TSG-RAN Working Group 1 meeting #20
Busan, Korea
May 21 – May 25, 2001

TSGR1#20(01)0565

Agenda item: R99/Rel-4

Source: Ericsson

Title: Dual transport format detection

Document for: Decision

Blind transport format detection

The following cases are specified in [1] for R99/Rel-4 for transport format detection in absence of TFCI

- no detection
- explicit blind detection
- guided detection.

The case of *no detection* corresponds to the trivial case where a TrCH has only one transport format, i.e. the transport format is the same in all TFCs and no transport format detection is required for this TrCH.

Explicit blind detection is defined for TrCHs that have more than one transport format, and where at least one transport block is transmitted per TTI, in order to enable CRC based BTFD.

Explicit blind detection may not always be possible for all TrCHs, e.g. if the TrCH is not configured to use CRC. Under certain restrictions on the TFCS, it is still possible to detect the transport format for those TrCHs, when *guided detection* is used. Guided detection means that the transport format of all TrCHs that use guided detection can be determined from the transport format of one or several guiding TrCH. The guiding TrCH must use explicit blind dection, i.e. it is possible to perform CRC based transport format detection for the guiding TrCH.

Dual transport format detection

In practice, the case of no detection (only one transport format) does not apply, as there will always be at least one transport format defined for the case of no data, which is often the zero block transport format. Especially signaling control channels (e.g. DCCH) are typically defined with a dual transport format (zero or one transport block).

As can be seen in [2] for the AMR service, the transport format of the TrCH carrying DCCH is independent of the transport format of the other TrCHs, i.e. guided detection is not possible for the DCCH. This implies that either no detection or explicit blind detection could be applied for this TrCH. However, the rules for explicit detection require that at least one transport block is transmitted in each TTI, which means that the zero block transport format is not allowed. On the other hand, the trivial case of “no detection” is not applicable either, because the TrCH has more than one transport format. Formally, this would mean that BTFD is not possible, e.g. for all AMR services that do not use TFCI and also for the standalone DCCH.

In the informative annex A.1 of [1], an example for a special case of transport format detection is described, where the TrCH has only two transport formats (dual transport format), where the data rate is either zero or full rate. This case is quite similar to the case of DCCH, where the two transport formats are either zero blocks (no CRC transmitted) or one block (CRC transmitted).

Considering the requirements on synchronisation and BLER measurement, it is not sensible in the case of no TFCI to consider the CRC for TrCH where a zero block transport format is contained in the TFS, as without TFCI it cannot be distinguished between no transport block (no CRC) or a corrupt transport block (CRC failure). Therefore in case of no TFCI, BLER measurement cannot be required for the TrCHs that have a zero block transport format, and those TrCHs are also neglected in the synchronisation primitives. The only exception would be for TrCHs using guided detection, as

there the transport format can be derived from the guiding TrCH, and thus there is no need to have a CRC available in every transport format.

Following from the above, one can conclude that for the case of a TrCH with dual transport format (zero or N transport blocks) that is not using guided detection, a simplified detection is possible, as the CRC does not need to be evaluated. Hence, it is fully sufficient that the UE assumes the transport format with more than zero blocks for decoding and calculates the CRC accordingly. In case of zero blocks transmitted, this may result in CRC failure, but this is not critical as the TrCH is anyway not included in synchronisation primitives and no BLER measurement is required either.

Proposal

Considering the fact, that the case of *no detection* is not likely to be used as it is currently defined, it is proposed to extend the requirements for *no detection* to also cover the dual transport format case. In addition it is clarified that even if a TrCH has only one transport format or dual transport format, guided detection can be used also for this TrCH. Corresponding CRs for Rel99 and Rel-4 are attached.

References

[1] TS 25.212 V3.5.0 “Multiplexing and channel coding (FDD)”

[2] TS 34.108 V3.2.0 “Common Test Environments for User Equipment (UE) Conformance Testing”

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CHANGE REQUEST

⌘ **25.212** **CR** **107** ⌘ ev **1** ⌘ Current version: **3.5.0** ⌘

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Proposed change affects: ⌘ (U)SIM ☐ ME/UE **X** Radio Access Network **X** Core Network ☐

Title:	⌘	Dual transport format detection
Source:	⌘	Ericsson
Work item code:	⌘	***Date:*** ⌘ 2001-05-18
Category:	⌘	**F** ***Release:*** ⌘ R99

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
REL-4	*(Release 4)*
REL-5	*(Release 5)*

Reason for change:	⌘	No detection case with one transport format is not likely to be used, while the very simple case of detecting two transport formats (zero and N transport blocks) is not supported in certain configurations.
Summary of change:	⌘	Allow the no detection case also to be used for a dual transport format (zero and N transport blocks), and thus enabling DCCH to be detected in absence of TFCI.
Consequences if not approved:	⌘	BTFD does not work for at least all downlink RABs containing DCCH.

Clauses affected:	⌘	4.3, 4.3.1
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

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4.3 Transport format detection

If the transport format set of a TrCH *i* contains more than one transport format, the transport format can be detected according to one of the following methods:

- TFCI based detection: This method is applicable when the transport format combination is signalled using the TFCI field;
- explicit blind detection: This method typically consists of detecting the TF of TrCH *i* by use of channel decoding and CRC check;
- guided detection: This method is applicable when there is at least one other TrCH *i'*, hereafter called guiding TrCH, such that:
  - the guiding TrCH has the same TTI duration as the TrCH under consideration, i.e. $F_{i'} = F_i$;
  - different TFs of the TrCH under consideration correspond to different TFs of the guiding TrCH;
  - explicit blind detection is used on the guiding TrCH.

If the transport format set for a TrCH *i* does not contain~~s~~ more than one transport format ~~only~~ with more than zero transport blocks, no explicit blind transport format detection needs to be performed for this TrCH. The UE can use guided detection for this TrCH or single transport format detection, where the UE always assumes the transport format corresponding to more than zero transport blocks for decoding.

For uplink, blind transport format detection is a network controlled option. For downlink, the UE shall be capable of performing blind transport format detection, if certain restrictions on the configured transport channels are fulfilled.

For a DPCH associated with a PDSCH, the DPCCH shall include TFCI.

4.3.1 Blind transport format detection

When no TFCI is available then explicit blind detection or guided detection shall be performed on all TrCHs within the CCTrCH that have more than one transport format and that do not use single transport format detection. The UE shall only be required to support blind transport format detection if all of the following restrictions are fulfilled:

1. only one CCTrCH is received by the UE;
2. the number of CCTrCH bits received per radio frame is 600 or less;
3. the number of transport format combinations of the CCTrCH is 64 or less;
4. fixed positions of the transport channels is used on the CCTrCH to be detectable;
5. convolutional coding is used on all explicitly detectable TrCHs;
6. CRC with non-zero length is appended to all transport blocks on all explicitly detectable TrCHs;
7. at least one transport block shall be transmitted per TTI on each explicitly detectable TrCH;
8. the number of explicitly detectable TrCHs is 3 or less;
9. for all explicitly detectable TrCHs *i*, the number of code blocks in one TTI (C_i) shall not exceed 1;
10. the sum of the transport format set sizes of all explicitly detectable TrCHs, is 16 or less. The transport format set size is defined as the number of transport formats within the transport format set;
11. there is at least one TrCH that can be used as the guiding transport channel for all transport channels using guided detection.

Examples of blind transport format detection methods are given in annex A.

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