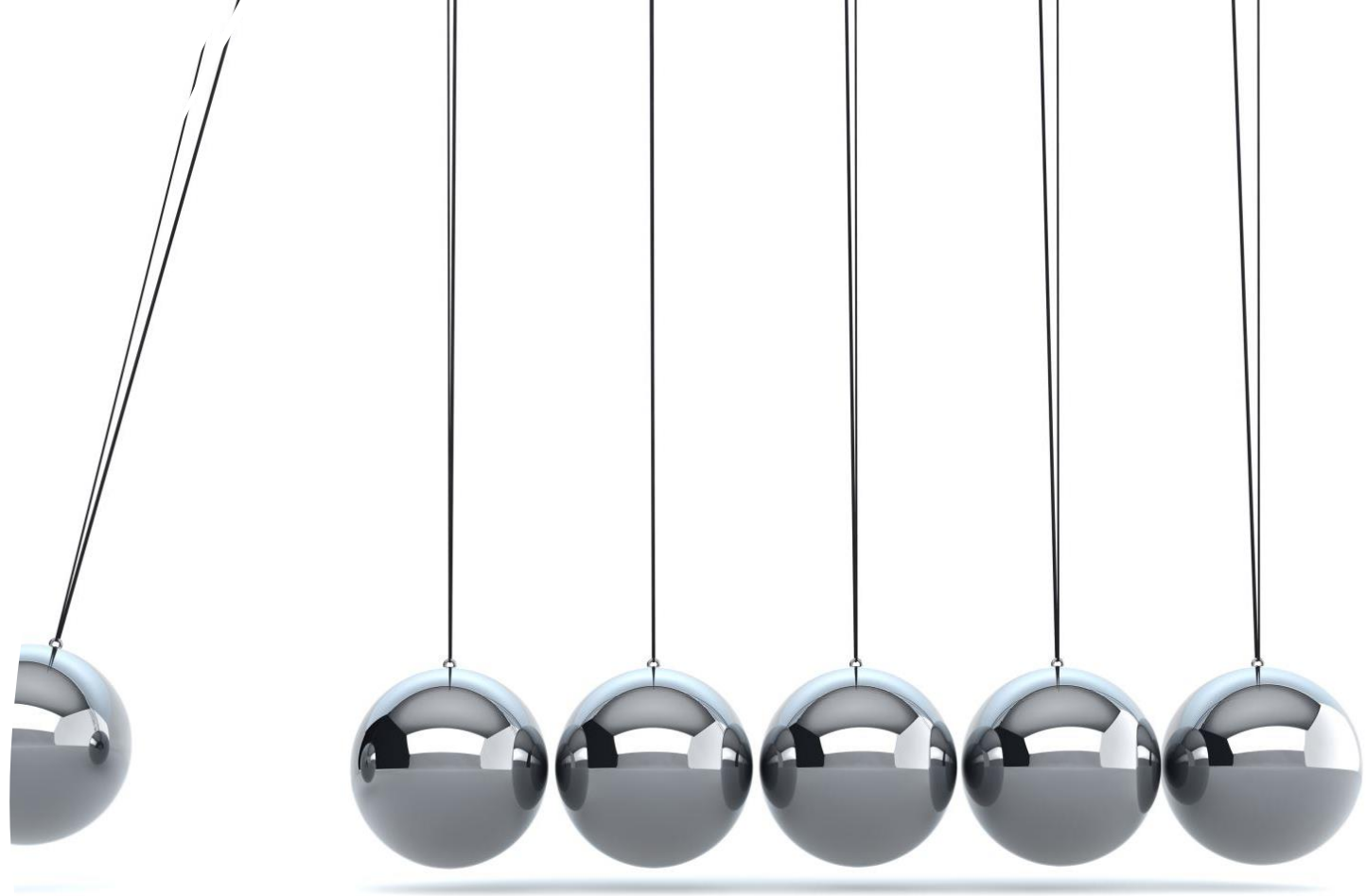


Case Study

Re-define network visibility for capacity planning & forecasting with Grafana

CASE-1: Objective/Goal

Integrate & Correlate Usage & Latency data sets from multiple Collectors/Probes for Capacity Planning & Performance Analytics



Popular Monitoring Tools used in BD



Monitoring Software Type Comparison

ICMP Based monitoring

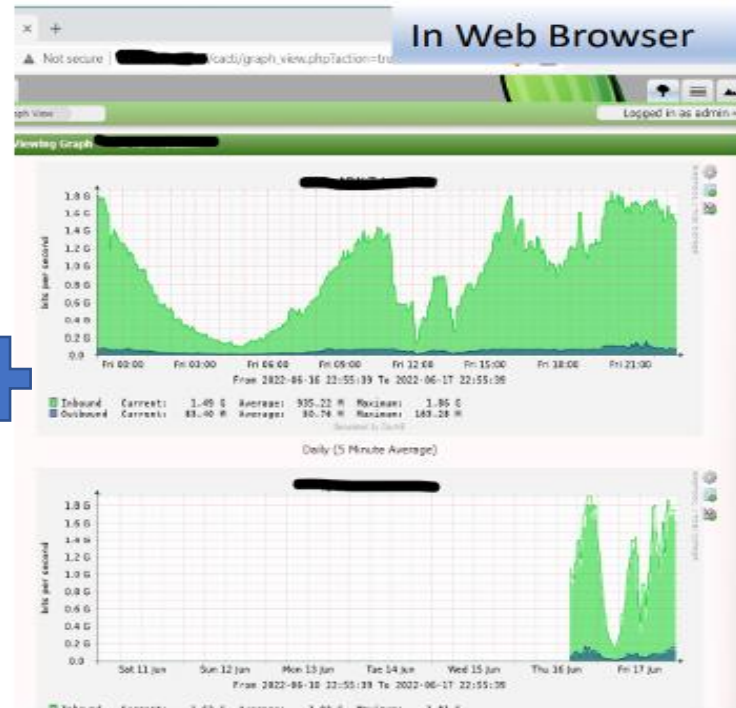
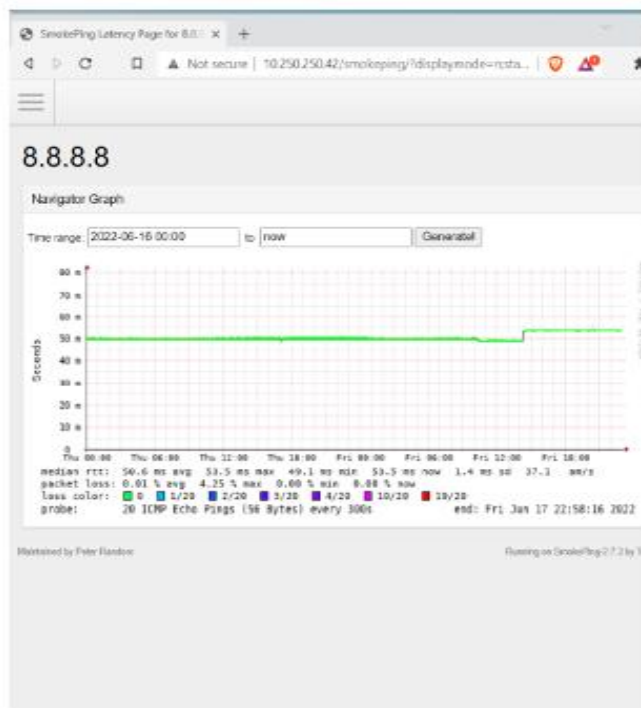
- Zabbix
- Solarwinds
- PRTG
- Smokeping
- Nagios

SNMP Based Monitoring

- Zabbix
- Solarwinds
- PRTG
- Cacti
- LibreNMS
- Observium
- Nagios

Operational Challenges

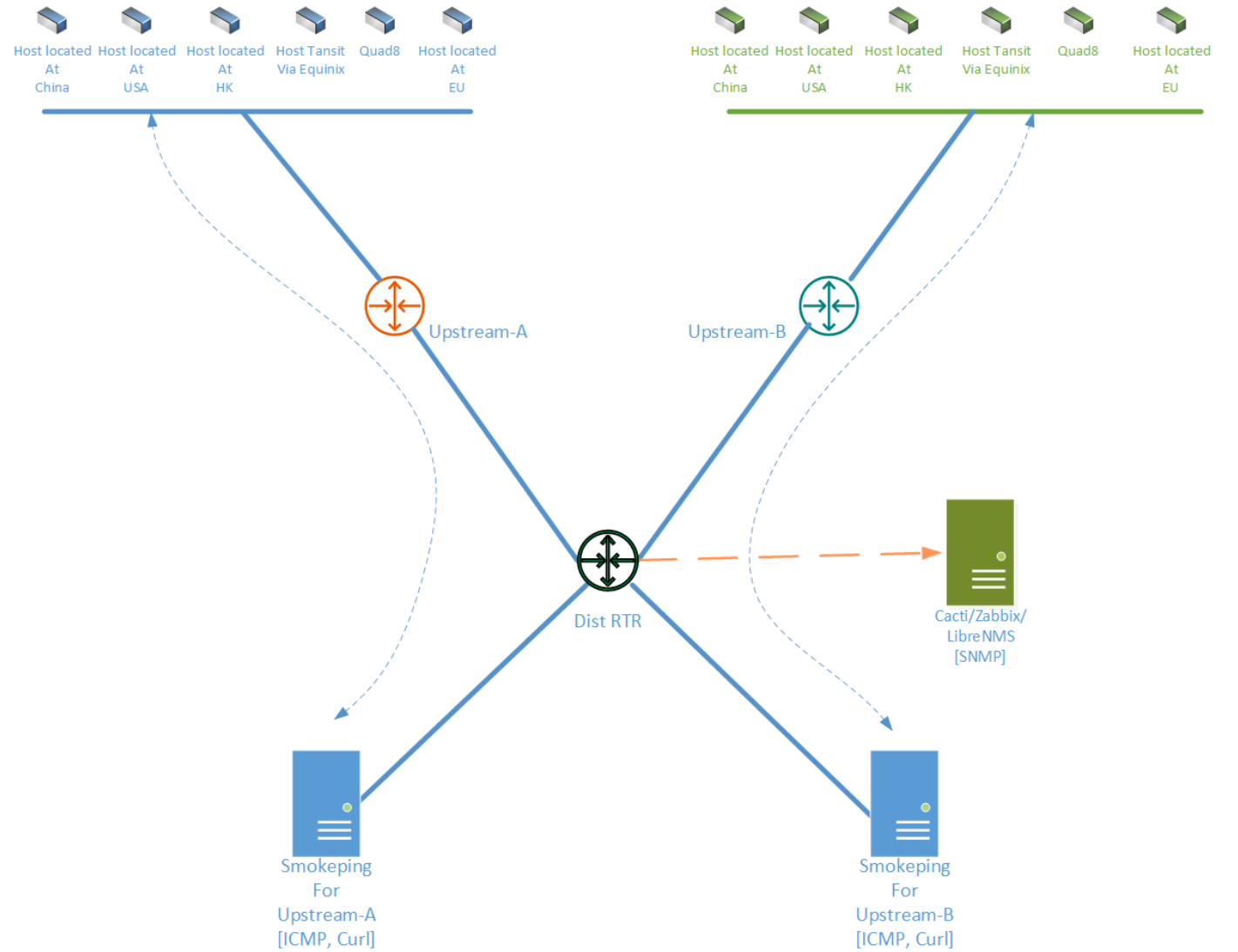
- Tracking & Logging Latency deviation from ISP prefixes
- Transit Provider Performance Analysis correlating ICMP & SNMP data sets
- Too much manual works also time consuming & error prone
- Timeline based aggregated comparison was not possible



Operational Challenges (contd.)

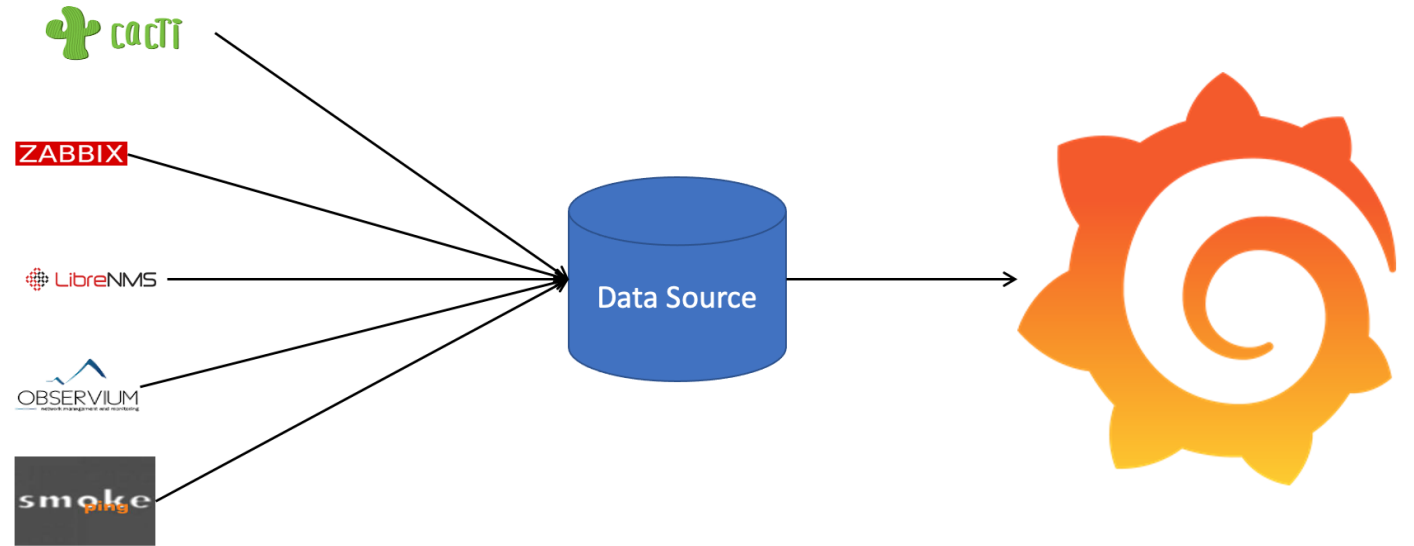
- **Capacity planning & forecast:**
 - Threshold target was not statistically available
 - Aggregated Transit usage was needed for upgrade/downgrade plans
 - Management Dashboard was needed
- **Reporting:**
 - Manual records with multiple Screen Shots and Excel file logs for incidents
- **Ops Notes:**
 - Need to keep the existing platforms safe (data integrity) to avoid unforeseen risks
 - Need solution for cross platform data integration

Monitoring System Topology: Existing

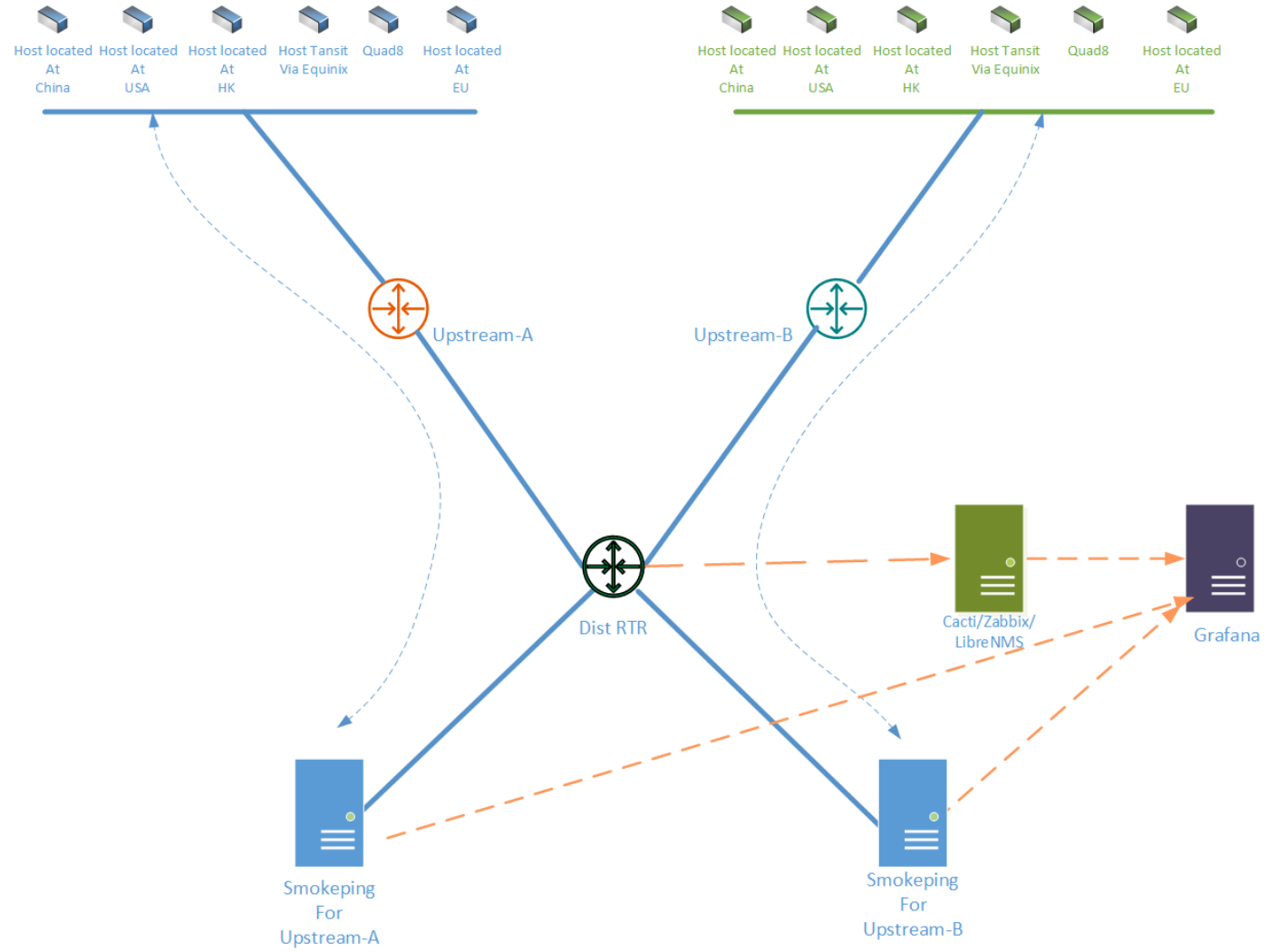


Selecting Grafana

- Grafana is an open-source interactive data-visualization platform, developed by [Grafana Labs](#), which allows users to see their data via charts and graphs that are unified into one dashboard (or multiple dashboards!) for easier interpretation and understanding. You can also query and set alerts on your information and metrics from wherever that information is stored.



Monitoring System Topology: with Grafana



Data Sources for Grafana integration

- Cacti & Smokeping
 - Grafana SimpleJson datasource with Grafana-rrd-Server
- Zabbix
 - Zabbix App
- Librenms & Observium
 - Grafana mysql data source [Need to configure mysql database to allow Grafana Server IP for accessing database and run the query]
 - Grafana InfluxDB Data Source

Grafana Integration Steps

Installation Steps:

1. Install Grafana
2. Install Grafana-rrd-Server in Cacti & Smokeping server
3. Add SimpleJson Data-Sources at Grafana server
4. Add Zabbix App at Grafana server

Configuration Steps:

1. Create a new Dashboard at Grafana
2. Selected the *data-source* and run required query
3. Select in-built graphing options for graph
4. Start ICMP & SNMP based data correlation & performance analysis

Installation & Integration Challenges

Key notes on RRD:

- Most of the graphing softwares like *cacti/smokeping/librenms* store values to *rrd files* and use those rrd files to generate graphs
- These *rrd files* need to be readable via Grafana SimpleJSON data-collector

Importing rrd values:

- Install small software/script called **Grafana RRD Server** which works as a bridge between existing rrd based graphing softwares and Grafana
- Follow online installation process:
Download/Install Link: <https://github.com/doublemarket/grafana-rrd-server>
- Allow server firewall to listen to port 9000 for Grafana
`grafana-rrd-server -p 9000 -r /path/to/rrds -s 300`

Configuration Samples

Adding Data Source

Data Sources / smokeping
Type: SimpleJson

Settings

Name: smokeping Default

HTTP

URL: 10.250.250.42:9000

Access: Server (default) Help >

Allowed cookies: New tag (enter key to add)

Timeout: Timeout in seconds

Auth

Basic auth With Credentials

TLS Client Auth With CA Cert

Skip TLS Verify

Forward OAuth Identity

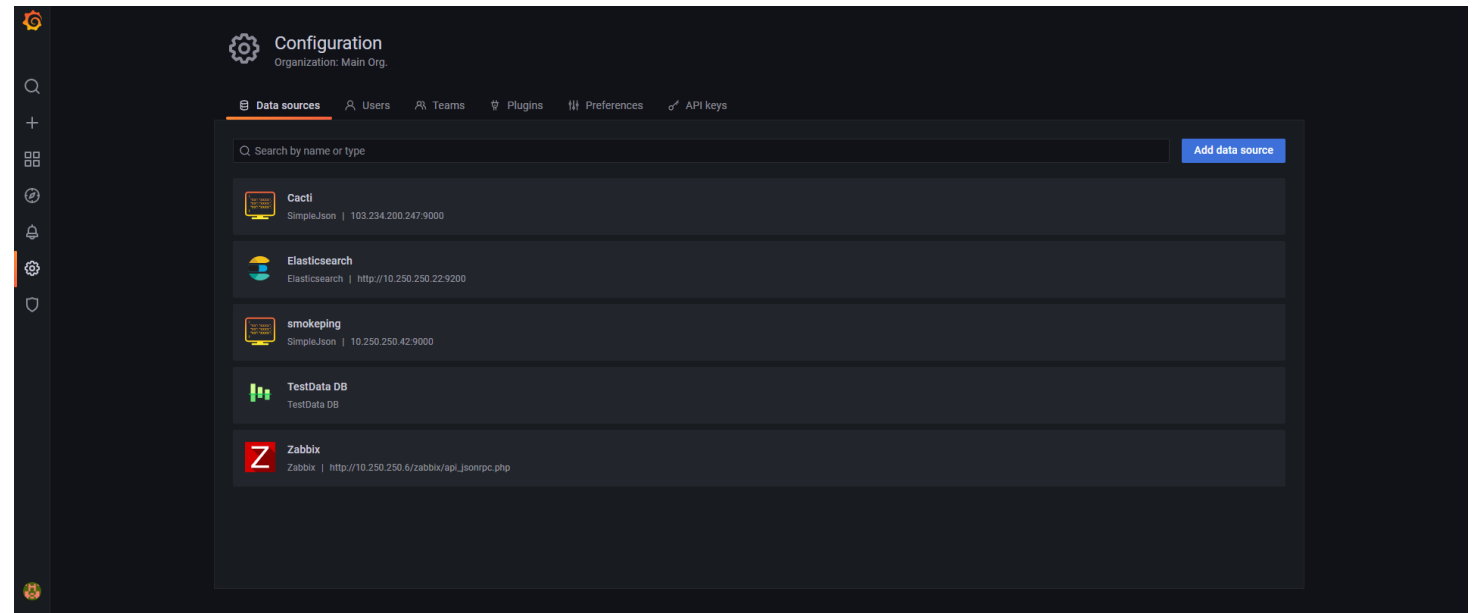
Custom HTTP Headers

+ Add header

Back Explore Delete Save & test

Configuration Samples

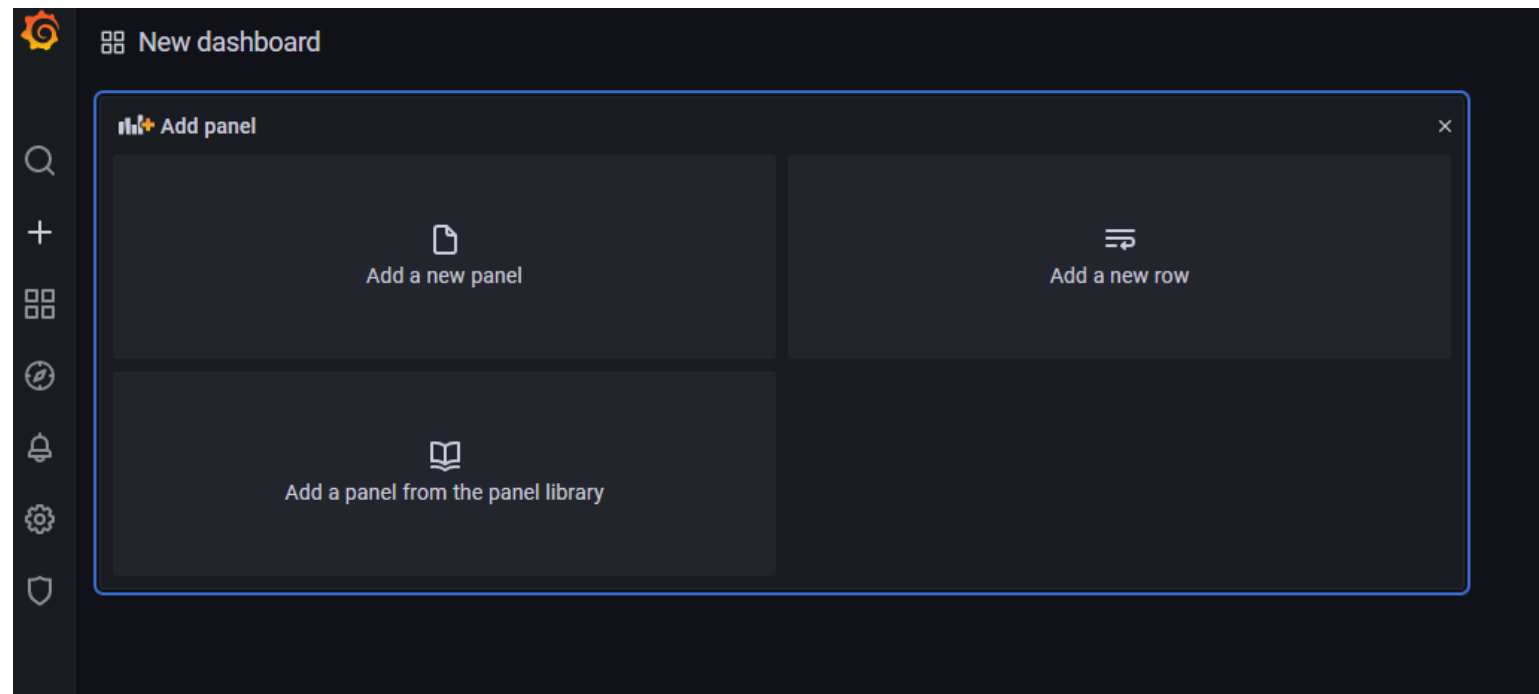
- **Data-Source Panel:**
- Each Remote server [Cacti/Smokeping/Zabbix] needs a separate data-source





Configuration Samples

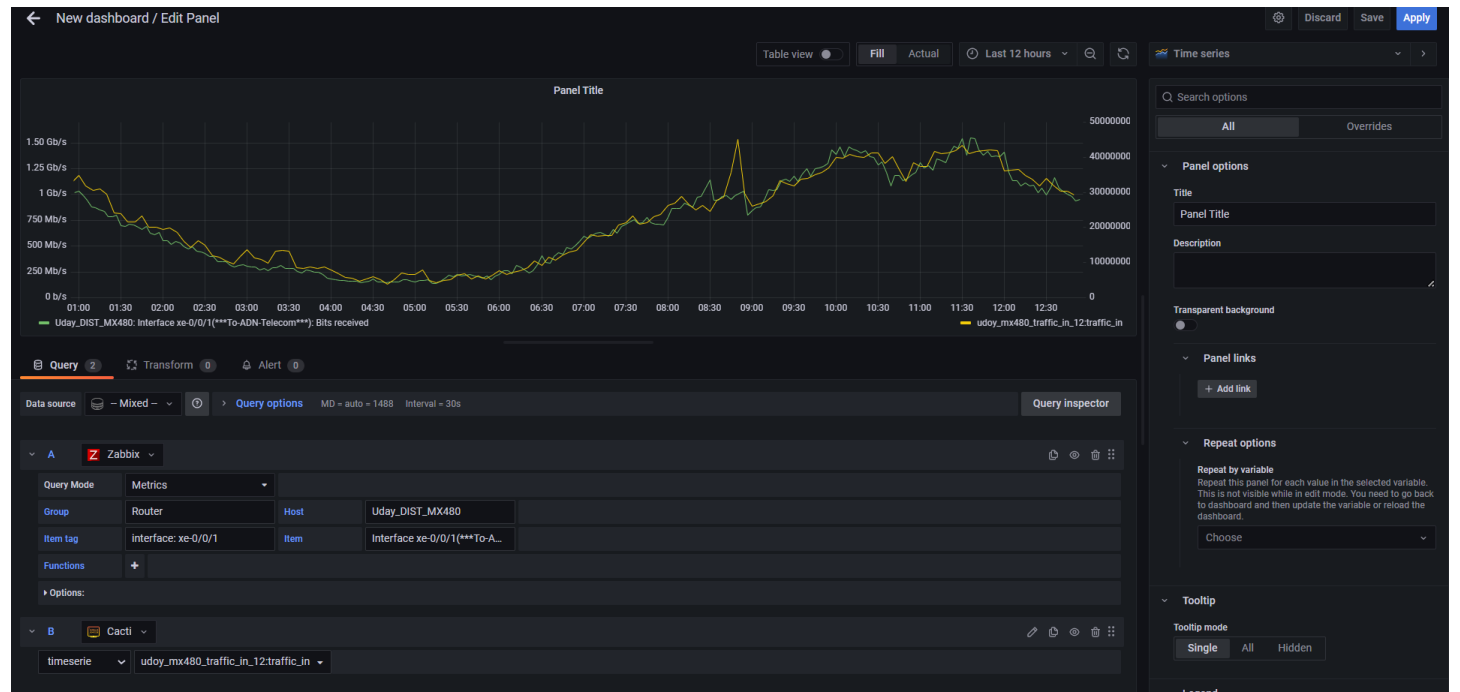
Creating Dashboard





Configuration Samples

Creating Dashboard – contd.



Outcome - Cross Platform Data Correlation

Multiple data-sources are combined
into one dashboard



Results – *we need a end point!*

Challenges

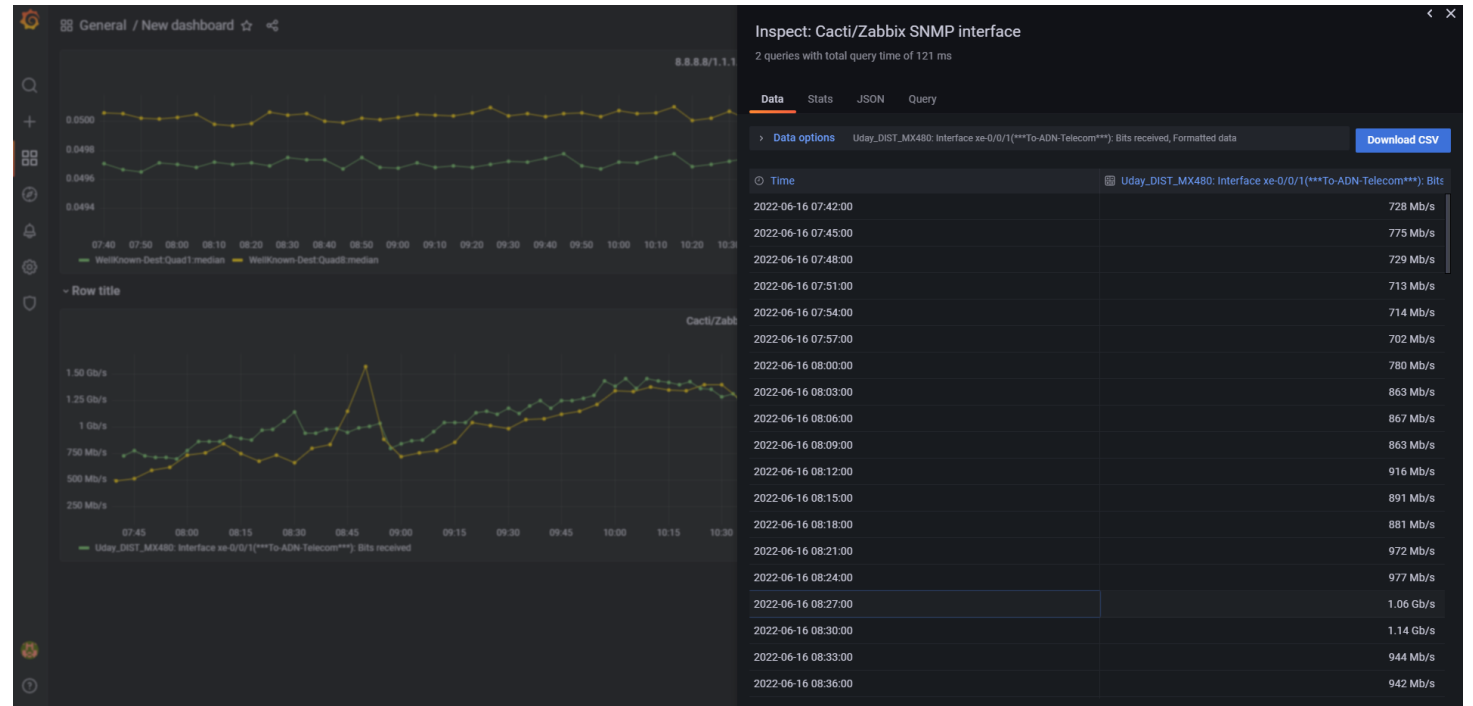
- **Capacity planning & forecast:**
 - Threshold target was not statistically available
 - Aggregated Transit usage was needed for upgrade/downgrade plans
 - Management Dashboard was needed
- **Reporting:**
 - Manual records with multiple Screen Shots and Excel file logs for incidents
- **Ops Notes:**
 - Need to keep the existing platforms safe (data integrity) to avoid unforeseen risks
 - Need solution for cross platform data integration

Results

- **Capacity planning & forecast:**
 - Link Threshold found in between 89-91% utilization
 - Timeline based aggregated Transit usage was recorded in 5 mins granular interval with no data loss.
 - Management Dashboard was made possible
- **Reporting:**
 - Accurately report weekly peak usage and plan for necessary upgrade/downgrade
 - Live Graph comments were available for more readily available reports
- **Ops Notes:**
 - Avoided the risk of re-tuning all existing platforms
 - Achieved Cross-Platform Data integration for correlated analytics

Still not done!!! 😊

- Exporting data (CSV):
- 5 min interval Full/Partial records are available in CSV format in a couple of clicks.
- This can later be used for more extensive reporting!





Little more!!!

Not only Graphs but Features can also be combined in a single dashboard



CASE-2: Objective/ Goal

An alternative approach to view
Mikrotik PPPoE interface
historical usage using Zabbix &
Grafana

Hardware & Software used for Retail network



Mikrotik Routers [CCR Series Mostly]



In-house developed OSS/BSS software billing & client management



Zabbix Server



Grafana Server

Operation Challenges

Widely used features like these

1. PPPoE users' session status
[Connection/Disconnection/Failed]
2. Usage history





Are missing

To resolve
Problem-2
[Usage
history]

1. Enabled SNMP at Mikrotik NAS/BRAS
2. Installed Zabbix Server and Start probing Mikrotik interfaces using built-in Mikrotik templates

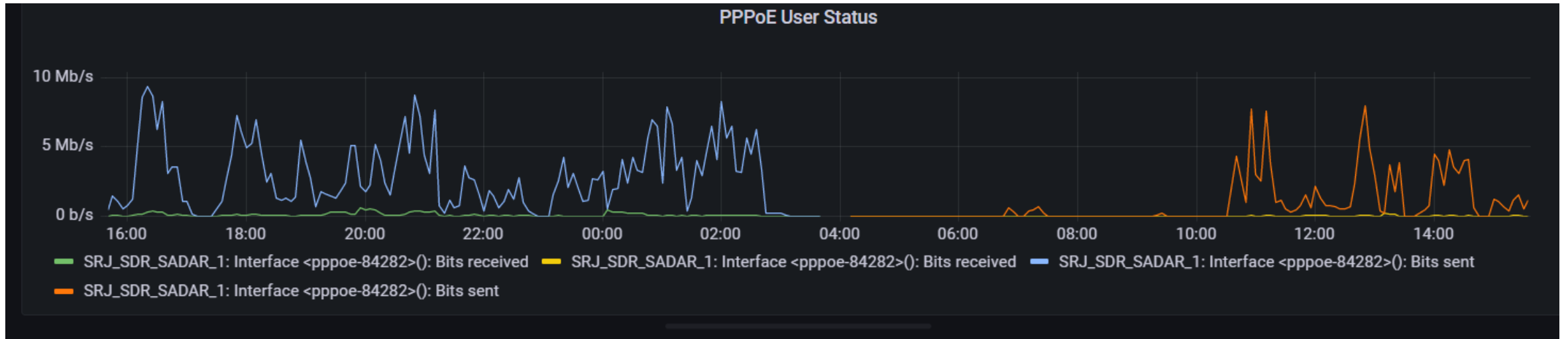
Configuration challenges

As PPPoE interfaces are created dynamically, their SNMP index values keep changing every time session starts. So its impossible to generate static graphs using rrd number.

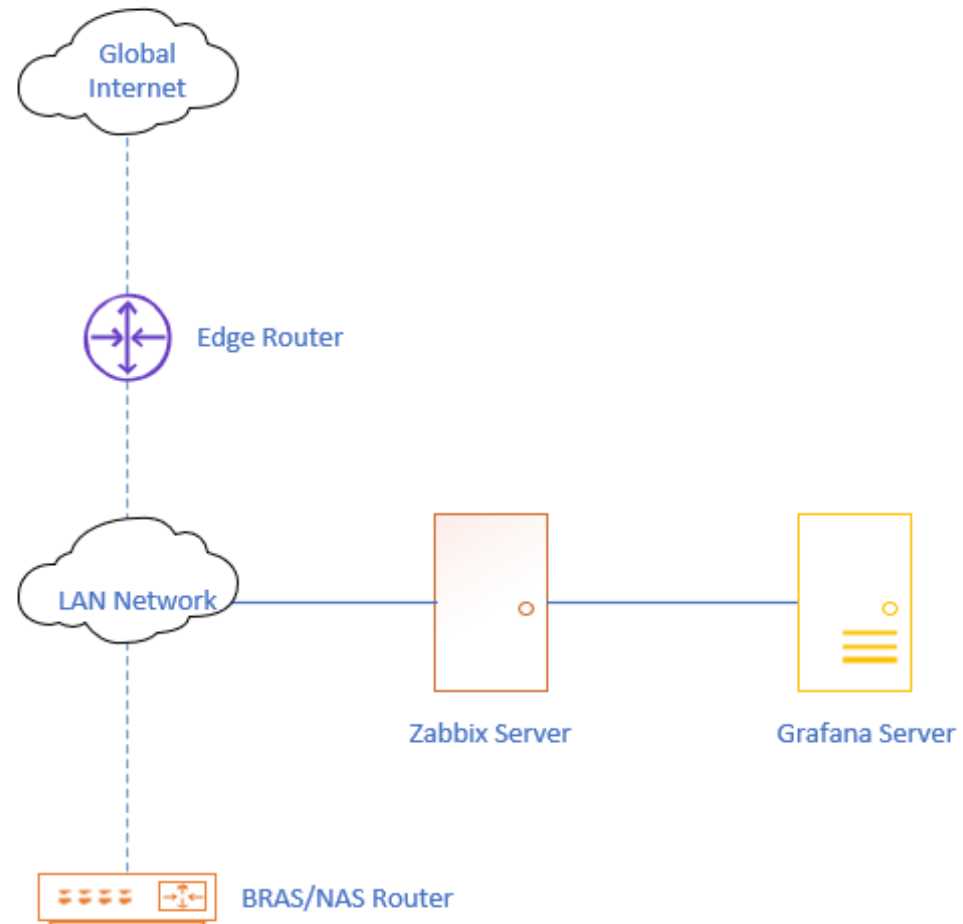
Interface <pppoe-84282>(): Bits received ?	11h 51m 3s	24 bps	-1.79 Kbps	component: network description interface: <pppoe-84282>	Graph 
Interface <pppoe-84282>(): Bits received ?	59s	34.64 Kbps	-30.47 Kbps	component: network description interface: <pppoe-84282>	Graph
Interface <pppoe-84282>(): Bits sent ?	11h 50m 58s	48 bps	-608 bps	component: network description interface: <pppoe-84282>	Graph 
Interface <pppoe-84282>(): Bits sent ?	55s	576.46 Kbps	-1.01 Mbps	component: network description interface: <pppoe-84282>	Graph
Interface <pppoe-84282>(): Interface type ?	23h 30m 34s	ppp (23)		component: network description interface: <pppoe-84282>	Graph 
Interface <pppoe-84282>(): Interface type ?	10h 30m 57s	ppp (23)		component: network description interface: <pppoe-84282>	Graph
Interface <pppoe-84282>(): Operational status ?	11h 51m 3s	up (1)		component: network description interface: <pppoe-84282>	Graph 
Interface <pppoe-84282>(): Operational status ?	1m 4s	up (1)		component: network description interface: <pppoe-84282>	Graph

Workaround

At this point we found Grafana provides excellent way to generate the time series graph which we are looking for



Setup scenario



Data Source & Template used for this

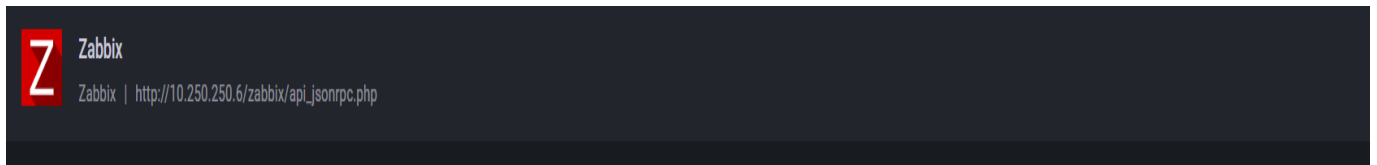
- Zabbix:

- Builtin Mikrotik Templates

<input type="checkbox"/>	Name ▲	Hosts	Items	Triggers	Graphs	Dashboards	Discovery	Web	Linked templates	Linked to templates	Tags
<input type="checkbox"/>	MikroTik CCR1009-7G-1C-1S+PC SNMP	Hosts 2	Items 18	Triggers 10	Graphs 1	Dashboards 1	Discovery 8	Web			class: network target: ccr1009-7g-1c-1... target: mikrotik
<input type="checkbox"/>	MikroTik CCR1009-7G-1C-1S+ SNMP	Hosts 13	Items 18	Triggers 10	Graphs 1	Dashboards 1	Discovery 8	Web			class: network target: ccr1009-7g-1c-1... target: mikrotik
<input type="checkbox"/>	MikroTik CCR1009-7G-1C-PC SNMP	Hosts	Items 18	Triggers 10	Graphs 1	Dashboards 1	Discovery 8	Web			class: network target: ccr1009-7g-1c-pc target: mikrotik
<input type="checkbox"/>	MikroTik CCR1016-12G SNMP	Hosts	Items 18	Triggers 10	Graphs 1	Dashboards 1	Discovery 8	Web			class: network target: ccr1016-12g target: mikrotik
<input type="checkbox"/>	MikroTik CCR1016-12S-1S+ SNMP	Hosts	Items 18	Triggers 10	Graphs 1	Dashboards 1	Discovery 8	Web			class: network target: ccr1016-12s-1spl... target: mikrotik
<input type="checkbox"/>	MikroTik CCR1036-8G-2S+EM SNMP	Hosts	Items 18	Triggers 10	Graphs 1	Dashboards 1	Discovery 8	Web			class: network target: ccr1036-8g-2spl... target: mikrotik
<input type="checkbox"/>	MikroTik CCR1036-8G-2S+ SNMP	Hosts 10	Items 18	Triggers 10	Graphs 1	Dashboards 1	Discovery 8	Web			class: network target: ccr1036-8g-2splus target: mikrotik
<input type="checkbox"/>	MikroTik CCR1036-12G-4S-EM SNMP	Hosts	Items 18	Triggers 10	Graphs 1	Dashboards 1	Discovery 8	Web			class: network target: ccr1036-12g-4s-em target: mikrotik
<input type="checkbox"/>	MikroTik CCR1036-12G-4S SNMP	Hosts 4	Items 18	Triggers 10	Graphs 1	Dashboards 1	Discovery 8	Web			class: network target: ccr1036-12g-4s target: mikrotik
<input type="checkbox"/>	MikroTik CCR1072-1G-8S+ SNMP	Hosts	Items 18	Triggers 10	Graphs 1	Dashboards 1	Discovery 8	Web			class: network target: ccr1072-1g-8spl... target: mikrotik

- Grafana:

- Zabbix App



Grafana Query

Inspect: PPPoE User Status

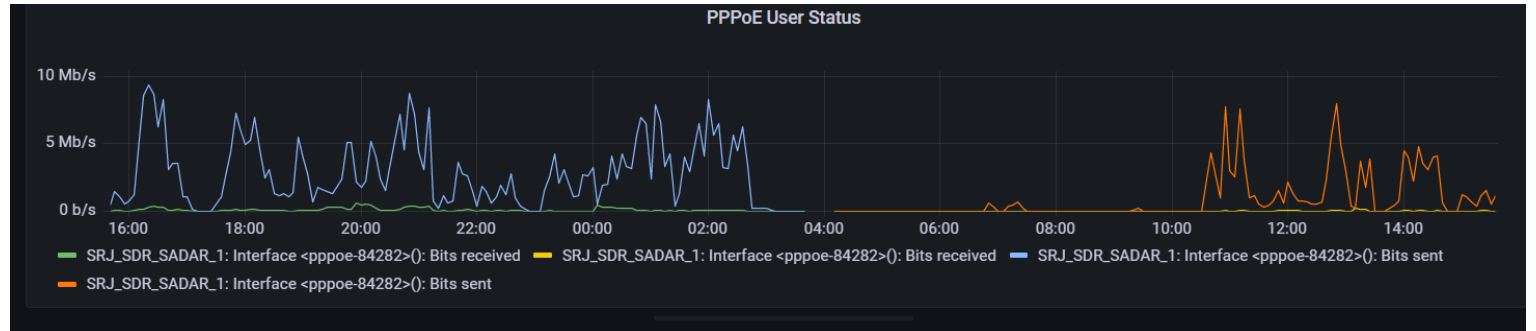
2 queries with total query time of 1 s

Data Stats JSON Query

```
request: object
  url: "api/ds/query"
  method: "POST"
  data: Object
    queries: Array[2]
      0: Object
        application: Object
        datasource: Object
        functions: Array[0]
        group: Object
        hide: false
        host: Object
          filter: "SRJ_SDR_SADAR_1"
        item: Object
          filter: "Interface <pppoe-84282>(): Bits received"
        itemTag: Object
          filter: "interface: <pppoe-84282>"
        options: Object
        proxy: Object
        queryType: "0"
        refId: "A"
        resultFormat: "time_series"
        table: Object
```

```
1: Object
  application: Object
  datasource: Object
  functions: Array[0]
  group: Object
  hide: false
  host: Object
    filter: "SRJ_SDR_SADAR_1"
  item: Object
    filter: "Interface <pppoe-84282>(): Bits sent"
  itemTag: Object
    filter: "interface: <pppoe-84282>"
  options: Object
  proxy: Object
  queryType: "0"
  refId: "B"
  resultFormat: "time_series"
```

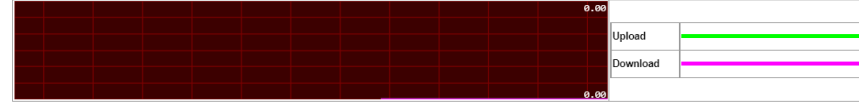
Outcome/Result at Grafana Dashboard



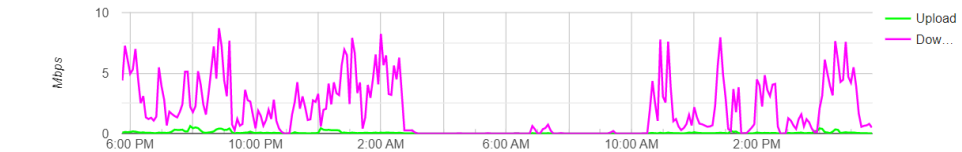
Result for Udoy OSS/BSS

shared.udoyadn.com/OnuData/GetInternetUsages?id=mkB79vlwFQG7cjCr7BpMXwawspfmpeawspfmpe

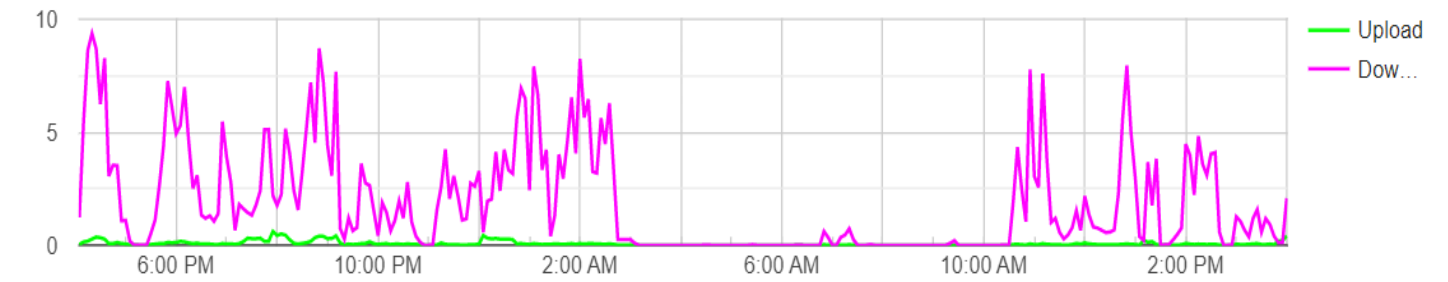
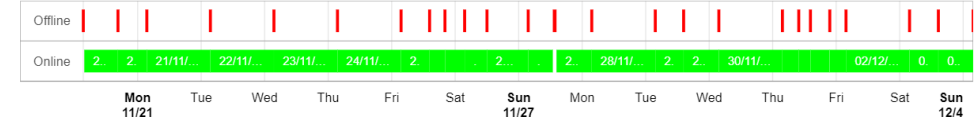
Subscriber Code:	09610300490	Customer Mac:	28:87:BA:A3:19:D7, Vendor: TP-Link Corporation Limited, Country: HK
PPPOE UserID:	84282	Last connected time:	DEC/04/2022 03:46:31 (13H54...)
Session Expire:	36	Total upload during current session:	1.11 MB
		Total download during current session:	7.12 GB
Mikrotik Address:	{id:*183,list:Padma,address:10.64.1.138,creation-time:jun 02 2022 13:28:05,dynamic:false,disabled:false,comment:84282}		
Mikrotik Secret:	{id:*C47,name:84282,service:pppoe,password:046044,profile:Padma,local-address:10.64.1.1,remote-address:10.64.1.138,limit-bytes-in:0,limit-bytes-out:0,last-logged-out:dec 04 2022 03:45:33,last-caller-id:28:87:BA:A3:19:D7,last-disconnect-reason:nas-request,disabled:false}		



Subscriber usages graph for Last 24 Hours



Subscriber connect/disconnect timeline to router.





Questions & Answers





Thank You

