



## eDRX Support on the MME

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This feature describes the Extended Discontinuous Reception support on the MME in the following sections:

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## 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.

The Extended DRX feature is license controlled. Contact your Cisco Account or Support representative for information on how to obtain a license.

## How eDRX Works

In order to use the eDRX feature, the UE requests eDRX parameters during ATTACH and TAU procedures.

Based on the configuration, the MME may accept or reject the UE's request to enable the eDRX feature. If the MME accepts the eDRX request, different values of the eDRX parameters are provided based on operator policies, apart from the parameters requested by the UE.

## eDRX Parameters

A Hyper-SFN (H-SFN) frame structure is defined for regular idle mode DRX. Each H-SFN value corresponds to a legacy SFN cycle comprised of 1024 radio frames (10.24 seconds). The eDRX consists of values that are a power of 2, ranging from 5.12 seconds (i.e. 5.12, 10.24, 20.48 seconds and so on) up to a maximum of 2621.44 seconds (43.69 minutes). When EDRX is enabled for a UE, the UE is reachable for paging in specific Paging Hyperframes (PH), which is a specific set of H-SFN values. The PH computation is a formula that is function of the EDRX cycle, and a UE specific identifier. This value can be computed at all UEs and MMEs without need for signalling. The MME includes the extended idle mode DRX cycle length in paging message to assist the eNodeB in paging the UE.

The MME also assigns a Paging Time Window length, and provides this value to the UE during attach/TAU procedures together with the extended idle mode DRX cycle length. The UE first paging occasion is within the Paging Hyperframe. The UE is assumed reachable for paging for an additional Paging Time Window

length after first paging occasion. After the Paging Time Window length, the MME considers the UE unreachable for paging until the next Paging Hyperframe.

## Loose Hyper SFN Synchronization

In order for the UE to be paged at roughly similar time, the H-SFN of all eNodeBs and MMEs should be loosely synchronized.

Each eNodeB and MME synchronizes internally the H-SFN counter so that the start of H-SFN=0 coincides with a preconfigured time. It is assumed that eNodeBs and MMEs are able to use the same H-SFN value with accuracy in the order of legacy DRX cycle lengths, e.g. 1 to 2 seconds. There is no need for synchronization at SFN level.

There is no signalling between network nodes required to achieve this level of loose H-SFN synchronization.

## Paging and Paging Retransmission Strategy

When the MME receives trigger for paging and the UE is reachable for paging, the MME sends the paging request. If the UE is not reachable for paging, then the MME pages the UE just before the next paging occasion.

The MME determines the Paging Time Window length based on paging retransmission strategy, and uses it to execute the retransmission scheme.

## Standards Compliance

The eDRX feature complies with the following standards:

- 3GPP TS 23.682 version 13.4.0, Architecture enhancements to facilitate communications with packet data networks and applications (Release 13)
- 3GPP TS 24.302 version 13.5.0, Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3 (Release 13)
- 3GPP TS 23.401 version 13.5.0, General Packet Radio Service (GPRS) enhancements for Evolved Universal Terrestrial Radio Access Network (E-UTRAN) access.

- 3GPP TS 29.274 version 13.5.0, 3GPP Evolved Packet System (EPS); Evolved General Packet Radio Service (GPRS) Tunneling Protocol for Control plane (GTPv2-C); Stage 3

## Limitations and Restrictions

The eDRX feature is compatible only with IoT devices. It is not available for all Mobile Stations (MS), that is, only those MSs and their respective Base Service Stations (BSS) that have the extended coverage parameters are supported by the SGSN.

## Configuring eDRX on the MME

### Enabling eDRX on MME

The following CLI configuration enables the eDRX feature on the SGSN. The configuration also provides the following:

- Accept eDRX parameters: Paging Time Window (PTW) and eDRX cycle length value, from the UE.
- Configure PTW and eDRX cycle length value.

The above configuration is available under the Call Control Profile Configuration mode.

```
configure
  context context_name
    mme-service service_name
      edrx { ue-requested | ptw ptw_value edrx-cycle cycle_length_value [ dl-buf-duration [
packet-count packet_count_value
]] }
      remove edrx
    end
```

Notes:

- **remove** disables the eDRX configuration on the MME.
- **edrx** configures Extended Discontinuous Reception parameters.
- **ue-requested** specifies the UE requested values of the Paging Time Window and the eDRX Cycle Length are accepted.
- **ptw** Specifies the Paging Time Window (PTW) value received from the UE in the Attach REquest/TAU Request message. The PTW value is an integer ranging from 0 to 20 seconds.
- **edrx-cycle** Specifies the accepted UE requested values of the Paging Time Window and the eDRX Cycle Length.
- MME sends Downlink Buffer Duration IE in Downlink Data Notification Acknowledgment message to the gateway when MME is unable to page the UE.
- MME sends Downlink Buffering Suggested Packet Count value to gateway in Downlink Data Notification Acknowledgment message when MME is unable to page UE. the packet count is an integer that ranges from 0 to 65535.

### Verifying eDRX on the MME

The below given command displays the following new fields that are added to support the eDRX feature:

**show call-control-profile full name <cp-name>**

```
Extended DRX:
  Paging Time Window           : 10 Seconds
  eDRX Cycle Length            : 512 Seconds
  Downlink Buffer Duration in DDN Ack : Enabled
  DL Buffering Suggested Packet count in DDN Ack : 10
```

## Configuring Hyper SFN Synchronization

The following CLI allows to configure the Hyper SFN Synchronization start time.

**configure**

```
context context_name
  mme-service service_name
    edrx hsfm-start UTC_Time
  no edrx hsfm-start
end
```

Notes:

- The **no** option disables the H-SFN synchronization time configuration.
- The **edrx** command specifies the Extended Discontinuous Reception H-SFN start time.
- The **hsfm-start** keyword specifies the UTC Time at which H-SFN=0 starts. The time should be entered in the UTC Time format as follows: **YYYY:MM:DD:hh:mm:ss**. For example: 2016:03:01:12:34:56.

### Verifying H-SFN Synchronization

The below given command displays the following new fields that are added to verify H-SFN Synchronization:

**show mme-service full <service-name>**

```
Extended DRX:
  H-SFN Start: 2016:03:01:12:34:56
```

## Monitoring and Troubleshooting eDRX

### eDRX Show Command(s) and /or Outputs

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

**show mme-service statistics**

- EDRX Subscribers
  - Attached Cells
  - DDN Rejects

Notes:

- Attached Calls: Displays the number of attached subscribers for which EDRX is enabled.

- DDN Rejects: Displays the number of DDNs rejected when EDRX subscribers cannot be paged (UE is out of the paging window)

**show egtpc statistics verbose**

Executing the above command displays the following fields for this feature:

- Create Bearer Denied
- Create Bearer Denied TX
  - UE not reachable due to PSM
- Update Bearer Denied
- Update Bearer Denied TX
  - UE not reachable due to PSM

## Bulk Statistics

Functional descriptions, triggers and statistic type are defined for each of the bulk statistics listed below in the *Statistics and Counters Reference*

- %attached-edrx-subscriber%
- %ddn-rejects-edrx%

