

QoS Group of Ruledefs Support

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Revision History

Note Revision history details are not provided for features introduced before release 21.24.

Revision Details	Release
First introduced	Pre 21.24

Feature Descriptions

QoS Group of Ruledefs is also called as QGR or SGQ. This feature enables fair usage policing for the subscriber.

How It Works

The following configuration primarily does Flow-Status and Bandwidth Limiting in hierarchical manner, first doing at matched Charging-Action and then at QoS-Group Level.

```
conf
active-charging service acs
  qos-group-of-ruledefs QGR1
      add-group-of-ruledef group
      add-ruledef http
    #exit
rulebase cisco
action priority 2 ruledef http charging-action standard
action priority 5 ruledef catchall charging-action standard
```

```
route priority 1 ruledef http-rule analyzer http
end
```

QoS Group QGR1 received over PCRF.

```
qos-group-rule-install
qgr-name QGR2
qgr-mon-key 1
qgr-flow-status 3
qgr-precedence 1
qgr-eqos-information
qgr-eqos-mbr 1000 2000
qgr-eqos-mbr-burst-size 1000 2000
qgr-eqos-mbr-limit-conform-action 1 -1 1 -1
qgr-eqos-mbr-limit-exceed-action 2 7 2 8
```

Data Path Enforcement

1. Packet matches ruledef ‘http’.
2. QGR match is carried out to check if there is a QGR with the matched ruledef/group. Highest Priority QGR is returned. The ruledef/group can be static or predefined.
3. If QGR matches, then Flow-Action Enforcement which is first done at Charging-Action Level and then at QGR Level assuming Charging-Action has allowed the packet. If the packet is dropped, then QGR Level Flow Action Enforcement is skipped.
4. If Flow-Action at QGR allows the packet, then QER Limiting is enforced on a packet. If it is dropped at QGR, QER Limiting is skipped.
5. Likewise, QER Limiting is done stepwise, first at Charging-Action Level and then at the QGR subject to packet is allowed at Charging-Action.

Static Configuration Push to UPlane

- Static configuration pushed from CP to UP via the PFD mechanism in similar to ECS elements ruledef/charging-action/group-of-ruledefs.
- Show CLIs ‘show user-plane-service qos-group-of-ruledefs all/name’ displays the static configuration on UPlane.

QGR Params Push to UPlane

QGR is pushed along with Session Establishment and Modification Request.

QGR Name and Precedence is sent in a private IE. Flow-action, bandwidth parameters, and monitoring-key will create a new FAR, new QER, and new URR respectively.

Any changes to QGR dynamic parameters triggers an update to FAR/QER/URR.

This is sent in Session Establishment or Modification Request.

Private IE

```
Qos-Group-Of-Ruledef:
Name:
Operation:  (0 - Add  1 - Modify 2 - Delete)
```

```
Precedence:
FAR ID:
URR ID:
QER ID:
```

Table 1: FAR Format

FAR ID	Unique ID
Extended Apply Action	Private IE to include Flow-Action Allow as well Discard, Uplink, Discard Downlink, Terminate Flow.

Table 2: QER Format

QER ID	Unique ID
Maximum Bitrate	MBR of QGR in Kbps: UL MBR: DL MBR:
Burst Size	Private IE to include the Burst Size: UL Burst: DL Burst:
Conform Action	Private IE to configure the conform action: Uplink Action: Uplink ToS: Downlink Action: Downlink ToS:
Exceed Action	Private IE to configure the exceed action: Uplink Action: Uplink ToS: Downlink Action: Downlink ToS:

Display the FAR, PDR, QER, and URR in ‘show subscribers user-plane-only callid <> far|qer full all’.

Processing of QGR on UPlane

- On Receiving a IE ‘Qos-Group-Of-Ruledef', search for the QGR in static configuration. For each ruledef/group-of-ruledef in QGR, look up for its corresponding PDR and update the FAR/QER list with the received QGR FAR/URR/QER IDs.
- For each ruledef/group-of-ruledef PDR on UPlane, associate high priority QGR’s FAR-id, QER-id.

- Maintain QGR map at both Control and UPlane, it consists of QGR name, precedence, QER-ID, and FAR-ID. Use QGR map for recovery and lookup whenever required.

QGR Hit in Data Path

- For a packet matching rule PDR, search for the highest priority QGR FAR, and QER and enforce the parameters.
- Enforce flow-status and flow-rate as expected.
- QGR matching for Offloaded Flows are handled.
- QGR hit statistics are incremented.

Limitations

The QoS Group of Ruledefs support feature has the following limitations:

- URR creation and enforcement is not supported.
- Inclusion of dynamic-rules in static QGR definition is not supported.
- Flow-Status Redirect and Kill Flow are not supported.
- QoS Group Conform action as Drop and Exceed action as ALLOW or MARK_DSCP are not supported.
- CP can communicate maximum 20 QGRs received over PCRF to UP.

Monitoring and Troubleshooting

This section provides information about CLI commands available for monitoring and troubleshooting the feature.

Show Commands and Outputs

This section provides information about show commands and their outputs in support of this feature.

show subscribers user-plane-only full all

The output of this show command has been enhanced to include the following fields introduced in support of this feature.

- Total QoS-Group Active
- QoS-Group Statistics
  - QGR Name
  - Pkts-Down
  - Bytes-Down

- Pkts-Up
- Bytes-Up
- Hits
- Match-Bypassed
- FP-Down(Pkts/Bytes)
- FP-Up(Pkts/Bytes)

show user-plane-service qos-group-of-ruledefs all name

The output of this show command has been enhanced to include the following fields introduced in support of this feature.

QGR-INFO-LIST

- Value
- Number of QGRs
- QGR INFO
  - NAME
  - PRECEDENCE
  - OPERATION
  - FAR ID
  - QER ID
- QGR INFO
  - NAME
  - PRECEDENCE
  - OPERATION
  - FAR ID
  - QER ID

show subscribers user-plane-only callid 00004e21 qos-group all

The output of this show command has been enhanced to include the following fields introduced in support of this feature.

```
Callid: 00004e21
           Interface Type: Sxb
         QGR-Name:      Priority:       FAR-ID:         QER-ID:         URR-ID:
         ---------      ---------       -------         -------         ------


        Total Number of QGRs found:
```

show subscribers user-plane-only callid 00004e21 far full all

The output of this show command has been enhanced to include the following fields introduced in support of this feature.

- Associated with QGR
  - Extended Apply Action

show subscribers user-plane-only callid 00004e21 qer full all

The output of this show command has been enhanced to include the following fields introduced in support of this feature.

- UL Burst
- UL Conform Action
  - UL DSCP Value
- UL Exceed Action
  - UL DSCP Value
- DL Burst
- DL Conform Action
  - DL DSCP Value
- DL Exceed Action
  - DL DSCP Value

show subscribers user-plane-only callid 00004e21 qos-group statistics all name

This show command and its output is introduced to support of this feature.

- Flow-Status Statistics
  - Total Uplink Packets
  - Total Uplink Bytes
  - Uplink Packets Redirected
  - Uplink Bytes Redirected
  - Uplink Packets Dropped
  - Uplink Bytes Dropped
  - Uplink Packets Term-Flow
  - Uplink Bytess Term-Flow
  - Total Downlink Packets

    - Total Downlink Bytes
    - Downlink Packets Redirected
    - Downlink Bytes Redirected
    - Downlink Packets Dropped
    - Downlink Bytes Dropped
    - Downlink Packets Term-Flow
    - Downlink Bytes Term-Flow

- Bandwidth-Control Statistics
    - Total Uplink Packets
    - Total Uplink Bytes
    - Uplink Packets QoS-Exceed
    - Uplink Bytes QoS-Exceed
    - Uplink Packets QoS-Conform
    - Uplink Bytes QoS-Conform
    - Uplink Packets Dropped
    - Uplink Bytes Dropped
    - Uplink Packets Marked
    - Uplink Bytes Marked
    - Total Downlink Packets
    - Total Downlink Bytes
    - Downlink Packets QoS-Exceed
    - Downlink Bytes QoS-Exceed
    - Downlink Packets QoS-Conform
    - Downlink Bytes QoS-Conform
    - Downlink Packets Dropped
    - Downlink Bytes Dropped
    - Downlink Packets Marked
    - Downlink Bytes Marked

- Total qos-group-of-ruledefs matched
- Total subscribers matching specified criteria

show user-plane-service statistics qos-group sessmgr all

Sessmgr Instance

- Total Uplink Pkt
- Total Uplink Bytes
- Uplink FP Pkts
- Uplink FP Bytes
- Total Dnlink Pkts
- Total Dnlink Bytes
- Dnlink FP Pkts
- Dnlink FP Bytes
- Flow-Status Statistics
  - Total Uplink Packets
  - Total Uplink Bytes
  - Uplink Packets Redirected
  - Uplink Bytes Redirected
  - Uplink Packets Dropped
  - Uplink Bytes Dropped
  - Uplink Packets Term-Flow
  - Uplink Bytess Term-Flow
  - Total Downlink Packets
  - Total Downlink Bytes
  - Downlink Packets Redirected
  - Downlink Bytes Redirected
  - Downlink Packets Dropped
  - Downlink Bytes Dropped
  - Downlink Packets Term-Flow
  - Downlink Bytes Term-Flow
- Bandwidth-Control Statistics
  - Total Uplink Packets
  - Total Uplink Bytes
  - Uplink Packets QoS-Exceed
  - Uplink Bytes QoS-Exceed

- Uplink Packets QoS-Conform
- Uplink Bytes QoS-Conform
- Uplink Packets Dropped
- Uplink Bytes Dropped
- Uplink Packets Marked
- Uplink Bytes Marked
- Total Downlink Packets
- Total Downlink Bytes
- Downlink Packets QoS-Exceed
- Downlink Bytes QoS-Exceed
- Downlink Packets QoS-Conform
- Downlink Bytes QoS-Conform
- Downlink Packets Dropped
- Downlink Bytes Dropped
- Downlink Packets Marked
- Downlink Bytes Marked