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RELEASE NOTE

Recommendation GSM 03.13

Discontinuous Reception (DRX) in the GSM System

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1. Reason for changes

No changes since the previously distributed version.

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PREFATORY NOTE

ETSI has constituted stable and consistent documents which give specifications for the implementation of the European Cellular Telecommunications System. Historically, these documents have been identified as "GSM recommendations".

Some of these recommendations may subsequently become Interim European Telecommunications Standards (I-ETSs) or European Telecommunications Standards (ETSs), whilst some continue with the status of ETSI-GSM Technical Specifications. These ETSI-GSM Technical Specifications are for editorial reasons still referred to as GSM recommendations in some current GSM documents.

The numbering and version control system is the same for ETSI-GSM Technical Specifications as for "GSM recommendations".

0. SCOPE

This recommendation provides a system wide view of the operation of discontinuous reception on the GSM system.

The support of DRX is mandatory in GSM PLMNs.

The detailed coding and procedural details are defined in the relevant recommendations dealing with the specific interfaces that are involved, for instance 08.08, 04.08. Reference is also made to the framing on the air interface which is defined in recommendation GSM 05.02.

The recommendation gives an overview of the implementation of discontinuous reception DRX within the GSM system, the actions required at MSC, BSS, and MS, the support of the facility via the air interface, and some operational aspects of the facility.

1. OVERVIEW OF DISCONTINUOUS RECEPTION

DRX is a technique that allows the mobile station to power down significant amounts of its internal circuitry for a high percentage of the time when it is in the idle mode.

It also ensures that the MS is aware of exactly when page requests for it may be transmitted and it can then therefore schedule other tasks such that it avoids the problem of not decoding valid page requests transmitted by the network in the idle mode periods.

The technique works by dividing the MSs within a cell into a set of groups. The group in which an MS resides is then known locally at both the MS and the BSS. All paging requests to each group are then scheduled and sent at a particular time which is derived from the TDMA frame number in conjunction with the IMSI of the MS and some BCCH transmitted data.

Thus both the BSS and the MS know when relevant page requests will be sent and the MS can power down for the period when it knows that page requests will not occur.

The page request can contains the IMSI and may contain the TMSI in order to identify the MS concerned. The IMSI is however always used to identify the paging population. Paging by means of the IMEI is for further study.

2. MSC FUNCTIONS

The MSC is almost transparent to DRX, since it has no real time knowledge of the absolute frame numbers on the air interface (recommendation GSM 08.02 refers).

It should be noted however that the MSC does define which cells are to be paged in order to locate a particular MS, normally this will be a location area.

The MSC therefore constructs page requests towards the BSS and sends them, each page request always includes the IMSI. The timer to non receipt of page response may require altering depending upon the number of page groups that are involved, if this is the case then the timer will be set by O and M command at the same time as the number of paging groups at the cell is altered.

3. BSS FUNCTIONS

At the BSS page requests are received. It is implicit (single cell BSSs) or explicit (multi cell BSSs) within the page requests from the MSC to which cell the page request is destined (recommendations GSM 08.08 and GSM 08.02 refers).

The BSS analyses the IMSI in order to derive the page group of the MS involved. The air interface page request is then constructed and transmitted in the appropriate TDMA burst. If the page request includes a TMSI and IMSI then the IMSI is used to derive the page population and the TMSI is inserted into the actual page request message. The scheduling of the page requests is therefore completely controlled by the BSS.

The relationship between paging group and TDMA burst, and IMSI and paging group is given in recommendation GSM 05.02.

The exact scheduling mechanism used at the BSS is not defined in this recommendation.

However the BSS may set the "page mode" bits as described in recommendation GSM 04.08. This can be used to optimise paging load and reduce missed page requests during system reconfiguration.

4. MS FUNCTIONS

The MS shall derive its paging group as defined in recommendation GSM 05.02.

The MS shall interpret all paging requests in its paging group according to the paging mode bits as described in recommendation GSM 04.08.

5. SUPPORT VIA THE AIR INTERFACE

The BCCH and paging channel messages are defined in recommendation GSM 04.08. Recommendation GSM 05.02 defines the algorithms which enable an MS to know the exact frame and and burst when page requests relevant to it might be transmitted.

6. OPERATIONAL ASPECTS

There will be occasions when it is necessary to alter the parameters of cell such that the paging group of the MS may alter.

If (referring to recommendation GSM 05.02) any of the parameters BS_AG_BLKS_RES, BS_CC_CHANS_COMB, BS_CC_CHANS or BS_PA_MFRMS have to be altered then the period when page requests may be lost can be minimised for example by :

Firstly setting the page mode to "page reorganisation" in all page requests on the affected cell for the exact duration of one paging period (i.e. BS_PA_MFRMS multiframes). At the completion of this announcement period, the BCCH parameters are set to the new values and the BSS starts scheduling the paging messages according to the new parameters. The page mode is reset to any of the values "normal mode" or "extended mode" as required.