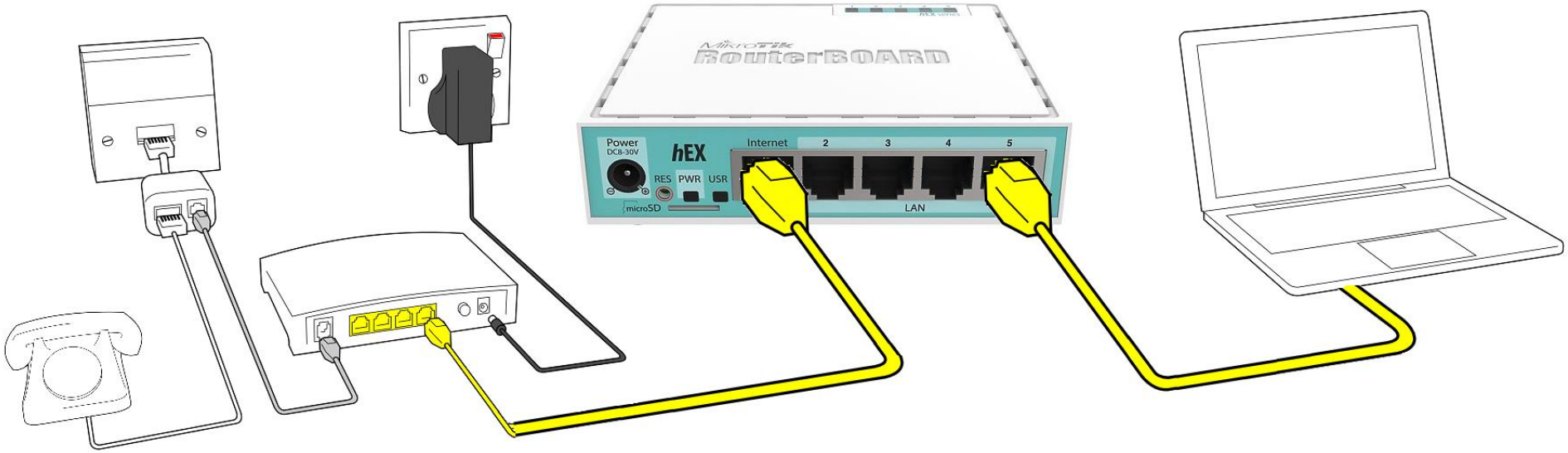
MikroTik User Meeting

26-January-2019

Beirut - Lebanon

Khalil Chamseddine – khalil@tahandos.com

MikroTik RouterOS is rich in many features



About me, the MikroTik Certified Trainer

- Name: Khalil Chamseddine
- Experience: Software, Hardware and Networking
- MikroTik Certified Trainer in Lebanon and Region:
  - MTCNA
  - MTCWE
  - MTCTCE
  - MTCUME
  - MTCRE
  - MTCIPv6
  - MTCINE
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TRAINING | ABOUT US

All MikroTik Certifications – 4 weeks

MTCNA
- Network

MTCUME
- RADIUS, Hotspot

MTCINE
- BGP, MPLS, VPLs

MTCRE
- OSPF Routing

MTCWE
- Wireless

MTCTCE
- Firewall & QoS

MTCIPv6
- IP version 6

7 certifications - Flexible Schedule

MikroTik Certified Trainer

MikroTik Certified Consultant

Powered by MikroTik

Networking - Routing - Traffic Control
Firewall - Gateway - Bandwidth - VPN

Outline

- Network Monitoring and FLOW
- MikroTik Traffic Flow
- MikroTik RouterOS and PRTG
  - How To, Step By Step
  - Sample Reporting

Simple question: What do we want to know?

- Who is consuming the bandwidth?
  - From inside out
  - From outside in
- What they are consuming?
- Which protocols and services?
  - HTTP
  - Email
  - Video
  - Voice
  - Torrent
  - …

Simple question: Why do we want to know?

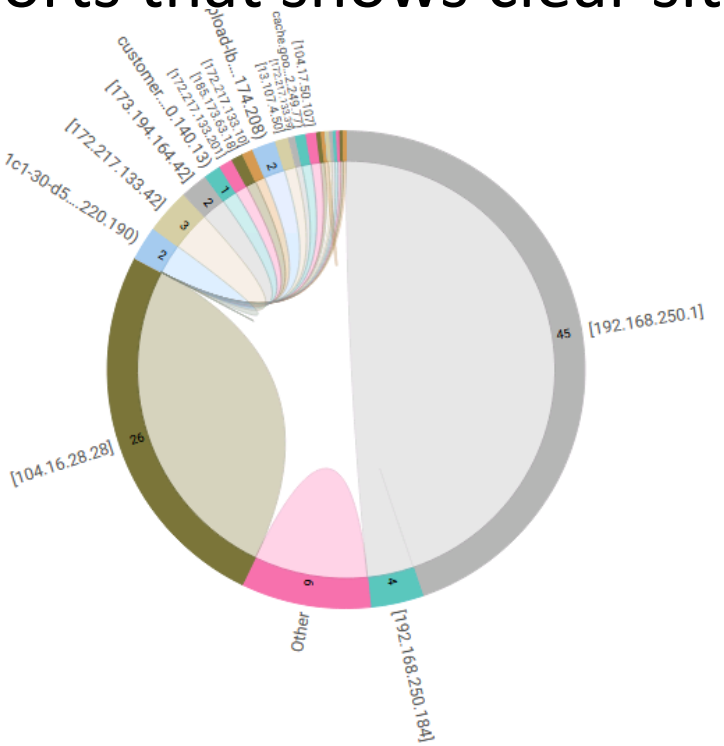
- Identification / Solving
  - Traffic Classification
  - Flow-based detection
  - DoS Trace back
  - …

- Traffic Analysis
  - Inter-AS traffic analysis
  - Reporting on application proxies
  - …

- Accounting
  - Cross verification from other sources
  - …

Simple question: What do we need to get?

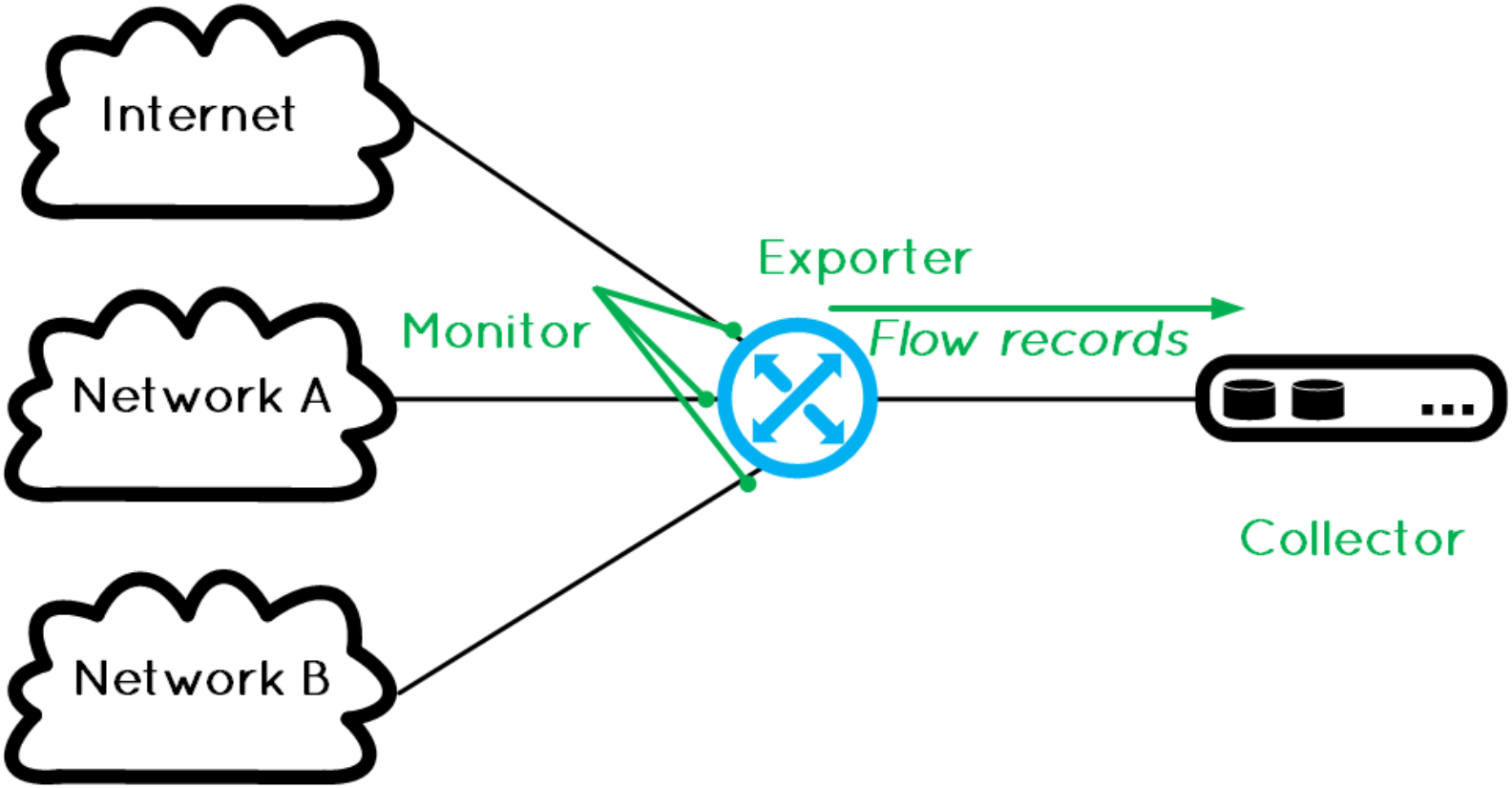
- Nice presented reports that shows clear situation



Source IP	Source Port	Destination IP	Destination Port	Protocol	Channel	IP	Port	Sender IP	Bytes
a23-56-177-96.de...	443	[192.168.1.64]	52935	TCP	WWW	a23-56-177-96.de...	443	[10.111.222.33]	2,238 KByte
[185.173.63.18]	443	[192.168.1.64]	52396	TCP	WWW	[192.168.1.64]	52396	[10.111.222.33]	2,220 KByte
cloudproxy10113...	443	[192.168.1.64]	55504	TCP	WWW	cloudproxy10113...	443	[10.111.222.33]	2,201

How we are supposed to know it?

- Observation Point / Interface
- Flow Exporter: Exports Flow Records
- Flow Collector: Receives Flow Records / present them nicely



Bandwidth Monitoring Alternatives

- Bandwidth monitoring is a method for measuring the actual bandwidth available on a local system

- SNMP
  - Usually it is considered lighter than other options
  - Gets total amount of traffic and some layer 2 and layer 3 statistics like number of errors, number of broadcasts…

- Packet Sniffer
- …
- xFlow

General Flow Definition

- A flow is defined as a set of packets having common properties:
  - one or more packet header fields (e.g. destination IP address, transport header field),
  - one or more characteristics of the packet
  - …

  - a packet belongs to a flow record if it completely matches all defined flow properties.

Flow Exporting Protocols

- CISCO NetFlow
- Juniper…
- HPE…
- IETF IPFIX

- MikroTik Traffic Flow
  - a system that provides statistic information about packets which pass through the router.
  - network monitoring and accounting
  - identify various problems that may occur in the network
  - analyze, optimize the overall network performance
  - MikroTik Traffic-Flow is compatible with Cisco NetFlow, it can be used with various utilities which are designed for Cisco's NetFlow.

NetFlow Flow definition

- NetFlow defines a flow as the combination of the following seven key-fields:
  - Source IP address.
  - Destination IP address.
  - Source port number.
  - Destination port number.
  - Layer 3 protocol type.
  - ToS byte
  - Logical interface, whether input (ingress) or output (egress)

Flow formats

- Differ in the format of the export massage
- Version 1 - never use it ☺
- Version 5 – limited to inbound traffic (ingress) and IPv4.
- Version 9 - a new format which can be extended with new fields and record types because of its template-style design
  - Version 9 is independent of the underlying transport protocol whether it is TCP, UDP, or SCTP
  - Support for IPv6 and bi-directional flows (ingress and egress)
  - Support for MPLS/VLAN…

IPFIX: IP Flow Information Export

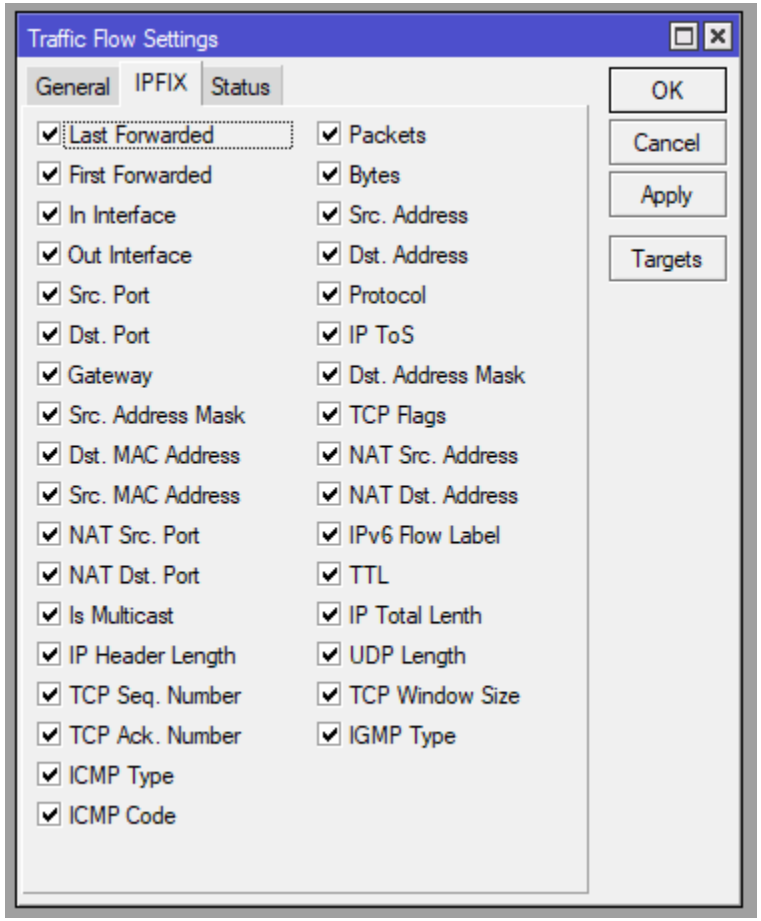
- IETF: Internet Engineering Task Force

- IPFIX: Official Standard for all flow technologies
  - Sometimes described as NetFlow Version 10
  - used CISCO NetFlow version 9 as a base
  - common, universal standard of export for Internet Protocol flow information from routers, probes and other devices that are used by mediation systems, accounting/billing systems and network management systems to facilitate services such as measurement, accounting and billing
  - defines how IP flow information is to be formatted and transferred from an exporter to a collector

- IPFIX is a push protocol, i.e. each sender will periodically send IPFIX messages to configured receivers without any interaction by the receiver.

MikroTik IPFIX

- MikroTik Traffic Flow template

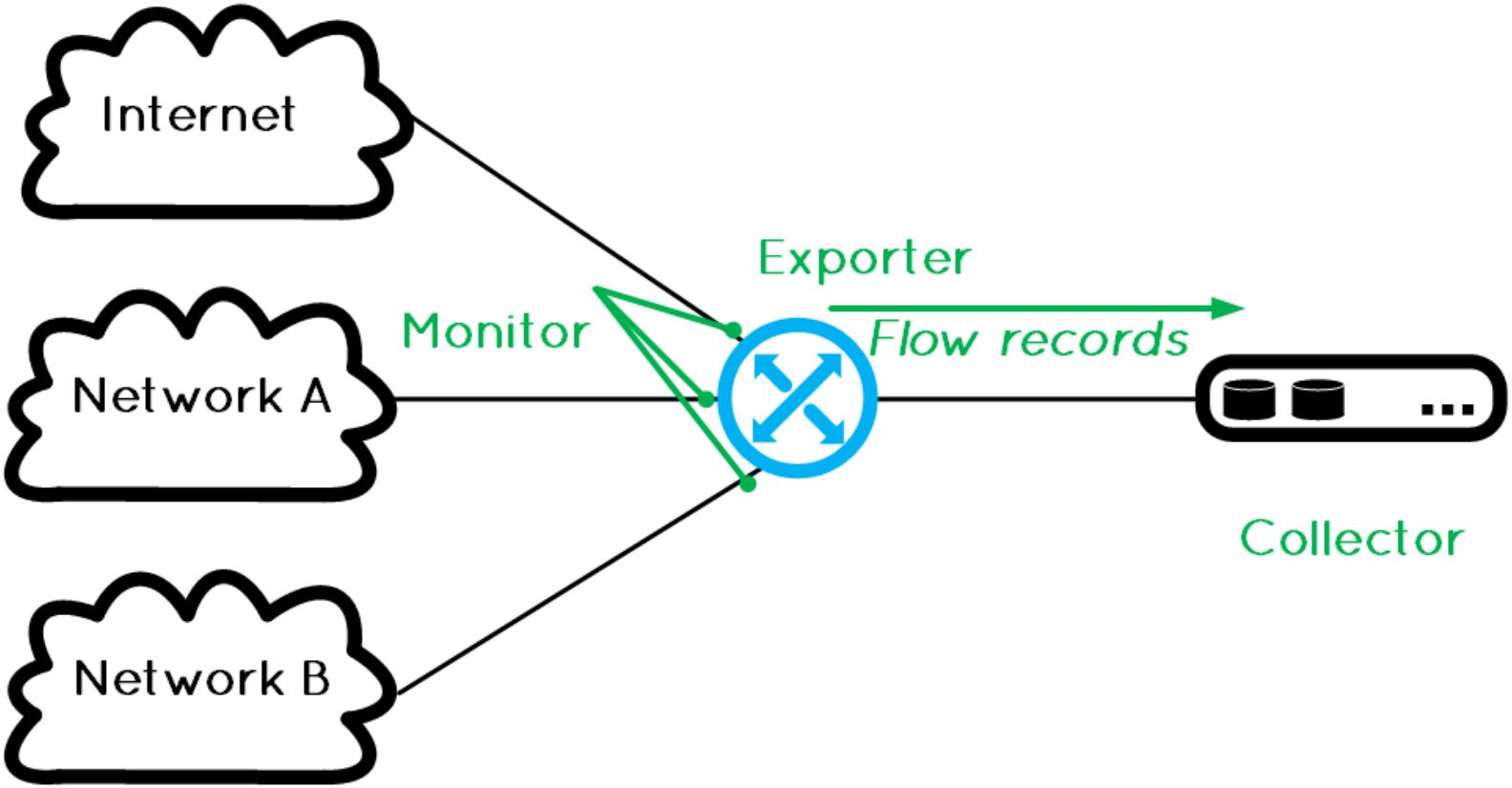


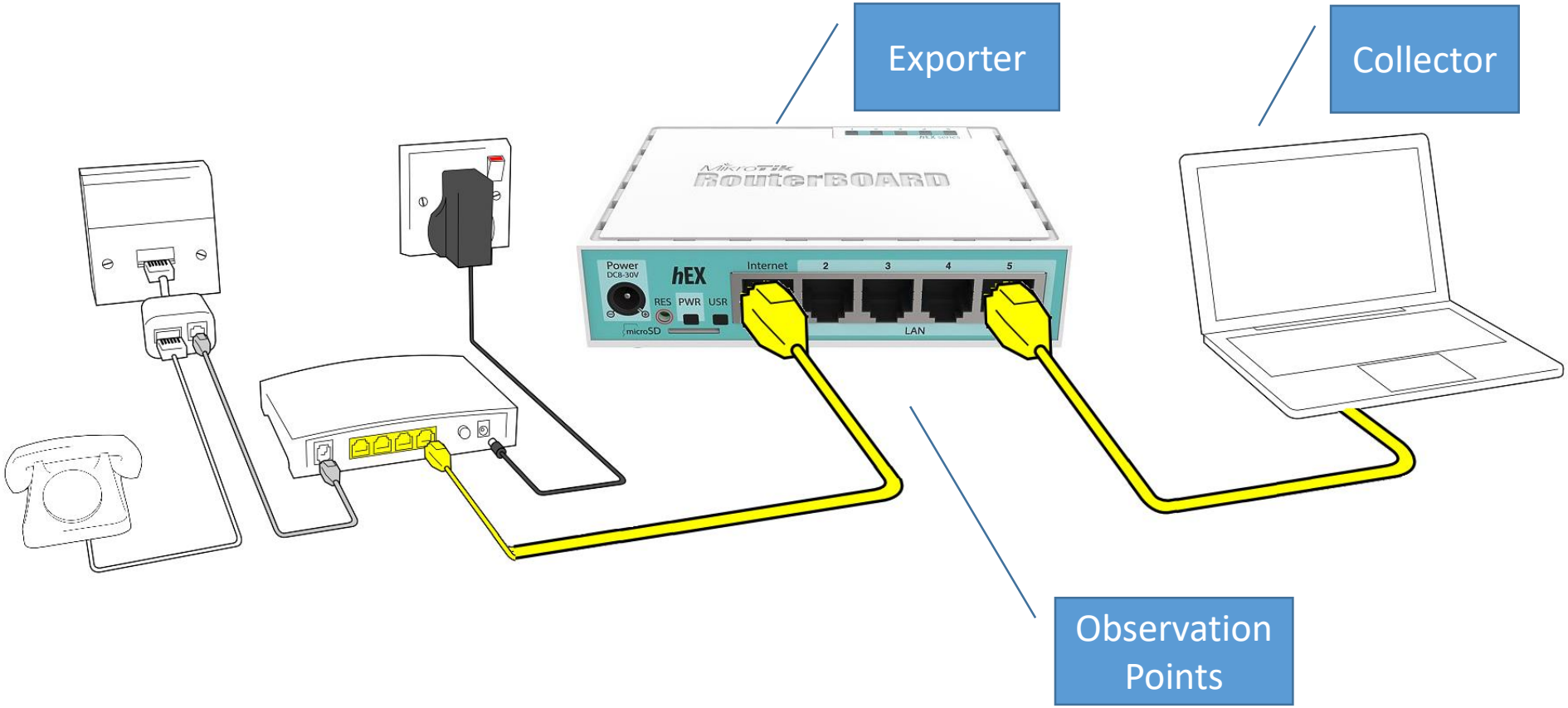
How To

- Configure the Exporter (MikroTik)
- Configure the Flow Record (MikroTik)
- Apply it to the Interface (MikroTik)
- Configure the Flow Monitor (PRTG)

How we are supposed to know it?

- Observation Point / Interface
- Flow Exporter: MikroTik RouterBoard
- Flow Collector: PRTG




Exporter
Collector
Observation Points
MikroTik
RouterBOARD
Power
DC8-30V
hEX
Internet
2
3
4
5
RES
PWR
USR
microSD
LAN

PRTG, the collector

- PRTG Network Monitor
  - PRTG: Paessler Router Traffic Grapher
  - Agentless network monitoring software
  - German Company: Paessler AG
  - First release: 2003

  - PRTG is a full-service monitoring solution
    - It can monitor and classify system conditions like bandwidth usage or uptime and collect statistics from miscellaneous hosts as switches, routers, servers and other devices and applications

PRTG, the collector

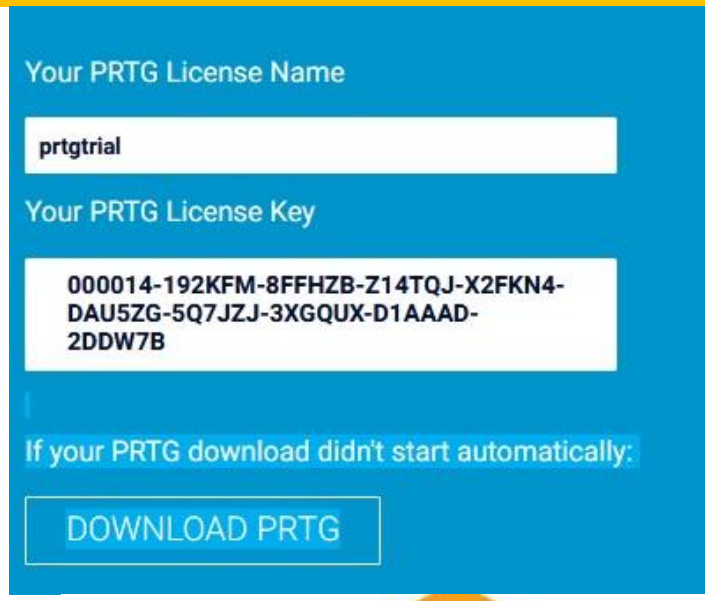
- Sensors
  - over 200 different predefined sensors
  - application sensors and hardware-specific sensors
- Web Interface and Desktop Client
  - AJAX-based web interface
  - desktop application for Windows and macOS (beta status)
- Notifications and Reports
  - Email and SMS
  - push notification on smartphones using an app
  - customizable reports
- Pricing
  - based on sensors
  - 100 integrated sensors is available free of charge
  - Usually, each MikroTik Traffic-Flow device represents one sensor

PRTG, IPFIX Sensor

- The IPFIX sensor receives traffic data from MikroTik Traffic-Flow and shows traffic by type. It filters traffic into different channels:
  - Chat (IRC, AIM)
  - Citrix
  - FTP/P2P (file transfer)
  - Infrastructure (network services: DHCP, DNS, Ident, ICMP, SNMP)
  - Mail (mail traffic: IMAP, POP3, SMTP)
  - NetBIOS
  - Remote control (RDP, SSH, Telnet, VNC)
  - WWW (web traffic: HTTP, HTTPS)
  - Total traffic
  - Other protocols (other UDP and TCP traffic)

PRTG Download and Install

- Go to https://www.paessler.com/
- Download PRTG (prtg.zip) and extract it; save the License name and key in a text file for later use
- Run the executable install. Steps are easy to follow.
  - Enter an email address to receive alerts
- When installation is complete
  - Login, Watch the video that pops up, change the password, set the SSL; it is yours to discover.. A lot of helping pop ups.. Read and follow..



PRTG Network Monitor

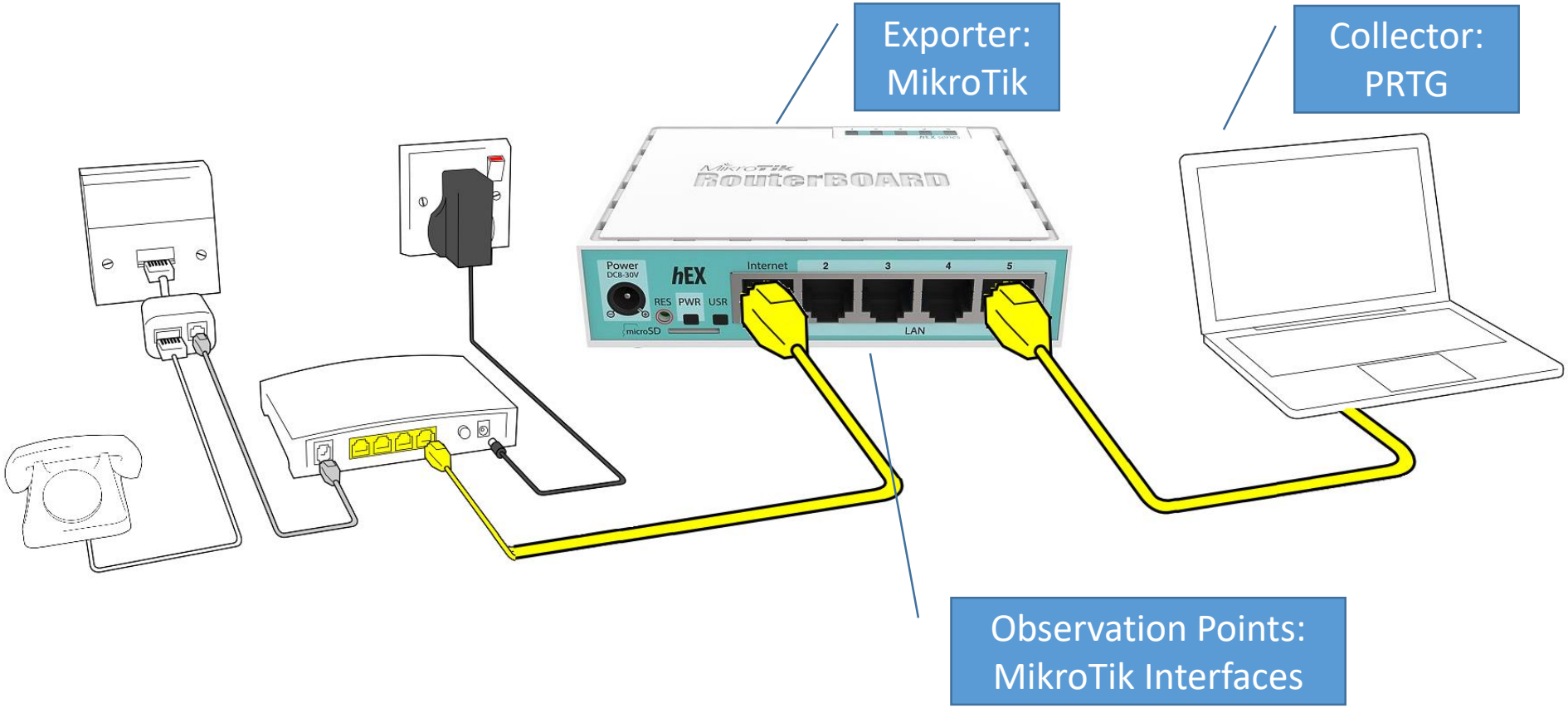
8:20:11 AM Init License
8:20:11 AM Init License Done
8:20:11 AM - 0% - Starting PRTG Core Server (1/1/2019)
8:20:12 AM - 1% - Read basic OSK Definitions: OK
8:20:12 AM - 2% - Read template defaults: OK
8:20:20 AM - 3% - Initialize Sensor Types: OK
8:20:32 AM - 4% - Initializing Help System

PRTG First things first

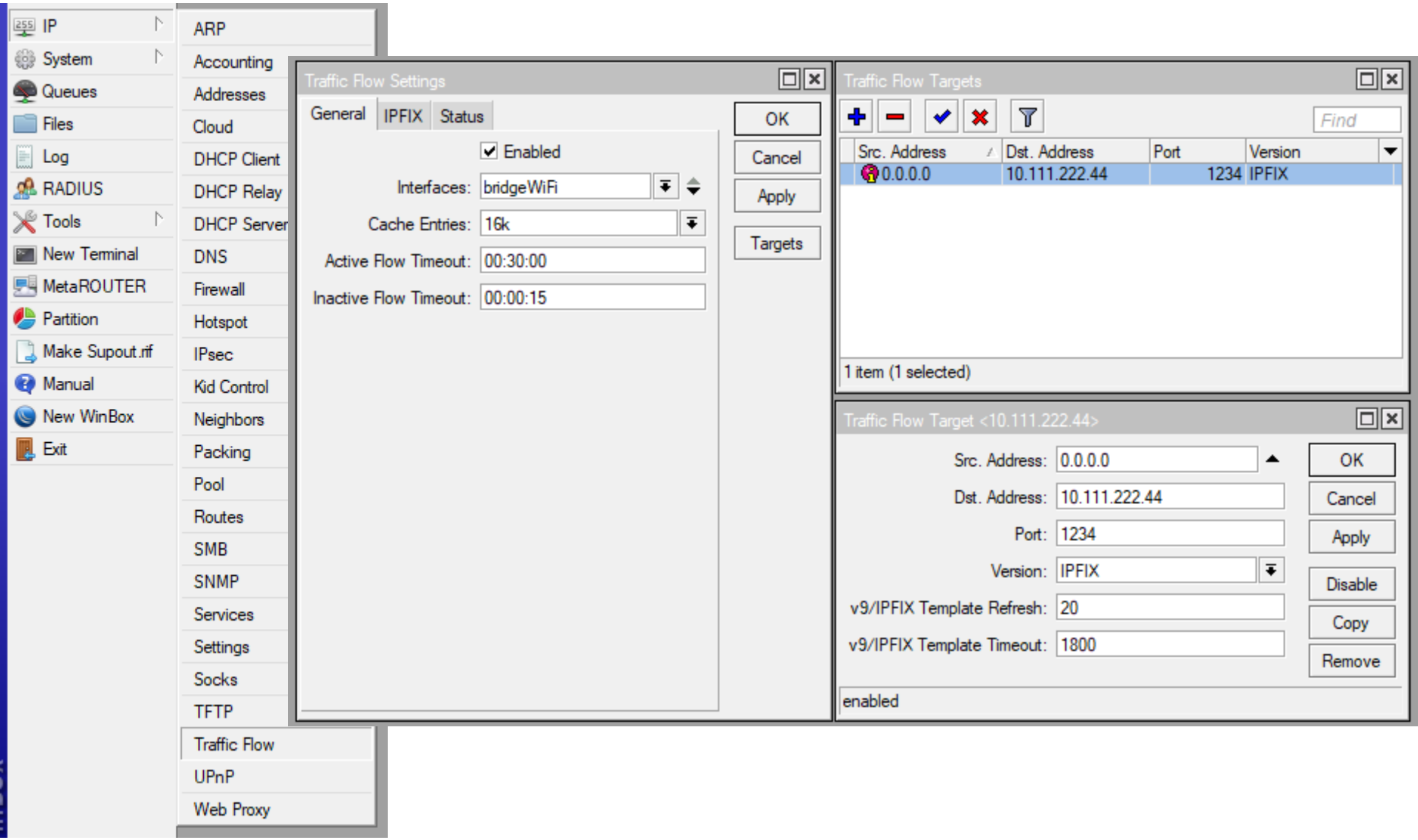
- PRTG auto discovery will attempt to discover your network and create a sensor for each probe it discovers
- Wait till auto-discovery finishes. Review the discovered devices and the created sensors. You will see a lot of sensors: ping, DNS, HTTP, SSL ….
  - Better to stop auto-discovery: Automatic auto-discovery is set on group or device level. You can change it in your group's or device's settings, section Group Type or Device Type, setting Sensor Management.
- Delete all the sensors discovered automatically because PRTG is free for the first 100 sensors only
  - You can disable the initial auto-discovery in a fresh PRTG installation. Simply run the installer in command prompt and add /NoInitialAutoDisco=1 as parameter

How To

- Configure the Exporter (MikroTik)
- Configure the Flow Record (MikroTik)
- Apply it to the Interface (MikroTik)
- Configure the Flow Monitor (PRTG)


Exporter:
MikroTik
Collector:
PRTG
Observation Points:
MikroTik Interfaces
RouterBOARD
Power
DC8-30V
hEX
Internet
2
3
4
5
RES
PWR
USR
microSD
LAN

MikroTik Traffic Flow Configuration



MikroTik Traffic Flow Configuration

- /ip traffic-flow set
  - #Settings for the exporter
  - interfaces=bridgeWiFi
    - #interfaces which will be used to gather statistics for traffic-flow
  - cache-entries=2k
    - #flows which can be in router's memory simultaneously
  - active-flow-timeout=30m
    - #maximum life-time of a flow
  - inactive-flow-timeout=15s
    - #how long to keep the flow active
  - enabled=yes

- /ip traffic-flow target
  - #Settings for the collector
  - add disabled=no
  - dst-address=10.111.222.44
  - port=1234
  - src-address=0.0.0.0
  - v9-template-refresh=20
  - v9-template-timeout=30m
  - version=ipfix

PRTG: Configure the Flow Monitor

- Select Add sensor
- Create a new device if necessary or use existing device
  - Usually the MikroTik RouterBoard is already discovered under network infrastructure
- Select Sensor type IPFIX
- Set the sensor settings. Most important:
  - Sensor Name
  - UDP Port
  - Active Flow Timeout

Add a sesnor

Add Sensor to Device hAP Mikrotik Traffic Flow [10.111.222.33]

Monitor What?

- Availability/Uptime
- CPU Usage
- Hardware Parameters
- Bandwidth/Traffic
- Disk Usage
- Network Infrastructure
- Speed/Performance
- Memory Usage
- Custom Sensors

< Cancel sensor creation

Search ipf

Matching Sensor Types

IPFIX

Monitors a switch using IPFIX

The router/switch must be configured to send compatible flow data to PRTG.

IPFIX (Custom)

Monitors a switch using IPFIX (customizable)

The router/switch must be configured to send compatible flow data to PRTG.

Add Sensor to Device hAP Mikrotik Traffic Flow [10.111.222.33]

< Cancel

Basic Sensor Settings

Sensor Name: IPFIX

Parent Tags:

Tags: bandwidthsensor × netflowsensor ×

Priority: ★★★☆☆

IPFIX Specific Settings

Receive IPFIX Packets on UDP Port:

This field is required.

Sender IP:

Receive IPFIX Packets on IP:

- [x] Probe's Local IPs
- [x] 10.0.2.15

Active Flow Timeout (Minutes):

This field is required.

Sampling Mode:

- (•) Off
- ( ) On

Log Stream Data to Disk (for Debugging):

- (•) None (recommended)
- ( ) Only for the 'Other' channel
- ( ) All stream data

Configure the Flow Monitor (PRTG)

Sensors | Alarm

- All
- Add Sensor
- Favorite Sensors
- Top 10 Lists
- By Current Value
- By Current Status
- By Uptime/Downtime
- By Type
- By Tag
- Cross Reference
- View Historic Data
- Similar Sensors Overview

Edit Object IPFIX

Basic Sensor Settings

Sensor Name

IPFIX

Parent Tags

Tags

bandwidthsensor × netflowsensor ×

Priority

★★★☆☆

IPFIX Specific Settings

Receive IPFIX Packets on UDP Port

1234

Sender IP

10.111.222.33

Receive IPFIX Packets on IP

- [x] Probe's Local IPs
- [x] 10.0.2.15

Active Flow Timeout (Minutes)

30

Edit Object IPFIX

Sampling Mode

- (•) Off
- ( ) On

Log Stream Data to Disk (for Debugging)

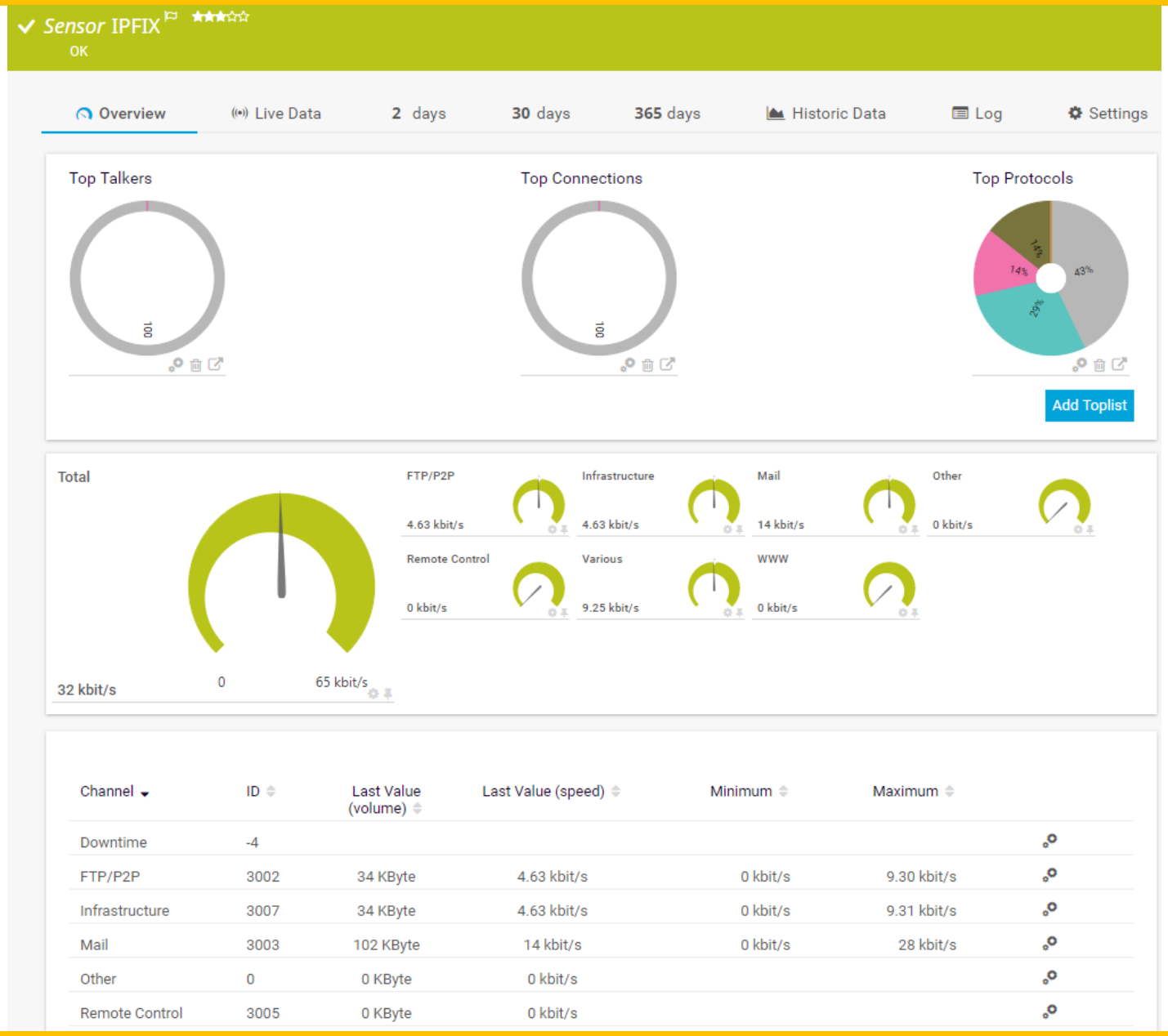
- (•) None (recommended)
- ( ) Only for the 'Other' channel
- ( ) All stream data

Channel Configuration

Channel Selection

Group	✖	✔	🔍	Content
Web	( )	(•)	( )	WWW Traffic: HTTP, HTTPS
File Transfer	( )	(•)	( )	File Transfer: FTP (Control)
Mail	( )	(•)	( )	Mail Traffic: IMAP, POP3, SMTP
Chat	( )	(•)	( )	Chat, Instant Messaging: IRC, AIM
Remote Control	( )	(•)	( )	Remote Control: RDP, SSH, Telnet, VNC
Infrastructure	( )	(•)	( )	Network Services: DHCP, DNS, Ident, ICMP, SNMP
NetBIOS	( )	(•)	( )	NetBIOS: NETBIOS
Citrix	( )	(•)	( )	Citrix: Citrix
Other Protocols	( )	(•)	( )	Various: OtherUDP, OtherTCP

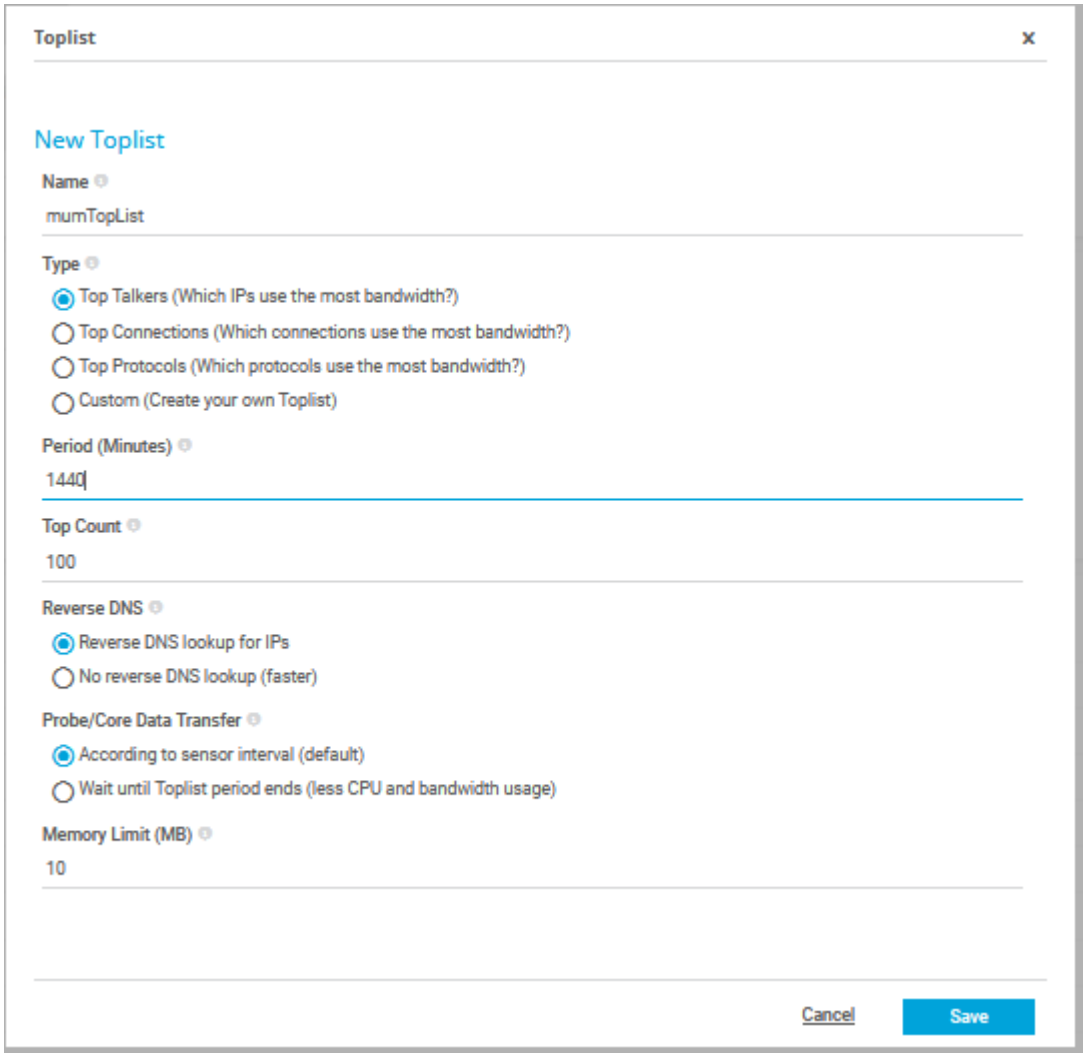
Sensor Overview



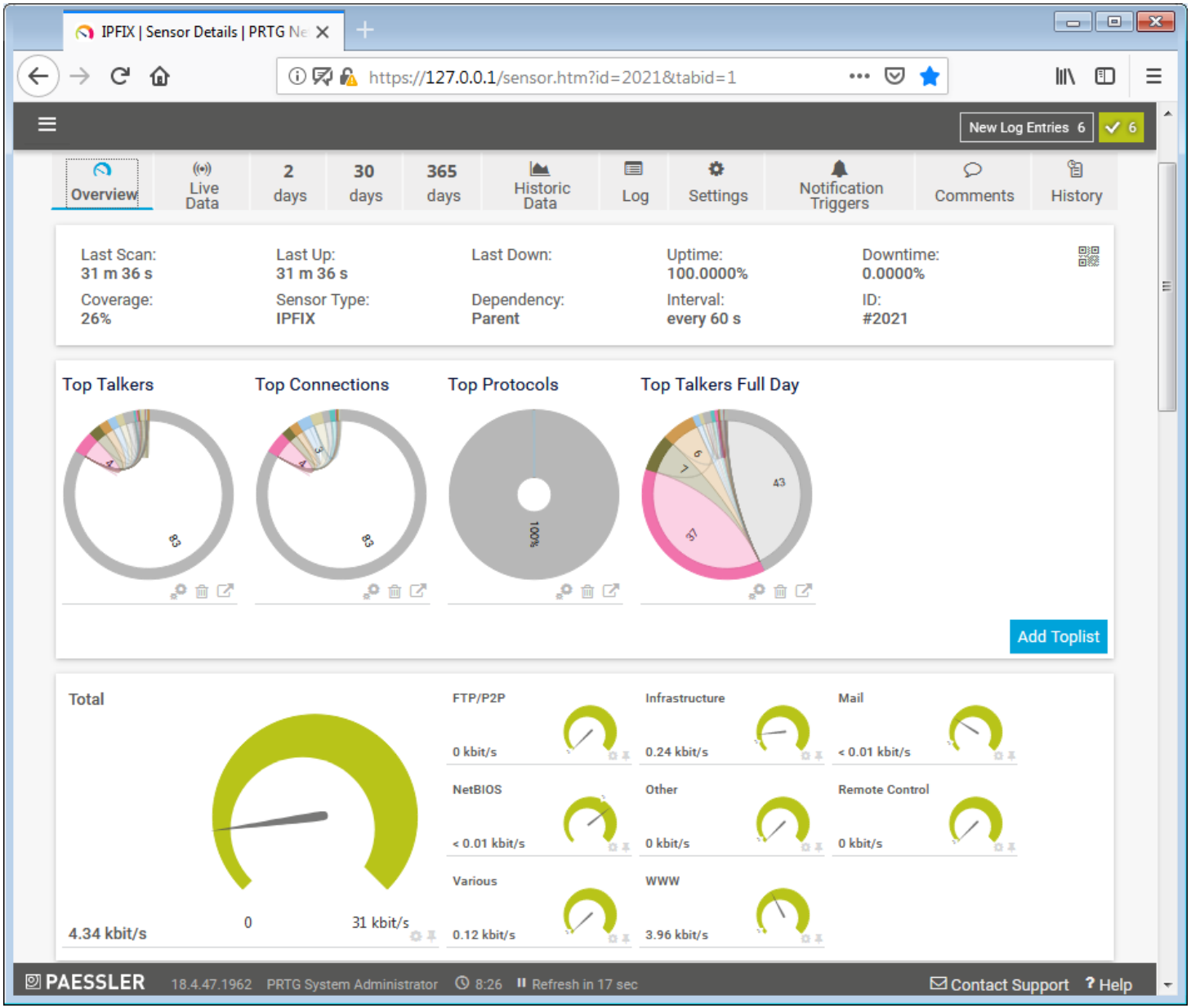
Channel	ID	Last Value (volume)	Last Value (speed)	Minimum	Maximum
Downtime	-4				
FTP/P2P	3002	34 KByte	4.63 kbit/s	0 kbit/s	9.30 kbit/s
Infrastructure	3007	34 KByte	4.63 kbit/s	0 kbit/s	9.31 kbit/s
Mail	3003	102 KByte	14 kbit/s	0 kbit/s	28 kbit/s
Other	0	0 KByte	0 kbit/s		
Remote Control	3005	0 KByte	0 kbit/s		

PRTG: Add Top lists

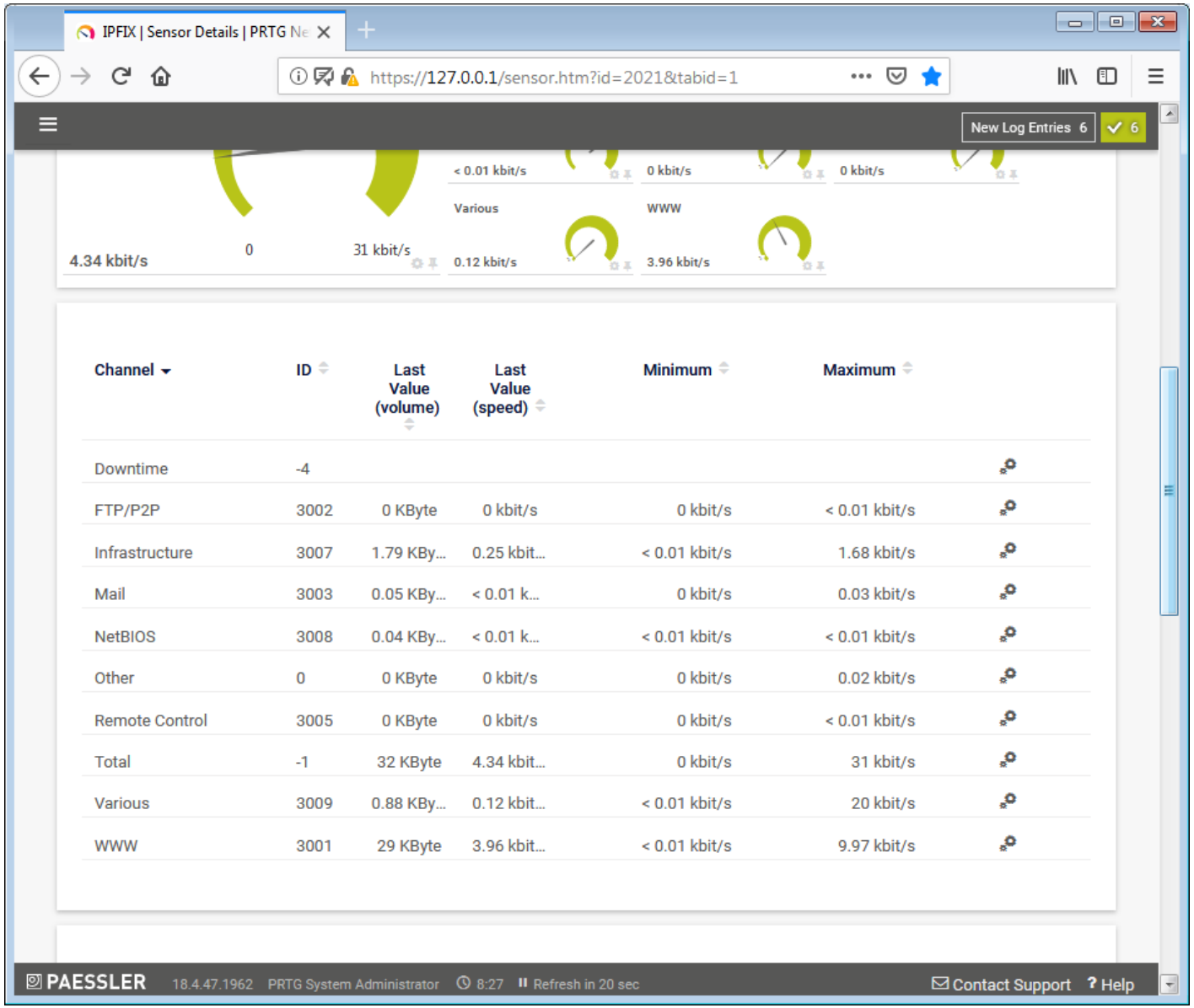
- PRTG comes with primary top lists
  - Top Talkers
  - Top Connections
  - Top Protocols
  - Custom Toplist



Sensor Overview



Sensor Channels



Channel	ID	Last Value (volume)	Last Value (speed)	Minimum	Maximum
Downtime	-4				
FTP/P2P	3002	0 KByte	0 kbit/s	0 kbit/s	< 0.01 kbit/s
Infrastructure	3007	1.79 KBy...	0.25 kbit...	< 0.01 kbit/s	1.68 kbit/s
Mail	3003	0.05 KBy...	< 0.01 k...	0 kbit/s	0.03 kbit/s
NetBIOS	3008	0.04 KBy...	< 0.01 k...	< 0.01 kbit/s	< 0.01 kbit/s
Other	0	0 KByte	0 kbit/s	0 kbit/s	0.02 kbit/s
Remote Control	3005	0 KByte	0 kbit/s	0 kbit/s	< 0.01 kbit/s
Total	-1	32 KByte	4.34 kbit...	0 kbit/s	31 kbit/s
Various	3009	0.88 KBy...	0.12 kbit...	< 0.01 kbit/s	20 kbit/s
WWW	3001	29 KByte	3.96 kbit...	< 0.01 kbit/s	9.97 kbit/s

Sensor Live Data

IPFIX | Sensor Details | PRTG Ne

https://127.0.0.1/sensor.htm?id=2021&tabid=2

New Log Entries 6 | 6

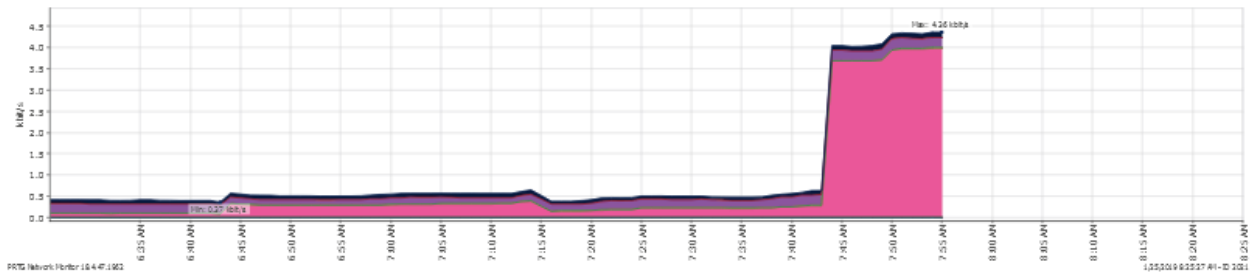
Devices | Local Probe | Network Discovery | Network Infrast... | hAP Mikrotik Tr... | IPFIX

Sensor IPFIX

OK

Overview | Live Data | 2 days | 30 days | 365 days | Historic Data | Log | Settings | Notification Triggers | Comments | History

Last Scan: 31 m 27 s	Last Up: 31 m 27 s	Last Down:	Uptime: 100.0000%	Downtime: 0.0000%
Coverage: 26%	Sensor Type: IPFIX	Dependency: Parent	Interval: every 60 s	ID: #2021

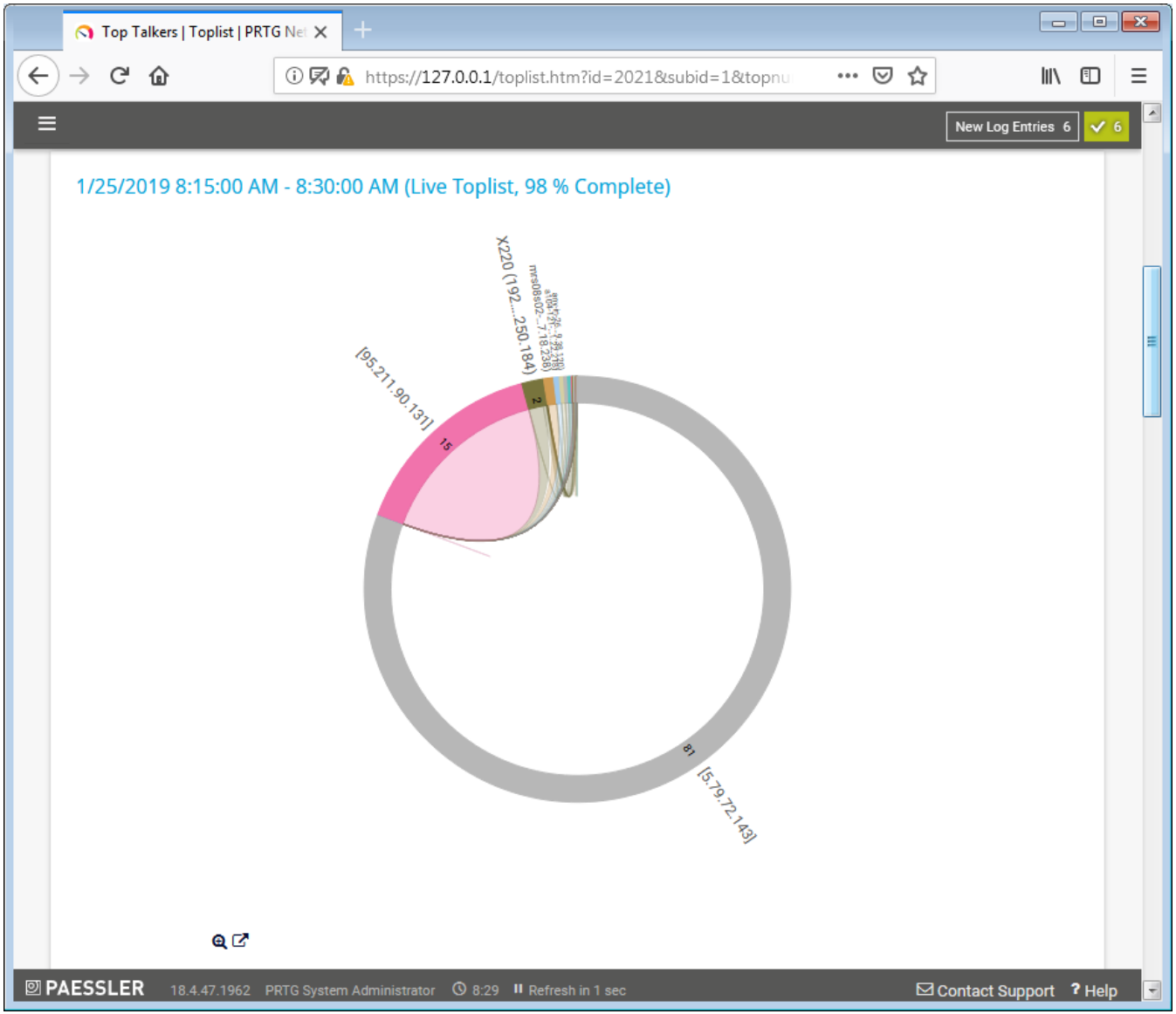


Downtime	(%)	Total	(kbit/s)	Other	(kbit/s)
WWW	(kbit/s)	FTP/P2P	(kbit/s)	Mail	(kbit/s)
Remote Control	(kbit/s)	Infrastructure	(kbit/s)	NetBIOS	(kbit/s)
Various	(kbit/s)				

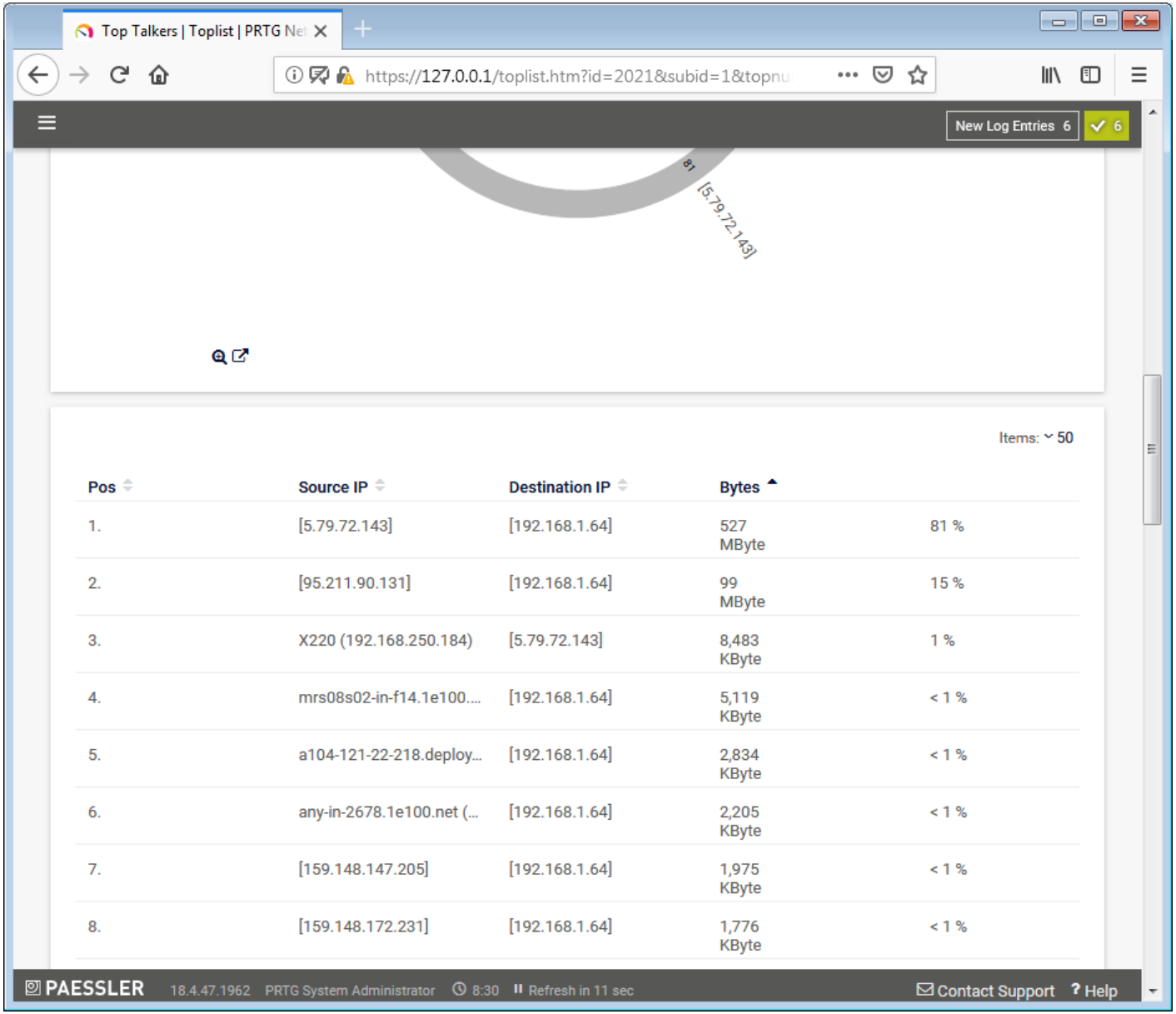
Show all | Hide all

PAESSLER 18.4.47.1962 PRTG System Administrator 8:25 Refresh in 14 sec Contact Support ? Help

Sensor Live Data

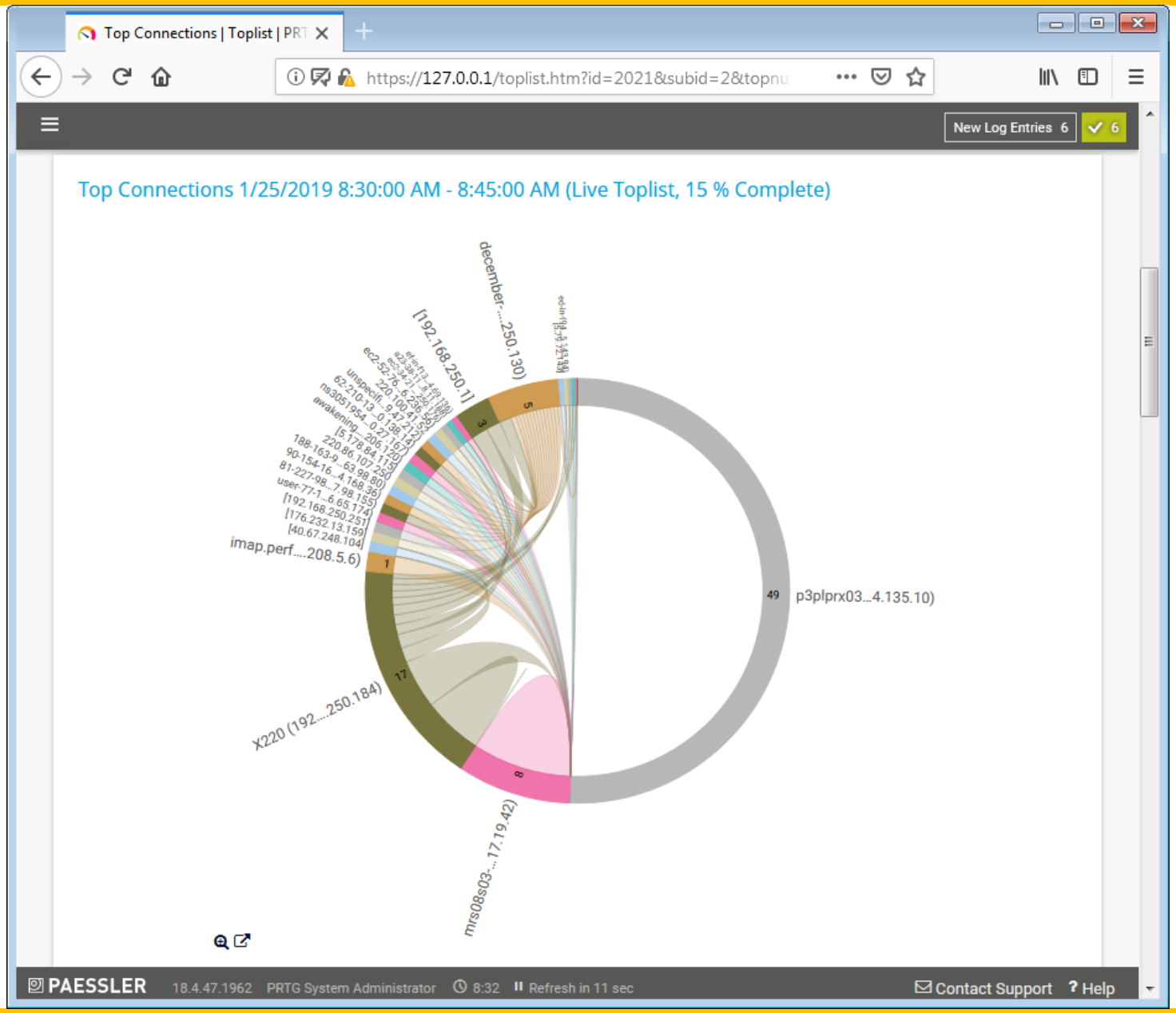


Sensor Live Data Detailed list

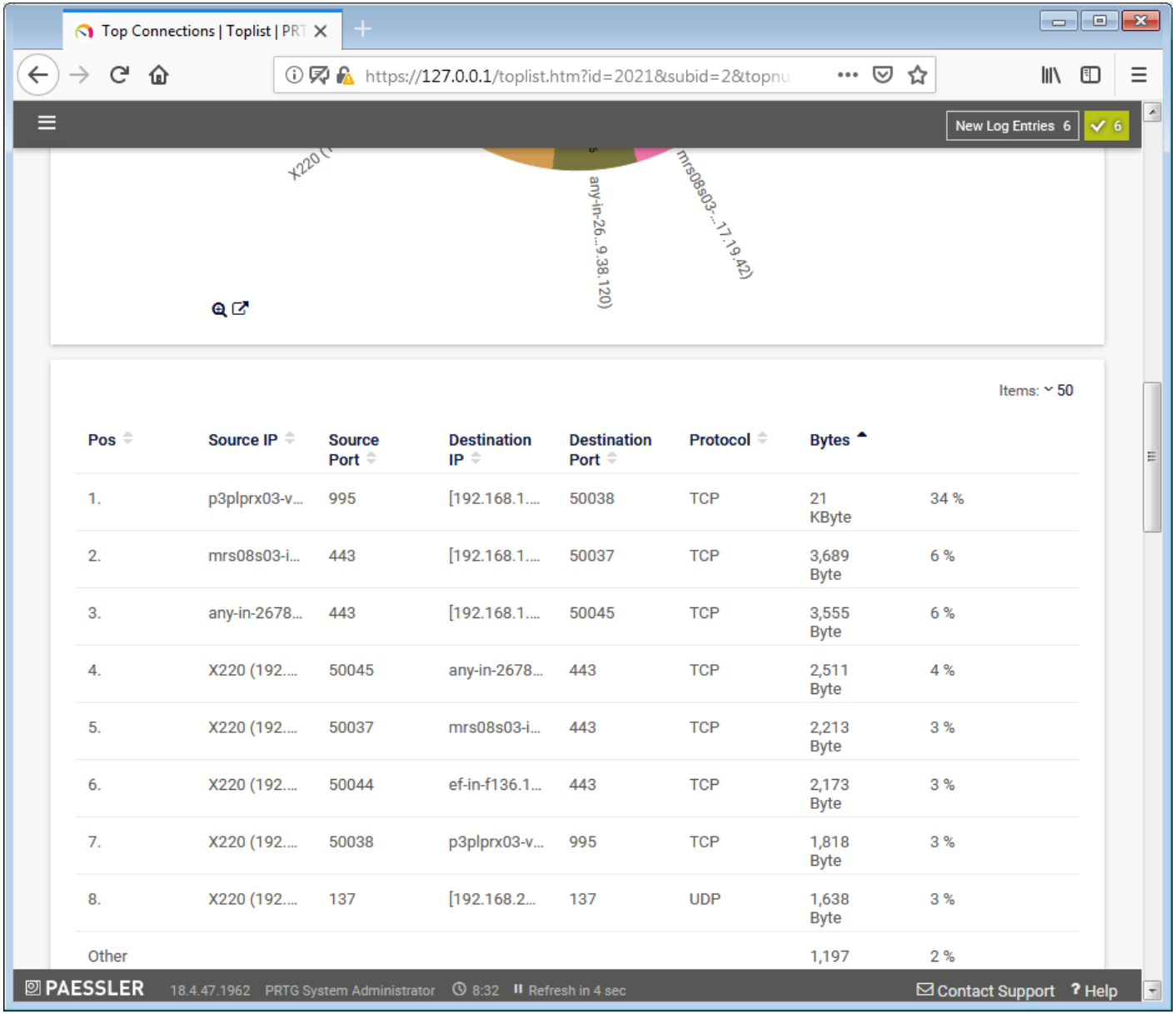


Pos	Source IP	Destination IP	Bytes	
1.	[5.79.72.143]	[192.168.1.64]	527 MByte	81 %
2.	[95.211.90.131]	[192.168.1.64]	99 MByte	15 %
3.	X220 (192.168.250.184)	[5.79.72.143]	8,483 KByte	1 %
4.	mrs08s02-in-f14.1e100....	[192.168.1.64]	5,119 KByte	< 1 %
5.	a104-121-22-218.deploy...	[192.168.1.64]	2,834 KByte	< 1 %
6.	any-in-2678.1e100.net (...	[192.168.1.64]	2,205 KByte	< 1 %
7.	[159.148.147.205]	[192.168.1.64]	1,975 KByte	< 1 %
8.	[159.148.172.231]	[192.168.1.64]	1,776 KByte	< 1 %

Top Connections

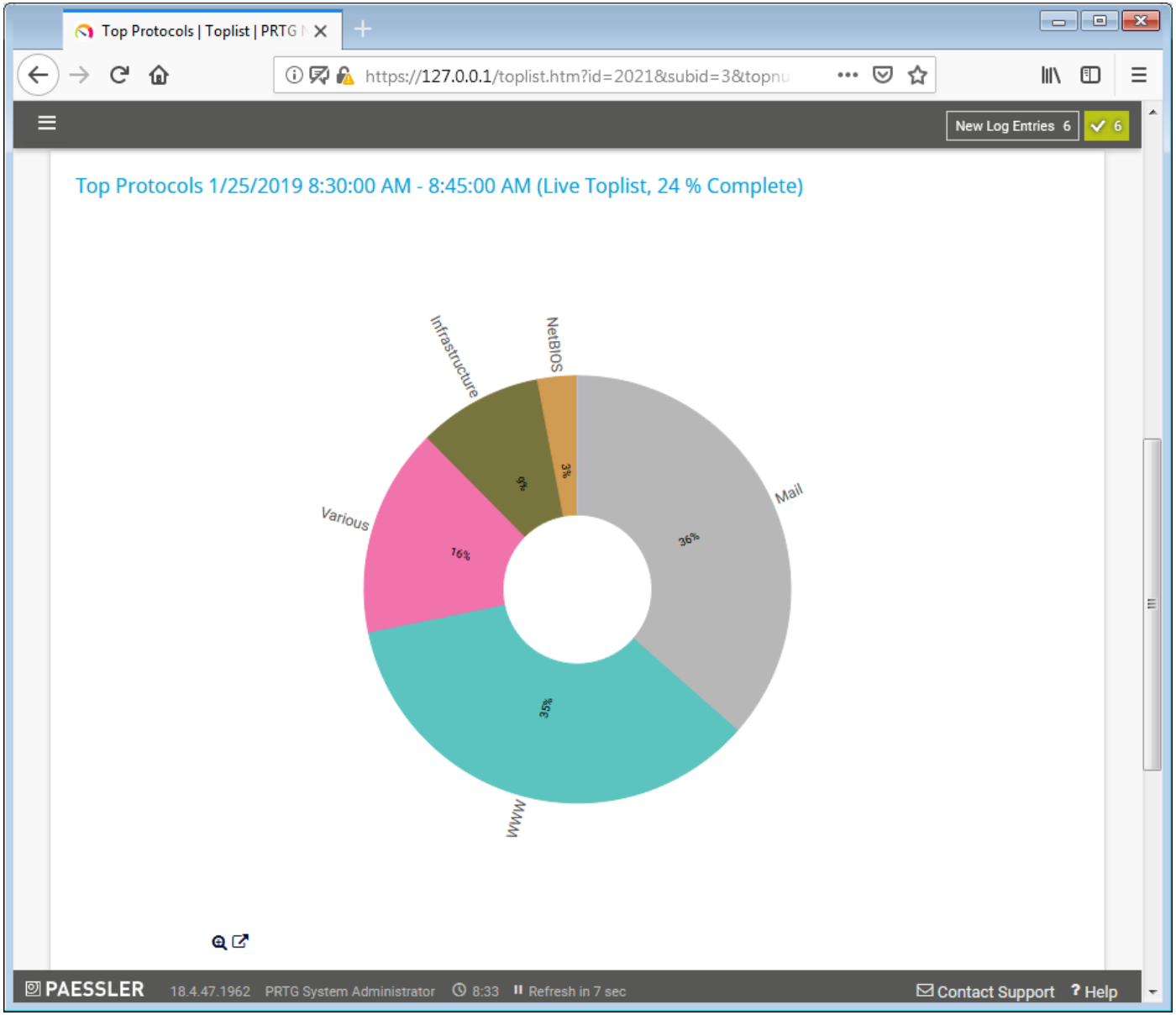


Top Connections Detailed List

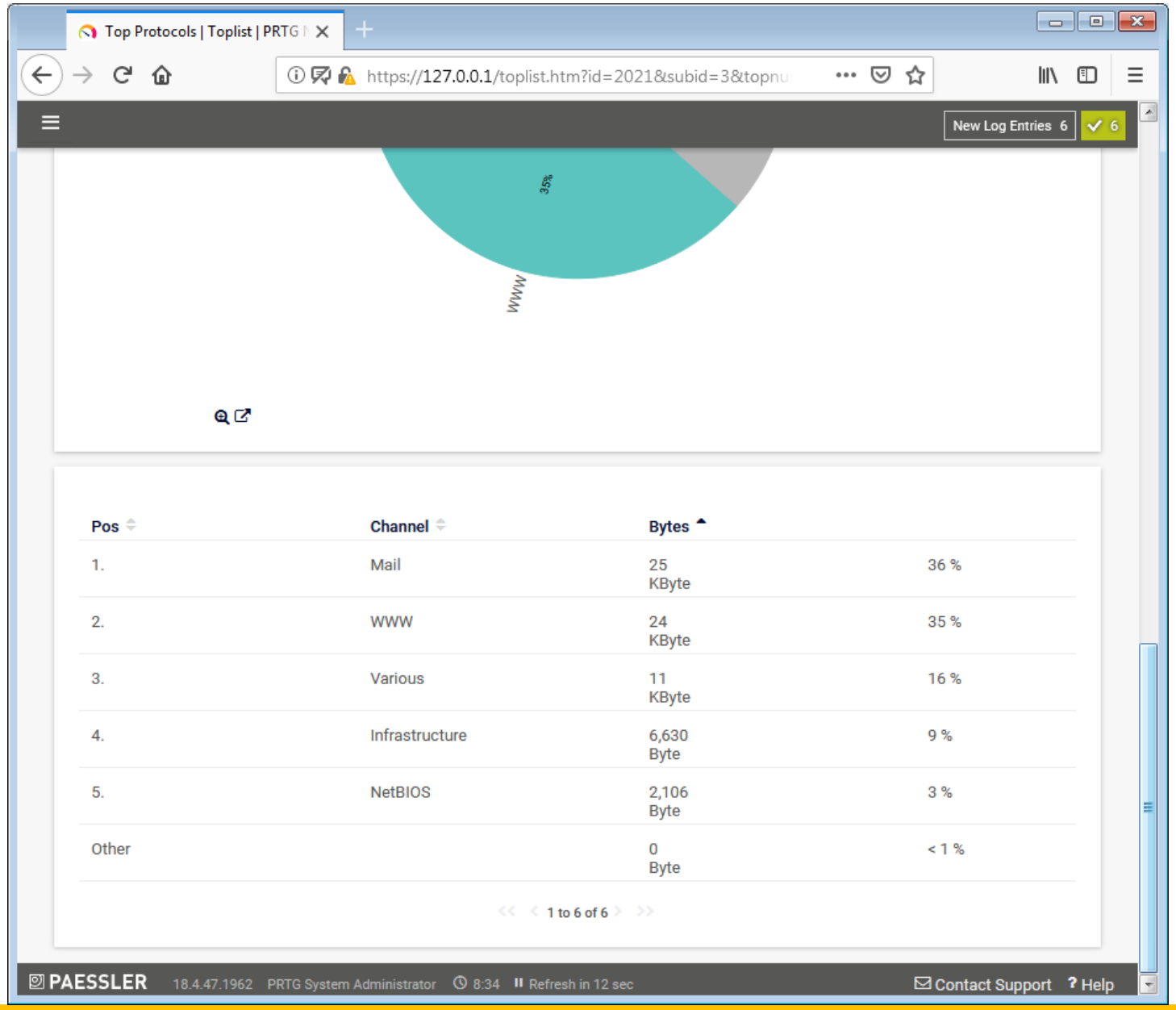


Pos	Source IP	Source Port	Destination IP	Destination Port	Protocol	Bytes	
1.	p3plprx03-v...	995	[192.168.1....	50038	TCP	21 KByte	34 %
2.	mrs08s03-i...	443	[192.168.1....	50037	TCP	3,689 Byte	6 %
3.	any-in-2678...	443	[192.168.1....	50045	TCP	3,555 Byte	6 %
4.	X220 (192....	50045	any-in-2678...	443	TCP	2,511 Byte	4 %
5.	X220 (192....	50037	mrs08s03-i...	443	TCP	2,213 Byte	3 %
6.	X220 (192....	50044	ef-in-f136.1...	443	TCP	2,173 Byte	3 %
7.	X220 (192....	50038	p3plprx03-v...	995	TCP	1,818 Byte	3 %
8.	X220 (192....	137	[192.168.2...	137	UDP	1,638 Byte	3 %
Other						1,197	2 %

Top Protocols



Top Protocols details



Thank you

☺

Questions?