eDRX and PSM Support on Gateways

This chapter describes the support of Extended Discontinuous Reception (eDRX) and Power Saving Mode (PSM) on gateways.

Feature Summary and Revision History

Summary Data

Applicable Product(s) or Functional Area	• C-SGN • P-GW • S-GW • SAEGW
Applicable Platform(s)	• UGP • VPC-DI • VPC-SI
Feature Default	Disabled - License Required
Related Changes in This Release	Not Applicable
Related Documentation	*Statistics and Counters Reference*

Revision History

Revision Details	Release
The feature is tested and qualified on the ASR 5500 platform.	21.3
First introduced.	N5.1 (21.1.V0)

Feature Description

The Extended Discontinuous Reception (eDRX) feature allows IoT devices to remain inactive for longer periods. This feature allows the device to connect to a network on a need basis – the device can remain inactive or in sleep mode for minutes, hours or even days, thus increasing the battery life of the device. Extended DRX cycles provide UEs longer inactive periods between reading, paging or controlling channels.

Power Saving Mode (PSM) was introduced in 3GPP Release 12, to improve device battery life of IOT devices. The most significant benefit of this feature is the UE has more control in terms of power management required for its application. There are a wide range of IoT applications where flexibility of the UE to manage its power is very important and also implementation of PSM can prevent network congestion. The timers of all the devices can be managed using PSM, and the wake-up periods can be adjusted to be offset as much as possible. This way, all of the devices will not wake at the same time and attempt to access the network. The PSM mode is similar to power-off but the UE remains registered on the network.

As part of this eDRX and PSM Support on Gateways feature, when UE is in PSM and any Update Bearer Request (UBReq) or Create Bearer Request (CBReq) is rejected with Cause Code “UE is temporarily not reachable due to power saving”, control packets are buffered for delay tolerant PDN’s.

How It Works

A CLI-based configuration is introduced under APN Configuration Mode for P-GW to determine if a PDN connection is Delay Tolerant. If the PDN is Delay Tolerant, the P-GW sends Delay Tolerant Connection Indication (DTCI) flag (set to 1) in Create Session Response.

A new GTP cause code (UE is temporarily not reachable due to power saving) in Create Bearer Response/Update Bearer Response (CBResp/UBResp) messages is introduced to indicate the corresponding network initiated control plane procedure is rejected when the UE is in PSM/eDRX mode.

The ongoing network initiated procedure are buffered until further indication that the UE is available again for end-to-end signaling. In the time interval when MME indicates the UE is in PSM/eDRX mode, the P-GW buffers all the control packets that requires UBReq/CBReq. The buffering at session manager (SM) is done using the existing framework. Any subsequent request is rejected. When P-GW receives MBReq with ‘UE Available for Signaling Indication’ (UASI) flag (set as 1), the P-GW reattempts the pending network initiated procedure. When P-GW is Delay Tolerant, it includes DTCI flag in MBResp on S-GW Relocation, and when UE moves from S4-SGSN/MME.

For S-GW, the UASI flag is set to 1 by the MME during a TAU/RAU or a Service Request procedure for E-UTRAN, when the PDN connection is delay tolerant, and when there is pending network initiated PDN connection signaling. The S-GW includes the UASI Information Element (IE) on S5/S8 when it receives from the MME.

The S-GW receives the UASI flag in Create Session Request (CSReq) when the UE is available for signaling and the S-GW relocation is initiated at the same time. The S-GW forwards the UASI flag in MBReq to P-GW to reattempt pending network initiated procedure.

Limitations

Following are the known limitations of this feature:

- SR/ICSR of buffered packets is not be supported.
- Maximum of four control signal transactions can be buffered at gateway, beyond which any network requested transactions are rejected.
- S-GW and MME restoration does not consider Delay Tolerant Connection Indication (DTCI) capability while retaining the session.

License Requirements

The eDRX and PSM Support on Gateways feature is license dependent. Contact your Cisco account representative for detailed information on specific licensing requirements.

Configuring eDRX and PSM Support on Gateways

This section explains the configuration procedures required to enable the feature.

Configuring APN for P-GW to Support Delay Tolerant PDN

Use the following configuration under APN Configuration Mode for P-GW to support Delay Tolerant PDN connections and to configure maximum number of P-GW initiated control signaling messages to be buffered.

```
configure
   context context_name
      apn apn_name
         delay-tolerant-pdn max-control-signal-buffer <1-4>
         end
```

Notes:

- **delay-tolerant-pdn**: Configures Delay Tolerant behavior for PDN connection to support UE in Power Saving Mode.
- **max-control-signal-buffer** *<1-4>*: Configures maximum number of P-GW initiated control signaling messages to be buffered (range 1 to 4) when UE is in Power Saving Mode.
- If previously configured, use the **no delay-tolerant-pdn** CLI command to remove and restore the configuration to its default value.
- By default, the command is disabled and eDRX support is not applicable.
- This CLI command takes effect during new call set-up or during handoff procedure to S5/S8 interface.

Monitoring and Troubleshooting

Show Commands and/or Outputs

This section provides information regarding show commands and/or their outputs in support of the eDRX and PSM Support on Gateways feature.

show subscribers pgw-only full all

The output of this command is modified to display if the UE is in Power saving Mode. Sample output below:

```
UE in Power Saving Mode: No | Yes
```

show apn name

The output of this command is modified to display the APN configuration. Sample output below:

```
delay tolerant pdn: yes
```

```
max-control-signal-buffer: 4
```

show pgw-service statistics all

The output of these command are modified to display the number of UE that are in Power Saving Mode per P-GW Service. Sample output below:

```
Power Saving Mode(PSM) Statistics:
   No of UEs in PSM mode: 0
```

These new fields are also introduced in the output of following show command:

- **show pgw-service statistics name**

eDRX and PSM Support on Gateways Bulk Statistics

The following statistic is introduced in support of the feature:

P-GW Schema

- ue-in-psm - This statistic indicates the total number of UEs currently in Power Saving Mode.