Understand Differential Policies Between 4G and 5G NSA Subscribers using Override Control Feature

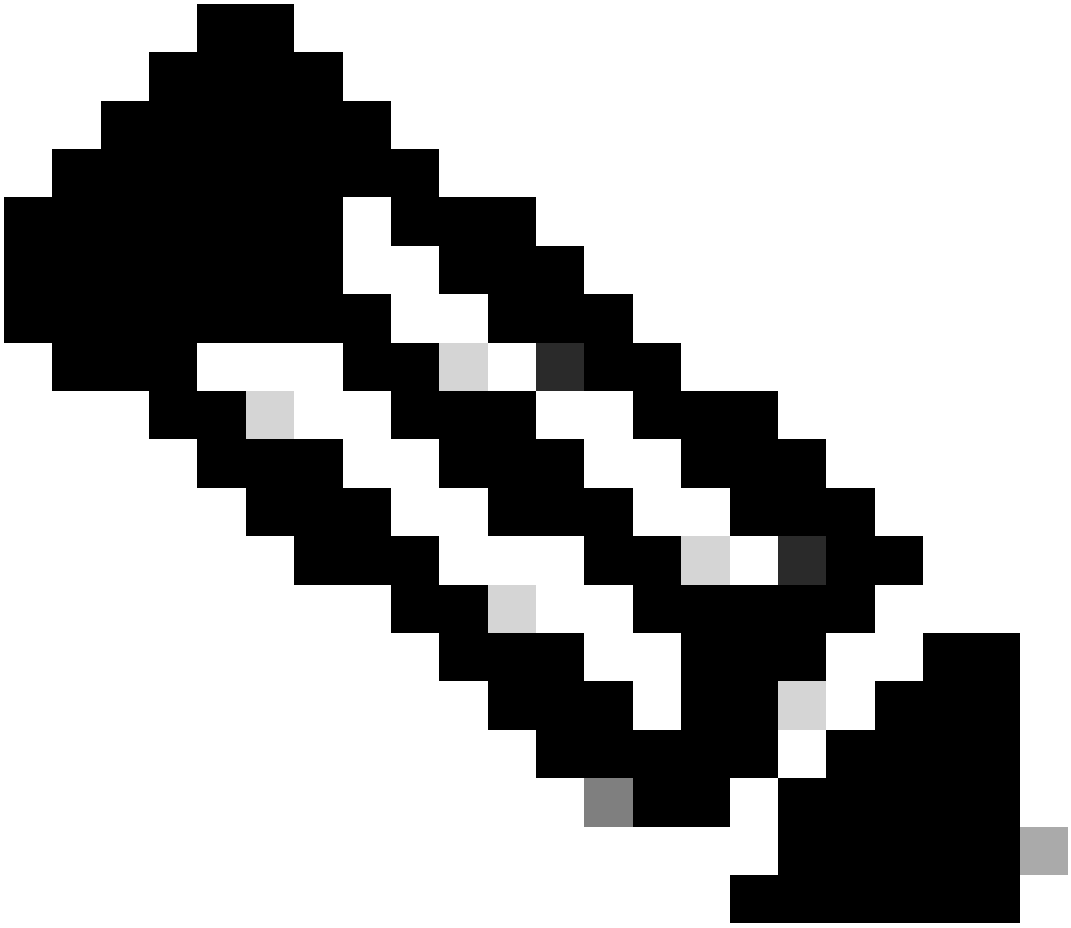
Contents

Introduction

This document describes the Override Control Feature (non-3GPP) to enable differential billing/policies for 4G and 5G subscribers.

Prerequisites

Requirements



Note: 1. This is a Licensed Feature.

2. As it is non-3GPP feature, Packet Data Network Gateway (PGW) and the Policy and Charging Rules Function (PCRF) can exchange support for this feature through the Supported Features in the Gx Credit Control Answer (CCA)-I during session establishment.

Cisco recommends that you have basic knowledge of these topics:

- Offline Charging Server (OFCS)/Charging Collection Function (CCF)
- Online Charging Server (OCS)
- Cisco PGW
- PCRF
- Override Control Feature Documentation

Components Used

The information in this document is based on StarOS: 21.28.mx.

The information in this document was created from the devices in a specific lab environment (or) are just random samples. All of the devices used in this document started with a cleared (default) configuration. If

your network is live, ensure that you understand the potential impact of any command.

Background Information

This document describes the differential charging and policies between 4G and 5G Non Stand Alone (NSA) subscribers and different subscriber types based on non-3GPP Override Control Feature.

This feature is to support the requirement of differential charging between 4G and 5G NSA subscribers or between different subscribers on 4G/5G NSA without the need to create multiple rules on the packet gateway and PCRF where the rule logic is the same or the flow match criteria remains the same but there is a need to charge differently based on subscriber type or access-technology type. This also ensures that the problem of requiring hundreds of rules on the packet gateway and frequent operational updates like Method of Procedure (MOP)s and so on, on the PGW and the PCRF thus considerably reducing time and efforts required to support these changes in the network.

Override-Control Solution Overview

This feature can define a set of custom Attribute Value Pairs (AVP) that can enable the PCRF to override charging and policy parameters for all rules (wildcard) or a specified set of rules or charging actions.

The override values must be sent by PCRF over Gx using the custom AVPs. Override Control feature will be configured at the rulebase level. The Diameter capability exchange message can indicate support for Override Control Feature when the override-control CLI command is configured in the rulebase configuration mode.

Support to override Group-of-Ruledefs is provided for the Override Control Feature. Override sent for a Group-of-Ruledefs applies to all the ruledefs defined in a group. The same Override-Rule-Name AVP is used to send Ruledef or Group-of-Ruledef interchangeably. The two AVPs — Override-Rule-Name and Override-Charging-Action-Exclude-Rule, support either a Ruledef name or a Group-of-Ruledefs name.

The Gx interface is updated to include custom AVPs for the PCRF to send override values to PGW. These override values can be sent for all rules (wildcard) or for specific rule(s) or for charging action(s). In case the override values are sent for a charging action, a rule or some of the rules can be excluded from using the override values by sending the rules names in the Gx message. The override values are check pointed and recovered in case of either standalone recovery or Interchassis Session Recovery (ICSR).

When multiple overrides are received from PCRF, these mentioned points are the priority in which they are applied:

1. Rule level override control
2. Charging action level override control
3. Wildcard level override control

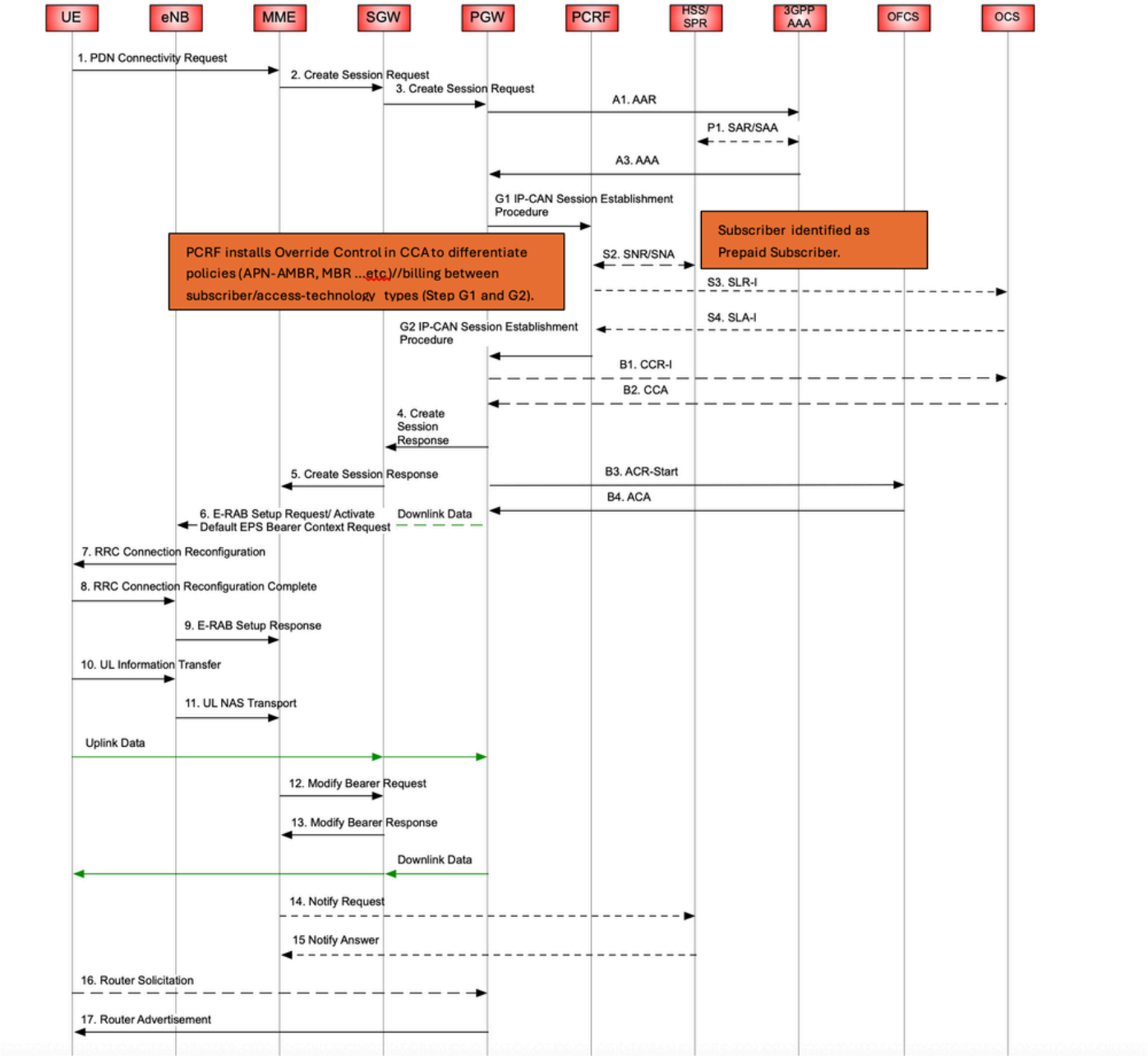
When installing a predefined rule, if override control is received for that predefined rule and Quality of Service Class Identifier (QCI)/Address Resolution Protocol (ARP) is overridden, then the new overridden QCI/ARP values are used for bearer binding of the predefined rule. If the QCI/ARP is not overridden, then the values configured in charging action is used. The override charging and policy parameters received from PCRF continue to apply for the entire duration of the call. These values can be modified by PCRF by sending the modified values with the same override control criteria (Rule name(s), Charging Action Name(s) and Exclude Rule(s)). Any change in the Override Control criteria is interrupted as a new Override control (OC). There can only be one wildcard OC installed for a subscriber.

Refer to Override Control documentation for complete list of AVPs.

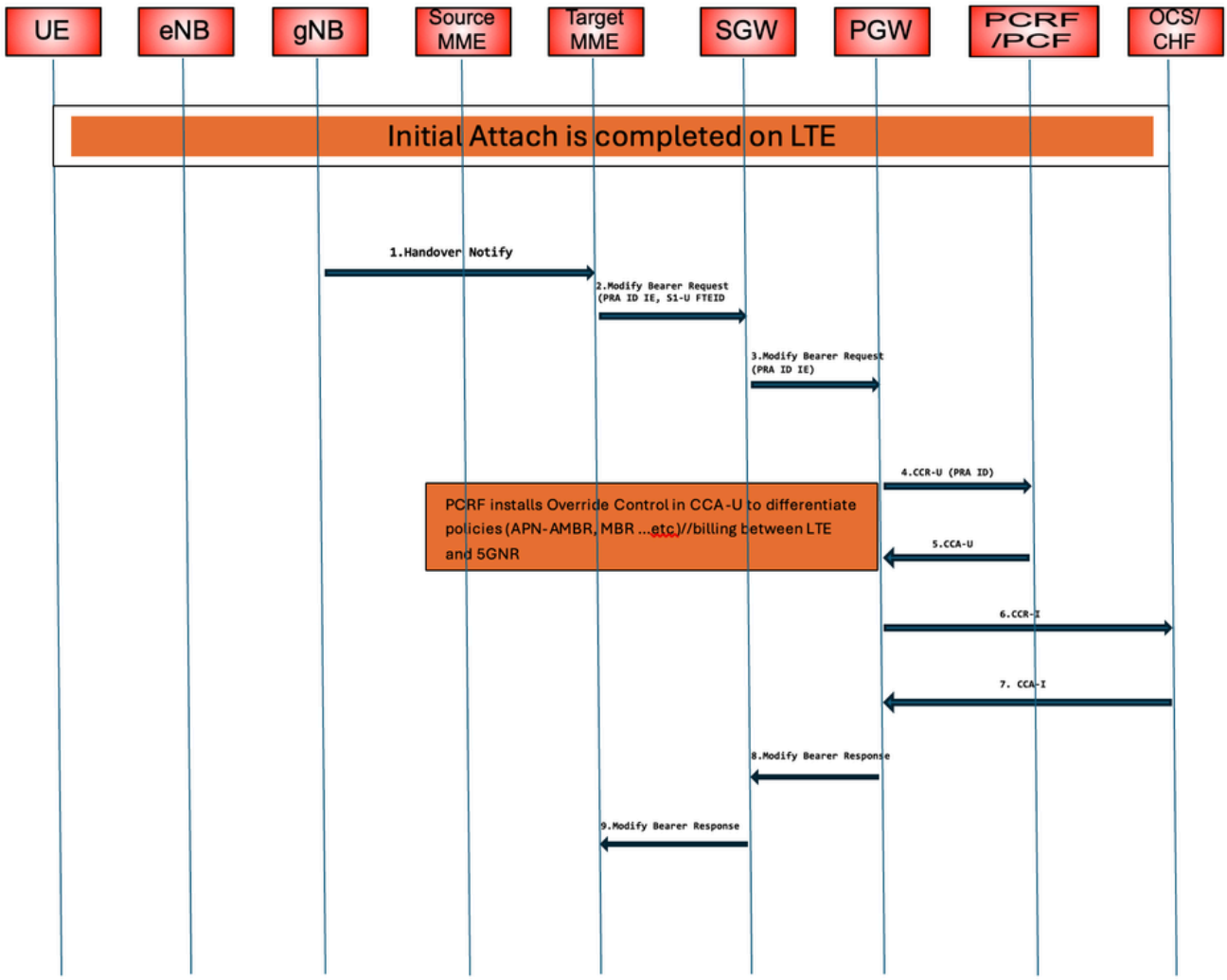
Possible Impacts and Considerations

- Solution proposed is non-3GPP and involves development of the feature on PGW and PCRF.
- This is a Licensed Feature.
- Proposed solution is a customization and has not been implemented globally.
- End-to-end field testing is required to be done in the network before implementation in production.
- Enabling Override-Control for differential charging/policies can cause additional signaling on Gx interface, which can impact PCRF performance.

Flow



MME - Mobility Management Entity
SGW - Serving Gateway



Procedure

- PCRF is able to identify the subscriber type from Home Subscriber Server (HSS) in Subscribe-Notifications-Request (SNR)/Subscribe-Notifications-Answer (SNA) exchange and install Override Control AVPs based on whether the subscriber type is Prepaid/Postpaid/Tablet and so on, and also based on access-technology type such as LTE/5GNR based on Presence Reporting Area (PRA) ID as depicted earlier.
- The Override-Control ensures that the appropriate Rating-Group/Content-Id and QoS paremeters such as Maximum Bitrate (MBR)/Access Point Name Aggregate Maximum Bit Rate (APN-AMBR) are applied for the subscriber whenever static/pre-defined rules are matched for a flow on the PGW/Policy and Charging Enforcement Function (PCEF) as these rules are only defined on the PGW.

PGW Configuration Changes

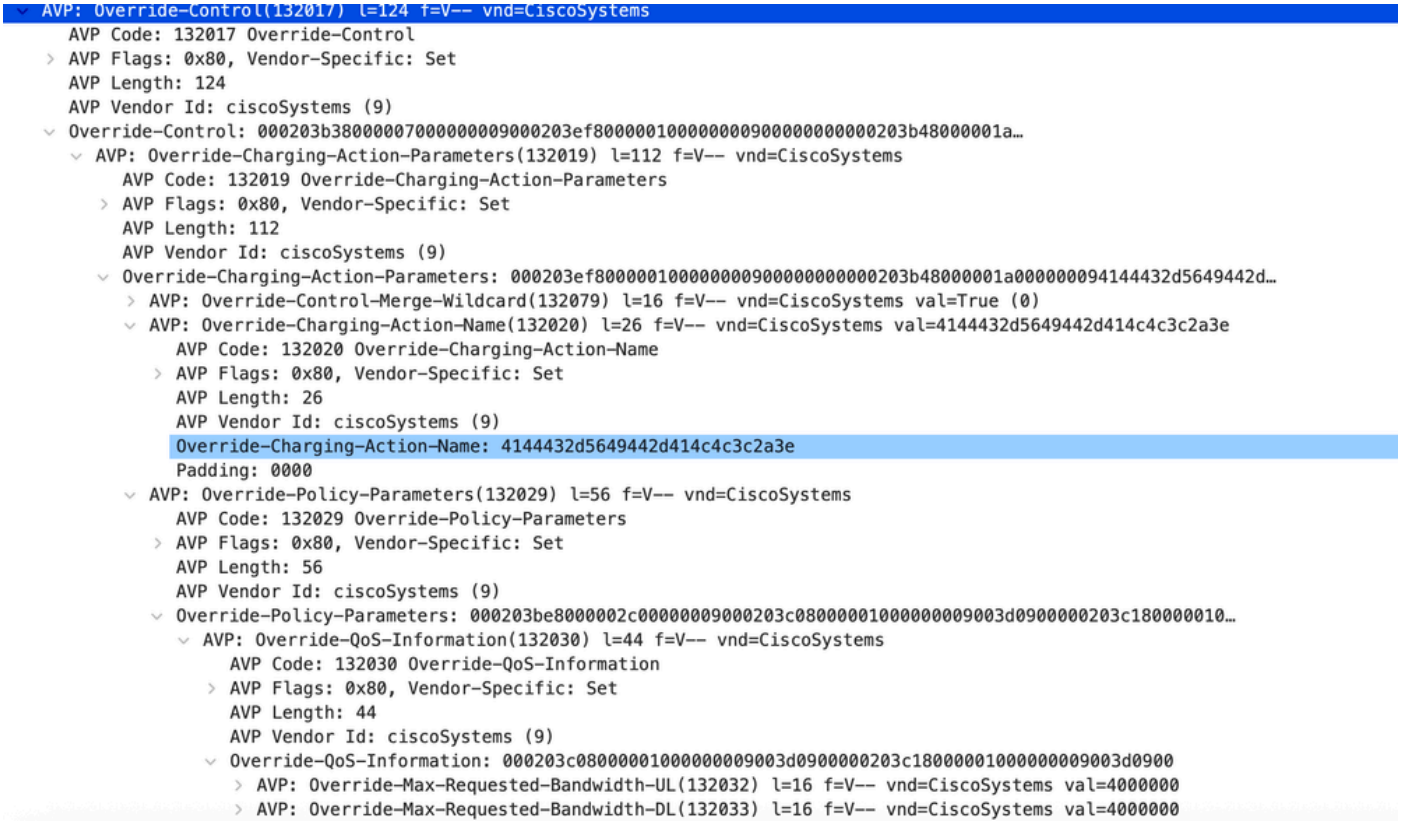
```
configure
   active-charging service  service_name
      rulebase  rulebase_name
         [  default | no ] override-control [ with-oc-name ]
         end
```

Notes

- The override-control CLI command will be visible only when the license to configure the Override Control feature is installed.
- By default, this feature is disabled. If this command is configured, the Override Control feature will be enabled.
- The with-oc-name optional keyword specifies to use OC-name as the unique key to identify an OC for the session. If with-oc-name option is not configured in rulebase, OC will be identified using the Rule/Certificate Authority (CA) and exclude rule as keys. This is the default behavior.

Verification

Wireshark Capture PGW CCA-I



Notes

- Override-Control-Merge-Wildcard AVP indicates that for the charging-action configured here under Override-Control-Charging-Action-Name, the wildcard Override-Control will also be merged/applied.
- Override-Charging-Action-Name AVP indicates that this Override-Control will be applied for the charging-action configured here.
- Override-Policy-Parameters AVP contain the QoS (MBR) information to be applied to the charging-action. Note that this has higher precedence than what is configured on the PGW and hence dynamically sent by PCRF without the need to configure multiple static/pre-defined rule on the PGW for different subscriber/access-technology types.

```
Override-Control: 000203b38000008c00000009000203b5800000130000000969702d706b747300000203b5…
  AVP: Override-Charging-Action-Parameters(132019) l=140 f=V-- vnd=CiscoSystems
    AVP Code: 132019 Override-Charging-Action-Parameters
  > AVP Flags: 0x80, Vendor-Specific: Set
    AVP Length: 140
    AVP Vendor Id: ciscoSystems (9)
  v Override-Charging-Action-Parameters: 000203b5800000130000000969702d706b747300000203b5800000150000000953504441…
    > AVP: Override-Charging-Action-Exclude-Rule(132021) l=19 f=V-- vnd=CiscoSystems val=ip-pkts
    > AVP: Override-Charging-Action-Exclude-Rule(132021) l=21 f=V-- vnd=CiscoSystems val=SPDATA<*>
    > AVP: Override-Charging-Action-Exclude-Rule(132021) l=21 f=V-- vnd=CiscoSystems val=TETHER<*>
    v AVP: Override-Charging-Parameters(132022) l=60 f=V-- vnd=CiscoSystems
        AVP Code: 132022 Override-Charging-Parameters
      > AVP Flags: 0x80, Vendor-Specific: Set
        AVP Length: 60
        AVP Vendor Id: ciscoSystems (9)
      v Override-Charging-Parameters: 000203b880000010000000900000ce4000203ba800000100000000900000001000203bb…
          > AVP: Override-Rating-Group(132024) l=16 f=V-- vnd=CiscoSystems val=3300
          > AVP: Override-Online(132026) l=16 f=V-- vnd=CiscoSystems val=Enable-Online (1)
          > AVP: Override-Offline(132027) l=16 f=V-- vnd=CiscoSystems val=Enable-Offline (1)
```

Notes

- This Override-Control Structure is called the wildcard Override Control as it does not mention any charging-action (or) rulename for which the Override Control can be applied.
- Override-Charging-Action-Exclude-Rule AVP indicates that the wildcard override-control be applied to all static/pre-defined rules configured on the PGW except for the rules mentioned here for which the PGW configuration within the charging-action for that rule is applied and not changed dynamically by the PCRF.
- Override-Rating-Group AVP indicates that this rating-group/content-id will be used for all the static and pre-defined rules within the rulebase for that subscriber.
- Override-Online AVP indicates that this subscriber is subscribed to Online/Gy billing.
- Override-Offline AVP indicates that this subscriber is subscribed to Offline/Rf billing.

PGW CLI Verification

show active-charging sessions full all

The output of this show command is changed to indicate how many Overrides were received and how many are currently active for the subscriber. The next fields are new in this release:

- Override Control
  - Installs Received
  - Installs Succeeded
  - Installs Failed
- Total Override Control

As part of Support for Execution-Time AVP feature, the output of this CLI command has been further modified to show information related to pending OCs at subscriber-level. The next snippet is a partial sample output:

```
show active-charging sessions full all
.
.
.
```

```
Override Control:
    Installs Received:              1
    Installs Succeeded:             1  Installs Failed:             0
    Install Pending:
      Total  :                      2
      Merged :                      0
      Flushed:                      0
      Failed :                      0
    Disables Received:              0
    Disables Succeeded:             0  Disables Failed:             0
```

show active-charging subscribers callid <callid> override-control

This command is added to display the override being applied for the subscriber.

```
show active-charging subscribers callid <callid> override-control pending
CALLID: XXXXXXXX
Override Control :
  Rule Name :
                      qci2
  Charging Parameters:
    Rating Group     : 100
    Offline Enabled  : TRUE
Override Control :
  Rule Name :
                      qci1
  Charging Parameters:
    Rating Group     : 105
    Offline Enabled  : TRUE
  Policy Parameters:
    QCI              : 4
    ARP Byte         : 81
    MBR UL           : 25000
    MBR DL           : 13000
```