TSG-RAN Working Group1 meeting #9 **TSGR1#9(99)k11**
Dresden, Germany, 30th November – 3rd December 1999

Agenda Item: **Ad Hoc 4**

Source: **NTT DoCoMo**

Title: **Modification of BTFD description in 25.212 Annex**

Document for: **Discussion and Decision**

This contribution proposes some modifications of Blind Transport Format Detection (BTFD) description in 25.212 Annex. The main modification is an addition of the description about the requirement for BTFD, namely the requirement of each transport format within a TrCH to have different number of bits. Inclusion of this additional description in 25.212 Annex was agreed as a recommendation in the S4/R1 joint meeting held on 19th November [1]. The other modifications are editorial changes for the BTFD description.

Reference:
[1] TSG RAN WG1 Chairman, TSG SA WG4 Chairman, “Joint TSG-R1-S4 Meeting Notes”, TSGR1#9(99)j58

3GPP/SMG Meeting #?
Location, Country, DD-DD MMM YYYY

Document ???99???
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

25.212 CR ??? Current Version: 3.0.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to: TSG RAN #6
list expected approval meeting # here ↑

for approval	X	strategic		*(for SMG use only)*
for information		non-strategic		

Form: CR cover sheet, version 2 for 3GPP and SMG The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc

Proposed change affects: (U)SIM [ ] ME [ ] UTRAN / Radio [X] Core Network [ ]
(at least one should be marked with an X)

Source: NTT DoCoMo **Date:** 1999-12-01

Subject: Modification of BTFD description in 25.212 Annex

Work item:

Category: *(only one category shall be marked with an X)*

F	Correction	
A	Corresponds to a correction in an earlier release	
B	Addition of feature	
C	Functional modification of feature	
D	Editorial modification	X

Release:

Phase 2	
Release 96	
Release 97	
Release 98	
Release 99	X
Release 00	

Reason for change: Clarification on the requirement for blind transport format detection

Clauses affected:

Other specs affected:

Other 3G core specifications		→ List of CRs:
Other GSM core specifications		→ List of CRs:
MS test specifications		→ List of CRs:
BSS test specifications		→ List of CRs:
O&M specifications		→ List of CRs:

Other comments:

help.doc

<---------- double-click here for help and instructions on how to create a CR.

Annex A (informative): Blind transport format detection

A.1 Blind transport format detection using fixed positions

A.1.1 Blind transport format detection using received power ratio

- This method is used for dual transport format case (the possible data rates, 0 and full rate, and only transmitting CRC for full rate).
- The rate detection is done using average received power ratio of DPDCH to DPCCH.

  Pc: Received Power per bit of DPCCH calculated from all pilot and TPC bits per slot over 10ms frame.

  Pd: Received Power per bit of DPDCH calculated from *X* bits per slot over 10ms frame.

  X: the number of DPDCH bits per slot when transport format corresponds to full rate.

  T: Threshold of average received power ratio of DPDCH to DPCCH for rate detection.

If *Pd/Pc >T* then
    "TX_ON"

else
    "TX_OFF"

A.1.2 Blind transport format detection using CRC

- This method is used for multiple transport format case (the possible data rates: 0, …, (full rate)/r, …, full rate, and always transmitting CRC for all transport formats). When this method is used, no one transport format should have the same number of bits as any other transport format does within a TrCH.
- At the transmitter, the data stream with variable~~-rate~~ number of bits ~~DCH data~~ from higher layers~~to be transmitted~~ is block-encoded using a cyclic redundancy check (CRC) and then convolutionally encoded. ~~It is necessary that the~~ CRC parity bits are attached just after ~~mapped on the head position (or certain position) in a frame~~ the data stream with variable number of bits as shown in figure A-1.
- The receiver knows only the possible transport formats (or the possible end bit position $\{n_{end}\}$ by Layer-3 negotiation (see figure A-1). The receiver performs Viterbi-decoding on the soft decision sample sequence. The correct trellis path of the Viterbi-decoder ends at the zero state at the correct end bit position.
- Blind rate detection method by using CRC traces back the surviving trellis path ending at the zero state (hypothetical trellis path) at each possible end bit position to recover the data sequence. Each recovered data sequence is then error-detected by CRC and if there is no error, the recovered sequence is declared to be correct.
- The following variable is defined:

  $$s(n_{end}) = -10 \log \left((a_0(n_{end}) - a_{min}(n_{end})) / (a_{max}(n_{end}) - a_{min}(n_{end})) \right) \text{ [dB]} \quad \text{(Eq. 1)}$$

  where $a_{max}(n_{end})$ and $a_{min}(n_{end})$ are, respectively, the maximum and minimum path-metric valuse among all survivors at end bit position n_{end}, and $a_0(n_{end})$ is the path-metric value at zero state.

- In order to reduce the probability of false detection (this happens if the selected path is wrong but the CRC misses the error detection), a path selection threshold D is introduced. D determines whether the hypothetical trellis path connected to the zero state should be traced back or not at each end bit position n_{end}. If the hypothetical trellis path connected to the zero state that satisfies

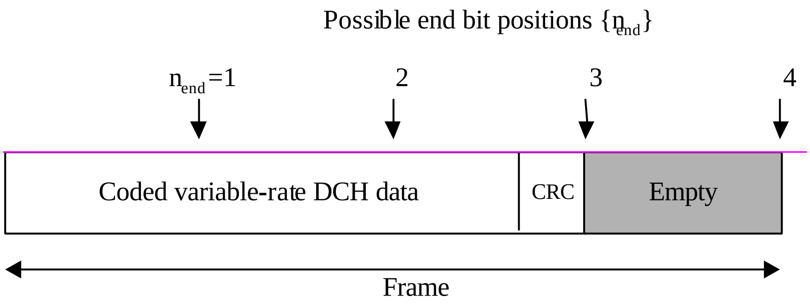
  $$s(n_{end}) =< D \quad \text{(Eq. 2)}$$

is found, the path is traced back to recover the frame data, where D is the path selection threshold and a design parameter.

- If more than one end bit positions satisfying Eq. 2 are found, the end bit position which has minimum value of $s(n_{end})$ is declared to be correct.

- If no path satisfying Eq. 2 is found even after all possible end bit positions have been exhausted, the received frame data is declared to be in error.

Figure A-2 shows the procedure of blind transport format detection using CRC.



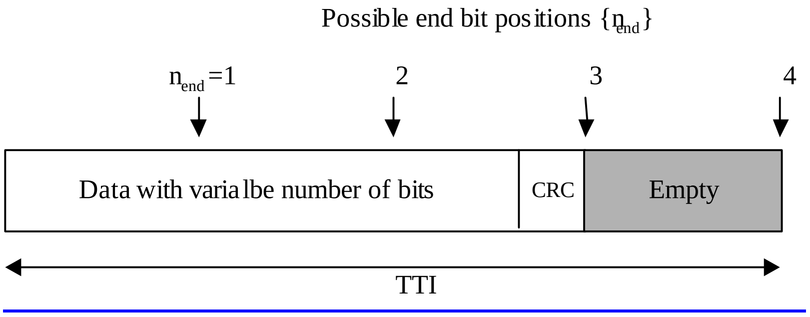


Figure A-1: An example of the data format with variable number of bits ~~rate data format~~

(Number of possible transport formats = 4, transmitted end bit position n_{end} = 3)

A.2 Blind transport format detection with flexible positions

In certain cases where the CCtrCH consists of multiple transport channels and a small number of transport format combinations are allowed, it is possible to allow blind transport format detection with flexible positions.
Several examples for how the blind transport format detection with flexible positions might be performed are:

- The blind transport format detection starts at a fixed position and identifies the transport format of the first present transport channel and stops. The position of the other transport channels and their transport formatbeing derived on the basis of the allowed transport format combinations, assuming that there is a one to one relationship between the transport format combination and the transport format of the first present transport channel.

- The blind rate detection evaluates all transport format combinations and picks the most reliable one.

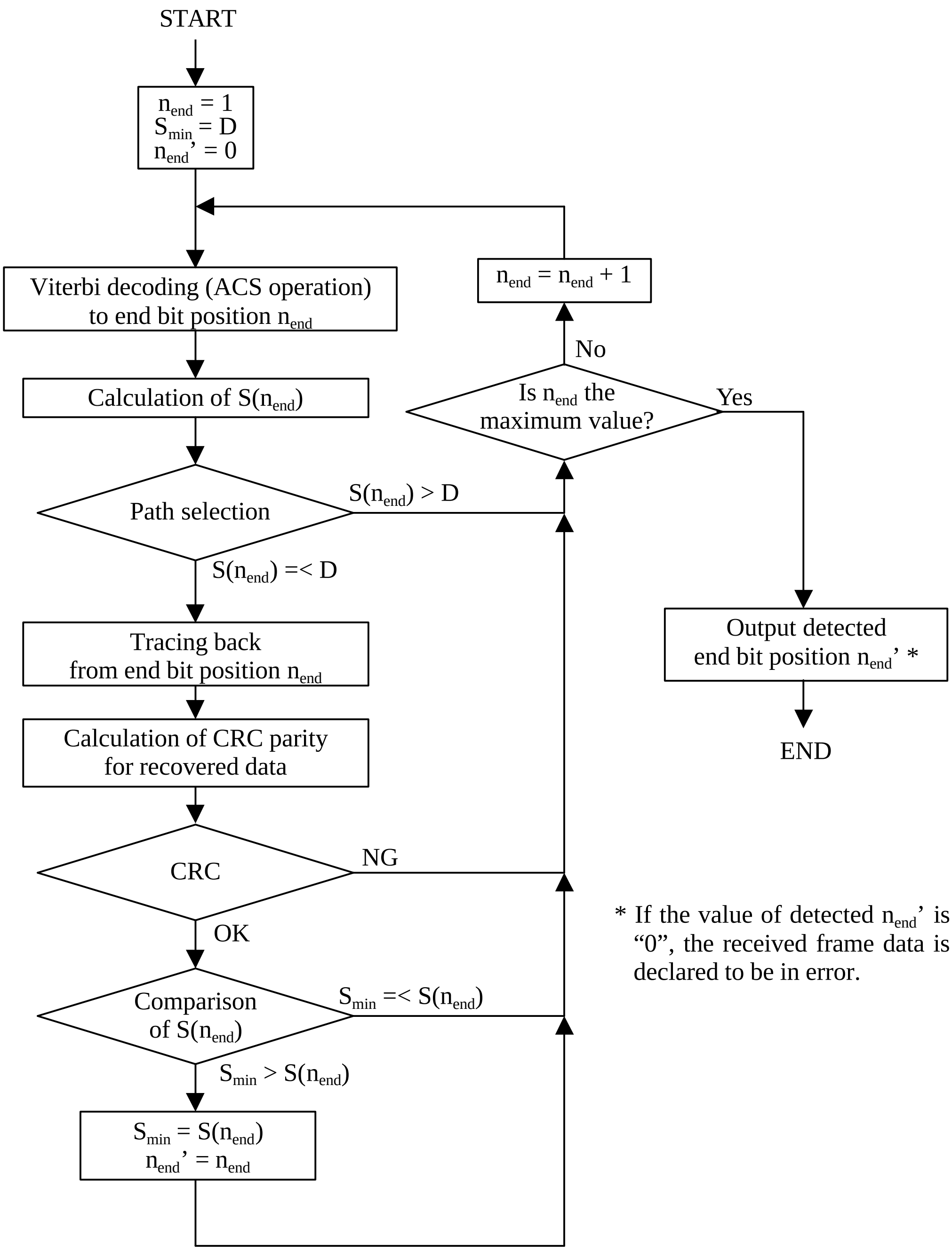


Figure A-2: Basic processing flow of blind transport format detection