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Agenda Item: **9.1**

Source: **Ericsson**

Title: **Frame quality classification in Iu UP for Support Mode**

Document for: **Decision**

1   Introduction

The purpose of this contribution is to propose how the functionality of frame quality classification is used in the Iu UP in Support Mode.

2   Frame quality classification

2.1   General

Frame quality classification is used to classify data based on the quality of the data. This way erroneous data can be used in a special way when the user of the data has information of the quality.

E.g. in GSM for the AMR codec the data frames are classified to 'good', 'degraded', 'bad' or 'no data'. This results in improved speech quality. If erroneous frames would not be marked as bad and then be used by the speech transcoder (or decoder), then the speech quality would suffer. Also if erroneous frames would be dropped, the speech quality would suffer.

In case of Unequal Error Protection (UEP) the frame quality classifying can contain information on several subflows. This is how the radio frame classification is made after the first radio transmission form the UE. The subframes of different protection classes are classified as 'good', 'bad' or with a level of degration on the uplink after the first radio transmission from the UE.

2.2   Iu UP

2.2.1   General

On the Iu UP in Support Mode the frames are classified with the Frame Quality Classifier (FQC). This classifying is based on the radio frame classification and the setting of the RAB attributes 'Delivery of erroneous SDUs', see [2]. The RAB attribute 'Delivery of erroneous SDUs' tells if erroneous frames shall be delivered or not.

Figure 1 below shows the main input and output information for frame quality classification on the Iu UP in Support Mode.

subflow). The meaning of the values are as follows:

(a) When the 'Delivery of erroneous SDUs' indicator is set to 'No' (on RAB or subflow level) it means that SDUs containing errors shall not be sent. The whole frame containing the erroneous SDU shall be dropped.

(b) If the indicator is set to 'Yes' then the SDU (eventually a subflow) may be delivered when it contain errors, as long as the frame is marked as 'bad'.

(c) If the indicator is set to 'NA' then error detection is not applicable for that SDU (eventually a sub-flow). In this case there is no checking for errors for that SDU (eventually a subflow), so the frame may still be delivered and marked as 'good' (or bad), eventually depending on the attributes of the other SDUs (i.e. subflows).

2.2.2 Frame coding

The figure below shows how FQC in PDU type 0.

Bits								Number of Octets	
7	6	5	4	3	2	1	0		
PDU Type				Frame Number				1	Frame Control Part
FQC		RFCI						1	
Frame Payload Check Sum		Frame Header Check Sum						2	Frame Check Sum Part
Frame Payload Check Sum									
Payload Fields								0-n	Frame Payload part

Figure 2: Iu UP PDU Type 0 Format

The FQC is set to 1 when the frame is classified as bad, see Table 1 below.

Table1: Frame Quality Classifier

FQC Value	Definition
0	Frame good
1	Frame bad
2	Spare
3	Spare

2.2.3 Functionality on uplink

2.2.3.1 General

On the uplink the Iu UP frame quality classifying in UTRAN is based on the radio frame classifying and the RAB attribute 'Delivery of erroneous SDUs'. The UTRAN sets the FQC and passes it to the Iu UP protocol instance in the SRNC together with the RFCI and payload. In UTRAN a CRC is added to the payload. In the CN the CRC is then checked on the uplink.

2.2.4.1 UTRAN

(a) If for any SDU (eventually a subflow) that the 'Delivery of erroneous SDUs' is set to 'No' and for that SDU (eventually a subflow) an indication is got from upper layers that the SDU (subflow) is bad, then the Iu frame payload shall not be sent.

(b) If the above case is not fulfilled, then, if for any SDU (eventually a subflow) that the 'Delivery of erroneous SDUs' is set to 'Yes' and for that SDU (eventually a subflow) an indication is got from upper layers that the SDU (subflow) is bad, then the FQC for that Iu UP frame shall be set to 'bad'.

(c) If the above cases are not fulfilled then the FQC for that Iu UP frame shall be set to 'good'.

2.2.4.2 CN

(a) If for any SDU (eventually a subflow) the 'Delivery of erroneous SDUs' is set to 'No' and the Iu UP frame payload CRC check reveals an error, then the Iu UP frame shall not be sent to the upper layers. When the frame is dropped, an Iu-UP-Status primitive indicating 'No data' is sent at the RNL-SAP.

(b) If the above case is not fulfilled then, if for any SDU (eventually a subflow) the 'Delivery of erroneous SDUs' is set to 'Yes' and the Iu UP frame payload CRC check reveals an error, then the FQC for that Iu UP frame shall be set to 'bad' and the Iu UP frame payload forwarded to the upper layers together with the FQC.

(c) If the above cases are not fulfilled then the Iu UP frame payload shall be forwarded to the upper with FQC as set by the SRNC.

2.2.4 Functionality on downlink

2.2.5.1 General

On the downlink the SRNC is responsible for frame quality classifying. On the downlink the FQC is however not sent down to the UE since the radio protocol does not support the sending of this information. Therefore the Iu UP in UTRAN will not send a frame that is marked as bad.

2.2.5.2 CN

The Iu UP passes all Iu frames (with correct header) to UTRAN.

2.2.5.3 UTRAN

(a) If the frame is marked with FQC as good and the Iu UP payload CRC check reveals that the frame is good then the frame is passed up to the radio interface protocol.

(b) If 'Delivery of erroneous SDUs' is set to 'N/A' then the frame is sent (even if FQC is bad and/or CRC error). In the case where the RAB is made of subflows, this handling is perfomred only when the 'Delivery of erroneous SDUs' is set to 'N/   subflows.

(c) If the above cases are not fulfilled (i.e. FQC bad and/or CRC error and errors shall be detected) then the Iu UP frame payload is not sent.

3   Proposal

It is proposed to enhance the Iu UP in support mode, in [1], to handle frame quality classification as described in section 2 above. This includes to update the

- Iu-UP-DATA primitive's Iu-UP-control parameter with a field for FQC

- Iu-UP-Status primitive's Iu-UP-Procedure-Control parameter with a field for 'No data'

4   References

[1]   TS 25.415 (V1.0.1) Iu Interface CN-UTRAN User Plane Protocol

[2]   Tdoc S2q99036, Reliability attribute definition extension for unequal error protection