



QOE RATE PLAN MANAGEMENT USING REST API & PYTHON

Cambium Networks QoE

Version (1.2)



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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.

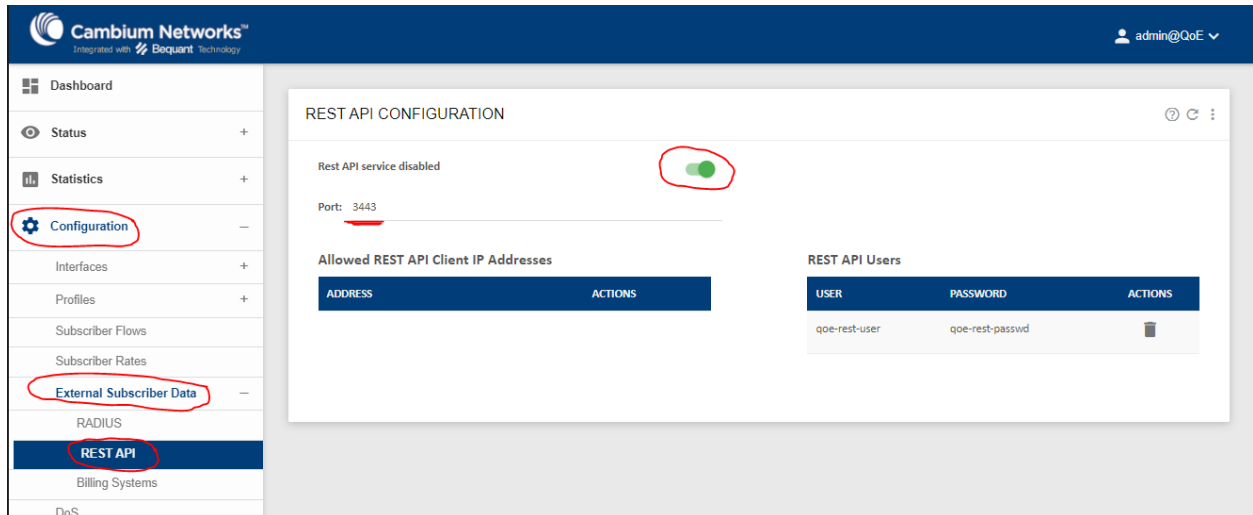
This option can be used if there are multiple QoE servers that the customer has. The customer will create multiple configuration files, one per QoE server. Then pass the appropriate config file to the script using the `-cfg` option.


Below is an example of the configuration file contents:

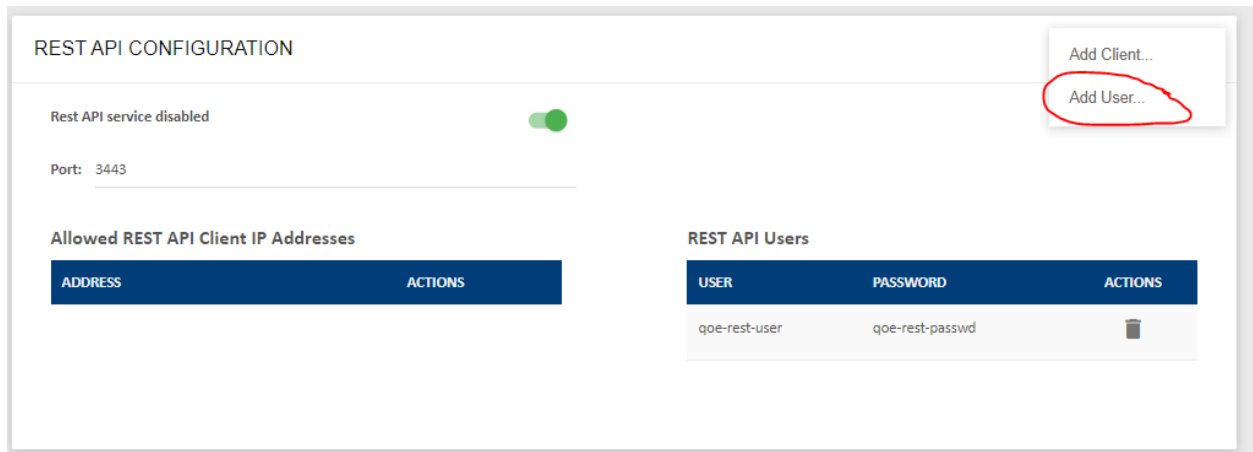
```
10.0.0.100
3443
qoe-rest-user
qoe-rest-passwd
```

QoE REST API Access Configuration

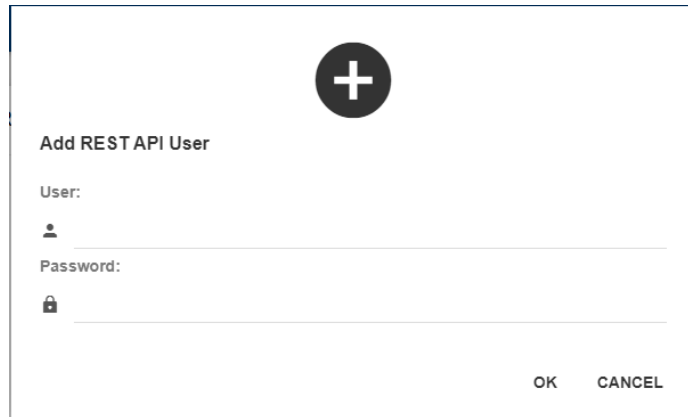
The following image shows an example of how-to setup a REST API User on the QoE



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



The following windows will pop up:

A dialog box titled "Add REST API User" with a dark blue header bar containing a white plus icon. The dialog has two input fields: "User:" with a person icon and "Password:" with a lock icon. At the bottom right are "OK" and "CANCEL" buttons.

Add REST API User

User:

Password:

OK CANCEL

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 in 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 [polycyname]]

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": 20000
      }
    }
  ]
}
```

```

    },
    "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 the subscriber 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 in help option to display usage:

```
C:\python.exe QoE-REST-RatePlansManagement.py loadSubsFromFile -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,
Quota_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
```