

Seoul, Korea, April 10 ~ 13, 2000

Agenda Item:

Source: CWTS

To: TSG RAN WG1

Title: Random Access procedures for low chip rate TDD option

Document for: Discussion and Approval

Introduction:

This paper introduce the random access physical layer procedure for low chip rate TDD option.

Conclusion:

It is proposed to discuss and to include the following text proposal in the new sub clause of TR25.928.

----- changes to 25.928 begin -----

10.7 Random access procedures

[Description:]

The random access procedure and the collision problems for low chip rate option are described here. It include the preparation of random access, the random access procedure and the procedure for random access collision.

Note:

In this paper, the P-FACH is just a physical channel used to carry one burst message responding to SYNC1 during random access procedure. There is no mapping relationship between FACH and P-FACH. The P-FACH here is a little like the AICH in FDD.

[Rationale:]

10.7.1 Preparation of random access

When the UE is in Idle mode, it will keep the downlink synchronisation and read the cell broadcast information. From the used DwPTS, the UE will get the code set of 8 SYNC1 codes (signatures) assigned to UpPTS physical channel for random access. There are total 256 different SYNC1 sequences. SYNC1 sequences number divided by 8 gives the DwPTS sequences number. From the cell broadcast information, the UE will get to know the used SYNC1 sequences within the code set to be used; the description of the P-RACH channels, the description of the P-FACH channels, and other information related to random access.

In the BCH it is described what SYNC1 sequences are associated with what P-FACH resources; what P-FACHs are associated with what P-RACH resources and what P-RACH resources are associated with what (P/S-)CCPCH (carrying the FACH logical channel) resources.

Thus, when sending a SYNC1 sequence, the UE knows which P-FACH resources, P-RACH resources and CCPCH resources will be used for the access.

10.7.2 Random access procedures

The SYNC1 sequence in UpPTS following the guard time slot is used only for uplink synchronisation. The UE randomly selects one of the 1-8 possible signatures of the cell it wants to access to and sends it on the UpPTS physical channel.

Then the UE determines the timing and the Tx power level (open loop procedure) for the UpPTS and transmits the selected signature on the UpPTS.

Once the Node B detects the UpPTS transmission from an UE, the arrival time and the received power are known. The Node B determines the Tx power update and timing adjustment and sends them to the UE within the next four frames through the P-FACH (in a single burst/sub-frame message). Note that the P-FACH also contains the signature reference and the relative frame number (number of frames passed after the reception of the acknowledged signature) for cross check with the UE.

Once the UE receives the above mentioned control signalling from the chosen P-FACH (i.e. the P-FACH which is associated to the selected signature), its UpPTS sequence has been accepted by the Node B. Then the UE will adjust its timing and power level and send the RACH (also as a single burst/sub-frame message) on the P-RACH channel corresponding to the P-FACH exactly two frames later. In this step, the RACH sent to Node B by UE will have high synchronisation precision.

After that, the UE will receive a response from the network from the CCPCH associated to the P-RACH (by the FACH logical channel) indicating whether the UE random access has been accepted or not. In case it has been accepted the further signalling for establishing the link will take place on UL and DL dedicated channels assigned by the network through the FACH.

The UE can transmit a second UpPTS and wait for the response from the P-FACH for a further power and SS update before transmitting on the assigned resources.

10.7.3 Random access collision

When a collision is very likely or in bad propagation environment, the Node B does not transmit the P-FACH or cannot receive the SYNC1. In this case, the UE will not get any response from the Node B. Thus the UE will have to adjust its Tx time and Tx power level based on a new measurement and send a SYNC1 again after a random delay.

Note that at each (re-)transmission, the SYNC1 burst will be randomly selected again by the UE.

Due to the two-step approach a collision most likely happens on the UpPTS. The RACH RUs are virtually collision free. This two-step approach will guarantee that the RACH RUs can be handled with conventional traffic on the same UL time slots.

[Explanation difference:]

Different from the high chip rate option, the random access procedure of low chip rate option has two-step approach. The SYNC1 word is used to carry out uplink synchronisation and to resolve the access collision. This two-step procedure enables the RACH RUs to be handled with conventional traffic on the same UL time slots.

----- changes to 25.928 end -----