

Agenda item: AH 99
Source: Ericsson
Title: CR 25.214-130r1: Radio link establishment and sync status reporting
Document for: Decision

As pointed out in discussions on the RAN WG1 reflector, there may be some problems with the synchronisation primitive reporting in the UE at physical channel establishment.

The problem is that initially at physical channel establishment, typically UTRAN does not send the UE any DPDCH data (transport blocks). Sending information to the UE before the network knows that the UE is listening could lead to need for retransmission etc. Without any data, the CRC criterion for determining in-sync is useless. Moreover, the DPCCH criteria is fulfilled during the first 200 ms. If the CRC criterion is assumed to be fulfilled when there is no transport blocks available, this will lead to the UE reporting in-sync directly. If the CRCg criterion is assumed to not be fulfilled when there is no transport block available, then the UE will not be able to report in-sync unless it receives some transport blocks.

It seems that a solution where in-sync may be reported based solely on the DPCCH quality is beneficial. However, averaging times of 200 ms may be too much, since this will lead to a large initial delay before physical channel establishment can be reported.

We propose that the synchronisation status reporting shall be divided into two phases, one up to physical channel establishment, and one after that point in time. For the different phases different criteria will be used. The first phase will use only DPCCH quality as criteria (with shorter filtering time), while the second phase will use both DPCCH quality (with longer filtering time) and CRC criteria. We believe that the radio link supervision may benefit from the increased accuracy the CRC criteria and longer filtering time brings, while for physical channel establishment a less accurate but faster criteria may be used.

It was further pointed out on the reflector that the 200 ms filtering is incompatible with the RAN WG4 test, that test a maximum response time equal to 200 ms. Without any margin between the filtering time and maximum response time surely the test will fail. It was proposed to use a filtering time of 160 ms in TS 25.214, which seems reasonable. Hence, this CR also changes 200 ms filtering into 160 ms filtering.

By letting the second phase start 160 ms after physical channel establishment, there is no need for the special rules that applies for the DPCCH quality criterion before 160 ms of measurements have been performed. Further, this also clarifies the out-of-sync CRC criteria, which relies on 160 ms of data being available. To illustrate the problem, assume that the UE does not find a DPCCH. Does that mean that it will see a lot of CRC errors during that time? In that case, this would mean that out-of-sync will be reported as soon as the out-of-sync primitive can be reported, because the UE has seen a lot of incorrect CRCs before it could detect the DPCCH with good quality.

In the review process, it was also noted that there is room for different interpretations of the CRC criteria, especially for the case where no transport block is transmitted/received. Can the in-sync CRC criterion be fulfilled when there is a transport channel configured to use CRC, but no transport blocks have been transmitted? Therefore, a clarification that only transport blocks with CRC attached shall be included in the decision has been added.

Further, it has been clarified that the criteria are such that there may be radio frames where neither the in-sync, not the out-of-sync primitive will be reported. This was already true with the old test, and is not changed by the new text.

Finally, section 5.1.2.2.1.1 has been updated to clarify when the UE shall monitor the downlink DPCCH quality to control its uplink transmitter. By using the physical channel establishment point in time as a reference, the ambiguous formulation "during the first 200 ms of the dedicated channel's existence" (what is meant by a "channel's existence"?), can be avoided in a similar way as in the synchronisation primitive definitions.

There may be a need to confirm the 40 ms filtering assumed in the new in-sync criteria with RAN WG4. It should be up to them to decide if such a filter length gives reasonable accuracy in determining if a DPCCH is present or not.

CHANGE REQUEST		Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.
25.214	CR	130r1
GSM (AA.BB) or 3G (AA.BBB) specification number ?		? CR number as allocated by MCC support team
For submission to: RAN#10 <i>list expected approval meeting # here ?</i>		Current Version: 3.4.0
for approval <input checked="" type="checkbox"/>		strategic <input type="checkbox"/> <i>(for SMG use only)</i>
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Proposed change affects: (U)SIM ME UTRAN / Radio Core Network
(at least one should be marked with an X)

Source: Ericsson **Date:** 2000-10-10

Subject: Radio link establishment and sync status reporting

Work item:

Category:	F Correction <input checked="" type="checkbox"/> A Corresponds to a correction in an earlier release <input type="checkbox"/> B Addition of feature <input type="checkbox"/> C Functional modification of feature <input type="checkbox"/> D Editorial modification <input type="checkbox"/>	Release:	Phase 2 <input type="checkbox"/> Release 96 <input type="checkbox"/> Release 97 <input type="checkbox"/> Release 98 <input type="checkbox"/> Release 99 <input checked="" type="checkbox"/> Release 00 <input type="checkbox"/>
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(only one category Shall be marked With an X)

Reason for change: The current radio link establishment criteria cannot be fulfilled without the network sending the UE transport blocks. This is unnecessarily inflexible. Further, a number of clarifications of ambiguous formulations have been made.

Clauses affected: 4.3.1.2, 5.1.2.2.1.1

Other specs Affected:	Other 3G core specifications <input type="checkbox"/> ? Other GSM core specifications <input type="checkbox"/> ? MS test specifications <input type="checkbox"/> ? BSS test specifications <input type="checkbox"/> ? O&M specifications <input type="checkbox"/> ?	List of CRs: <input type="text"/> List of CRs: <input type="text"/> List of CRs: <input type="text"/> List of CRs: <input type="text"/> List of CRs: <input type="text"/>
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Other comments:

4 Synchronisation procedures

4.1 Cell search

During the cell search, the UE searches for a cell and determines the downlink scrambling code and common channel frame synchronisation of that cell. How cell search is typically done is described in Annex C.

4.2 Common physical channel synchronisation

The radio frame timing of all common physical channels can be determined after cell search. The P-CCPCH radio frame timing is found during cell search and the radio frame timing of all common physical channel are related to that timing as described in [1].

4.3 DPCCH/DPDCH synchronisation

4.3.1 Synchronisation primitives

4.3.1.1 General

For the dedicated channels, synchronisation primitives are used to indicate the synchronisation status of radio links, both in uplink and downlink. The definition of the primitives is given in the following subclauses.

4.3.1.2 Downlink synchronisation primitives

Layer 1 in the UE shall every radio frame check synchronisation status of the downlink dedicated channels. Synchronisation status is indicated to higher layers using the CPHY-Sync-IND and CPHY-Out-of-Sync-IND primitives.

The criteria for reporting synchronisation status are defined in two different phases.

The first phase lasts until 160 ms after the downlink dedicated channel is considered established by higher layers (physical channel establishment is defined in [5]). During this time out-of-sync shall not be reported and in-sync shall be reported using the CPHY-Sync-IND primitive if the following criterion is fulfilled:

- The UE estimates the DPCCH quality over the previous 40 ms period to be better than a threshold Q_{in} . This criterion shall be assumed not to be fulfilled before 40 ms of DPCCH quality measurements have been collected. Q_{in} is defined implicitly by the relevant tests in [7].

The second phase starts 160 ms after the downlink dedicated channel is considered established by higher layers. During this phase both out-of-sync and in-sync are reported as follows.

Out-of-sync shall be reported using the CPHY-Out-of-Sync-IND primitive if either of the following criteria ~~are is~~ fulfilled:

- The UE estimates the DPCCH quality over the ~~previous last 160/200~~ ms period to be worse than a threshold Q_{out} . ~~This criterion shall never be fulfilled during the first 200 ms of the dedicated channel's existence.~~ Q_{out} is defined implicitly by the relevant tests in [7].
- The ~~last 20~~ most recently received transport blocks with a CRC attached, as observed on all TrCHs using CRC, ~~have been~~ received with incorrect CRC. In addition, over the ~~previous last 160/200~~ ms, ~~all~~ transport blocks with a CRC attached ~~have~~ been received with incorrect CRC.

In-sync shall be reported using the CPHY-Sync-IND primitive if both of the following criteria are fulfilled:

- The UE estimates the DPCCH quality over the ~~previous last 160/200~~ ms period to be better than a threshold Q_{in} . ~~This criterion shall always be fulfilled during the first 200 ms of the dedicated channel's existence.~~ Q_{in} is defined implicitly by the relevant tests in [7].

- At least one transport block with a CRC attached, as observed on all TrCHs using CRC, is received in a TTI ending in the current frame with correct CRC. If no transport blocks are received, or no transport block has a CRC attached, this criterion shall be assumed to be fulfilled. If there is no TrCH using CRC, this criterion is always fulfilled.

How the primitives are used by higher layers is described in [5]. The above definitions may lead to radio frames where neither the in-sync nor the out-of-sync primitives are reported.

4.3.1.3 Uplink synchronisation primitives

Layer 1 in the Node B shall every radio frame check synchronisation status of all radio link sets. Synchronisation status is indicated to the RL Failure/Restored triggering function using either the CPHY-Sync-IND or CPHY-Out-of-Sync-IND primitive. Hence, only one synchronisation status indication shall be given per radio link set.

The exact criteria for indicating in-sync/out-of-sync is not subject to specification, but could e.g. be based on received DPCCCH quality or CRC checks. One example would be to have the same criteria as for the downlink synchronisation status primitives.

5.1.2.2.1.1 Out of synchronisation handling

After 160 ms after physical channel establishment (defined in [5]), the UE shall control its transmitter according to a downlink DPCCH quality criterion as follows:

- The UE shall shut its transmitter off when the UE estimates the DPCCH quality over the last ~~160~~200 ms period to be worse than a threshold Q_{out} . ~~This criterion is never fulfilled during the first 200 ms of the dedicated channel's existence.~~ Q_{out} is defined implicitly by the relevant tests in [7].
- The UE can turn its transmitter on again when the UE estimates the DPCCH quality over the last ~~160~~200 ms period to be better than a threshold Q_{in} . ~~This criterion is always fulfilled during the first 200 ms of the dedicated channel's existence.~~ Q_{in} is defined implicitly by the relevant tests in [7]. When transmission is resumed, the power of the DPCCH shall be the same as when the UE transmitter was shut off.