Scopemon Configuration

Configuration defines how Scopemon connects to Probes, what network traffic is measured, and how results are handled. Scopemon always requires configuration when deployed on a new computer. Familiarizing with parameters, their purpose, and use cases is therefore essential in efficient use of Scopemon.

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For a detailed description of each parameter and how to use them, please refer to Scopemon Parameter Reference.

1. Configuration File

Scopemon is configured by editing the configuration file `config.ini`, located in Scopemon installation directory. The configuration file follows basic *ini* configuration notation. All parameters belong to a *section*, and are defined by using `=`:

```
[SectionName]
parameter1=value
parameter2=value
```

- Each parameter has a list/range of allowed values. Consult each parameter individually for allowed values
- Using an invalid value for a parameter results in a warning/error/undesired behavior
- If a parameter is omitted, the default value will be used instead

2. Editing & Saving

The configuration file can be edited with any text editor software which supports basic text files. When Scopemon is started, the configuration file is loaded automatically.

A typical configuration editing process is as follows:

- Close running Scopemon instance
- Open the configuration file for editing
- After editing, save changes and close the configuration file
- Restart Scopemon

After editing configuration file, Scopemon needs to be restarted for the new changes to take effect.

3. Scopemon Example Configuration

This section presents an example of how to configure Scopemon. It should give an insight into what the configuration file looks like and how it is structured. Most parameters are already set to default values, which are appropriate for most use cases. However, several parameters are almost always required.

3.1. Configuration File Contents

The configuration file used in this example is presented below. We define only a subset of parameters and leave the rest to their default values.

```
[Application]
admin_tools=true
measurer=1

[ThroughputChart]
received_upper_threshold=10000000
received_upper_alert=true

[ScheduledMeasurer]
schedule_rules\size=2
schedule_rules\1\start_time=8:00:00
schedule_rules\1\end_time=10:00:00
schedule_rules\2\start_time=18:00:00
schedule_rules\2\end_time=23:00:00

[Measurement]
primary_probe_hostname=127.0.0.1
primary_probe_interface_index=2
use_secondary_probe=true
secondary_probe_hostname=192.168.1.236
secondary_probe_interface_index=3
packet_filter=udp port 6889 or udp port 6890
packet_filter_mode=220
write_average_results=true
write_filename_suffix=MyMeasurement
write_path=E:/Measurement Results/
```

Let's go through this configuration, piece by piece, in the next sections.

3.2. Application Group

Application Group defines the general settings for Scopemon. The most important step in this group is to select the measurer, which controls the measurements autonomously.

```
[Application]
admin_tools=true
measurer=1
```

First, we select a **scheduled measurer** by setting `measurer=1`. We'll need to configure it later in its own group. Let's also select `admin_tools=true` to enable the control panel window and some other extra privileges. It's recommended to turn on the admin tools during setup, testing, and debugging.

3.3. ThroughputChart

Let's assume that we want an alert notification each time the received traffic exceeds 10 Mbps. We set the upper threshold by typing `received_upper_threshold=10000000`. This alone does not enable alerts; it only expresses that 10 Mbps is the upper boundary to our range of interest. To enable the alert, we type `received_upper_alert=true`.

```
[ThroughputChart]
received_upper_threshold=10000000
received_upper_alert=true
```

3.4. ScheduledMeasurer Group

Since we selected the scheduled measurer in our application group, we need to configure it. Let's assume

that we want automatic measurements between 8.00-10.00 and 18.00-23.00. We define 2 rules by assigning `schedule_rules\size=2`. We issue the `start_time` and `end_time` fields to appropriate values for both rules.

```
[ScheduledMeasurer]
schedule_rules\size=2
schedule_rules\1\start_time=8:00:00
schedule_rules\1\end_time=10:00:00
schedule_rules\2\start_time=18:00:00
schedule_rules\2\end_time=23:00:00
```

3.5. Measurement Group

Regardless of which measurer is selected, the measurement group is always relevant when defining the actual measurement.

```
[Measurement]
primary_probe_hostname=127.0.0.1
primary_probe_interface_index=2
use_secondary_probe=true
secondary_probe_hostname=192.168.1.236
secondary_probe_interface_index=3
packet_filter=udp port 6889 or udp port 6890
packet_filter_mode=220
write_average_results=true
write_filename_suffix=MyMeasurement
write_path=E:/Measurement Results/
```

Let's assume that we want to perform a two-point measurement by using two Probes. Our first Probe is running on a local computer, so we define the hostname as `primary_probe_hostname=127.0.0.1`. The interface we want to use for capturing has an index of 2. Therefore we define `primary_probe_interface_index=2`. The same settings must be used for the second Probe, in addition to `use_secondary_probe=true`.

But we don't want to capture any traffic, but just certain UDP traffic. For a custom packet filter, we need to set two parameters. First, by typing `packet_filter_mode=220`, we tell Scopemon that we want to use our own packet filter instead of an auto-generated one. Then we type `packet_filter=udp port 6889 or udp port 6890` to capture only UDP traffic going through port 6889 or 6890.

Finally, we write the average results to disk by issuing `write_average_results=true`. The last parameters define the filename suffix and the write directory.

3.5.1. Determining Interfaces

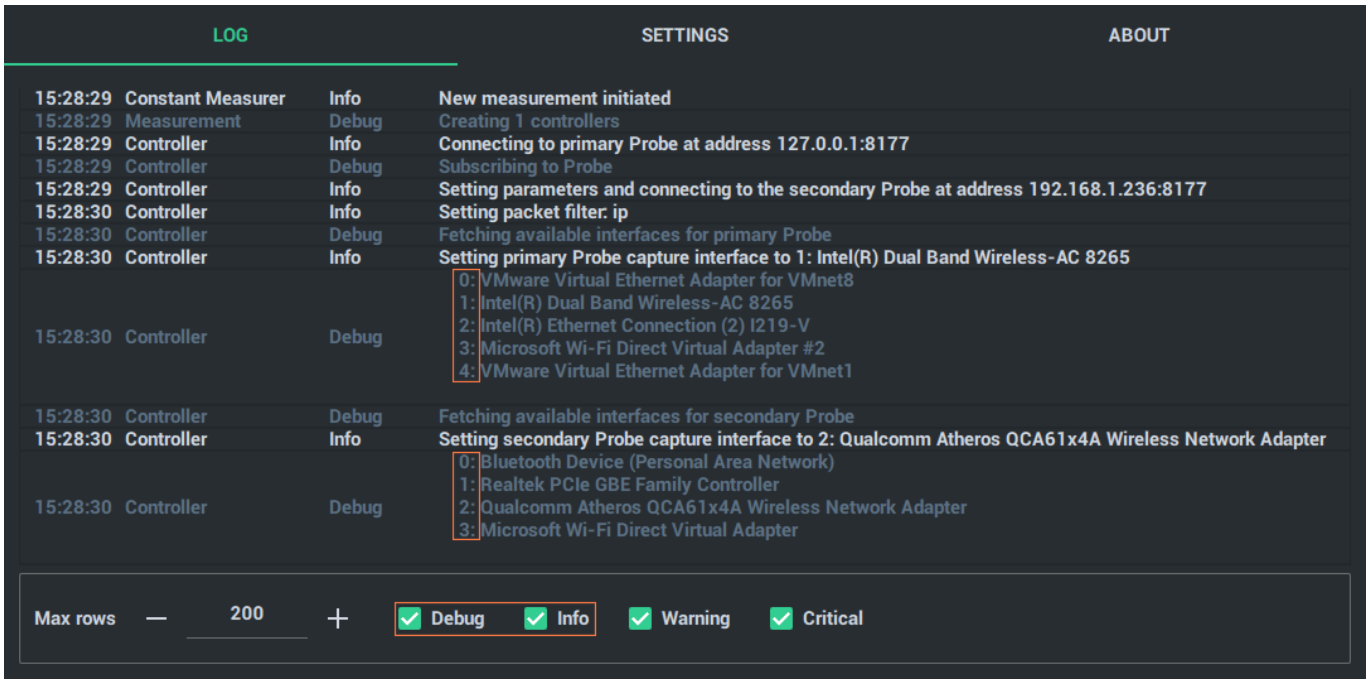
The capture interface index identifies the network interface which is used in the measurement setup. Qosium uses internal indexing for interfaces, which is not the same as the order your OS is displaying. For both the primary and the secondary Probe, capture indexes need to be defined manually. Defining capture interface indexes correctly is vital in configuration, and ignoring these indexes is one reason why measurement configuration fails.

There is no direct way to deduce the index for each interface that Qosium uses. To find out the indexes of interfaces, follow these steps:

- Configure Scopemon as usual
- Assign any number to interfaces indexes, or omit them from the configuration file
- Set `measurer` to `0` so that measurement starts immediately

- Set `admin_tools` to `true` to access the log page in the control panel window

After following the steps above, launch Scopemon. The log window displays the available interfaces (Make sure *Info* and *Debug* messages are enabled):



If, for example, we want to use `Intel(R) Dual Band Wireless-AC 8265` (index 1) as the primary Probe capture interface and `Qualcomm Atheros QCA61x4A Wireless Network Adapter` (index 2) as the secondary capture interface, we would update the configuration file with the following information:

```
[Measurement]
primary_probe_interface_index=1
secondary_probe_interface_index=2
```

4. Scopemon Parameter Reference

Scopemon is configured via parameters. This reference lists all available parameters, default values, allowed values, and use examples.

4.1. Introduction

The reference is organized in sections. Each section corresponds to a group in the configuration file.

4.2. Application Group

The application group contains all general parameters related to the operation of Scopemon.

4.2.1. admin_tools

When set to true, Log and Settings windows are available, and the user is given elevated privileges.

- Values:
  - `true` - Admin tools are enabled

- `false` - Admin tools are disabled
- Default: `true`

Example

```
[Application]
admin_tools=true
```

4.2.2. measurer

Determine the type of measurer. The measurer is responsible for starting and stopping automatic measurements.

- Values:
  - `0` Constant Measurer - Always-on measurement
  - `1` Scheduled Measurer- Measure within specific time period
  - `2` Flow Monitor Measurer - Measure specific traffic flow
- Default: `0`

Example
To switch to scheduled measurer, defined this parameter as:

```
[Application]
measurer=1
```

4.2.3. start_offline

Determine if Scopemon should start in an offline state. Measurement functionality must be turned on manually from the settings window.

- Values:
  - `true` - Application starts with offline mode
  - `false` - Application starts with online mode
- Default: `false`

If admin_tools are disabled, this option has no effect, and Scopemon is started in online mode

Example

```
[Application]
start_offline=true
```

4.2.4. stay_on_top

When set to true, Scopemon stays on top of other windows even when not active. This is especially useful when performing other tasks on the device while simultaneously keeping an eye on Scopemon GUI.

- Values:

- `true` - Scopemon stays on top of other windows even when not active
- `false` - Scopemon recedes behind other windows when they become active

- Default: `false`

Example

```
[Application]
stay_on_top=true
```

4.2.5. taskbar_alert

When set to true, Scopemon gives a taskbar notification when one or more visualization charts yield an alert. The visual appearance of the taskbar notification depends on the operating system. This feature is activated only if the Scopemon window is minimized while the alert is given.

- Values:
  - `true` - Scopemon gives a taskbar notification while minimized when an alert is raised
  - `false` - Scopemon gives no taskbar notifications
- Default: `false`

Example

```
[Application]
taskbar_alert=true
```

4.3. DebugLog Group

DebugLog group contains settings related to the log window and writing the log to one or multiple files.

4.3.1. write_file_datecode_format

When writing multiple log files, this date code defines the format used to determine the date part of the log filename. This parameter also implicitly determines the file-swapping frequency since a new log file is created as soon as this date code changes.

- Type: `string`
- Default: `yyyyMMdd`

Example
To save log files every hour, define the following parameters as:

```
[DebugLog]
write_log_file=true
write_filename_format={DATE}_hourly.log
write_file_datecode_format=yyyyMMdd-hh
```

4.3.2. write_file_dir

Determines the directory where the log files are saved. By default, the log files are saved to `C:\Users\<user>\AppData\Local\Kaitotek\Qosium Scopemon\logs` in Windows.

- Type: `string`


Use forward slashes / or double backslashes \\ as directory separators

Example
To save log files to directory `E:\ScopemonLogs\`, define this parameters as:

```
[DebugLog]
write_file_dir=E:\\ScopemonLogs
```

4.3.3. write_filename_format

Determines the filename format of the log file or multiple log files.

- Type: `string`
- Default: `{DATE}_debug.log`


Use forward slashes / or double backslashes \\ as directory separators.

Example
To save log files to directory `E:\ScopemonLogs\`, define this parameters as:

```
[DebugLog]
write_file_dir=E:\\ScopemonLogs
```

4.3.4. write_mode_append

Determines whether the log file is opened in *overwrite* or *append* mode when using single file mode. This option has no effect when writing multiple log files, as they are always opened in *append* mode.

- Values:
  - `true` - File is opened in append mode, and new log entries are added at the end of the file
  - `false` - The log file contents will be erased each time Scopemon is started
- Default: `false`


When using append mode, the file size grows indefinitely. It is advisable to set this to false in production environments or to make sure the file size won't become a problem by other means.

Example
To preserve log messages from previous runs, set this parameter as:

```
[DebugLog]
write_mode_append=true
```

4.3.5. write_log_file

Determines whether Scopemon writes the log into file(s). By default, Scopemon does not produce log files.

- Values:
  - `true` - Log file(s) are written
  - `false` - Log files won't be written
- Default: `false`

Example
To enable log writing, define this parameter as:

```
[DebugLog]
write_log_file=true
```

4.4. FlowMonitorMeasurer Group

Flow Monitor Measurer has several parameters, which define how it detects the target traffic flow.

4.4.1. flowmap_interval

Determines how often the flow map is collected. A lower value consumes more resources but is more responsive.

- Unit: `milliseconds`
- Precision: `integer`
- Minimum: `50`
- Default: `1000`

Setting this value below `200` is not advisable in production environments or regular use.

Example
To make Scopemon collect flow results twice per second (i.e., every 500 ms), define this parameter as:

```
[FlowMonitorMeasurer]
flowmap_interval=500
```

4.4.2. flow_timeout

The duration in which a flow can remain inactive before the measurement is stopped. Setting this value too low may result in duplicate measurement for a single traffic flow. Setting this value too high results in measurement carrying unnecessarily long after the flow has ended.

- Unit: `seconds`
- Precision: `integer`
- Minimum: `1`
- Default: `10`

Example
To set the flow timeout to 5 seconds, define this parameter as:

```
[FlowMonitorMeasurer]
flow_timeout=5
```

4.4.3. operation_mode

Flow monitoring can be set to operate either in single flow or multi-flow mode. In single flow mode, Scopemon expects to detect a single flow at a time and create a measurement for each flow. The detection of more than 1 flow results in a warning. In multi-flow mode, Scopemon carries out a measurement as long as one or more flows are detected.

- Values:
  - `0` Multi-flow mode - Detect and measure multiple flows
  - `1` Single flow mode - Detect and measure a single flow
- Default: `0`

Example
To switch to single flow mode, define this parameter as:

```
[FlowMonitorMeasurer]
operation_mode=1
```

4.4.4. probe_hostname

The hostname of the Probe which is used for flow monitoring. This can be omitted if the Probe is located on the same device where Scopemon is used.

- Type: `string`
- Default: `127.0.0.1`

Example
If the Probe is installed in another device at IP address *192.168.1.43*, define this parameter as:

```
[FlowMonitorMeasurer]
probe_hostname=192.168.1.43
```

4.4.5. probe_interface_index

Capture interface for flow monitoring. Typically `0` is the default OS interface.

- Precision: `integer`
- Minimum: `0`
- Default: `0`

Example
If the capture interface index is 2, define this parameter as:

```
[FlowMonitorMeasurer]
probe_interface_index=2
```

4.4.6. probe_port

The port number of the local Probe. This can be typically omitted unless the port where Probe serves control connections has been changed in Probe configuration.

- Precision: `integer`
- Minimum: `0`
- Maximum: `65535`
- Default: `8177`

Example
If Probe is configured to serve control connections on port 9776, define this parameter as:

```
[FlowMonitorMeasurer]
probe_port=9776
```

4.4.7. packet_filter

Packet filter is one of the most important parameters, as it defines which traffic flows are measured. The packet filter needs to be strict enough so that no irrelevant flows are captured. Otherwise the application is unable to select a flow for monitoring and throws out a flow unambiguity warning. For more information, see Packet Filters in Qosium.

- Type: `string`
- Default: `ip`

Example
To enable monitoring only for UDP traffic going through ports 6889 or 6890, define this parameter as:

```
[FlowMonitorMeasurer]
packet_filter=udp port 6889 or udp port 6890
```

4.4.8. reconnect_interval

If a connection cannot be established to the local Probe, Scopemon waits for a duration specified by this parameter and then attempts to reconnect.

- Unit: `milliseconds`
- Precision: `integer`
- Minimum: `0`
- Default: `1000`

Example
To attempt a reconnection after 500 milliseconds, define this parameter as:

```
[FlowMonitorMeasurer]
reconnect_interval=500
```

4.4.9. use_promiscuous_mode

Promiscuous mode allows the detection of incoming traffic that is not directed to the selected network

interface. This scenario is common when capturing mirrored traffic, e.g., from a switch.

- Values:
  - `true` - Allow detection of all incoming traffic
  - `false` - Allow detection of incoming traffic destined only for this interface
- Default: `true`

Example
To disable detection of traffic not designated to the network interface, define this parameter as:

```
[FlowMonitorMeasurer]
use_promiscuous_mode=false
```

4.4.10. use_remote_probe

By default, Flow Monitor Measurer carries out measurements by using two Probes. With this setting, it's possible to disable the use of remote Probe entirely.

- Values:
  - `true` - Perform a two-point measurement
  - `false` - Perform a single-point measurement
- Default: `true`

Single-point measurement significantly limits the number of available measurement result types

Example
To perform a single-point measurement using the local Probe only, define this parameter as:

```
[FlowMonitorMeasurer]
use_remote_probe=false
```

4.4.11. user_id

User ID can be used to identify a controller, i.e., the Qosium Scopemon instance in this case. You can set this freely. The set value will appear in the results, where it can be used as a parameter to find results. Thus, you can use this as you wish as an identifier for your measurement, e.g., in a large-scale measurement setup. The User ID here applies only for the flow monitor measurement.

- Precision: `integer`
- Minimum: `0`
- Maximum: '4294967295'
- Default: `0`

Example
To set an id of 6 for this client, define this parameter as:

```
[FlowMonitorMeasurer]
user_id=6
```

4.4.12. write_date_code_format

Date code format governs the frequency of file creation when `write_multiple_files`. Whenever Scopemon detects a change in the date code, it automatically triggers new result files. A timestamp with this date code is then appended to the filename.

- Type: `string`
- Default: `yyyyMMdd`

Example
To write results every hour, define this parameter as:

```
[FlowMonitorMeasurer]
write_multiple_files=true
write_date_code_format=yyyyMMdd-hh
```

4.4.13. write_filename_suffix

File suffix string when forming a filename for measurement result files.

- Type: `string`
- Default: Empty


This option has no impact when *write_flowmap_to_file* is set to *false*

Example
If defined for example as “MyMeasurement”, the resulting filename is “flows_MyMeasurement.txt”.

```
[FlowMonitorMeasurer]
write_flowmap_to_file=true
write_filename_suffix=MyMeasurement
```

4.4.14. write_flowmap_to_file

When true, flow measurement results are written to file.

- Values:
  - `true` - Results are written to file
  - `false` - Results are not written to file
- Default: `false`

Example

```
[FlowMonitorMeasurer]
write_flowmap_to_file=true
```

4.4.15. write_multiple_files

When true, flow results are written to multiple files. By default, one file is created for each day. For configuring multiple file writing frequency, see write_date_code_format.

- Values:
  - `true` - Results are written to multiple files
  - `false` - All results are written into a single file
- Default: `false`

This option has no impact when *write_flowmap_to_file* is set to *false*

Example

```
[FlowMonitorMeasurer]
write_flowmap_to_file=true
write_multiple_files=true
```

4.4.16. write_path

Set to override the path where measurement result files are stored. Use `/` as the directory separator.

- Type: `string`
- Default: Scopemon root directory

This option has no impact when *write_flowmap_to_file* is set to *false*

Example

```
[FlowMonitorMeasurer]
write_flowmap_to_file=true
write_path=c:/temp
```

4.5. Measurement Group

Scopemon is configured via parameters. This reference lists all available parameters, default values, allowed values, and use examples for the measurement.

4.5.1. averaging_interval

Determines how often quality is measured for the ongoing measurement. Lower value gives more detailed results and consumes more resources. A higher value gives smoother values.

- Unit: `milliseconds`
- Precision: `integer`

- Minimum: `50`
- Default: `1000`

Setting this value below `500` is not advisable in production environments or regular use

Example
To make Scopemon collect quality results twice per second (i.e., every 500 ms), define this parameter as:

```
[Measurement]
averaging_interval=500
```

4.5.2. get_secondary_probe_average_results

Determines whether average results are gathered from the secondary Probe.

- Values:
  - `true` - Gather average results from the secondary Probe
  - `false` - Do not gather average results from the secondary Probe
- Default: `false`

This setting is relevant only when write_average_results is enabled.

4.5.3. measurement_description

Verbose description of the measurement. This value is written to results files as metadata.

- Type: `string`
- Default: `[empty]`

Example
To name this measurement “My measurement”, define this parameter as:

```
[Measurement]
measurement_description=My measurement
```

4.5.4. measurement_start_offset

Artificially delay the start of the measurement by the given time. If the value is 0, the measurement starts as soon as possible.

- Unit: `milliseconds`
- Precision: `integer`
- Minimum: `0`
- Default: `0`

This feature is used in particular scenarios and is rarely needed

Example

To delay the start of the measurement by 1 second, define this parameter as:

```
[Measurement]
measurement_start_offset=1000
```

4.5.5. nat_between_probes

Qosium needs to be aware if a Network Address Translation (NAT) occurs between Probes. If this is the case, enable this parameter.

- Values:
  - `true` - There's a NAT occurring between Probes
  - `false` - No NAT is occurring between Probes
- Default: `false`

This parameter has no effect when the secondary Probe is disabled

4.5.6. packet_filter

Packet filter is one of the most important parameters, as it defines which traffic is measured. The packet filter needs to be strict enough so that no irrelevant traffic is captured. Otherwise, the results may not be useful.

- Type: `string`
- Default: `ip`

For more information, see Packet Filters in Qosium.

Example
To enable monitoring only for UDP traffic going through ports 6889 or 6890, define this parameter as:

```
[Measurement]
packet_filter=udp port 6889 or udp port 6890
```

4.5.7. packet_filter_mode

This parameter determines the mode in which packets are filtered. In most cases, the selection is between *Automatic*, which generates an automatic filter, or *Manual* , which allows the use of a manual filter defined in packet_filter. For more information, see Packet Filters in Qosium.

- Values:
  - `220` Manual - Packet filter is defined manually in packet_filter. In a two-point measurement, this filter is used in the secondary Probe as well.
  - `240` Automatic - Generates automatically a filter, which includes all traffic between the hosts (a two-point measurement) or the measurement point's own traffic (a single-point measurement).
  - `231` Automatic for secondary (strict) - This mode is meant for cases where a *NAT* is between the measurement points in a two-point measurement. The filter is set manually for the primary Probe, but Qosium generates an automatic filter for the secondary Probe. The generated filter will be strict, focusing on a single flow, so define the primary Probe filter to be strict as well.

- `233` Automatic for secondary (light) - This mode is similar to the previous, but now a loose automatic filter is generated for the secondary Probe. A *loose filter* includes only addresses, so all traffic traveling between these addresses will be included. Remember to define the primary Probe's manual filter to be loose as well.

- Default: `240`

Example

```
[Measurement]
packet_filter_mode=231
```

4.5.8. packet_id_method

This parameter defines how Probes identify packets during a measurement. See Qosium Scope's Packet Identification Method for more details of this parameter.

- Values:
  - `10` Auto - Qosium selects the method from the options below based on the measurement scenario.
  - `50` IPv4 ID Field - Qosium uses the *Identification field* in the IPv4 header for packet identification.
  - `60` RTP Sequence Number - Qosium uses the *Sequence number field* in the *RTP* header for packet identification.
  - `100` Payload-Based ID - Qosium calculates the identification based on the packet payload. If a packet has no payload, *IP4 ID Field*, when present, is used.
  - `110` Extended Payload-Based ID - Qosium calculates the identification based on the packet payload, including some parts of the transport layer header.
  - `120` Pure Payload-Based ID - This is a very similar method with *Payload-Based ID*, but packets without payload are just ignored from QoS calculation.
  - `200` NAT bypasser + Payload based ID - Operates as *Payload-Based ID* but with NAT bypasser functionality enabled.
  - `210` NAT Bypasser + Pure Payload Based ID - Operates as *Pure Payload-Based ID* but with NAT bypasser functionality enabled.
- Default: `10`

Example

```
[Measurement]
packet_id_method=50
```

4.5.9. packet_loss_timer

Packet loss statistics can only be compiled by monitoring if packets detected by one Probe arrive at the seconds one. Each packet is allowed to be 'late' by a number of milliseconds before being considered lost.

- Unit: `milliseconds`
- Precision: `integer`
- Minimum: `1`
- Default: `1000`

Example

To allow packet delay up to 2 seconds, define this parameter as:

```
[Measurement]
packet_loss_timer=2000
```

4.5.10. pk_delay_threshold

Packets with a delay above this threshold are counted in QoS Statistics: Th. ex. delay pkts.

- Precision: `integer`
- Unit: `microseconds`
- Minimum: `0`
- Default: `100000`

Example
To count packets that have a delay of 500 ms (500000 µs), define this parameter as:

```
[Measurement]
pk_delay_threshold=500000
```

4.5.11. pk_jitter_threshold

Packets with a jitter above this threshold are counted in QoS Statistics: Th. ex. jitter pkts.

- Precision: `integer`
- Unit: `microseconds`
- Minimum: `0`
- Default: `100000`

Example
To count packets that have a jitter of 500 ms (500000 µs), define this parameter as:

```
[Measurement]
pk_jitter_threshold=500000
```

4.5.12. primary_probe_hostname

The hostname of the primary Probe. This can be omitted if the Probe is located on the same device where Scopemon is used.

- Type: `string`
- Default: `127.0.0.1`

Example
If the primary Probe is installed in another device at IP address *192.168.1.43*, define this parameter as:

```
[Measurement]
primary_probe_hostname=192.168.1.43
```

4.5.13. primary_probe_interface_index

Capture interface of the primary Probe. Typically `0` is the OS default interface.

- Precision: `integer`
- Minimum: `0`
- Default: `0`

Example
If the capture interface index is 2, define this parameter as:

```
[Measurement]
primary_probe_interface_index=2
```

4.5.14. primary_probe_placement

The topological placement of the primary Probe.

- Values:
  - `10` Measurement end-point - Probe is in either one of the endpoints of the measured traffic. In other words, the device Probe is installed to is either sending or receiving the measured network traffic
  - `100` Within measured path - Probe is not located at either one of the end-points but instead resides somewhere along the path where the measured traffic traverses
  - `200` Off-path - Probe is not located within the measurement path at all. This is the case, e.g., when the Probe is located in a separate device where the traffic to be measured is mirrored.
- Default: `10`

4.5.15. primary_probe_port

The port number of the primary Probe. This can be typically omitted unless the port where Probe serves control connections has been changed in Probe configuration.

- Precision: `integer`
- Minimum: `0`
- Maximum: `65535`
- Default: `8177`

Example
If Probe is configured to serve control connections on port 9776, define this parameter as:

```
[Measurement]
primary_probe_port=9776
```

4.5.16. primary_probe_senders_eth_address_list

The manual Ethernet senders list of the local Probe. Used only when *primary_probe_senders_eth_mode* is set to *manual* or *mask* mode.

Example

```
[Measurement]
primary_probe_senders_eth_address_list/size=1
primary_probe_senders_eth_address_list/1/address=0
primary_probe_senders_eth_address_list/1/value=0
```

4.5.17. primary_probe_senders_eth_mode

The Ethernet senders mode of the primary Probe. See Direction of Traffic and Senders under concepts section for more information what the senders mean.

- Values:
  - `0` Auto-search - Attempt to automatically determine the direction.
  - `249` Manual - Input sender addresses manually.
  - `250` Inverse definition - The senders are defined according to the senders of the secondary Probe.
  - `252` Mask - Define the senders manually by using a mask instead of individual addresses.
- Default: `0`

Example

```
[Measurement]
primary_probe_senders_eth_mode=0
```

4.5.18. primary_probe_senders_ipv4_address_list

The manual IPv4 senders list of the local Probe. Used only when *primary_probe_senders_ipv4_mode* is set to *Manual* or *Mask* mode.

Example

```
[Measurement]
primary_probe_senders_ipv4_address_list/size=1
primary_probe_senders_ipv4_address_list/1/address=0
primary_probe_senders_ipv4_address_list/1/value=0
```

4.5.19. primary_probe_senders_ipv4_mode

The IPv4 senders mode of the primary Probe. See Direction of Traffic and Senders under concepts section for more information what the senders mean.

- Values:
  - `0` Auto-search - Attempt to automatically determine the direction.
  - `249` Manual - Input sender addresses manually.
  - `250` Inverse definition - The senders are defined according to the senders of the secondary Probe.
  - `252` Mask - Define the senders manually by using a network mask instead of individual addresses.
- Default: `0`

Example

```
[Measurement]
senders_p_ipv4_mode=0
```

4.5.20. primary_probe_senders_pure_mac_method_enabled

Determines whether the pure MAC method is used for defining primary Probe senders. When enabled, the senders are defined only based on MAC addresses and no other senders settings are required for the primary Probe.

- Values:
  - `true` - Pure MAC method is used
  - `false` - Pure MAC method is not used
- Default: `false`

This mode works only if the measured traffic contains Ethernet-like MAC addresses.

4.5.21. qoe_swa_window_size

Sliding window averaging (SWA) window size.

- Precision: `Unsigned integer`
- Unit: `Averaging samples`
- Minimum: `0`
- Default: `5`

Example

```
[Measurement]
qoe_swa_window_size=2
```

4.5.22. qoe_wma_weight_newest

- Weight of the newest sample in weighted moving averaging (WMA).
- Precision: Real number
  - Minimum: `0.0`
  - Default: `0.5`

Example

```
[Measurement]
qoe_wma_weight_newest=1.0
```

4.5.23. reconnect_interval

If a connection cannot be established to the primary Probe, Scopemon waits for a duration specified by this parameter and then attempts to reconnect.

- Unit: `milliseconds`

- Precision: `integer`
- Minimum: `0`
- Default: `1000`

Example
To attempt a reconnection after 500 milliseconds, define this parameter as:

```
[Measurement]
reconnect_interval=500
```

4.5.24. results_distribution_destinations

Qosium Probe can send measurement results to additional receivers during measurement. These receivers must be running the Qosium server, such as Qosium Storage.

- Type: `Array`
- Fields:
  - `address` The IPv4 address of the receiver
  - `port` The port number of the receiver

Example
To send Qosium results to destinations *127.0.0.1:7700* and *192.168.1.3:7710*, define this parameter as:

```
[Measurement]
use_results_distribution=true
results_distribution_destinations/size=2
results_distribution_destinations/1/address=127.0.0.1
results_distribution_destinations/1/port=7700
results_distribution_destinations/2/address=192.168.1.3
results_distribution_destinations/2/port=7710
```

4.5.25. robust_mode_max_cbd

The maximum duration the connection to Probes can be re-attempted before giving up.

- Unit: `minutes`
- Precision: `integer`
- Minimum: `1`
- Default: `10`

Example
To make the client attempt reconnect 3 for minutes, define this parameter as:

```
[Measurement]
robust_mode_max_cbd=3
```

4.5.26. secondary_probe_hostname

The hostname of the secondary Probe. This can be omitted if the Probe is located on the same device where Scopemon is used.

- Type: `string`
- Default: `127.0.0.1`

Example
If a secondary Probe is installed in another device at IP address *192.168.1.43*, define this parameter as:

```
[Measurement]
secondary_probe_hostname=192.168.1.43
```

4.5.27. secondary_probe_interface_index

Capture interface of the secondary Probe. Typically `0` is the OS default interface.

- Precision: `integer`
- Minimum: `0`
- Default: `0`

Example
If the capture interface index is 2, define this parameter as:

```
[Measurement]
secondary_probe_interface_index=2
```

4.5.28. secondary_probe_placement

The topological placement of the secondary Probe.

- Values:
  - `10` Measurement end-point - Probe is in either one of the endpoints of the measured traffic. In other words, the device Probe is installed to is either sending or receiving the measured network traffic
  - `100` Within measured path - Probe is not located at either one of the end-points but instead resides somewhere along the path where the measured traffic traverses
  - `200` Off-path - Probe is not located within the measurement path at all. This is the case, e.g., when the Probe is located in a separate device where the traffic to be measured is mirrored.
- Default: `10`

4.5.29. secondary_probe_port

The port number of the secondary Probe. This can be typically omitted unless the port where Probe serves control connections has been changed in Probe configuration.

- Precision: `integer`
- Minimum: `0`
- Maximum: `65535`
- Default: `8177`

Example
If Probe is configured to serve control connections on port 9776, define this parameter as:

```
[Measurement]
secondary_probe_port=9776
```

4.5.30. secondary_probe_senders_eth_address_list

The manual Ethernet senders list of the secondary Probe. Used only when *secondary_probe_senders_eth_mode* is set to *manual* or *mask*.

Example

```
[Measurement]
secondary_probe_senders_eth_address_list/size=1
secondary_probe_senders_eth_address_list/1/address=0
secondary_probe_senders_eth_address_list/1/value=0
```

4.5.31. secondary_probe_senders_eth_mode

The Ethernet senders mode of the secondary Probe. See Direction of Traffic and Senders under concepts section for more information what the senders mean.

- Values:
  - `0` Auto-search - Attempt to automatically determine the direction.
  - `249` Manual - Input sender addresses manually.
  - `250` Inverse definition - The senders are defined according to the senders of the secondary Probe.
  - `252` Mask - Define the senders manually by using a network mask instead of individual addresses.
- Default: `250`

Example

```
[Measurement]
secondary_probe_senders_eth_mode=0
```

4.5.32. secondary_probe_senders_ipv4_address_list

The manual IPv4 senders list of the secondary Probe. Used only when *secondary_probe_senders_ipv4_mode* is set to *Manual* or *Mask*.

Example

```
[Measurement]
secondary_probe_senders_ipv4_address_list/size=1
secondary_probe_senders_ipv4_address_list/1/address=0
secondary_probe_senders_ipv4_address_list/1/value=0
```

4.5.33. secondary_probe_senders_ipv4_mode

The IPv4 senders mode of the secondary Probe.

- Values:
  - `0` Auto-search - Attempt to automatically determine the direction.

- `249` Manual - Input sender addresses manually.
- `250` Inverse definition - The senders are defined according to the senders of the secondary Probe.
- `252` Mask - Define the senders manually by using a network mask instead of individual addresses.

- Default: `250`

Example

```
[Measurement]
secondary_probe_senders_ipv4_mode=254
```

4.5.34. secondary_probe_senders_pure_mac_method_enabled

Determines whether the pure MAC method is used for defining secondary Probe senders. When enabled, the senders are defined only based on MAC addresses and no other senders settings are required for the secondary Probe.

- Values:
  - `true` - Pure MAC method is used
  - `false` - Pure MAC method is not used
- Default: `false`

This mode works only if the measured traffic contains Ethernet-like MAC addresses.

4.5.35. use_promiscuous_mode

Promiscuous mode allows the detection of incoming traffic that is not directed to the selected network interface. This scenario is common when capturing mirrored traffic, e.g., from a switch.

- Values:
  - `true` - Allow detection of all incoming traffic
  - `false` - Allow detection of incoming traffic destined only for this interface
- Default: `true`

Example
To disable detection of traffic not designated to the network interface, define this parameter as:

```
[Measurement]
use_promiscuous_mode=false
```

4.5.36. use_qoe_swa

Enable or disable sliding window averaging (SWA) for quality estimates.

- Values:
  - `true` - Enable SWA
  - `false` - Disable SWA
- Default: `false`

Example

```
[Measurement]
use_qoe_swa=true
```

4.5.37. use_qoe_wma

Enable or disable weighted moving averaging (WMA) for quality estimates.

- Values:
  - `true` - Enable WMA
  - `false` - Disable WMA
- Default: `false`

Example

```
[Measurement]
use_qoe_wma=true
```

4.5.38. use_results_distribution

Enable or disable result distribution directly from primary Probe to external result receivers.

- Values:
  - `true` - Enable result distribution
  - `false` - Disable result distribution
- Default: `false`

4.5.39. use_secondary_probe

By default, measurement is performed with one Probe. With this setting, it's possible to set a two-point measurement.

- Values:
  - `true` - Perform a two-point measurement
  - `false` - Perform a single-point measurement
- Default: `false`

Single-point measurement significantly limits the number of available measurement result types

Example
To perform two-point measurement using the local Probe only, define this parameter as:

```
[Measurement]
use_secondary_probe=false
secondary_probe_hostname=192.168.1.14
secondary_probe_interface_index=4
```

4.5.40. user_id

User ID can be used to identify a controller, i.e., the Qosium Scopemon instance in this case. You can set this freely. The set value will appear in the results, where it can be used as a parameter to find results. Thus, you can use this as you wish as an identifier for your measurement, e.g., in a large-scale measurement setup.

- Precision: `integer`
- Minimum: `0`
- Maximum: `4294967295`
- Default: `0`

Example
To set an id of 6 for this client, define this parameter as:

```
[Measurement]
user_id=6
```

4.5.41. write_absolute_results

When true, absolute measurement results are written to file. Two files are generated, and the filenames have format *pk_qosDL[suffix].txt* and *pk_qosUL[suffix].txt*, and new measurements are appended to the files.

- Values:
  - `true` - Results are written to files
  - `false` - Results are not written to files
- Default: `false`

Example

```
[Measurement]
write_absolute_results=true
```

4.5.42. write_average_results

When true, average measurement results are written to file. The filename has the format “averages_[suffix].txt”, and new measurements are appended to the file.

- Values:
  - `true` - Results are written to file
  - `false` - Results are not written to file
- Default: `false`

Example

```
[Measurement]
write_average_results=true
```

4.5.43. write_date_code_format

Date code format governs the frequency of file creation when `write_multiple_files`. Whenever Scopemon detects a change in the date code, it automatically triggers new result files. A timestamp with this date code is then appended to the filename.

- Type: `string`
- Default: `yyyyMMdd`

Example
To write results every hour, define this parameter as:

```
[Measurement]
write_multiple_files=true
write_date_code_format=yyyyMMdd-hh
```

4.5.44. write_filename_suffix

File suffix string when forming a filename for measurement result files.

- Type: `string`
- Default: Empty


This settings has effect only when write_absolute_results, write_average_results, write_flow_results, and/or write_packet_results is set to true.

Example
If defined for example as “test”, filenames will begin with the suffix and underscore, e.g. *averages_test.txt*.

```
[Measurement]
write_average_results=true
write_filename_suffix=test
```

4.5.45. write_flow_results

When true, flow measurement results are written to file. The filename has the format “flows_[suffix].txt”, and new measurements are appended to the file. This data only contains flow map detected during the measurement, which starts later than the actual flow. Therefore expect the reported flow duration to be shorter. Typically only one flow should be visible.

- Values:
  - `true` - Results are written to file
  - `false` - Results are not written to file
- Default: `false`

Example

```
[Measurement]
write_flow_results=true
```

4.5.46. write_multiple_files

When true, measurement results are written to multiple files. By default, one file is created for each day. For configuring multiple file writing frequency, see write_date_code_format.

- Values:
  - `true` - Results are written to multiple files
  - `false` - All results are written into a single file
- Default: `false`

This settings has effect only when write_absolute_results, write_average_results, write_flow_results, and/or write_packet_results is set to true.

Example

```
[Measurement]
write_average_results=true
write_flows=true
write_multiple_files=true
```

4.5.47. write_packet_results

When true, packet measurement results are written to file. The filename has the format “pk*info*[suffix].txt”, and new measurements are appended to the file.

- Values:
  - `true` - Results are written to file
  - `false` - Results are not written to file
- Default: `false`

Example

```
[Measurement]
write_packet_results=true
```

4.5.48. write_path

Set to override the path where measurement result files are stored. Use `/` as the directory separator.

- Type: `string`
- Default: Scopemon root directory

This settings has effect only when write_absolute_results, write_average_results, write_flow_results, and/or write_packet_results is set to true.

Example

```
[Measurement]
write_path=c:/temp
```

4.5.49. Measurement Group (GQoSM)

Scopemon is configured via parameters. This reference lists all available parameters, default values, allowed values, and examples for GQoSM configuration.

4.5.49.1. qoe_gqosm_cbl_form

The form factor for connection break length.

- Precision: `float`
- Minimum: `0.0`
- Maximum: `1.0`
- Default: `0.0`

Ignored if use_qoe_gqosm_cbl is false

Example

```
[Measurement]
use_qoe_gqosm_cbl=true
qoe_gqosm_cbl_form=0.4
```

4.5.49.2. qoe_gqosm_cbl_threshold

Bad performance limit for connection break length.

- Unit: `packets`
- Precision: `integer`
- Minimum: `0`
- Default: `5`

Ignored if use_qoe_gqosm_cbl is false

Example

```
[Measurement]
use_qoe_gqosm_cbl=true
qoe_gqosm_cbl_threshold=2
```

4.5.49.3. qoe_gqosm_delay_form

The form factor for the delay.

- Precision: `float`
- Minimum: `0.0`

- Maximum: `1.0`
- Default: `0.3`


Ignored if use_qoe_gqosm_delay is false

Example

```
[Measurement]
use_qoe_gqosm_delay=true
qoe_gqosm_delay_form=0.4
```

4.5.49.4. qoe_gqosm_delay_threshold

Bad performance limit for the delay.

- Unit: `seconds`
- Precision: `float`
- Minimum: `0.0`
- Default: `1.0`


Ignored if use_qoe_gqosm_delay is false

Example

```
[Measurement]
use_qoe_gqosm_delay=true
qoe_gqosm_delay_threshold=0.5
```

4.5.49.5. qoe_gqosm_jitter_form

The form factor for jitter.

- Precision: `float`
- Minimum: `0.0`
- Maximum: `1.0`
- Default: `0.3`


Ignored if use_qoe_gqosm_jitter is false

Example

```
[Measurement]
use_qoe_gqosm_jitter=true
qoe_gqosm_jitter_form=0.1
```

4.5.49.6. qoe_gqosm_jitter_threshold

Bad performance limit for jitter.

- Unit: `seconds`
- Precision: `float`
- Minimum: `0.0`
- Default: `0.05`

Ignored if use_qoe_gqosm_jitter is false

Example

```
[Measurement]
use_qoe_gqosm_jitter=true
qoe_gqosm_jitter_threshold=0.07
```

4.5.49.7. qoe_gqosm_packet_loss_form

The form factor for packet loss.

- Precision: `float`
- Minimum: `0.0`
- Maximum: `1.0`
- Default: `0.3`

Ignored if use_qoe_gqosm_packet_loss is false

Example

```
[Measurement]
use_qoe_gqosm_packet_loss=true
qoe_gqosm_packet_loss_form=0.4
```

4.5.49.8. qoe_gqosm_packet_loss_threshold

Bad performance limit for packet loss.

- Unit: `fraction`
- Precision: `float`
- Minimum: `0.0`
- Maximum: `1.0`
- Default: `0.03`

Ignored if use_qoe_gqosm_packet_loss is false

Example

```
[Measurement]
use_qoe_gqosm_packet_loss=true
qoe_gqosm_packet_loss_threshold=0.08
```

4.5.49.9. use_qoe_gqosm

Determines if GQoSM quality model calculations are performed. When false, GQoSM results are not available in results.

- Values:
  - `true` - GQoSM quality model is calculated
  - `false` - GQoSM quality model is not calculated
- Default: `false`

Example

```
[Measurement]
use_qoe_gqosm=true
```

4.5.49.10. use_qoe_gqosm_cbl

Determines if connection break length parameter should be used in quality assessment.

- Values:
  - `true` - Parameter is used
  - `false` - Parameter is not used
- Default: `true`

Example

```
[Measurement]
use_qoe_gqosm_cbl=false
```

4.5.49.11. use_qoe_gqosm_delay

Determines if delay parameter should be used in quality assessment.

- Values:
  - `true` - Parameter is used
  - `false` - Parameter is not used
- Default: `true`

Example

```
[Measurement]
use_qoe_gqosm_delay=false
```

4.5.49.12. use_qoe_gqosm_jitter

Determines if jitter parameter should be used in quality assessment.

- Values:
  - `true` - Parameter is used
  - `false` - Parameter is not used
- Default: `true`

Example

```
[Measurement]
use_qoe_gqosm_jitter=false
```

4.5.49.13. use_qoe_gqosm_packet_loss

Determines if packet loss parameter should be used in quality assessment.

- Values:
  - `true` - Parameter is used
  - `false` - Parameter is not used
- Default: `true`

Example

```
[Measurement]
use_qoe_gqosm_packet_loss=false
```

4.5.50. Measurement Group (PSQA)

Scopemon is configured via parameters. This reference lists all available parameters, default values, allowed values, and examples for PSQA configuration.

4.5.50.1. qoe_psqa_codec_list

The audio codec for VoIP listening mode.

- Values:
  - `0` PCM - PCM codec is used
  - `1` GSM - GSM codec is used
- Default: `0`

Example

```
[Measurement]
qoe_psqa_codec_list=1
```

4.5.50.2. qoe_psqa_fec_conv

Forward error correction for VoIP conversational mode.

- Values:
  - `0` Off - FEC is off
  - `1` Low - FEC is low
  - `2` High - FEC is high
- Default: `0`

Example

```
[Measurement]
qoe_psqa_fec_conv=0
```

4.5.50.3. qoe_psqa_fec_list

Forward error correction offset for VoIP listening mode.

- Values:
  - `0` Off - FEC is off
  - `1` FEC 1 - FEC offset = 1.0
  - `2` FEC 2 - FEC offset = 2.0
  - `3` FEC 3 - FEC offset = 3.0
- Default: `0`

Example

```
[Measurement]
qoe_psqa_fec_list=2
```

4.5.50.4. qoe_psqa_mode

The neural network model of PSQA.

- Values:
  - `1` VoIP listening - PSQA is used for VoIP in listening mode
  - `2` VoIP conversational - PSQA is used for VoIP in conversational mode
  - `3` Video AV - Video in streaming audiovisual mode
  - `4` Video AV MLP - Video in streaming audiovisual mode (MPL)
- Default: `1`

Example

```
[Measurement]
qoe_psqa_mode=1
```

4.5.50.5. qoe_psqa_pi

Packetization interval for VoIP listening mode.

- Values:
  - `0` 20 ms - Packetization interval is 20 ms
  - `1` 40 ms - Packetization interval is 40 ms
  - `2` 80 ms - Packetization interval is 80 ms
- Default: `0`

Example

```
[Measurement]
qoe_psqa_pi=2
```

4.5.50.6. qoe_psqa_speex_rate

Speex codec data rate for VoIP conversational mode.

- Values:
  - `10` 2.4 - Speex rate: 2.4 kbit/s
  - `11` 4.0 - Speex rate: 4.0 kbit/s
  - `12` 6.0 - Speex rate: 6.0 kbit/s
  - `13` 8.0 - Speex rate: 8.0 kbit/s
  - `14` 11.2 - Speex rate: 11.2 kbit/s
  - `15` 14.2 - Speex rate: 14.2 kbit/s
  - `16` 18.4 - Speex rate: 18.4 kbit/s
  - `17` 24.8 - Speex rate: 24.8 kbit/s
- Default: `10`

Example

```
[Measurement]
qoe_psqa_codec_conv=11
```

4.5.50.7. qoe_psqa_video_resolution

The resolution of the video content.

- Values:
  - `0` 480p - Video resolution is 480p
  - `1` 720p - Video resolution is 720p
  - `2` 1080p - Video resolution is 1080p
- Default: `0`

Example

```
[Measurement]
qoe_psqa_video_resolution=1
```

4.5.50.8. qoe_psqa_video_motion

The amount of motion in the video content.

- Values:
  - `0` Low - Low motion (e.g., news)
  - `1` Moderate - Moderate motion (e.g., typical TV shows)
  - `2` High - High motion (e.g., sports)
- Default: `0`

Example

```
[Measurement]
qoe_psqa_video_motion=1
```

4.5.50.9. qoe_psqa_video_ec

The error concealment mode of the video content

- Values:
  - `0` Off - Error concealment is off
  - `1` On - Error concealment is on
- Default: `0`

Example

```
[Measurement]
qoe_psqa_video_ec=1
```

4.5.50.10. qoe_psqa_video_cmq

Calculated movement quantity of the video content.

- Unit: `percentage`
- Precision: `float`
- Minimum: `0.0`
- Maximum: `100.0`
- Default: `0.0`

Example

```
[Measurement]
qoe_psqa_video_cmq=1.15
```

4.5.50.11. use_qoe_psqa

Determines if PSQA quality model calculations are performed. When false, PSQA results are not available in results.

- Values:

- `true` - PSQA quality model is calculated
- `false` - PSQA quality model is not calculated

- Default: `false`

Example

```
[Measurement]
use_qoe_psqa=true
```

4.6. QoEChart Group

QoEChart contains configuration options for Quality of Experience visualization.

4.6.1. mode

Select whether the chart uses GQoSM or PSQA as the source data.

- Values:
  - `0` GQoSM - Use GQoSM as the source model
  - `1` PSQA- Use PSQA as the source model
- Default: `0`

Example
To use PSQA as the source model, define this parameter as:

```
[QoEChart]
mode=1
```

4.6.2. received_lower_threshold

Defines the lower threshold for received quality.

- Unit: `MOS`
- Precision: `float`
- Minimum: `1.0`
- Maximum: `5.0`
- Default: `0.0`

Example
To set the lower threshold to 2.0 MOS, define this parameter as:

```
[QoEChart]
received_lower_threshold=2.0
```

4.6.3. received_lower_alert

When enabled, an alert is emitted whenever the received quality falls below `received_lower_threshold`.

- Values:

- `true` - An alert is emitted
- `false` - No alert is emitted

- Default: `false`

4.6.4. sent_lower_threshold

Defines the lower threshold for sent quality.

- Unit: `MOS`
- Precision: `float`
- Minimum: `1.0`
- Maximum: `5.0`
- Default: `0.0`

Example
To set the lower threshold to 2.0 MOS, define this parameter as:

```
[QoEChart]
sent_lower_threshold=2.0
```

4.6.5. sent_lower_alert

When enabled, an alert is emitted whenever the sent quality falls lower than `sent_lower_threshold`.

- Values:
  - `true` - An alert is emitted
  - `false` - No alert is emitted
- Default: `false`

4.6.6. visible

Determines if this visualizer is displayed in the GUI.

- Values:
  - `true` - Visualizer is displayed
  - `false` - Visualizer is not displayed
- Default: `false`

Example
To display the visualizer, define this parameter as:

```
[QoEChart]
visible=true
```

4.7. ScheduledMeasurer Group

Scopemon is configured via parameters. This reference lists all available parameters, default values, allowed values, and examples for measurer ScheduledMeasurer.

4.7.1. schedule_rules

Schedule rules determine when a measurement commences. When the current system time meets all rule requirements, measurement is started. The measurement persists until the current system clock time no longer meets the set of rules.

Schedule rules is a list of rule entries. Scopemon supports a time range rule, which defines a timespan when a measurement should be performed.

- Type: `array`
- Fields:
  - `start_time` The time when the schedule is turned on
  - `end_time` The time when the schedule is turned off

Example
To run measurement every day between 8am and 9am, and between 2pm and 9:30pm, define the list as:

```
[ScheduledMeasurer]
schedule_rules\size=2
schedule_rules\1\start_time=8:00:00
schedule_rules\1\end_time=9:00:00
schedule_rules\2\start_time=14:00:00
schedule_rules\2\end_time=21:30:00
```

4.8. ThroughputChart Group

ThroughputChart contains configuration options for throughput visualization.

4.8.1. received_lower_threshold

Defines the lower threshold for received traffic.

- Unit: `bits per second`
- Precision: `integer`
- Minimum: `0`
- Default: `0`

Example
To set the lower threshold to 1 kbps (= 1000 bps), define this parameter as:

```
[ThroughputChart]
received_lower_threshold=1000
```

4.8.2. received_lower_alert

When enabled, an alert is emitted whenever the received traffic load falls lower than `received_lower_threshold`.

- Values:
  - `true` - An alert is emitted
  - `false` - No alert is emitted

- Default: `false`

Example
To emit an alert when received traffic falls below 1 kbps, define this parameter as:

```
[ThroughputChart]
received_lower_threshold=1000
received_lower_alert=true
```

4.8.3. received_upper_threshold

Defines the upper threshold for received traffic.

- Unit: `bits per second`
- Precision: `integer`
- Minimum: `0`
- Default: `1000000`

Example
To set the upper threshold to 5 Mbps (= 5000000 bps), define this parameter as:

```
[ThroughputChart]
received_upper_threshold=5000000
```

4.8.4. received_upper_alert

When enabled, an alert is emitted whenever the received traffic load exceeds `received_upper_threshold`.

- Values:
  - `true` - An alert is emitted
  - `false` - No alert is emitted
- Default: `false`

Example
To emit an alert when received traffic exceeds 5 Mbps, define this parameter as:

```
[ThroughputChart]
received_upper_threshold=5000000
received_upper_alert=true
```

4.8.5. sent_lower_threshold

Defines the lower threshold for sent traffic.

- Unit: `bits per second`
- Precision: `integer`
- Minimum: `0`
- Default: `0`

Example

To set the lower threshold to 1 kbps (= 1000 bps), define this parameter as:

```
[ThroughputChart]
sent_lower_threshold=1000
```

4.8.6. sent_lower_alert

When enabled, an alert is emitted whenever the sent traffic load falls lower than `sent_lower_threshold`.

- Values:
  - `true` - An alert is emitted
  - `false` - No alert is emitted
- Default: `false`

Example
To emit an alert when sent traffic falls below 1 kbps, define this parameter as:

```
[ThroughputChart]
sent_lower_threshold=1000
sent_lower_alert=true
```

4.8.7. sent_upper_threshold

Defines the upper threshold for sent traffic.

- Unit: `bits per second`
- Precision: `integer`
- Minimum: `0`
- Default: `1000000`

Example
To set the upper threshold to 5 Mbps (= 5000000 bps), define this parameter as:

```
[ThroughputChart]
sent_upper_threshold=5000000
```

4.8.8. sent_upper_alert

When enabled, an alert is emitted whenever the sent traffic load exceeds `sent_upper_threshold`.

- Values:
  - `true` - An alert is emitted
  - `false` - No alert is emitted
- Default: `false`

Example
To emit an alert when sent traffic exceeds 5 Mbps, define this parameter as:

```
[ThroughputChart]
sent_upper_threshold=5000000
sent_upper_alert=true
```

4.8.9. visible

Determines if this visualizer is displayed in the GUI.

- Values:
  - `true` - Visualizer is displayed
  - `false` - Visualizer is not displayed
- Default: `false`

Example
To display the visualizer, define this parameter as:

```
[ThroughputChart]
visible=true
```

5. Glossary

Network Address Translation

A technique for remapping an IP address space

Wikipedia article on Network Address Translation

Real-time Transport Protocol

A transport protocol for applications with real-time constraints, such as video streams, VoIP, and remote control.