

Agenda Item: 11.3.2
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Title: Paging control and paging channels
Document for: Discussion and decision

1. Introduction

This document discusses the paging control and paging channels. It is presented that the PCH is mapped to the downlink physical shared channel, and the page indicator info is carried on DSCCH. The DSCCH carrying paging indicators is distinguished with normal DSCCH by special UE ID such as C-RNTI. The working procedure of paging is also discussed in this document.

2. Discussion

1. The Mapping of PCH and Page indicator

In the TR25.813, the Paging channel is characterised by:

- support of UE power saving (DRX cycle is indicated by the network to the UE);
- requirement to be broadcast in the entire coverage area of the cell;
- mapped to physical resources which can be also used dynamically for traffic/other control channels.

So, PCH can be mapped to the downlink physical shared channel (DPSCH). When no paging, the downlink physical shared channel can carry DL-SCH to increase the efficiency of the radio resource. To enable UE power saving, there should be a paging indicator to indicate PCH information and UEs can listen to it in DRX pattern. Because PCH is mapped on DPSCH the schedule information (control signalling) of DPSCH is carried on the downlink shared control channel (DSCCH). We can use the DSCCH to carry the Page indicator. The page indicator should be sent in DTX mode (periodically), so the DSCCH carry the page indicator periodically. It is broadcasted on the BCH that which DSCCHs carry the paging indicators and what the DTX period and position is. The mapping is shown in the figure 1.

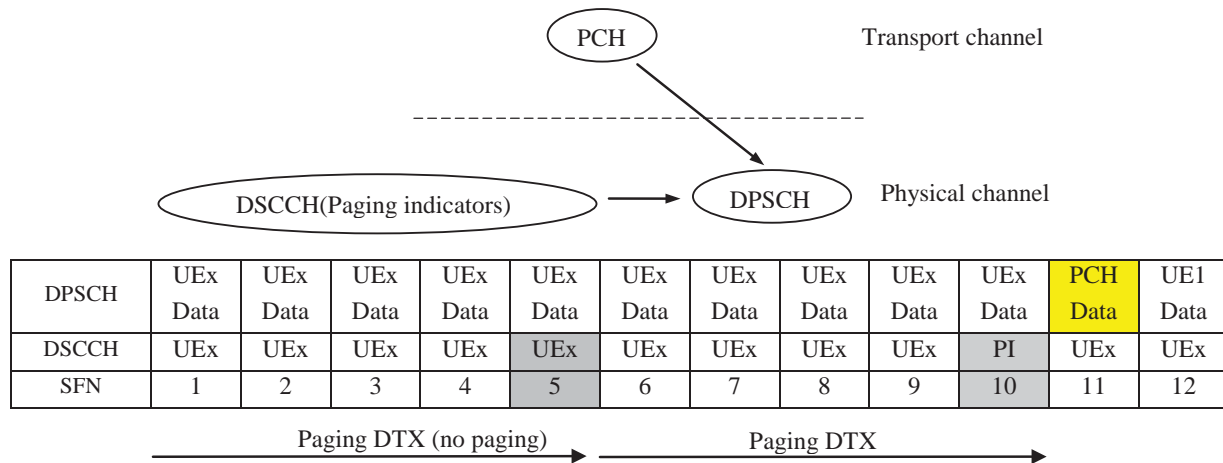


Figure 1. PCH mapping and PI mapping

2. The page indicator and resource indicator for PCH

Because the DSCCH carries both the normal control signalling and page indicators (not simultaneously, may be TDM mode), a method is needed for UE to identify whether it was normal control signalling or page indicator. By assigning a special UE-id (C-RNTI) for DSCCH carried page indicator, UE can identify the information carried on DSCCH. The special C-RNTI can not be assigned to UE for transferring normal data.

When there is no paging information, eNB do not need to send any page indicator on DSCCH. Instead, it can be used for transferring scheduling information for UE in RRC_connected state.

In LTE, the system is based on the shared channel. So mapping the PCH on the shared physical channel dynamically which also carried SCH data (not simultaneously) is a promising solution to increase the efficiency of radio resource. In addition, the resource info of DPSCH which carried PCH is informed to UE on the DSCCH.

3. Paging control procedure

The paging control procedure is depicted as following:

If the scheduler decides to transmit a paging message, the eNB first sets the special UE-id for paging together with page indicator and resource indicator of the DPSCH which will carry the paging message of the DPCCH and sends it at DTX occasion. Then it maps the paging message on the DPSCH and sends it at the scheduled position. If scheduler decides to transfer a user service data or has no paging message to transfer, eNB setups the scheduled ACTIVE UE's id and corresponding control signalling info and sends it at the occasion which is originally used to send page indicator. And then the eNB transfers service data to the ACTIVE UE.

UEs in RRC_IDLE state get the information of paging channel from BCH. Then monitor the DSCCHs which carry page indicator periodically.

When the DSCCH was received, the UE should judge the UE_ID at first. If the UE_ID is not the special C-RNTI for paging, it means there is no paging information and then the UE should return to sleep mode and monitor the DSCCH at the next DRX occasion; If the UE_ID is the special C-RNTI, it indicates there is a paging message. If the paging indicator indicates the message belong to their own group, the UEs will receive the DPSCH which carry the paging message according to the resource indicator on the DPCCH. Then MAC will judge whether the paging message is for itself. The whole paging procedure for Idle UE is shown in figure 2.

If UEs in RRC_CONNECTION state receive the DSCCH at the page indicator occasion, they will not treat it. If the occasion is used by normal control signalling when no paging messages or there are higher priority service data to send, UEs deal it as a normal control signalling.

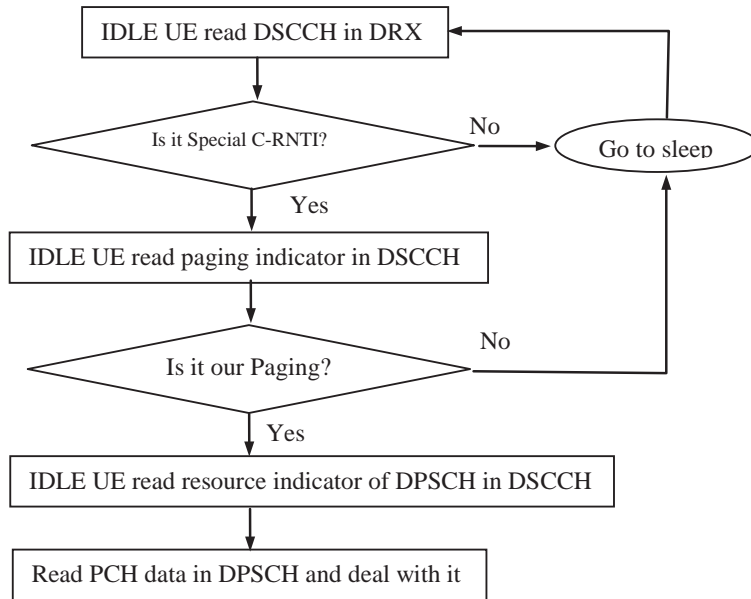


Figure 2. The paging procedure for Idle UE

3. Conclusion

In this document we present a solution for paging control and paging channels. The PCH is mapped to the downlink physical shared channel, and the paging indicator info (including resource indicator) is mapped on the DSCCH in TDM mode. From the above depicting, it can increase the efficiency of radio resource and make the scheduling of radio resource very flexible. Using special C-RNTI to indicate DSCCH carrying paging indicators can make the paging control procedure very easily and have no impacts on ACTIVE UEs' scheduling.

4. References

- [1] TR25.813 v0.8.4, Radio interface protocol aspects 2006-04
- [2] TR25.814 v1.2.2, Physical Layer Aspects for Evolved UTRA 2006-04
- [3] R2-060988, PCH mapping and Paging control, CATT RAN2#52 Athens 27-31 March, 2006