Modem Reset Loop Restriction

White Paper

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NORDIC® SEMICONDUCTOR

Contents

Revision history

Date	Description
2024-01-15	Editorial updates
2022-06-22	Editorial updates
2021-07-06	First release

1 Introduction

Reset loop restriction prevents excessive signaling towards the network during continuous modem or application reset loops on a nRF91 Series modem.

The restriction mechanism counts the modem activations that lead to a reset without deinitializing the modem between the activations. The modem starts blocking LTE radio connections after the number of resets has reached the defined limit. The modem continues blocking the connections for a certain amount of the modem's runtime. This means that the modem must be initialized for the duration of the blocking.

When the reset count reaches the limit, the blocking restriction is written to *Non-volatile Memory (NVM)*. The wait time cannot be bypassed after the wait has started. If the modem is reset during the wait period, the wait period is restarted with the initial wait period.

Note: Reset loop restriction should be taken into consideration when testing is planned to avoid unwanted behavior.

2 Activation of reset loop restriction

The modem counts all resets where the modem is not gracefully deinitialized with `+CFUN=0`. If modem deinitialization with `+CFUN=0` is triggered before the predefined limit is reached, the reset counter is set to zero and the counting starts from the beginning. In modem firmware version 1.3.0, the limit is 5. In modem firmware version 1.3.1 and later, the limit is 7.

CAUTION: `CFUN=0` causes writing to *NVM*. When using CFUN=0, take NVM wear into account.

The counter is reset after modem initialization when a reset has not occurred in 60 s. This indicates that the device does not constantly reset after initialization and the counting can start from the beginning.

If the modem is activated after initialization and registration to network succeeds before 60 s has passed, the 60 s validation timer is restarted. When the timer expires, the counter is reset.

The activation of the reset loop restriction is notified with the `%MDMEV: RESET LOOP` AT notification after the modem's activation when the blocking starts or is still ongoing. A modem reset and deinitialization with `+CFUN=0` removes the notification subscription and a new subscription is required after the modem is initialized.

Modem domain event notifications, including notifications of the modem reset loop restriction's activation, can be subscribed with the following **`%MDMEV`** *AT command*:

```
AT%MDMEV=1
```

For more information on the **`%MDMEV`** AT command, see Modem domain event notification %MDMEV in nRF9160 AT Commands or nRF91x1 Cellular AT Commands.

3 Modem behavior during reset loop restriction

The activation of the reset loop restriction starts the timer with a 30 minute period. During this time, the modem blocks all Attach attempts. After the timer has expired, the modem starts normal behavior and automatically regains LTE service for possible connections the same way as when the modem is activated without the reset loop restriction.

If the modem is switched off gracefully during a restriction period, the remaining time is stored to *NVM*, and the timer starts again with the remaining time during the next modem initialization. The timer starts again with the last remaining time that has been stored to NVM.

> **Note:** The stored remaining time may still be the initial 30 min if the NVM update has not yet been done periodically or by trigger after the restriction timer has started.

The restriction timer does not run when the modem has no power. The timer starts after the modem has been initialized. Clearing the reset count with `+CFUN=0` does not impact an ongoing restriction period.

If the modem is reset during a restriction period, the timer starts again with the initial value or a previously stored remaining time during the next modem initialization.

In product development phase, active reset loop restriction can be removed with the `%XFACTORYRESET=0` command. The command should not be used for this purpose in the final product. If `%XFACTORYRESET=0` is used, all modem data, including user-configurable data, is reset.

> **CAUTION:** `%XFACTORYRESET=0` causes writing to NVM. When using `%XFACTORYRESET=0`, take NVM wear into account.

The following command example subscribes modem domain event notifications:

```
AT%MDMEV=1
OK
```

The following command example activates the modem:

```
AT+CFUN=1
OK
```

The following modem domain event notification indicates that reset loop restriction is active:

```
%MDMEV: RESET LOOP
```

Glossary

AT command

A command used to control the modem.

User Equipment (UE)

Any device used by an end-user to communicate. The UE consists of the Mobile Equipment (ME) and the Universal Integrated Circuit Card (UICC).

Non-volatile Memory (NVM)

Memory that can retrieve stored information even after having been power-cycled.

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