Idle Mode Buffering and Paging

This chapter covers the following topics:

- Feature Summary and Revision History, on page 1
- Feature Description, on page 2
- Buffering Action Rule Call Flow, on page 2
- Downlink Data Report for First DL Packet, on page 3
- Paging Policy Differentiation, on page 3

Feature Summary and Revision History

Summary Data

Table 1: Summary Data

Applicable Product(s) or Functional Area	5G-UPF
Applicable Platform(s)	VPC-SI SMI
Feature Default Setting	Enabled – Always-on
Related Changes in this Release	Not Applicable
Related Documentation	Not Applicable

Revision History

Table 2: Revision History

Revision Details	Release
First introduced.	2020.02.0

Feature Description

A Buffering Action Rule (BAR) provides instructions to control the buffering behavior of the User Plane Function (UPF). The BAR controls the buffering behavior for all Forwarding Action Rules (FARs) of the Packet Forwarding Control Protocol (PFCP) session. This control is applicable when the PFCP session is set with an Apply Action parameter, which requests packets to be buffered and associated with the respective BAR.

How it Works

If the User Plane Function indicates the support of the feature UL or DL Buffering Control (UDBC), the SMF provides the buffering packet count IE in a BAR. The buffering count IE is created during a PFCP Session Establishment procedure or a PFCP Session Modification procedure. The SMF modifies it in a subsequent PFCP session modification request, "and" or "or" a PFCP Session Report Response message. The same BAR associates with all the FARs in a PFCP session to indicate that all service data flows in the PFCP session shares the same buffer in the UPF for the PFCP session. One BAR is created per PFCP session.

Provisioning of Buffering Action Rule in the UPF

The SMF provisions multiple buffering parameters in a BAR. It is in Create BAR or Update BAR in various PFCP messages.

Currently, UPF supports the following IE:

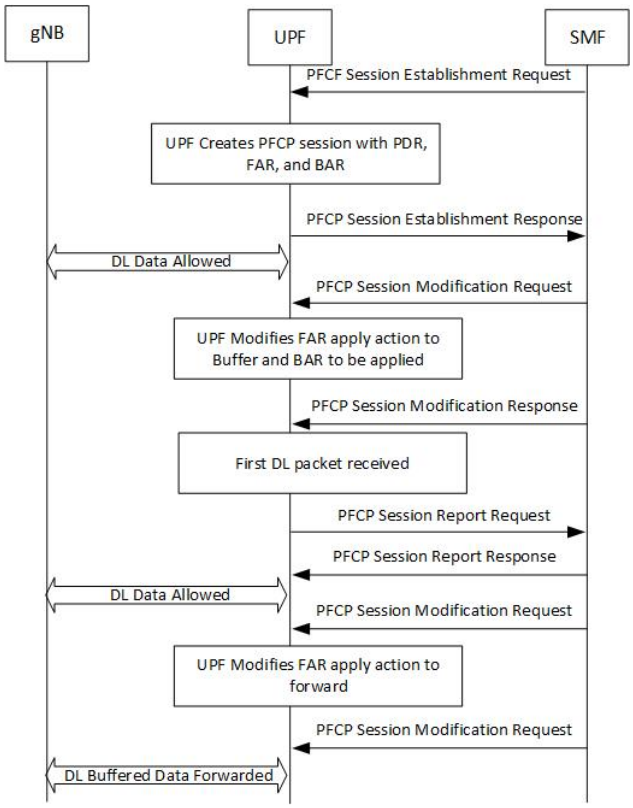
- The suggested buffering packet count IE—If the UPF indicates the support of the feature UDBC to indicate the number of packets. It includes both uplink or downlink that the SMF suggests buffering in the UPF, until it receives new instructions from the SMF. Example: when the new quota is granted.
- DL buffering suggested packet count IE—This IE is received with update BAR from SMF in Session Report Response message, if SMF wants more DL packets to be buffered on UPF.

The UPF does not apply the DL buffering duration and DL buffering suggested packet count parameters and deletes these parameters from the BAR (without explicit request from the SMF) when extended buffering of downlink data packets ends in the UPF. The UPF does not apply buffering when it receives the new instruction from the SMF. The buffered packets are either dropped or forwarded following the packet forwarding model and considering that the buffered packets are already processed earlier.

Buffering Action Rule Call Flow

This section describes the provisioning of buffering action rule in the UPF call flow.

Figure 1: Buffering Action Rule



Downlink Data Report for First DL Packet

When instructed to buffer and notify the SMF about the arrival of a DL packet, the UPF notifies the SMF, when it receives a first downlink packet for a given FAR. The UPF notifies the DL packet arrival by sending a PFCP Session Report Request including a Downlink Data Report IE identifying the PDR(s) for which downlink packets was received.

Paging Policy Differentiation

The UPF supports the Paging Policy Differentiation, for each PDR and for each packet that triggers a Downlink Data Notification, the UPF function copies the value of the DSCP in ToS (IPv4) or TC (IPv6) information received in the IP payload in Downlink Data Service Information IE.

For each PDR and for each packet that triggers a Downlink Data Notification, if the QFI of the downlink data packet is available, the QFI is also sent in Downlink Data Service Information IE.

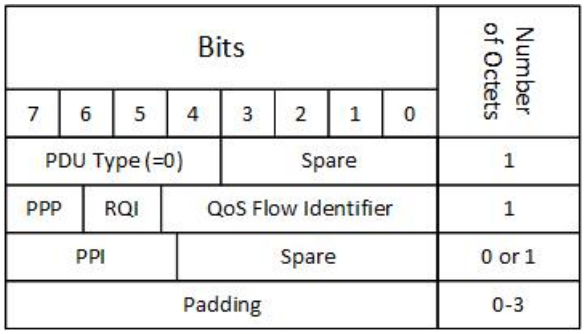
Paging Policy Indicator (PPI)

The SMF sends the PPI value in Create QER or Update QER, if UPF needs to set Paging Policy Indicator in outgoing PDU packets.

Frame Format for the PDU Session User Plane Protocol

Downlink PDU Session Information (PDU Type 0) - This frame format is defined to allow the NG-RAN to receive some control information elements which are associated with the transfer of a packet over the interface. The following figure shows the respective DL PDU SESSION INFORMATION frame.

Figure 2: DL PDU SESSION INFORMATION (PDU Type 0) Format



Bits								Number of Octets
7	6	5	4	3	2	1	0	
PDU Type (=0)				Spare				1
PPP	RQI	QoS Flow Identifier						1
PPI				Spare				0 or 1
Padding								0-3

QoS Flow Identifier (QFI)

Description: When present, the QoS Flow Identifier (QFI) parameter indicates the QoS Flow Identifier of the QoS flow to which the transferred packet belongs.

Value Range: The value range is between 0 to 2^6 -1.

Field Length: 6 bits.

Paging Policy Presence

Description: The Paging Policy Presence (PPP) parameter indicates the presence of the Paging Policy Indicator (PPI).

Value Range: A value of 0 indicates that Paging Policy Indicator is not present and 1indicates that Paging Policy Indicator is present.

Field Length: 1 bit.

Paging Policy Indicator

Description: When present, the Paging Policy Indicator (PPI) is used for paging policy differentiation (see details in 3GPP TS 23.501). This field applies to PDU sessions of IP type.

Value Range: the value range is between 0 to 2^3 -1.

Field Length: 3 bits.