kpn

LTE-M configuration data

LTE-M is the latest addition in the IoT connectivity portfolio of KPN for communication between Machines. KPN is an innovative player in the Global M2M market with the first nationwide LoRa network in the world, and now one of the first with an operational LTE-M network for data, with voice functionality on the roadmap.

LTE-M is part of the KPN 4G/LTE network and has a maximum theoretical speed of up to 1 MB/s down/uplink in full-duplex mode, with very low latency. Hence, you will be provided with the best coverage and newest security updates. KPN does not support full-duplex mode yet. Visit our LTE-M forum for more information, support and the most recent version of this document. Check out our LTE-M Coverage Map for coverage in your area.

Speed	Half duplex downlink	Half duplex uplink
Theoretical	300 Kb/s	375 Kb/s
Operational	200 Kb/s	300 Kb/s

This document provides the strictly necessary information for the Development Kit users for configuring LTE-M features. This document will be updated with the rollout of new LTE-M features. Please not that device specific configurations like AT commands, are not discussed in this document. We refer to the manufacturers website and manuals for those specific configurations.

APN's

LTE-M works with all APN's. New release futures will temporarily only work on certain test APN's before releasing it to all APN's. We are striving to make all features available for all APN's in the future:

1. LTEM.WEBTRIAL.M2M - Public IPv4 address
2. LTEM.INTERNET.M2M - Private IPv4 address (NAT)

The WEBTRIAL.M2M IP-address is public, which means the UE is reachable for anyone on the internet. The INTERNET.M2M is protected by NAT. This means that the UE needs to initiate a session with another public IP address, otherwise it isn't reachable from the outside.

Currently supported LTE-M features

Feature	Availability
Data	✔
Custom APN	✔
SMS	✔
Instant SIM Provisioning	✔
Power Saving Mode	✔
Idle Mode Mobility	✔
Remote SIM Provisioning	✔
Roaming	✔
eDRX	✔
VoLTE	
Enhanced Coverage	✔

Power Saving Mode (PSM)

Power Saving Mode (PSM) is a power saving feature in which the UE tells the network it is going to sleep for a predefined time. The UE wakes up in connected mode to send its data. After sending, it stays connected for a while, after which it goes into IDLE mode to listen for mobile terminated commands. After that, the UE goes into PSM again. The UE remains registered in the network while in PSM.

The user should be aware that - in case the UE is provided with a public IP Address - internet originated messages may keep the UE in connected mode and hence prevent the UE from entering the Power Saving Mode.

The UE can awake in two occasions:
1) The UE needs to send data.
2) The periodic TAU-timer expires, the UE needs to send a Traffic Area Update to the network.

For PSM to function properly, two timers need to be configured. The **T3324 Active Timer** and the **T3412 Extended Timer**. They are included in the Tracking Area Update by the UE.
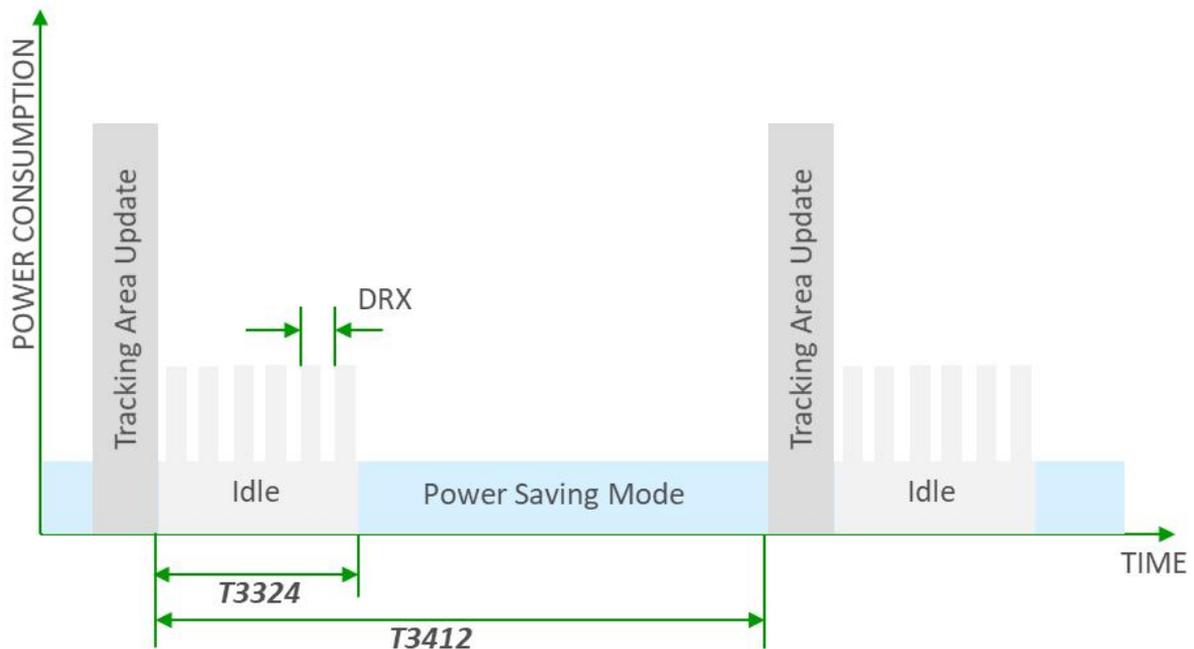

Figure 1: Relative power consumption for a UE in PSM

T3324 Active Timer

The T3324 Active Timer defines the time the UE stays in idle mode after the transition from connected to idle mode. In this time the UE is reachable for mobile terminated traffic. When the timer expires, the UE moves into PSM. At this moment, the network has UE controlled PSM, which means that the used values will get validated and accepted (within confinements) by the network.

Configuration
1. Active timer should be ≤ 186 minutes.
2. Active timer should be ≤ T3412 Extended timer.

T3412 Extended Timer

The T3412 timer is also called the periodic TAU-Timer. This periodical update is used to notify the availability of the UE to the network.

Configuration
1. Extended TAU timer should be ≥ 60 minutes.
2. Extended TAU timer should be ≤ 310 hours.

Extended Discontinuous Reception (eDRX)

eDRX is another power saving feature for LTE-M, besides PSM. There are two types of eDRX:

1. Idle Mode eDRX (I-eDRX)
2. Connected Mode eDRX (C-eDRX)

In regular LTE, UE's that are in idle mode are listening to the network to check for any potentially incoming signals (voice, data or messages). The I-eDRX feature allows for a LTE-M UE to listen less frequently to the network which has a power saving effect for the UE. If any data is sent to a LTE- M UE that has eDRX configured, the LTE-M networks buffers that data until the UE starts listening to the network. Then the UE is paged and consequently, the UE re-establishes connectivity to the network so the buffered data can be received.

Note that Connected Mode eDRX (C-eDRX) is currently not supported for LTE-M yet. Therefore eDRX refers to I-eDRX in the rest of this document.

The diagram below shows the relative power consumption of a UE, for a particular sequence of UE-events.
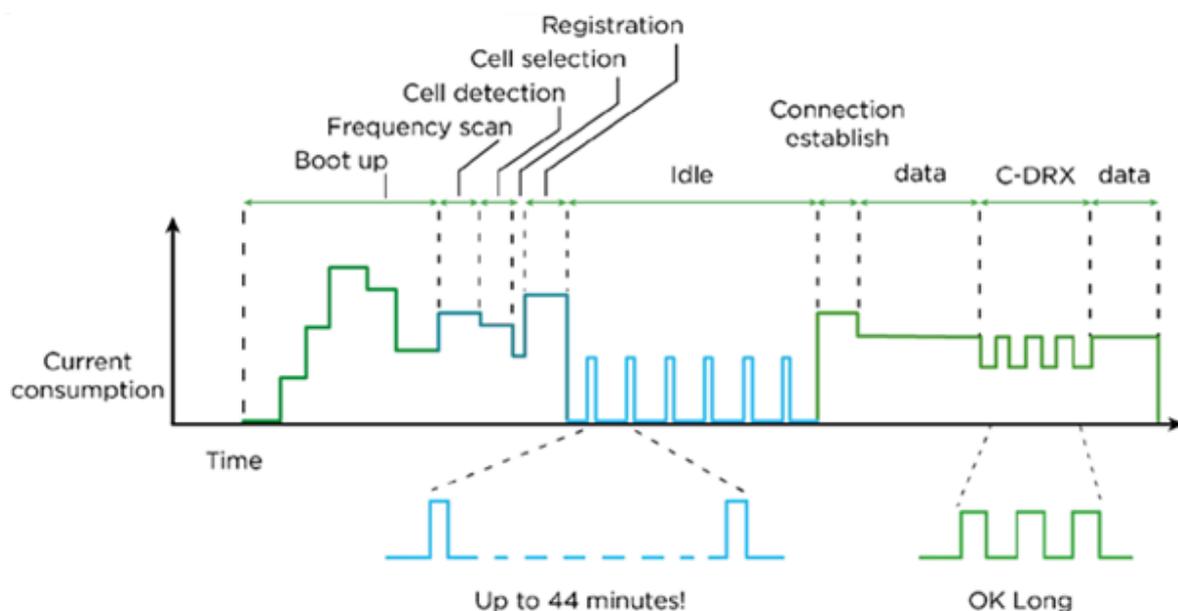

Figure 2: Relative power consumption for a UE in eDRX

eDRX Configuration
For eDRX to function properly, two timer settings need to be configured in the UE:

1. Paging Timer Window (PTW) size, this is the part of the eDRX cycle, during which a UE listens to the paging channel.
2. I-eDRX Cycle length, this is the duration of a complete cycle, including the Paging Timer Window.

Configuration eDRX
1. Paging Timer Window size should be between 1.28 and 20.48 seconds.
2. I-eDRX Cycle length should be between 5.12 **seconds** and 43.69 **minutes**.
3. I-eDRX Cycle length > Paging Time Window size

If invalid values are set in the UE, the network will adjust the PTW size so that it is equal or less than the eDRX cycle length.

Data Buffering Limitations

Only one data packet of 512 bytes is buffered in the LTE-M network for a data session of a UE. Any further data packets that are being sent within the same eDRX cycle for the same UE overwrite previously buffered packets.

The user should be aware that – in case the UE is provided with a public IP Address - a buffered packet can be overwritten by any internet originated messages directed to the UE in the same eDRX cycle.

PSM and eDRX Combined

When using the PSM and eDRX features simultaneously, the Active Timer must be set to a bigger value than the length of one eDRX cycle. Otherwise, the network will ignore the eDRX parameters.

SMS and eDRX

In contrary to mobile terminating data, MT SMS is not buffered. Instead, the network tries to deliver the SMS. If the UE is not listening to the paging channel, the SMS is stored for up to 72 hours in the Short Message Service Centre (SMSC), that retries to deliver the SMS according to a certain delivery scheme. A stored message is not overwritten by further incoming Short Messages (SM's) – all SM's are added to the delivery queue. If message delivery is not successful within 72 hours, the message will be discarded.

When using eDRX, we recommend not to use MT SMS, because eDRX decreases the reachability of the UE and therefore also the chance for a successful SMS delivery.

List of Abbreviations

APN	Access Point Name
C-eDRX	Connected Mode eDRX
eDRX	Extended Discontinuous Reception
I-eDRX	Idle Mode eDRX
LTE	Long Term Evolution (4G)
LTE-M	LTE for MTC or Machine-to-Human
M2M	Machine to machine
MSC	Mobile Switching Centre
MT SMS	Mobile Terminated SMS
MTC	Machine Type Communication
NAT	Network Address Translation
PSM	Power Saving Mode
PTW	Paging Timer Window
SM	Short Message
SMS	Short Message Service
SMSC	Short Message Service Centre
TAU	Traffic Area Update
UE	User Equipment