



Multiple Customized PCO Support

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Feature Summary and Revision History

Summary Data

Applicable Product(s) or Functional Area	<ul style="list-style-type: none"> • GGSN • P-GW
Applicable Platform(s)	<ul style="list-style-type: none"> • ASR5500 • VPC-DI
Feature Default	Disabled - Configuration Required
Related Changes in This Release	Not Applicable
Related Documentation	<ul style="list-style-type: none"> • <i>Command Line Interface Reference</i> • <i>GGSN Administration Guide</i> • <i>P-GW Administration Guide</i>

Revision History

Revision Details	Release
In this release, Enhanced Protocol Configuration Options (ePCO) support is added with the existing new operator defined PCO for UWB Indicator.	21.20.22
First introduced.	21.20.16

Feature Description

With the multiple PCO support feature, P-GW sends customized Protocol Container Options (PCOs) to MS GTP messages. Custom1 is an existing PCO and its Container ID is always set to FF00H.

This release supports the following PCOs:

- Custom2
- Custom3
- Custom4
- Custom5

The PCO container IDs ranging from FF03 to FFFF can be configured using the Command Line Interface (CLI).

New Operator Defined PCO for Ultra Wideband (UWB) Indicator Feature Enhancement: In the StarOS 21.20 and later releases, P-GW supports either Protocol Configuration Options (PCO) or Enhanced Protocol Configuration Options (ePCO) based on EPCOSI indication bit received from an UE in the Create Session Request and Modify Bearer Request.

If the EPCOSI bit is set, P-GW sends PCO containers in ePCO IE. If the EPCOSI bit is not set, then P-GW sends PCO containers in PCO Information Element (IE).



Note To support Gn/Gp mode, 3G (UMTS) PCO notification to the UE support is added. GGSN does not support ePCO IE.

How it Works

This section describes the updation of PCO values using the Gx and Gy interfaces. The term Gateway (GW) is interchangeably used in this chapter for P-GW and GGSN.

Updating PCO Value Using Gx Interface

This section explains updating PCO value using the Gx interface.

- Policy and Charging Rules Function (PCRF) sends request to activate predefined rules.
- If activation is successful and if the charging action is configured for PCO, then the retrieved value is sent to UE.
- If the predefined rule creation is performed during session creation (CCA), then the retrieved PCO is sent to UE in the Create Session Response message for P-GW and sent to UE in the Create PDP Context Response message for GGSN.
- If the predefined rule activation is sent in the middle of the session (CCA-U), then the retrieved PCO is sent to UE with the next message.

- PCRF sends request to deactivate predefined rules.
- If predefined rules removal is successful, and if PCO is configured for charging action, then the configured value in the APN is returned to UE with the next message.
- If multiple predefined rules are enabled, then the last charging action configured for PCO, in the order of rules sent, is considered as valid and Session Manager is updated with the value.



Note Ensure that the last predefined rule has the correct PCO value for this scenario. Remaining requested rules will follow the regular predefined rule activation procedure.

Updating PCO Value Using Gy Interface

This section explains updating PCO value using the Gy interface.

- Online Charging System (OCS) sends filter ID to enable the corresponding post-processing dynamic rule.
- If rule activation is successful and if the associated charging action is configured for PCO, then the retrieved value is sent to the Session Manager through the Session Update Indication event.
- GW sends PCO value to UE.
- If OCS sends multiple filter IDs, then the charging action associated with the last filter ID is used for PCO.
- CRF sends request to deactivate predefined rules.
- On successful removal of predefined rules, if charging action is configured for PCO, then a PCO default value under APN will be returned to UE with the next message.

Configuring PCO

This section describes the PCO configuration. CLI modifications are not permitted when calls are active for APN Configuration mode and Global Configuration mode, but modifications are permitted for active-charging service.

Configuring PCO in Charging Action Mode

Use the following sample configuration to configure multiple PCOs in the ACS Charging Action Configuration Mode.

```

configure
  active-charging service service_name
    charging-action action_name
      { pco-custom1 | pco-custom2 | pco-custom3 | pco-custom4 |
pco-custom5 } custom_value
    end

```

NOTES:

- **pco-custom1-pco-custom5**: Configures multiple operator-specific PCO.
- *custom_value*: Enter the container value as an integer in the range of 0–255.

Configuring Custom1 PCO in APN Configuration Mode

Use the following sample configuration to configure Custom1 PCO in the APN Configuration mode.

```
configure
  context context_name
    apn apn_name
      [ no ] pco-option custom1 [ ue-requested ]
    end
```

NOTES:

- **pco-option custom1**: Configures operator defined PCO container custom1 mode. By default, its container ID value is fixed to 0.
- **ue-requested**: Configures to include Custom PCO Options in PCO IE, only when it requested by UE.
- **no**: Removes custom1 PCO configuration in the APN Configuration mode.

Configuring Multiple PCOs in APN Configuration Mode

Use the following sample configuration to configure multiple PCOs in the APN Configuration mode.

```
configure
  context context_name
    apn apn_name
      [ no ] pco-options { { custom2 | custom3 | custom4 | custom5 } [
ue-requested value custom_value | value custom_value ] }
    end
```

NOTES:

- **custom2-custom5**: Configures APN to include custom PCO options in PCO IE.
- **ue-requested**: Configures to include Custom PCO Options in PCO IE, only when it is requested by UE.
- **value**: Configures default container value of Custom PCO.
- **no**: Removes PCO configuration in the APN Configuration mode.

Configuring PCO Container ID in Global Configuration Mode

Use the following sample configuration to configure multiple PCOs in the Global Configuration mode.

```
configure
  [ no ] pco-options { custom2 | custom3 | custom4 | custom5 } container-id
  container_id_value
end
```

NOTES:

- **container-id**: Configures the operator defined container ID and the value ranging from FF03 to FFFF.
- **no**: Removes PCO container ID configuration in the Global Configuration mode.



Note The custom1 container ID is not configurable in the Global Configuration mode as its container value is fixed to FF00.



Note If you are deleting or modifying an existing container ID value for an ongoing session, then it can result in erratic behavior. A confirmation message is displayed before the deletion or modification of the container ID. Based on your input (y/n), you can proceed to the next steps.

Monitoring and Troubleshooting

This section provides information on how to monitor and troubleshoot using show commands available in support of this feature.

Show Commands and Outputs

This section provides information regarding show commands and their outputs for this feature.

show active-charging charging-action all

The output of this command is enhanced to display the following field.

Table 1: show active-charging charging-action all Command Output Descriptions

Field	Description
PCO-Custom1/2/3/4/5 value	Indicates the action value for multiple operator-specific PCO.

show active-charging sessions full all

The output of this command is enhanced to display the following fields.

Table 2: show active-charging sessions full all Command Output Descriptions

Field	Description
custom	Indicates Operator specific custom option.
Value	Indicates the value used for sending in custom PCO container.

Field	Description
Interface	<p>Indicates the interface such as Gx. Gy or n/a based on the following conditions:</p> <ul style="list-style-type: none"> • Gx: The charging rule is applied from the Gx interface that has custom PCO value. • Gy: The charging rule is applied from the Gy interface that has custom pco value. • n/a: The configured PCO value which is applied from APN profile.

show apn all

The output of this command is enhanced to display the following fields.

Table 3: show apn all Command Output Descriptions

Field	Description
Custom1/2/3/4/5 value	Specifies the action value for multiple operator-specific PCO.
UE-Requested	Specifies PCO to the UE, which requested for new PCO option.