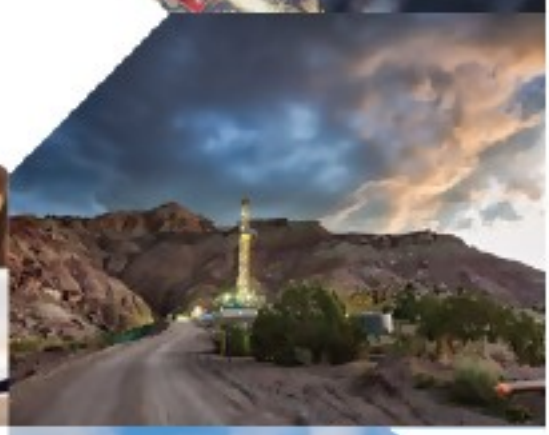
Cambium Networks™



QOE RATE PLAN MANAGEMENT

USING REST API & PYTHON

Cambium Networks QoE

Version (1.1)

Contents

Introduction

This tool allows the QoE user to manage subscriber rate plans from any system using REST APIs. QoE REST API documentation is available at Cambium Networks support site (https://support.cambiumnetworks.com/files/qoe_qoe/).

The script is developed by Cambium Networks to illustrate how to use REST APIs to manage subscribers rate plans. The script can be updated by end users to meet their system configuration and network model.

Functionality

The tool provides the following functionalities:

1- Add Rate Policy (Service Plan)
2- Update Rate Policy (Service Plan)
3- Delete Rate Policy (Service Plan)
4- Retrieve Rate Policy (Service Plan)
5- Assign Subscriber to Rate Policy
6- Update Subscriber's Rate Policy
7- Delete Subscriber's Rate Policy
8- Retrieve Subscriber's Rate Policy
9- Retrieve Subscriber's Metrics
10- Batch subscribers rate plan configuration from .csv file

Python Script Configuration

There are 4 configuration parameters:

- The `QoE_MNG_IP` is the management IP address of the QoE server.
- The `QoE_REST_PORT` is the REST API Port number configure don the QoE.
- The `QoE_REST_USER` is the REST API Users username configure don the QoE.
- The `QoE_REST_PASSWORD` is the REST API Users password configure don the QoE.

There are 2 ways to configure those parameters:

1- Update the script: This is recommended if there is only one QoE server to be configured. The parameters can be changed in the script at the top section with the "To Do" title, the default values are:
   - `QoE_MNG_IP = "10.0.0.100"`
   - `QoE_REST_PORT = "3443"`
   - `QoE_REST_USER = "qoe-rest-user"`
   - `QoE_REST_PASSWORD = "qoe-rest-passwd"`

2- Through configuration file: The parameters can be saved in a configuration file and the configuration file name is passed as input parameter to the script. Each line of the file holds one parameter, and the parameters are in the following order:

   Line #1: The `QoE_MNG_IP`
   Line #2: The `QoE_REST_PORT`
   Line #3: The `QoE_REST_USER`
   Line #4: The `QoE_REST_PASSWORD`

   The `-cfg` option is used to select the configuration file.

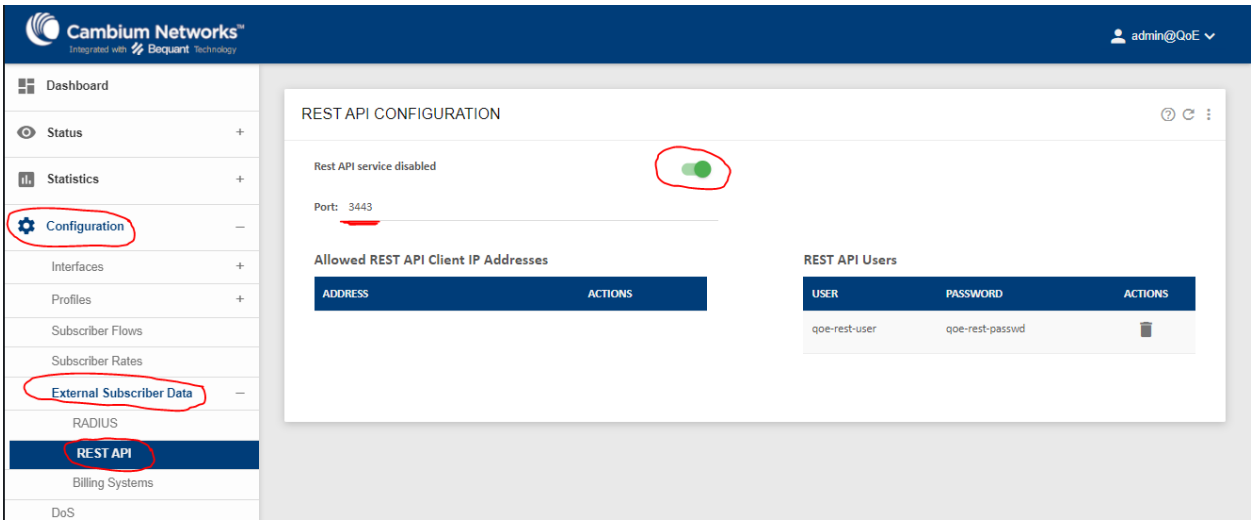
   This option can be used if there are multiple QoE servers that the customer has. The customer will create multiple configuration files, one per QoE server. Then pass the appropriate config file to the script using the `-cfg` option.

   Below is an example of the configuration file contents:

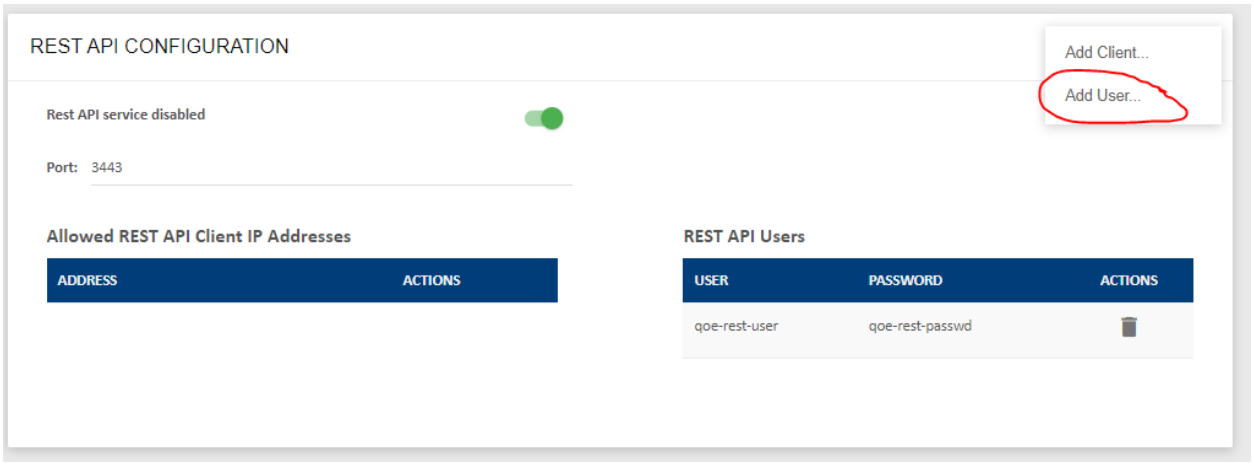
```
10.0..0.100
3443
qoe-rest-user
qoe-rest-passwd
```

QoE REST API Access Configuration

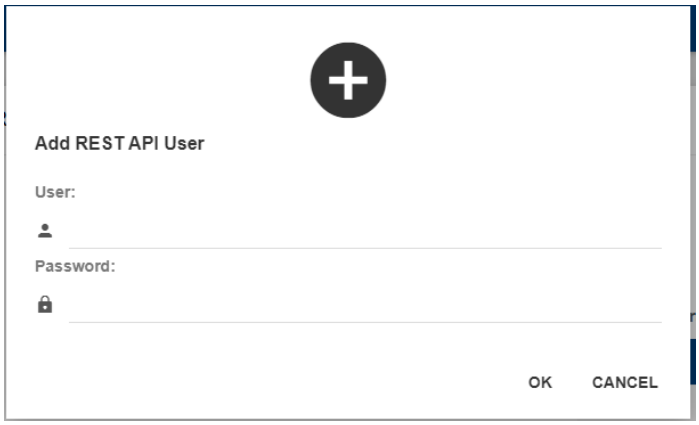
The following image shows an example of how-to setup a REST API User on the QoE



To add a REST API User click on the and select Add User



The following windows will pop up:



Enter the user and password and click on OK. Update the python script `QoE_REST_USER` and `QoE_REST_PASSWORD` with the configured user and password.

Tool Python Requirements

Python version 3.10 or above

Install argpars and optparse modules. (pip install argpars .. pip install optparse)

Script Usage

The script has a built is help option to display usage:

C:\python.exe QoE-REST-RatePlansManagement.py -h

usage: QoE-REST-RatePlansManagement.py [-h] [-p POLICYNAME] [-pi POLICYID] [-dl DOWNLINKRATE] [-ul UPLINKRATE] [-acm ACM] [-s SUBSCRIBER] [-si SUBSCRIBERID] [-m METRIC] [-mi METRIC_INTERVAL] [-mp METRIC_PERIOD] [-f SUBS_RATE_PLANS_FILE] [-cfg QOE_ACCESS_CONFIG_FILE] action

mandatory arguments:

action **Action to be performed:**

addPolicy|getPolicy|deletePolicy|setSubRatePolicy|getSubRatePolicy|deleteSubRatePolicy|getSubMetrics|loadSubsFromFile

options:

-h, --help **show this help message and exit**

-p POLICYNAME, --policyName POLICYNAME

Policy Name, no spaces or special characters

-pi POLICYID, --policyId POLICYID

Policy Identifier, no spaces or special characters

-dl DOWNLINKRATE, --downlinkRate DOWNLINKRATE

Downlink rate in kbps

-ul UPLINKRATE, --uplinkRate UPLINKRATE

Uplink rate in kbps

-acm ACM, --acm ACM Automatic Congestion Management (ACM) enabled: true/false

-s SUBSCRIBER, --subscriber SUBSCRIBER

subscriber IP address, IPv4 only

-si SUBSCRIBERID, --subscriberId SUBSCRIBERID

subscriber Id

-m METRIC, --metric METRIC

subscriber metric to retrieve: bandwidth|flows|latency|retransmission|volume

-mi METRIC_INTERVAL, --metric_interval METRIC_INTERVAL

subscriber metric time interval in minutes (default 60 minutes)

-mp METRIC_PERIOD, --metric_period METRIC_PERIOD

subscriber metric period in hours (default: 24 hours). The maximum query period is 3 months

-f SUBS_RATE_PLANS_FILE, --subs_rate_plans_file SUBS_RATE_PLANS_FILE

subscriber rate plans file name

-cfg QOE_ACCESS_CONFIG_FILE, --qoe_access_config_file QOE_ACCESS_CONFIG_FILE

QoE REST Configuration file name

Rate Policy Management

Add or Update Rate Policy

Usage:
python.exe QoE-REST-RatePlansManagement.py addPolicy --policyName [policyname] --policyId [policyID] --downlinkRate [dl_rate_kbps] --uplinkRate [ul_rate_kbps] --acm [true/false]

The following example adds (or updates) a rate policy with:

- Name: 100MDL_20MUL
- Policy ID: 100MDL_Policy
- DL Rate: 100 Mbps
- UL Rate: 20 Mbps
- ACM (Automatic Congestion Management feature): true (enabled)

C:\python.exe QoE-REST-RatePlansManagement.py addPolicy -p 100MDL_20MUL -pi 100MDL_Policy -dl 100000 -ul 20000 -acm true

Delete Rate Policy

Usage:
python.exe QoE-REST-RatePlansManagement.py deletePolicy --policyName [policyname]

The following example deletes a rate policy named 100MDL_20MUL

C:\python.exe QoE-REST-RatePlansManagement.py deletePolicy -p 100MDL_20MUL

The following example deletes ALL rate policies with Policy ID 100MDL_Policy

C:\python.exe QoE-REST-RatePlansManagement.py deletePolicy -pi 100MDL_Policy

Retrieve Rate Policy

Usage:
python.exe QoE-REST-RatePlansManagement.py getPolicy [--policyName [policyname]]

The following example retrieves the rate policy named 100MDL_20MUL

C:\python.exe QoE-REST-RatePlansManagement.py getPolicy -p 100MDL_20MUL

The output is in JSON format:


```
{
   "policyName": "100MDL_20MUL",
   "policyId": "100MDL_Policy",
   "rateLimitDownlink": {
      "rate": 100000,
      "congestionMgmt": true
   },
   "rateLimitUplink": {
      "rate": 20000
   }
}
```


The following example retrieves ALL rate policies

C:\python.exe QoE-REST-RatePlansManagement.py getPolicy

The output is in JSON format:


```
{
   "items": [
      {
            "policyName": "100MDL_20MUL",
            "policyId": "100MDL_Policy",
            "rateLimitDownlink": {
               "rate": 100000,
               "congestionMgmt": true
            },
            "rateLimitUplink": {
               "rate": 20000
            }
      },
            "policyName": "100MDL_30MUL",
            "policyId": "100MDL_Policy",
            "rateLimitDownlink": {
               "rate": 100000,
               "congestionMgmt": true
```

```
            },
            "rateLimitUplink": {
               "rate": 30000
            }
        },
        {
            "policyName": "100MDL_50MUL",
            "policyId": "100MDL_Policy",
            "rateLimitDownlink": {
               "rate": 100000,
               "congestionMgmt": true
            },
            "rateLimitUplink": {
               "rate": 50000
            }
        }
    ]
}
```


Assign (Update) Subscriber's Rate Policy

Usage:
python.exe QoE-REST-RatePlansManagement.py setSubRatePolicy --subscriber [IPv4] --subscriberId [ID] --policyName [policyname]

The following example assigns subscriber 10.0.0.133 to rate policy named 100MDL_20MUL

C:\python.exe QoE-REST-RatePlansManagement.py setSubRatePolicy -s 10.0.0.133 -si John-Brown -p 100MDL_20MUL

The following example changes subscriber 10.0.0.133 rate policy to 100MDL_50MUL

C:\python.exe QoE-REST-RatePlansManagement.py setSubRatePolicy -s 10.0.0.133 -si John-Brown -p 100MDL_50MUL

Retrieve Subscriber's Rate Policy

Usage:
python.exe QoE-REST-RatePlansManagement.py getSubRatePolicy --subscriber [IPv4]

The following example retrieves subscriber 10.0.0.133 rate policy

C:\python.exe QoE-REST-RatePlansManagement.py getSubRatePolicy -s 10.0.0.133

The output is in JSON format:


```
{
```

```
    "subscriberIp": "10.0.0.133",
    "subscriberId": "John-Brown",
    "policyRate": "100MDL_50MUL"
}
```


The following example retrieves the rate policy of ALL subscribers configured through REST:

C:\python.exe QoE-REST-RatePlansManagement.py getSubRatePolicy

The output is in JSON format:


```
{
  "items": [
    {
      "subscriberIp": "10.0.0.133",
      "subscriberId": "John-Brown",
      "policyRate": "100MDL_50MUL"
    },
    {
      "subscriberIp": "10.0.0.100",
      "subscriberId": "Mike-Brown",
      "policyRate": "100MDL_20MUL"
    },
    {
      "subscriberIp": "10.0.0.90",
      "subscriberId": "Al-Harris",
      "policyRate": "100MDL_20MUL"
    }
  ]
}
```


Delete Subscriber's Rate Policy

Usage:
python.exe QoE-REST-RatePlansManagement.py deleteSubRatePolicy --subscriber [IPv4] | --subscriberId [ID]
The following example deletes the rate policy of subscriber 10.0.0.100 using the IP address

C:\python.exe QoE-REST-RatePlansManagement.py deleteSubRatePolicy -s 10.0.0.100

The following example deletes the rate policy of subscriber 10.0.0.90 using thesubscriber ID

C:\python.exe QoE-REST-RatePlansManagement.py deleteSubRatePolicy -si Al-Harris

Retrieve Subscriber Metrics

Usage:
python.exe QoE-REST-RatePlansManagement.py getSubMetrics --subscriber [IPv4] --metric [bandwidth|flows|latency|retransmission|volume] --metric_interval [interval-minutes] --metric_period [period-hours]

The following example retrieves the volume metrics for subscriber 10.0.0.133 in the last 2 hours with interval 5 minutes:

C:\python.exe QoE-REST-RatePlansManagement.py getSubMetrics -s 10.0.0.133 -m volume -mp 2 -mi 5

The output is in JSON format:


```
{
   "subscriberIp": "10.0.0.133",
   "timestamp": [
      1663878000,
      1663878300,
      1663878600,
      1663878900,
      1663879200,
      1663879500,
      1663879800,
      1663880100,
      1663880400,
      1663880700,
      1663881000,
      1663881300,
      1663881600,
      1663881900,
      1663882200,
      1663882500,
      1663882800,
      1663883100,
      1663883400,
      1663883700,
      1663884000,
      1663884300,
      1663884600,
      1663884900,
      1663885200
   ],
   "dataDownlink": [
      0.9675,
      1.5055,
```

```
      1.399,
      1.4171,
      2.832,
      1.0049,
      5.0151,
      1.1529,
      6.4514,
      65.889,
      0.6082,
      0.9383,
      0.9498,
      9.7952,
      1.2841,
      0.6781,
      124.3488,
      1.27,
      0.9199,
      2.028,
      22.6179,
      0.7469,
      4.8027,
      2.9811,
      1.1995
    ],
    "dataUplink": [
      0.6642,
      0.8723,
      1.0162,
      1.3307,
      1.155,
      1.024,
      1.1205,
      1.9935,
      1.6216,
      1.6804,
      0.6573,
      0.8235,
      1.2274,
      1.3263,
      0.8746,
      0.753,
      2.0302,
      0.7017,
      0.9183,
      2.4477,
      1.24,
      0.8684,
      1.3673,
```

```
            1.1814,
            0.8274
        ]
    }
```


The entries show DL Volume and UL Volume in MB for each timestamp entry.

Batch subscribers rate plan configuration from .csv file

The script has a built is help option to display usage:

C:\python.exe QoE-REST-RatePlansManagement.py -f subs_rate_plans_csv_file [-acm [true|false]] [-cfg QoE_Configuration_File]

By default, ACM is enabled; if the switch `-acm false` is passed to the script, then ACM will be disabled for all rate plans.

The **subs_rate_plans_csv_file** is formatted as a sequence of comma separated parameters that identify the rate plan details of a subscriber:

```
Customer_Number, Customer_Name, IPv4_Address, Download_Rate_Kbps, Upload_Rate_Kbps,
Quota_enabled, Quota_Time_Expirey, Quota_KByte, Quota_Increment_KByte
```

The first line is a header field which includes the names of the parameters.

The parameters (`Customer_Number, Customer_Name`) can be repeated in multiple lines in the file to support multiple packages (services) under one account. If the parameters (`Customer_Number, Customer_Name`) are repeated then the `IPv4_Address` parameter must be different for all entries with the same parameters (`Customer_Number, Customer_Name`)

The following table defines each field:

Parameter	Description
`Customer_Number`	Unique Customer Number. Spaces in this parameter will be replaced with "_".
`Customer_Name`	Customer Name. Spaces in this parameter will be replaced with "_".
`IPv4_Address`	IPv4 Address
`Download_Rate_Kbps`	Downlink Rate in Kbps
`Upload_Rate_Kbps`	Uplink Rate in Kbps
`Quota_enabled`	Subscriber Quota: 0: disabled (next 3 parameters will be ignored by the script) 1: Enabled (next 3 parameters define the Quota)
`Quota_Time_Expirey`	Time the quota expires. Refer to QoE documentation for details and format of this parameter. This parameter is valid when the "`Quota_enabled`" is enabled
`Quota_Kbyte`	The subscriber quota in Kilo bytes. This parameter is valid when the "`Quota_enabled`" is enabled
`Quota_Increment_KByte`	The extra quota in Kilo bytes to be added on top of the current configured quota. If this parameter is > 0, the script will ignore the "`Quota_Kbyte`" parameter. This parameter is valid when the "`Quota_enabled`" is enabled

Below is a sample rate plans .csv file content:

```
Customer_Number, Customer_Name, IPv4_Address, Download_Rate_Kbps, Upload_Rate_Kbps,
Qouta_Enabled, Quota_Time_Expirey, Quota_kB, Quota_Increment_kB

2345,customer name 1,10.100.48.6,50000,10000,1,0,10000000,0

2346,customer name 2,10.100.48.7,10000,2000,0,0,20000000,0

2347,customer name 3,10.100.48.8,20000,4000,0,0,15000000,0

2347,customer name 3,10.100.48.81,120000,4000,0,0,15000000,0

2347,customer name 3,10.100.48.82,220000,4000,0,0,15000000,0

2347,customer name 3,10.100.48.83,320000,4000,0,0,15000000,0

2348,customer name 4,10.100.48.9,50000,10000,0,0,5000000,0

2348,customer name 4,10.100.48.91,150000,10000,0,0,5000000,0

2348,customer name 4,10.100.48.92,250000,10000,0,0,5000000,0

2348,customer name 4,10.100.48.93,350000,10000,0,0,5000000,0
```