TSG-RAN Working Group 1 meeting #4
Shin-Yokohama, Japan
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Agenda item: RACH AdHoc meeting

Source: Ericsson

Title: Text proposal for 3-valued acquisition indicator

Document for: Decision

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1 Introduction

At the 3rd WG1 meeting, there was a proposal for a 3-valued acquisition indicator, using the three signaling alternatives $\{S_i, 0, -S_i\}$. At the physical RACH AdHoc meeting of the 3rd WG1 meeting, the general idea of a 3-valued AI was accepted. but it was decided that the there should be some time to propose other alternatives for the third signaling alternative. However, until now no such proposals have been made. We therefore present text proposals for the 3-valued AI based on the $\{S_i, 0, -S_i\}$ signaling alternatives.

2 Modifications to S1.11

We propose minor modifications to Section 5.3.2.6 ("Acquisition Indication Channel (AICH)"), to allow for a negative value of the acquisition indicator.

5.3.2.6 Acquisition Indication Channel (AICH)

The acquisition indicatior channel (AICH) carries the acquisition indicators. The acquisition indicator AI_i corresponding to signature *i* is transmitted on the downlink, as a response to the detection of signature *i* on a PRACH. AI_i is equal to signature *i* (16 symbols, see S1.13) or *-i*.

Figure 1 illustrates the structure of the AICH.

- The AICH consists of access slots, each of length 1.25 ms.

- [The AICH access slots are transmitted time aligned with the PCCPCH frame boundary]

- The acquisition indicator is transmitted time aligned with the AICH access slots

- Up to 16 different acquisition indicators can be transmitted simultaneously within one access slot on one AICH.

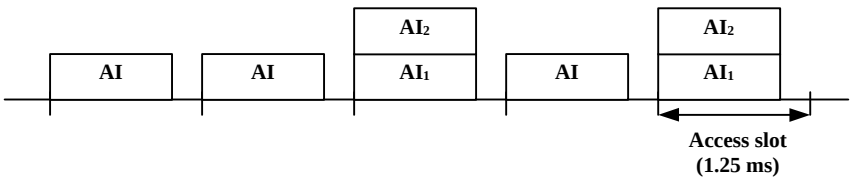

Figure 1: AICH structure

The AICH is transmitted on an ordinary downlink channel using a spreading factor of 256.

3 Modification to S1.14

We propose modifications to section 6 (“Random Access Procedure”) to include the actions to be taken by the UE at the reception of a negative AI. The actions taken is to retransmit the preamble without an increase of the transmit power. As it is yet not decided if the power should be unchanged or actually decreased somewhat, we keep it as a parameter.

6 Random Access Procedure

The procedure of a random access request is:

1. The UE acquires synchronisation to a cell
2. The UE reads the BCH to get information about:

   2.1 The preamble spreading code(s) / message scrambling code(s) used in the cell

   2.2 The available signatures

   2.3 The available access slots

   2.4 The available spreading factors for the message part

   2.5 The uplink interference level in the cell

   2.6 The primary CCPCH transmit power level

   2.7 The power offsets ΔP_0 and ΔP_1 used for power ramping in the random-access procedure
3. The UE selects a preamble spreading code
4. The UE selects a spreading factor for the message part.
5. The UE estimates the downlink path loss (by using information about the transmitted and received power level of the primary CCPCH), and determines the required uplink transmit power (by using information about the uplink interference level in the cell).

6 The UE implements the dynamic persistence algorithm by:

   6.1. Reading the current dynamic persistence value from the BCH.

   6.2. Perform a random draw against the current dynamic persistence value.

   6.3. Defer transmission for one frame and repeat step 6 if the result of the random draw is negative, otherwise proceed to step 7.

7. The UE:

   7.1 Randomly selects an uplink access slot from the available uplink access slots

   7.2 Randomly selects a signature from the available signatures

   7.3 Determines the preamble transmission power from the required uplink transmit power and the specified back-off power.
8. The UE transmits its preamble using the selected uplink access slot, signature, and preamble transmission power..
9. If the UE does not detect an acquisition indicator with the selected signature in the downlink access slot corresponding to the selected uplink access slot, the UE:

   9.1 Selects a new uplink access slot, either two or three access slots after the last selected access slot

   9.2 Randomly selects a new signature from the available signatures

   9.3 Increases the preamble transmission power with the specified offset ΔP_0.

9.4 Repeats from step 8

10. If the UE detects a negative acquisition indicator with the selected signature in the downlink access slot corresponding to the selected uplink access slot, the UE:

    10.1 Selects a new uplink access slot, either two or three access slots after the last selected access slot

    10.2 Randomly selects a new signature from the available signatures

    10.3 Modifies the preamble transmission power with the specified offset ΔP_1.

    10.4 Repeats from step 8

11. The UE transmits its random access message at the specified timing relative to the last transmitted preamble.

12. The UE waits for an acknowledgement from the network side. If no acknowledgement is received within a predefined time-out period, the UE starts again from step 5.

Dynamic persistence is provided for managing interference and minimising delay by controlling access to the RACH channel. The system will publish a dynamic persistence value on the BCH, the value of which is dependent on the estimated backlog of users in the system. .

4 Reference

[1] "Some minor modifications to the UTRA/FDD RACH scheme", TSGR1 #3 (99) 207