TSG RAN Meeting #18 **RP-020752**
New Orleans, Louisiana, USA, 3 - 6 December, 2002

Title **CRs (Rel-4 and Rel-5 Category A) to TS 25.415**
Source **TSG RAN WG3**
Agenda Item **7.3.4**

RAN3 Tdoc	Spec	curr. Vers.	new Vers.	REL	CR	Rev	Cat	Title	Work item
R3-022463	25.415	4.6.0	4.7.0	REL-4	115	-	F	Handling of FQC in down link, missing RNC action	TEI4
R3-022464	25.415	5.2.0	5.3.0	REL-5	116	-	A	Handling of FQC in down link, missing RNC action	TEI4
R3-022524	25.415	4.6.0	4.7.0	REL-4	117	1	F	Rapporteurs corrections	TEI4
R3-022525	25.415	5.2.0	5.3.0	REL-5	118	1	A	Rapporteurs corrections	TEI4

3GPP TSG-RAN WG3 Meeting #33 **Tdoc ⌘R3-022463**
Sophia Antipolis, France, 11 – 15 November 2002

CR-Form-v7

CHANGE REQUEST

⌘ **25.415** **CR** **115** ⌘ **rev** **-** ⌘ Current version: **4.6.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network **X** Core Network **X**

Title:	⌘	Handling of FQC in down link, missing RNC action
Source:	⌘	RAN WG3
Work item code:	⌘	TEI4
Date:	⌘	28/10/2002
Category:	⌘	**F**
Release:	⌘	Rel-4

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)*
Rel-6	*(Release 6)*

Reason for change:	⌘	There was a mistake in CR059 (R3-010983) that introduced general changes for TrFO support. The second bullet in section 6.4.4.1.3 was not a complete sentence since the action to be taken by the RNC is missing. A note below the bullets however informatively describes the intended behaviour for the RNC.
Summary of change:	⌘	Stating that the action to be taken by the RNC is to discard the Frame for this case completes the second bullet in section 6.4.4.1.3. Impact Assessment: This CR has no impact with the previous version of the specification (same release) since there is no functional modification to the intended behaviour.
Consequences if not approved:	⌘	If the CR is not approved, then a Rel-4 implementation will be dependant on the text of an informative note in order to find out the intended behaviour.

Clauses affected:	⌘	6.4.4.1.3

Other specs affected:	⌘	Y	N		⌘	
		X		Other core specifications		CR116 25.415 V5.2.0
			X	Test specifications		
			X	O&M Specifications		

Other comments:	⌘	

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Comprehensive information and tips about how to create CRs can be found at http://www.3gpp.org/specs/CR.htm.
Below is a brief summary:

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3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

6.4.4 Non Access Stratum Data Streams specific function(s)

These functions are responsible for a "limited manipulation" of the payload and the consistency check of the frame number. If a frame loss is detected due a gap in the sequence of the received frame numbers (for a RAB where frame numbers does not relate to time), this shall be reported to the Procedure Control function. These functions are responsible for the CRC check and calculation of the Iu UP frame payload part. These functions are also responsible for the Frame Quality Classification handling as described below.

These functions interact with the upper layers by exchanging Iu data stream blocks of Iu UP frame payload. These functions also handle the padding and depadding of the Iu UP frame payloads when needed.

These functions interact with the Procedure Control functions.

These functions provide service access to the upper layers for the Procedure Control functions.

6.4.4.1 Frame Quality Classification function

6.4.4.1.1 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 attribute *Delivery of erroneous SDU* IE. The RAB attribute *Delivery of erroneous SDU* IE tells if erroneous frames shall be delivered or not.

Figure 6 shows the main input and output information for frame quality classification function on the Iu UP.

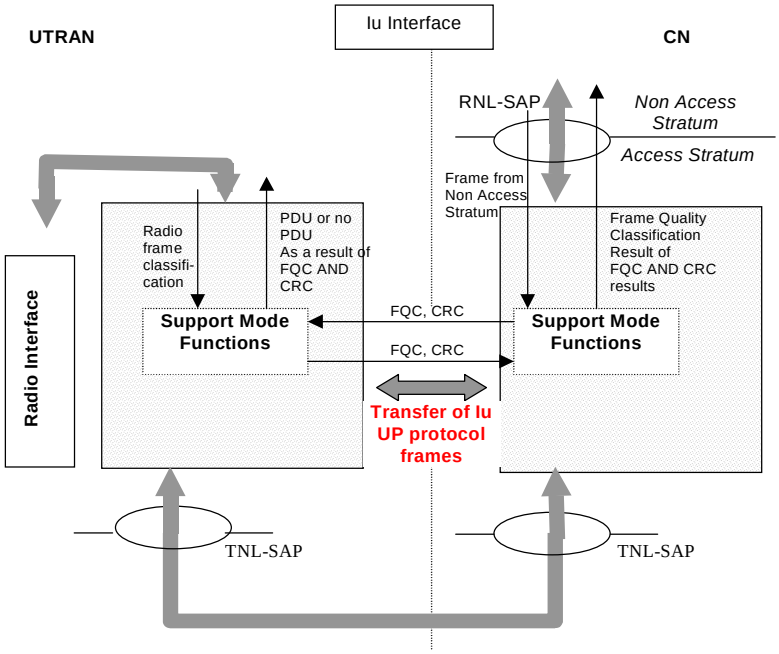

Figure 6: Frame quality classification in Iu UP

6.4.4.1.2 Handling of FQC information in uplink path

6.4.4.1.2.1 Handling of FQC information at RNC

In SRNC on the sending side, the Support Mode Functions takes as input the radio frame quality information together with the frame. Based on this, the *Frame Quality Classification (FQC)* IE is set for the frame, a CRC is or is not added (depending on PDU type) and the frame is sent to CN. The following steps shall be sequentially applied to derive the SRNC behaviour and the *Frame Quality Classification (FQC)* IE setting:

a) If there is at least one subflow with the *Delivery of erroneous SDU* IE set to "No" and for at least one of those subflows the radio frame classification is "Bad" then the Iu UP frame shall not be sent;

b) Otherwise, if there is at least one subflow with the *Delivery of erroneous SDU* IE set to "Yes" and for at least one of those subflows the radio frame classification is "Bad" then the Iu UP frame shall be sent with *Frame Quality Classification (FQC)* IE set to "frame bad due to radio";

c) Otherwise the Iu UP frame shall be sent with *Frame Quality Classification (FQC)* IE set to "frame good".

6.4.4.1.2.2 Handling of FQC information at CN

The Support Mode Functions in CN on the receiving side makes a CRC check of the frame payload, if CRC is present and passes the appropriate frame and the appropriate frame quality classification information through the RNL-SAP. The following steps shall be sequentially applied to derive the CN behaviour and the FQC field setting:

a) If a CRC is available and the CRC check indicates that the Iu UP is "Bad" and at least one subflow has the *Delivery of erroneous SDU* IE set to "No", then the Iu UP frame shall be dropped;

b) Otherwise, if a CRC is available and the CRC check indicates that the Iu UP is "Bad" and at least one subflow has the *Delivery of erroneous SDU* IE set to "Yes", then the Iu UP frame shall be forwarded with the FQC set to "Bad";

c) Otherwise the Iu UP frame shall be forwarded with the FQC as set by UTRAN.

6.4.4.1.3 Handling of FQC information in downlink path

The Support Mode Functions in CN on the sending side adds a CRC, if necessary to the frame payload and passes it together with the FQC. If the payload stems from a transcoding unit of the NAS within the CN the FQC is always set to good. Otherwise it may be set by a partner peer entity residing in another RNC.

The Support Mode Functions in SRNC then makes a CRC-check, if the CRC is present. Based on the CRC check, a decision is made whether to deliver the frame or not based on the following sequential steps:

a) If a CRC is available and the CRC check indicates that the Iu UP is "Bad" then the frame shall be dropped;

b) Otherwise, if the FQC value of the Iu UP frame is set to "frame bad" or "Frame bad due to radio" then the frame shall be dropped, regardless of the CRC check indication;

c) Otherwise, the frame shall be passed to radio interface protocols.

NOTE: The case where SRNC receives a frame with the FQC set to "Frame bad due to radio" (respectively: "frame bad"), corresponds to a TrFO (respectively: TFO) case. The frame is then trashed by the receiving RNC since there is currently no means to pass the frame quality indicator down to the UE.

3GPP TSG-RAN WG3 Meeting #33 **Tdoc ⌘R3-022464**
Sophia Antipolis, France, 11 – 15 November 2002

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CHANGE REQUEST

⌘ **25.415** **CR** **116** ⌘ **rev** **-** ⌘ Current version: **5.2.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ [ ] ME [ ] Radio Access Network [X] Core Network [X]

Title:	⌘	Handling of FQC in down link, missing RNC action
Source:	⌘	RAN WG3
Work item code:	⌘	TEI4
Date:	⌘	28/10/2002
Category:	⌘	**A**
Release:	⌘	Rel-5

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)*
Rel-6	*(Release 6)*

Reason for change:	⌘	There was a mistake in CR059 (R3-010983) that introduced general changes for TrFO support. The second bullet in section 6.4.4.1.3 was not a complete sentence since the action to be taken by the RNC is missing. A note below the bullets however informatively describes the intended behaviour for the RNC.
Summary of change:	⌘	Stating that the action to be taken by the RNC is to discard the Frame for this case completes the second bullet in section 6.4.4.1.3. Impact Assessment: This CR has no impact with the previous version of the specification (same release) since there is no functional modification to the intended behaviour.
Consequences if not approved:	⌘	If the CR is not approved, then a Rel-4 implementation will be dependant on the text of an informative note in order to find out the intended behaviour.

Clauses affected:	⌘	6.4.4.1.3			
Other specs affected:	⌘	**Y** / **N**	Other core specifications	⌘	CR115 25.415 V4.6.0
		X /	Other core specifications		
		/ **X**	Test specifications		
		/ **X**	O&M Specifications		
Other comments:	⌘				

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3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

6.4.4 Non Access Stratum Data Streams specific function(s)

These functions are responsible for a "limited manipulation" of the payload and the consistency check of the frame number. If a frame loss is detected due a gap in the sequence of the received frame numbers (for a RAB where frame numbers does not relate to time), this shall be reported to the Procedure Control function. These functions are responsible for the CRC check and calculation of the Iu UP frame payload part. These functions are also responsible for the Frame Quality Classification handling as described below.

These functions interact with the upper layers by exchanging Iu data stream blocks of Iu UP frame payload. These functions also handle the padding and depadding of the Iu UP frame payloads when needed.

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6.4.4.1 Frame Quality Classification function

6.4.4.1.1 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 attribute *Delivery of erroneous SDU* IE. The RAB attribute *Delivery of erroneous SDU* IE tells if erroneous frames shall be delivered or not.

Figure 6 shows the main input and output information for frame quality classification function on the Iu UP.

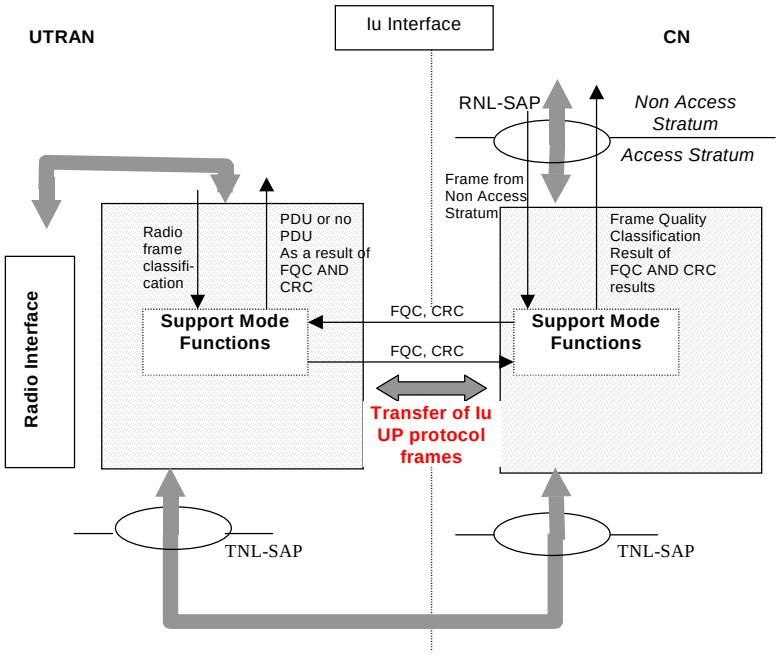

Figure 6: Frame quality classification in Iu UP

6.4.4.1.2 Handling of FQC information in uplink path

6.4.4.1.2.1 Handling of FQC information at RNC

In SRNC on the sending side, the Support Mode Functions takes as input the radio frame quality information together with the frame. Based on this, the *Frame Quality Classification (FQC)* IE is set for the frame, a CRC is or is not added (depending on PDU type) and the frame is sent to CN. The following steps shall be sequentially applied to derive the SRNC behaviour and the *Frame Quality Classification (FQC)* IE setting:

a) If there is at least one subflow with the *Delivery of erroneous SDU* IE set to "No" and for at least one of those

subflows the radio frame classification is "Bad" then the Iu UP frame shall not be sent;

b) Otherwise, if there is at least one subflow with the *Delivery of erroneous SDU* IE set to "Yes" and for at least one of those subflows the radio frame classification is "Bad" then the Iu UP frame shall be sent with *Frame Quality Classification (FQC)* IE set to "frame bad due to radio";

c) Otherwise the Iu UP frame shall be sent with *Frame Quality Classification (FQC)* IE set to "frame good".

6.4.4.1.2.2 Handling of FQC information at CN

The Support Mode Functions in CN on the receiving side makes a CRC check of the frame payload, if CRC is present and passes the appropriate frame and the appropriate frame quality classification information through the RNL-SAP. The following steps shall be sequentially applied to derive the CN behaviour and the FQC field setting:

a) If a CRC is available and the CRC check indicates that the Iu UP is "Bad" and at least one subflow has the *Delivery of erroneous SDU* IE set to "No", then the Iu UP frame shall be dropped;

b) Otherwise, if a CRC is available and the CRC check indicates that the Iu UP is "Bad" and at least one subflow has the *Delivery of erroneous SDU* IE set to "Yes", then the Iu UP frame shall be forwarded with the FQC set to "Bad";

c) Otherwise the Iu UP frame shall be forwarded with the FQC as set by UTRAN.

6.4.4.1.3 Handling of FQC information in downlink path

The Support Mode Functions in CN on the sending side adds a CRC, if necessary to the frame payload and passes it together with the FQC. If the payload stems from a transcoding unit of the NAS within the CN the FQC is always set to good. Otherwise it may be set by a partner peer entity residing in another RNC.

The Support Mode Functions in SRNC then makes a CRC-check, if the CRC is present. Based on the CRC check, a decision is made whether to deliver the frame or not based on the following sequential steps:

a) If a CRC is available and the CRC check indicates that the Iu UP is "Bad" then the frame shall be dropped;

b) Otherwise, if the FQC value of the Iu UP frame is set to "frame bad" or "Frame bad due to radio" then the frame shall be dropped, regardless of the CRC check indication;

c) Otherwise, the frame shall be passed to radio interface protocols.

NOTE: The case where SRNC receives a frame with the FQC set to "Frame bad due to radio" (respectively: "frame bad"), corresponds to a TrFO (respectively: TFO) case. The frame is then trashed by the receiving RNC since there is currently no means to pass the frame quality indicator down to the UE.

3GPP TSG-RAN WG3 Meeting #33 ***Tdoc ⌘R3-022524***
Sophia Antipolis, France, 11 – 15 November 2002

CR-Form-v7

CHANGE REQUEST

⌘ **25.415** **CR** **117** ⌘ **rev** **1** ⌘ Current version: **4.6.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network **X** Core Network **X**

Title: ⌘	Rapporteurs corrections	
Source: ⌘	RAN WG3	
Work item code: ⌘	TEI4	***Date:*** ⌘ 28/10/2002
Category: ⌘	**F**	***Release:*** ⌘ Rel-4

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)*
Rel-6	*(Release 6)*

Reason for change: ⌘

TS 25.990 (referred to for the definition of "RAB") is outdated and no longer applicable as the vocabulary document for release 4. The applicable vocabulary document according to TS 21.102 is TS 21.905. The definition of "RAB" in TS 21.905 is identical to the definition that was in 25.990 V3.0.0.
The applicable "Architecture requirements" document for release 4 is 21.221.

Section 4.2.3 aligned with necessary changes to the release 5 version of the specification.

The quoted word "Bad" is not used in a consistent way in section 6.4.4. It is currently used as a value of the radio frame quality information, as an indication from the CRC check and as a value of the Frame Quality Classification (FQC). The value "Bad" is however not a defined value for FQC.

The last sentence in section 6.5.2 is badly placed and actually contradicts the intention of CR110 (R3-021617) approved by TSG RAN#16.

Figures 9, 10 and 13 contain some editorials. The note text within the figures uses "n" instead of "N_{INIT}", and "Nrc" instead of "N_{RC}".

Summary of change: ⌘

21.905 replace the reference to 25.990.
21.221 replace the reference to 21.121.

Text in section 4.2.3 amended to state "implementation compliant to this release of the specification" instead of "release 4 implementation".

Section 6.4.4 on FQC handling is clarified to make use of the defined named values for the FQC bits. The word "Bad" will after the changes only be used as a

		value of the radio frame quality information. The scope of the CRC check is also clarified to be the CRC check of the Iu UP frame payload part. Not needed and badly placed sentence in section 6.5.2 is removed. Note text in figures 9,10 and 13 editorially corrected. <u>Impact Assessment:</u> This CR has no impact with the previous version of the specification (same release) since there is no functional modification to the intended behaviour.
Consequences if not approved:	⌘	If the CR is not approved, then text contradicting the intention of approved CRs will remain and the misleading usage of the word “Bad” may lead to confusion.

Clauses affected:	⌘	2, 4.2.3, 6.4.4, 6.5.2, 6.5.3				
Other specs affected:	⌘	**Y**	**N**		⌘	CR118 25.415 V5.2.0
		X		Other core specifications		
			X	Test specifications		
			X	O&M Specifications		
Other comments:	⌘					

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2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TS 25.401: "UTRAN Overall Description".

[2] 3GPP TS 25.410: "UTRAN Iu interface: General Aspects and Principles".

[3] 3GPP TS 25.413: "UTRAN Iu interface RANAP Signalling".

[4] 3GPP TS 25.414: "UTRAN Iu Interface Data Transport and Transport Signalling".

[5] 3GPP TS 23.110: "UMTS Access Stratum Services and Functions".

~~[6] 3GPP TS 23.121: "Architectural requirements for Release 1999".~~

[6] 3GPP TS 23.221: "Architectural requirements".

[7] ITU-T Recommendation I.363.2 (11/2000): "B-ISDN ATM Adaptation Layer specification: Type 2 AAL".

[8] ITU-T Recommendation I.366.1 (6/98): "Segmentation and reassembly service specific convergence sublayer for the AAL type 2".

~~[9] 3GPP TR 25.990: "Vocabulary".~~

[9] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[10] 3GPP TS 25.321: "Medium Access Control (MAC) protocol specification".

[11] 3GPP TS 25.322: "Radio Link Control (RLC) protocol specification".

[12] 3GPP TS 26.102: "Mandatory speech codec; AMR speech codec; Interface to Iu and Uu".

[13] 3GPP TS 23.153: "Out of Band Transcoder Control; Stage 2".

4.2.3 Support mode

The support modes are intended for those RABs that do require particular features from the Iu UP protocol in addition to transfer of user data. When operating in a support mode, the peer Iu UP protocol instances exchange Iu UP frames whereas in transparent mode, no Iu UP frames are generated.

The following figure illustrates the functional model of the Iu UP protocol layer in support mode of operation.

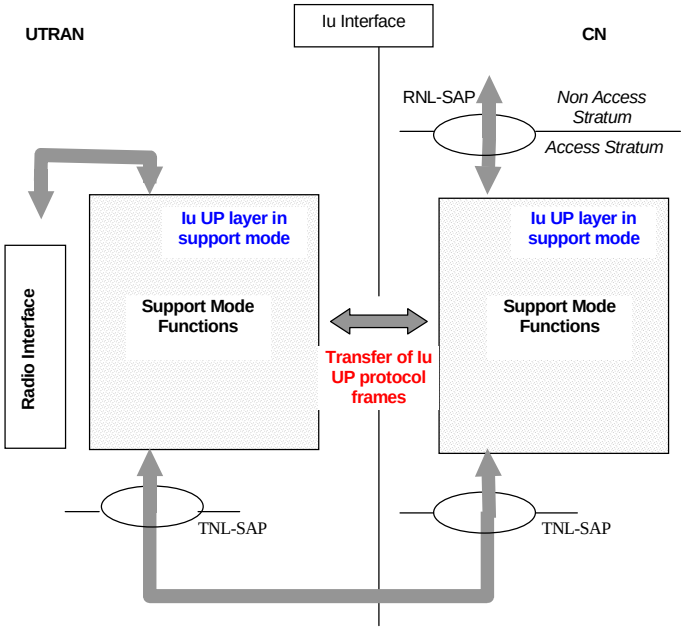

Figure 3: Iu UP protocol layer in support mode occurrence over Iu interface

Some RABs requesting Iu UP protocol support, constrain the Iu UP protocol and possibly the radio interface protocols in specific ways. For instance, certain RABs can have variable predefined rates.

The Iu UP support mode is prepared to support variations.

The only support mode defined here is the:

- Support mode for predefined SDU size (SMpSDU).

For instance, the transfer of AMR speech PDUs would utilise the support mode for predefined SDU size of the Iu UP protocol because it requires some Procedure Control functions and some NAS Data Streams specific functions while the sizes of the user data being transferred can vary in a predefined manner.

This release of the specification defines the Support mode for predefined SDU sizes version 2. The Support mode for predefined SDU sizes version 1 (see release 99 of this specification) shall also be supported by a 3GPP ~~release 4~~ implementation compliant to this release of the specification in order to be backward compatible with release 99.

6.4.4 Non Access Stratum Data Streams specific function(s)

These functions are responsible for a "limited manipulation" of the payload and the consistency check of the frame number. If a frame loss is detected due a gap in the sequence of the received frame numbers (for a RAB where frame numbers does not relate to time), this shall be reported to the Procedure Control function. These functions are responsible for the CRC check and calculation of the Iu UP frame payload part. These functions are also responsible for the Frame Quality Classification handling as described below.

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6.4.4.1.1 General

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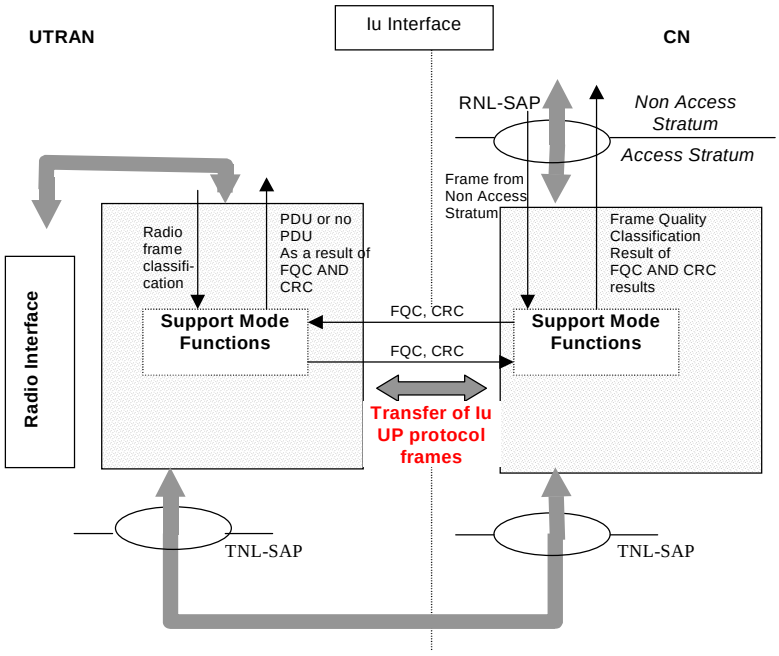

Figure 6: Frame quality classification in Iu UP

6.4.4.1.2 Handling of FQC information in uplink path

6.4.4.1.2.1 Handling of FQC information at RNC

In SRNC on the sending side, the Support Mode Functions takes as input the radio frame quality information together with the frame. Based on this, the *Frame Quality Classification (FQC)* IE is set for the frame, a CRC is or is not added (depending on PDU type) and the frame is sent to CN. The following steps shall be sequentially applied to derive the SRNC behaviour and the *Frame Quality Classification (FQC)* IE setting:

a) If there is at least one subflow with the *Delivery of erroneous SDU* IE set to "No" and for at least one of those

subflows the radio frame classification is "Bad" then the Iu UP frame shall not be sent;

b) Otherwise, if there is at least one subflow with the *Delivery of erroneous SDU* IE set to "Yes" and for at least one of those subflows the radio frame classification is "Bad" then the Iu UP frame shall be sent with *Frame Quality Classification (FQC)* IE set to "frame bad due to radio";

c) Otherwise the Iu UP frame shall be sent with *Frame Quality Classification (FQC)* IE set to "frame good".

6.4.4.1.2.2 Handling of FQC information at CN

The Support Mode Functions in CN on the receiving side makes a CRC check of the frame payload, if CRC is present and passes the appropriate frame and the appropriate frame quality classification information through the RNL-SAP. The following steps shall be sequentially applied to derive the CN behaviour and the FQC field setting:

a) If a CRC is available and the CRC check indicates that the Iu UP frame payload part is corrupted~~"Bad"~~ and at least one subflow has the *Delivery of erroneous SDU* IE set to "No", then the Iu UP frame shall be dropped;

b) Otherwise, if a CRC is available and the CRC check indicates that the Iu UP frame payload part is corrupted~~"Bad"~~ and at least one subflow has the *Delivery of erroneous SDU* IE set to "Yes", then the Iu UP frame shall be forwarded with the FQC set to "frame bad~~Bad~~";

c) Otherwise the Iu UP frame shall be forwarded with the FQC as set by UTRAN.

6.4.4.1.3 Handling of FQC information in downlink path

The Support Mode Functions in CN on the sending side adds a CRC, if necessary to the frame payload and passes it together with the FQC. If the payload stems from a transcoding unit of the NAS within the CN the FQC is always set to "frame good". Otherwise it may be set by a partner peer entity residing in another RNC.

The Support Mode Functions in SRNC then makes a CRC-check, if the CRC is present. Based on the CRC check, a decision is made whether to deliver the frame or not based on the following sequential steps:

a) If a CRC is available and the CRC check indicates that the Iu UP frame payload part is corrupted~~"Bad"~~ then the frame shall be dropped;

b) Otherwise, if the FQC value of the Iu UP frame is set to "frame bad" or "~~Frame~~ frame bad due to radio", regardless of the CRC check indication;

c) Otherwise, the frame shall be passed to radio interface protocols.

NOTE: The case where SRNC receives a frame with the FQC set to "~~Frame~~ frame bad due to radio" (respectively: "frame bad"), corresponds to a TrFO (respectively: TFO) case. The frame is then trashed by the receiving RNC since there is currently no means to pass the frame quality indicator down to the UE.

6.5.2 Initialisation procedure

6.5.2.1 Successful operation

This procedure is mandatory for RABs using the support mode for predefined SDU size. The purpose of the Initialisation procedure is to configure both termination points of the Iu UP with RAB Subflows Combinations, RFCIs, and associated RAB Sub Flows SDU sizes necessary to be supported during the transfer of user data phase.

Additional parameters may also be passed, such as the Inter PDU Timing Interval (IPTI) information.

The Initialisation procedure may be controlled at both end of the Iu access point, i.e. the CN and UTRAN.

The Initialisation procedure is invoked whenever indicated by the Iu UP Procedure Control function e.g. as a result of a relocation of SRNS or at RAB establishment over Iu or if the CN decides to resolve RFCI mismatch in case of TrFO (see [13]). The Initialisation procedure shall not be re-invoked by the SRNC for the RAB without a RAB modification requested via RANAP [3].

When this procedure is invoked all other Iu UP procedures are suspended until termination of the Initialisation procedure.

The Iu UP protocol entity invoking this procedure shall indicate the Iu UP Mode version it uses for the initialisation as well as the Iu UP Mode versions it supports for the related RAB among the versions the CN requested for the related RAB. The sender should use the lowest version for the initialisation that has enough information to initialise the highest proposed protocol version.

The invoking entity allocates a RAB sub-Flow Combination indicator (RFCI) to each RAB sub-Flow Combination it initialises. One requirement on which RAB sub-Flow Combinations to initialise, is that all requested compound RAB sub-Flow Combination SDU sizes shall be configured, except in the case when also version 1 of the user plane mode was included as an alternative in the request over RANAP. In that case, it is allowed to initialise just a subset of the requested RAB sub-Flow Combinations. The association of indicators to RAB Flow Combinations is valid for both the uplink and downlink direction in the Iu UP until a new Initialisation procedure is performed or the connection is terminated.

The Procedure Control function may also generate additional Iu UP protocol parameters necessary for the RAB service to operate properly over Iu.

To each RAB sub-Flow combination indicator is associated the size of each RAB sub-Flow SDU of that combination. The list of RAB sub-Flow Combination Indicators and their respective SDU sizes constitutes the RAB sub-Flow Combination set passed over the Iu UP in the INITIALISATION control frame i.e. into an appropriate Iu UP PDU Type.

The first RAB Sub-flow Combination proposed in the list of RAB Sub-Flow Combinations corresponds to the maximum bit rate allowed to be used when starting the communication phase i.e. until the first RATE CONTROL control frame occurs. The RAB Sub-flow Combinations for rates strictly below the guaranteed bit rate as specified in the RAB parameters (indicated to the Iu-UP at the RNC) shall not be used as the first RAB Sub-flow Combination in the proposed list of RAB Sub-Flow Combinations.

Any RAB Sub-Flow Combination of the set that is initialised shall be supported by the two Iu UP termination points and may optionally be used by the sender (except for the first in the list that shall be used when starting). In particular, the use by the sender of the RFC "NO_DATA" is optional even when it is included in the Initialisation procedure.

Conversely, any RAB Sub-Flow Combination that is not part of the initialised set shall not be used even if supported. In particular, the two Iu UP termination points shall be capable of operating without the use of the RFC "NO_DATA".

The complete set of information is framed by the Iu UP Frame Handler function and transferred in an Iu UP INITIALISATION control frame. If needed, the INITIALISATION control frame CRC is calculated and set accordingly in the respective frame field.

A supervision timer T_{INIT} is started after sending the Iu UP INITIALISATION control frame. This timer supervises the reception of the initialisation acknowledgement frame.

Upon reception of a frame indicating that an Initialisation procedure is active in the peer Iu UP entity, the Iu UP

protocol layer forwards the whole protocol information contained in the INITIALISATION control frame to the upper layers. It also stores the RAB sub-Flow Combination set (and thus replaces a possible previous set) in order to control during the transfer of user data, that the Iu UP payload is correctly formatted (e.g. RFCI matches the expected Iu UP frame payload total length). The peer Iu UP entity receiving the INITIALISATION control frame shall choose a version that it supports, which is among a set of required versions and for which the peer Iu UP entity has enough initialisation information.

If the INITIALISATION control frame is correctly formatted and treated by the receiving Iu UP protocol layer, this latter sends an initialisation acknowledgement frame using the version of the Iu UP Mode that is chosen.

Upon reception of an initialisation acknowledgement frame, the Iu UP protocol layer in the SRNC stops the supervision timer T_{INIT}.

If the Initialisation procedure requires that several frames are to be sent, each frame shall be acknowledged individually (i.e. any frame to be sent shall wait for the acknowledgement of the previous sent frame to be received before being sent. The supervision timer shall be used individually for each frame being sent.

The successful operation of the Initialisation procedure may require that one or several chained frames are positively acknowledged. The number of INITIALISATION control frames in such a chain shall not exceed 4. Each chained frame shall be positively acknowledged before the one with the next frame number can be sent.

The *Frame Number* IE of an INITIALISATION control frame shall always be set to "0" when the chain has only one frame. When several INITIALISATION control frames are used in a chain the *Frame Number* IE shall be set to "0" for the first one and incremented by one in the sending direction for each new frame in the chain. The positive acknowledgement or negative acknowledgement shall carry the frame number of the frame being acknowledged.

Upon reception of an INITIALISATION NEGATIVE ACKNOWLEDGEMENT control frame, an erroneous acknowledgement or at timer T_{INIT} expiry, the Iu UP protocol entity controlling the Initialisation procedure shall reset and restart the T_{INIT} supervision timer and repeat one INITIALISATION control frame with the same frame number. The repetition shall be performed up to N_{INIT} times, N_{INIT} being chosen by the operator (default $N_{INIT} = 3$). The N_{INIT} (maximum number of allowed repetition) is the aggregate count for each frame in the chain and is restart each time a frame is positively acknowledged.

~~Consequently, when in the communication phase (as indicated by internal functions in the Radio Network layer), the frame transmission starts in downlink in the initial RFCI.~~

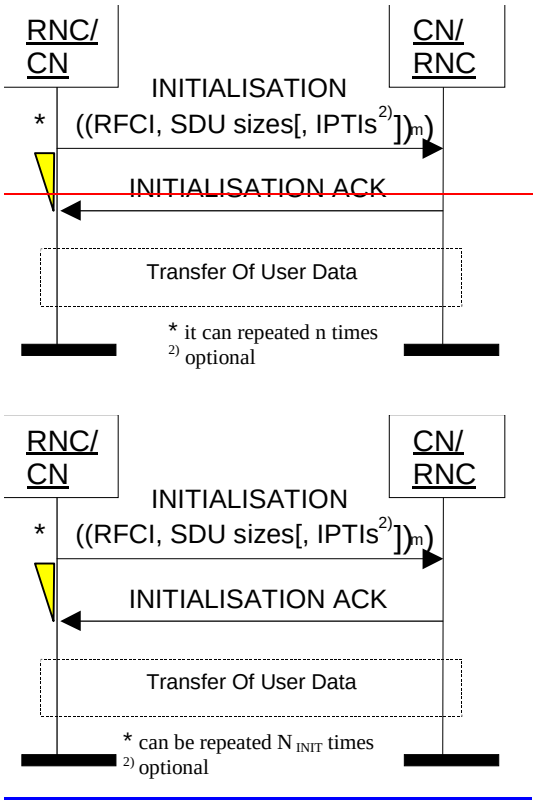

Figure 9: Successful Initialisation of Iu UP for m RFCIs

6.5.2.2 Unsuccessful operation

If the INITIALISATION control frame is incorrectly formatted and cannot be correctly treated by the receiving Iu UP protocol layer, this latter sends an INITIALISATION NEGATIVE ACKNOWLEDGEMENT control frame.

If the receiver does not support the Iu UP Mode version for the Initialisation procedure, it shall send a negative acknowledgement using the highest version it supports among the versions proposed by the sender. If none of the proposed versions are supported, the receiver shall respond with a negative acknowledgement using the highest version it supports.

After N_{INIT} successive negative acknowledgment, erroneous acknowledgment or T_{INIT} expiry for INITIALISATION control frames having the same frame number, the Initialisation procedure is unsuccessfully terminated and the Iu UP protocol layers in RNC take appropriate local actions.

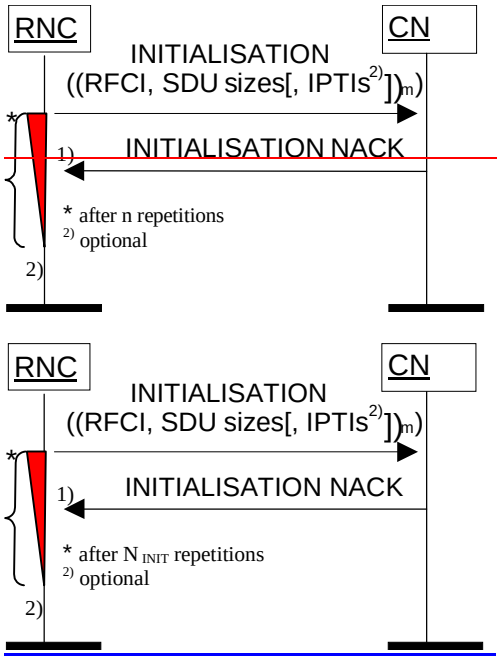

Figure 10: Unsuccessful initialisation of Iu UP: 1) N_{INIT} negative acknowledgement or 2) N_{INIT} expiries of timer T_{INIT}

6.5.3 Iu Rate Control procedure

6.5.3.1 Successful operation

The purpose of the Iu Rate Control procedure is to signal to the peer Iu UP protocol layer the maximum rate over Iu in the reverse direction of the sent RATE CONTROL control frame.

The Rate Control procedure over Iu UP is normally controlled by the entity controlling the rate control over UTRAN i.e. the SRNC. The Iu Rate Control procedure is invoked whenever the SRNC decides that the maximum rate permitted downlink over Iu shall be modified, or when a RATE CONTROL control frame is received from the CN. Within the context of TrFO the SRNC may also receive RATE CONTROL control frames from the TrFO partner.

The rates that can be controlled by the SRNC are all the rates that are defined by the Iu-Initialisation procedure and which are above the guaranteed bitrate specified in the RAB parameters (indicated to the Iu UP at the RNC) Rates below or equal to the guaranteed bitrate, e.g. the lowest speech rate or the SID frames, cannot be controlled (i.e. cannot be forbidden) by the SRNC.

The procedure can be signalled at any time when Transfer of User Data procedure is not suspended by another Procedure Control function. When the user plane was initiated due to SRNS relocation reasons no rate control shall be signalled before the reception of the relocation execution trigger (see [3]). At the reception of the relocation execution trigger the RNC shall start the Iu Rate Control procedure. This enables both TrFO partners to exchange current maximum rates and proceed user data transport based on latest rate decisions.

The Procedure Control function upon request of upper layer prepares the RATE CONTROL control frame payload containing the maximum rate of the reverse direction of the RATE CONTROL control frame. To align the Iu Rate Control procedure with version 1 of the Iu UP protocol the permitted maximum rate is given as a set of RFCI indicators, that shall contain the maximum rate and all rates below the maximum rate, i.e. all rate controllable and non rate controllable rates. In the context of TrFO and TFO the Iu Rate Control procedure may also be controlled by a remote peer.

The Frame Handler function calculates the frame CRC, formats the frame header into the appropriate PDU Type and sends the Iu UP frame PDU to the lower layers for transfer across the Iu interface.

A supervision timer T_{RC} is started after sending the Iu UP RATE CONTROL control frame. This timer supervises the reception of the rate control acknowledgement frame. Upon reception of a rate control acknowledgement frame, the Iu UP protocol layer in the SRNC stops the supervision timer T_{RC}.

Upon reception of a RATE CONTROL control frame, the Iu UP protocol layer checks the consistency of the Iu UP frame as follows:

- The Frame Handler function checks the consistency of the frame header and associated CRC. If correct, the Frame Handler function passes Procedure Control part to the procedure control functions;
- The Procedure Control functions check that all RFCIs in the initial RFCI set are indicated as either allowed or barred. If the whole rate control information is correct, the Procedure Control functions passes the rate control information to the NAS Data Streams specific functions;
- The NAS Data Streams specific functions forward to the upper layers the complete protocol data in a Iu-UP-Status indication primitive;
- Upon reception of the Iu-UP-Status request primitive, the Procedure Control functions shall acknowledge the RATE CONTROL control frame by including it's own maximum rate control information.

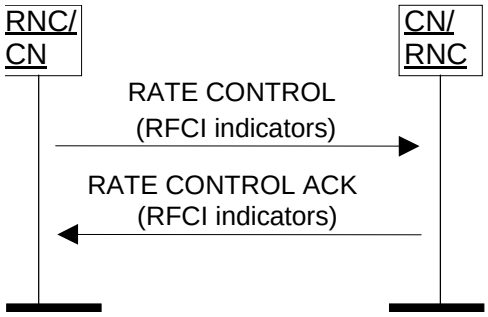

Figure 11: Successful Rate Control

Figure 12: Void

6.5.3.2 Unsuccessful operation

If the Iu UP protocol layer receives a RATE CONTROL control frame that is badly formatted or corrupted, it shall ignore the RATE CONTROL control frame, but send a RATE CONTROL NEGATIVE ACKNOWLEDGEMENT control frame back (figure 13a).

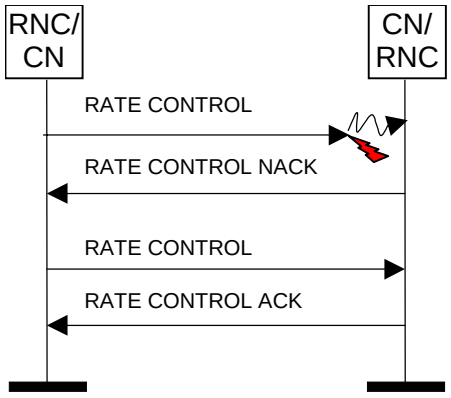

Figure 13a: Negative Acknowledgement received from the peer

If the Iu UP in the SRNC detects that the RATE CONTROL control frame has not been correctly interpreted or received (e.g. the observed rate is outside the set of permitted rates in the reverse direction of the RATE CONTROL control frame (figure 13b), or a RATE CONTROL NEGATIVE ACKNOWLEDGEMENT control frame has been received, or no RATE CONTROL POSITIVE ACKNOWLEDGEMENT control frame was received before the supervision timer T_{RC} expires (Figure 13c)), the Iu UP shall retrigger a Iu Rate Control procedure. If after N_{RC} repetitions, the error situation persists, the Iu UP protocol layers (sending and receiving) take the appropriate local actions.

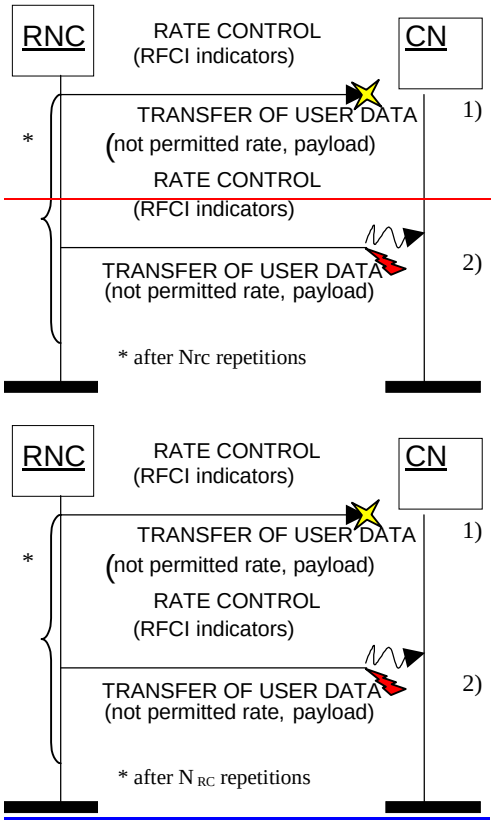

Figure 13: Unsuccessful Transfer of rate control from RNC: 1) Frame loss 2) Corrupted Frame

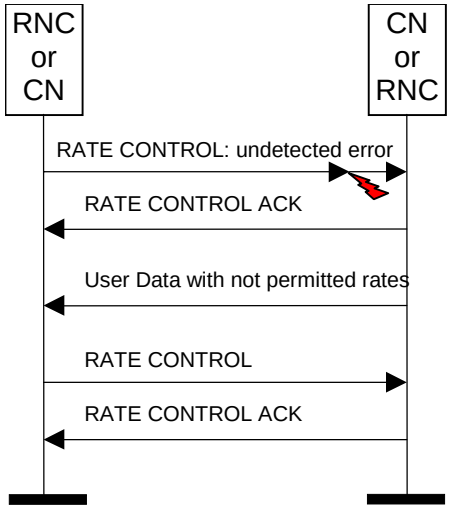

Figure 13b: Unsuccessful Transfer of rate control: undetected error

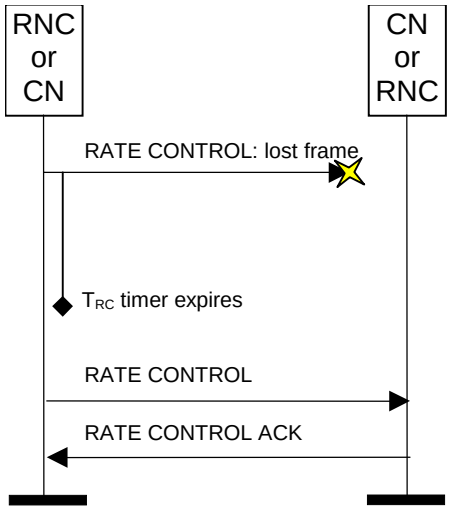

Figure 13c: Unsuccessful Transfer of rate control: lost rate control

3GPP TSG-RAN WG3 Meeting #33 ***Tdoc ⌘R3-022525***
Sophia Antipolis, France, 11 – 15 November 2002

CR-Form-v7

CHANGE REQUEST

⌘ **25.415** **CR** **118** ⌘ **rev** **1** ⌘ Current version: **5.2.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network **X** Core Network **X**

Title:	⌘	Rapporteurs corrections
Source:	⌘	RAN WG3
Work item code:	⌘	TEI4
Date:	⌘	28/10/2002
Category:	⌘	**A**
Release:	⌘	Rel-5

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)*
Rel-6	*(Release 6)*

Reason for change: ⌘

TS 25.990 (referred to for the definition of "RAB") is outdated and no longer applicable as the vocabulary document for release 5. The applicable vocabulary document according to TS 21.103 is TS 21.905. The definition of "RAB" in TS 21.905 is identical to the definition that was in 25.990 V3.0.0.
The applicable "Architecture requirements" document for release 5 is 21.221.

Section 4.2.3 was not amended when the release 5 version of the specification was created.

The quoted word "Bad" is not used in a consistent way in section 6.4.4. It is currently used as a value of the radio frame quality information, as an indication from the CRC check and as a value of the Frame Quality Classification (FQC). The value "Bad" is however not a defined value for FQC.

The last sentence in section 6.5.2 is badly placed and actually contradicts the intention of CR111 (R3-021618) approved by TSG RAN#16.

Figures 9, 10 and 13 contain some editorials. The note text within the figures uses "n" instead of "N_{INIT}", and "Nrc" instead of "N_{RC}".

Summary of change: ⌘

21.905 replace the reference to 25.990.
21.221 replace the reference to 21.121.

Text in section 4.2.3 amended to state "implementation compliant to this release of the specification" instead of "release 4 implementation".

Section 6.4.4 on FQC handling is clarified to make use of the defined named values for the FQC bits. The word "Bad" will after the changes only be used as a

		value of the radio frame quality information. The scope of the CRC check is also clarified to be the CRC check of the Iu UP frame payload part. Contradicting and badly placed sentence in section 6.5.2 is removed. Note text in figures 9,10 and 13 editorially corrected. <u>Impact Assessment:</u> This CR has no impact with the previous version of the specification (same release) since there is no functional modification to the intended behaviour.
Consequences if not approved:	⌘	If the CR is not approved, then text contradicting the intention of approved CRs will remain and the misleading usage of the word “Bad” may lead to confusion.

Clauses affected:	⌘	2, 4.2.3, 6.4.4, 6.5.2, 6.5.3				
Other specs affected:	⌘	**Y**	**N**	Other core specifications	⌘	CR117 25.415 V4.6.0
		X				
			X	Test specifications		
			X	O&M Specifications		
Other comments:	⌘					

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at http://www.3gpp.org/specs/CR.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TS 25.401: "UTRAN Overall Description".

[2] 3GPP TS 25.410: "UTRAN Iu interface: General Aspects and Principles".

[3] 3GPP TS 25.413: "UTRAN Iu interface RANAP Signalling".

[4] 3GPP TS 25.414: "UTRAN Iu Interface Data Transport and Transport Signalling".

[5] 3GPP TS 23.110: "UMTS Access Stratum Services and Functions".

~~[6] 3GPP TS 23.121: "Architectural requirements for Release 1999".~~

[6] 3GPP TS 23.221: "Architectural requirements".

[7] ITU-T Recommendation I.363.2 (11/2000): "B-ISDN ATM Adaptation Layer specification: Type 2 AAL".

[8] ITU-T Recommendation I.366.1 (6/98): "Segmentation and reassembly service specific convergence sublayer for the AAL type 2".

~~[9] 3GPP TR 25.990: "Vocabulary".~~

[9] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[10] 3GPP TS 25.321: "Medium Access Control (MAC) protocol specification".

[11] 3GPP TS 25.322: "Radio Link Control (RLC) protocol specification".

[12] 3GPP TS 26.102: "Mandatory speech codec; AMR speech codec; Interface to Iu and Uu".

[13] 3GPP TS 23.153: "Out of Band Transcoder Control; Stage 2".

[14] IETF RFC 1889: "RTP: A Transport Protocol for Real Time Applications".

[15] IETF RFC 1890: "RTP Profile for Audio and Video Conferences with Minimal Control".

4.2.3 Support mode

The support modes are intended for those RABs that do require particular features from the Iu UP protocol in addition to transfer of user data. When operating in a support mode, the peer Iu UP protocol instances exchange Iu UP frames whereas in transparent mode, no Iu UP frames are generated.

The following figure illustrates the functional model of the Iu UP protocol layer in support mode of operation.

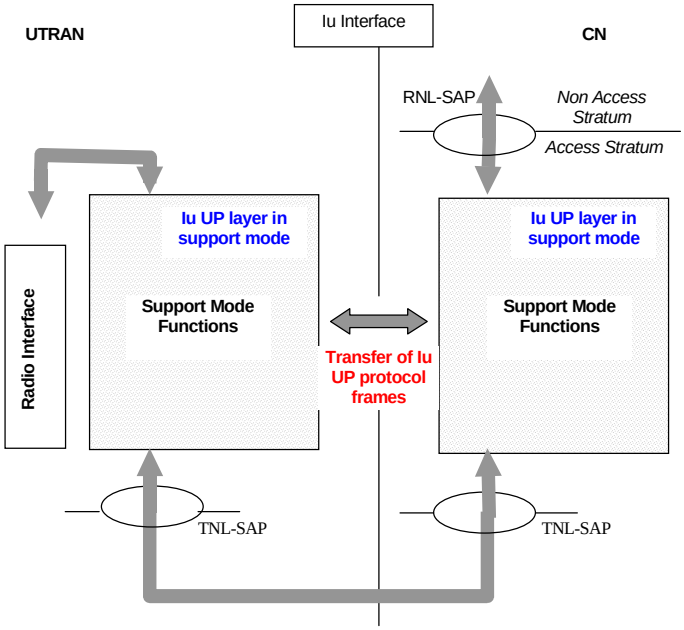

Figure 3: Iu UP protocol layer in support mode occurrence over Iu interface

Some RABs requesting Iu UP protocol support, constrain the Iu UP protocol and possibly the radio interface protocols in specific ways. For instance, certain RABs can have variable predefined rates.

The Iu UP support mode is prepared to support variations.

The only support mode defined here is the:

- Support mode for predefined SDU size (SMpSDU).

For instance, the transfer of AMR speech PDUs would utilise the support mode for predefined SDU size of the Iu UP protocol because it requires some Procedure Control functions and some NAS Data Streams specific functions while the sizes of the user data being transferred can vary in a predefined manner.

This release of the specification defines the Support mode for predefined SDU sizes version 2. The Support mode for predefined SDU sizes version 1 (see release 99 of this specification) shall also be supported by a 3GPP ~~release 4~~ implementation compliant to this release of the specification in order to be backward compatible with release 99.

6.4.4 Non Access Stratum Data Streams specific function(s)

These functions are responsible for a "limited manipulation" of the payload and the consistency check of the frame number. If a frame loss is detected due a gap in the sequence of the received frame numbers (for a RAB where frame numbers does not relate to time), this shall be reported to the Procedure Control function. These functions are responsible for the CRC check and calculation of the Iu UP frame payload part. These functions are also responsible for the Frame Quality Classification handling as described below.

These functions interact with the upper layers by exchanging Iu data stream blocks of Iu UP frame payload. These functions also handle the padding and depadding of the Iu UP frame payloads when needed.

These functions interact with the Procedure Control functions.

These functions provide service access to the upper layers for the Procedure Control functions.

6.4.4.1 Frame Quality Classification function

6.4.4.1.1 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 attribute *Delivery of erroneous SDU* IE. The RAB attribute *Delivery of erroneous SDU* IE tells if erroneous frames shall be delivered or not.

Figure 6 shows the main input and output information for frame quality classification function on the Iu UP.

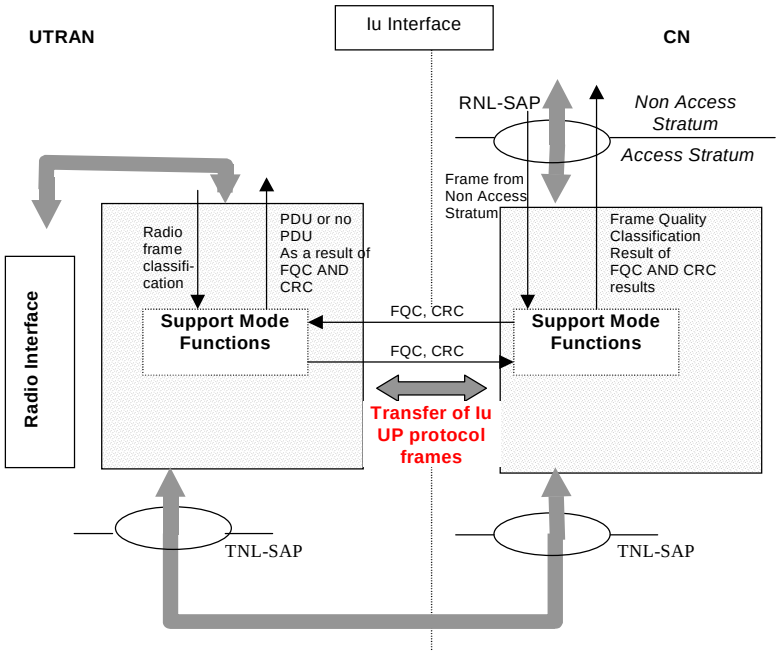

Figure 6: Frame quality classification in Iu UP

6.4.4.1.2 Handling of FQC information in uplink path

6.4.4.1.2.1 Handling of FQC information at RNC

In SRNC on the sending side, the Support Mode Functions takes as input the radio frame quality information together with the frame. Based on this, the *Frame Quality Classification (FQC)* IE is set for the frame, a CRC is or is not added (depending on PDU type) and the frame is sent to CN. The following steps shall be sequentially applied to derive the SRNC behaviour and the *Frame Quality Classification (FQC)* IE setting:

a) If there is at least one subflow with the *Delivery of erroneous SDU* IE set to "No" and for at least one of those

subflows the radio frame classification is "Bad" then the Iu UP frame shall not be sent;

b) Otherwise, if there is at least one subflow with the *Delivery of erroneous SDU* IE set to "Yes" and for at least one of those subflows the radio frame classification is "Bad" then the Iu UP frame shall be sent with *Frame Quality Classification (FQC)* IE set to "frame bad due to radio";

c) Otherwise the Iu UP frame shall be sent with *Frame Quality Classification (FQC)* IE set to "frame good".

6.4.4.1.2.2 Handling of FQC information at CN

The Support Mode Functions in CN on the receiving side makes a CRC check of the frame payload, if CRC is present and passes the appropriate frame and the appropriate frame quality classification information through the RNL-SAP. The following steps shall be sequentially applied to derive the CN behaviour and the FQC field setting:

a) If a CRC is available and the CRC check indicates that the Iu UP frame payload part is corrupted~~"Bad"~~ and at least one subflow has the *Delivery of erroneous SDU* IE set to "No", then the Iu UP frame shall be dropped;

b) Otherwise, if a CRC is available and the CRC check indicates that the Iu UP frame payload part is corrupted~~"Bad"~~ and at least one subflow has the *Delivery of erroneous SDU* IE set to "Yes", then the Iu UP frame shall be forwarded with the FQC set to "frame bad~~Bad~~";

c) Otherwise the Iu UP frame shall be forwarded with the FQC as set by UTRAN.

6.4.4.1.3 Handling of FQC information in downlink path

The Support Mode Functions in CN on the sending side adds a CRC, if necessary to the frame payload and passes it together with the FQC. If the payload stems from a transcoding unit of the NAS within the CN the FQC is always set to "frame good". Otherwise it may be set by a partner peer entity residing in another RNC.

The Support Mode Functions in SRNC then makes a CRC-check, if the CRC is present. Based on the CRC check, a decision is made whether to deliver the frame or not based on the following sequential steps:

a) If a CRC is available and the CRC check indicates that the Iu UP frame payload part is corrupted~~"Bad"~~ then the frame shall be dropped;

b) Otherwise, if the FQC value of the Iu UP frame is set to "frame bad" or "~~Frame~~ frame bad due to radio", regardless of the CRC check indication;

c) Otherwise, the frame shall be passed to radio interface protocols.

NOTE: The case where SRNC receives a frame with the FQC set to "~~Frame~~ frame bad due to radio" (respectively: "frame bad"), corresponds to a TrFO (respectively: TFO) case. The frame is then trashed by the receiving RNC since there is currently no means to pass the frame quality indicator down to the UE.

6.5.2 Initialisation procedure

6.5.2.1 Successful operation

This procedure is mandatory for RABs using the support mode for predefined SDU size. The purpose of the Initialisation procedure is to configure both termination points of the Iu UP with RAB Subflows Combinations, RFCIs, and associated RAB Sub Flows SDU sizes necessary to be supported during the transfer of user data phase.

Additional parameters may also be passed, such as the Inter PDU Timing Interval (IPTI) information.

The Initialisation procedure may be controlled at both end of the Iu access point, i.e. the CN and UTRAN.

The Initialisation procedure is invoked whenever indicated by the Iu UP Procedure Control function e.g. as a result of a relocation of SRNS or at RAB establishment over Iu or if the CN decides to resolve RFCI mismatch in case of TrFO (see [13]). The Initialisation procedure shall not be re-invoked by the SRNC for the RAB without a RAB modification requested via RANAP [3].

When this procedure is invoked all other Iu UP procedures are suspended until termination of the Initialisation procedure.

The Iu UP protocol entity invoking this procedure shall indicate the Iu UP Mode version it uses for the initialisation as well as the Iu UP Mode versions it supports for the related RAB among the versions the CN requested for the related RAB. The sender should use the lowest version for the initialisation that has enough information to initialise the highest proposed protocol version.

The invoking entity allocates a RAB sub-Flow Combination indicator (RFCI) to each RAB sub-Flow Combination it initialises. One requirement on which RAB sub-Flow Combinations to initialise, is that all requested compound RAB sub-Flow Combination SDU sizes shall be configured, except in the case when also version 1 of the user plane mode was included as an alternative in the request over RANAP. In that case, it is allowed to initialise just a subset of the requested RAB sub-Flow Combinations. The association of indicators to RAB Flow Combinations is valid for both the uplink and downlink direction in the Iu UP until a new Initialisation procedure is performed or the connection is terminated.

The Procedure Control function may also generate additional Iu UP protocol parameters necessary for the RAB service to operate properly over Iu.

To each RAB sub-Flow combination indicator is associated the size of each RAB sub-Flow SDU of that combination. The list of RAB sub-Flow Combination Indicators and their respective SDU sizes constitutes the RAB sub-Flow Combination set passed over the Iu UP in the INITIALISATION control frame i.e. into an appropriate Iu UP PDU Type.

The first RAB Sub-flow Combination proposed in the list of RAB Sub-Flow Combinations corresponds to the maximum bit rate allowed to be used when starting the communication phase i.e. until the first RATE CONTROL control frame occurs. The RAB Sub-flow Combinations for rates below the guaranteed bit rate as specified in the RAB parameters (indicated to the Iu-UP at the RNC) shall not be used as the first RAB Sub-flow Combination in the proposed list of RAB Sub-Flow Combinations.

Any RAB Sub-Flow Combination of the set that is initialised shall be supported by the two Iu UP termination points and may optionally be used by the sender (except for the first in the list that shall be used when starting). In particular, the use by the sender of the RFC "NO_DATA" is optional even when it is included in the Initialisation procedure.

Conversely, any RAB Sub-Flow Combination that is not part of the initialised set shall not be used even if supported. In particular, the two Iu UP termination points shall be capable of operating without the use of the RFC "NO_DATA".

The complete set of information is framed by the Iu UP Frame Handler function and transferred in an Iu UP INITIALISATION control frame. If needed, the INITIALISATION control frame CRC is calculated and set accordingly in the respective frame field.

A supervision timer T_{INIT} is started after sending the Iu UP INITIALISATION control frame. This timer supervises the reception of the initialisation acknowledgement frame.

Upon reception of a frame indicating that an Initialisation procedure is active in the peer Iu UP entity, the Iu UP

protocol layer forwards the whole protocol information contained in the INITIALISATION control frame to the upper layers. It also stores the RAB sub-Flow Combination set (and thus replaces a possible previous set) in order to control during the transfer of user data, that the Iu UP payload is correctly formatted (e.g. RFCI matches the expected Iu UP frame payload total length). The peer Iu UP entity receiving the INITIALISATION control frame shall choose a version that it supports, which is among a set of required versions and for which the peer Iu UP entity has enough initialisation information.

If the INITIALISATION control frame is correctly formatted and treated by the receiving Iu UP protocol layer, this latter sends an initialisation acknowledgement frame using the version of the Iu UP Mode that is chosen.

Upon reception of an initialisation acknowledgement frame, the Iu UP protocol layer in the SRNC stops the supervision timer T_{INIT}.

If the Initialisation procedure requires that several frames are to be sent, each frame shall be acknowledged individually (i.e. any frame to be sent shall wait for the acknowledgement of the previous sent frame to be received before being sent. The supervision timer shall be used individually for each frame being sent.

The successful operation of the Initialisation procedure may require that one or several chained frames are positively acknowledged. The number of INITIALISATION control frames in such a chain shall not exceed 4. Each chained frame shall be positively acknowledged before the one with the next frame number can be sent.

The *Frame Number* IE of an INITIALISATION control frame shall always be set to "0" when the chain has only one frame. When several INITIALISATION control frames are used in a chain the *Frame Number* IE shall be set to "0" for the first one and incremented by one in the sending direction for each new frame in the chain. The positive acknowledgement or negative acknowledgement shall carry the frame number of the frame being acknowledged.

Upon reception of an INITIALISATION NEGATIVE ACKNOWLEDGEMENT control frame, an erroneous acknowledgement or at timer T_{INIT} expiry, the Iu UP protocol entity controlling the Initialisation procedure shall reset and restart the T_{INIT} supervision timer and repeat one INITIALISATION control frame with the same frame number. The repetition shall be performed up to N_{INIT} times, N_{INIT} being chosen by the operator (default $N_{INIT} = 3$). The N_{INIT} (maximum number of allowed repetition) is the aggregate count for each frame in the chain and is restart each time a frame is positively acknowledged.

~~Consequently, when in the communication phase (as indicated by internal functions in the Radio Network layer), the frame transmission starts in downlink in the initial RFCI.~~

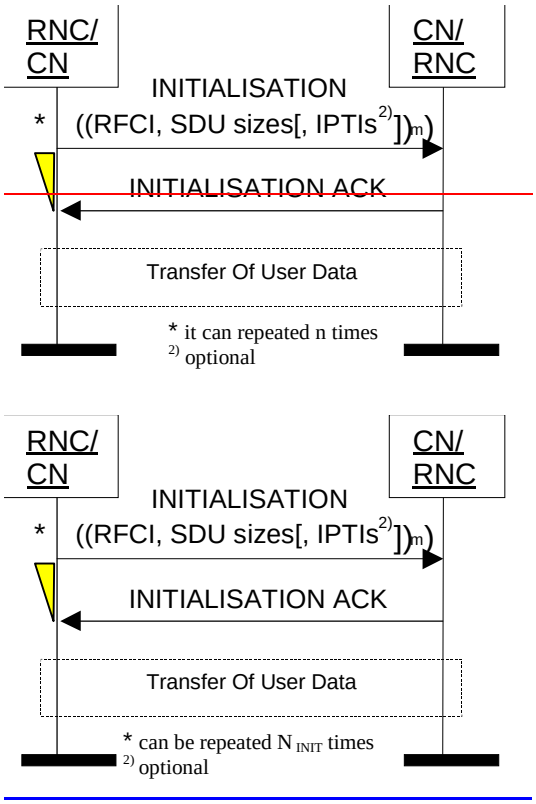

Figure 9: Successful Initialisation of Iu UP for m RFCIs

6.5.2.2 Unsuccessful operation

If the INITIALISATION control frame is incorrectly formatted and cannot be correctly treated by the receiving Iu UP protocol layer, this latter sends an INITIALISATION NEGATIVE ACKNOWLEDGEMENT control frame.

If the receiver does not support the Iu UP Mode version for the Initialisation procedure, it shall send a negative acknowledgement using the highest version it supports among the versions proposed by the sender. If none of the proposed versions are supported, the receiver shall respond with a negative acknowledgement using the highest version it supports.

After N_{INIT} successive negative acknowledgment, erroneous acknowledgment or T_{INIT} expiry for INITIALISATION control frames having the same frame number, the Initialisation procedure is unsuccessfully terminated and the Iu UP protocol layers in RNC take appropriate local actions.

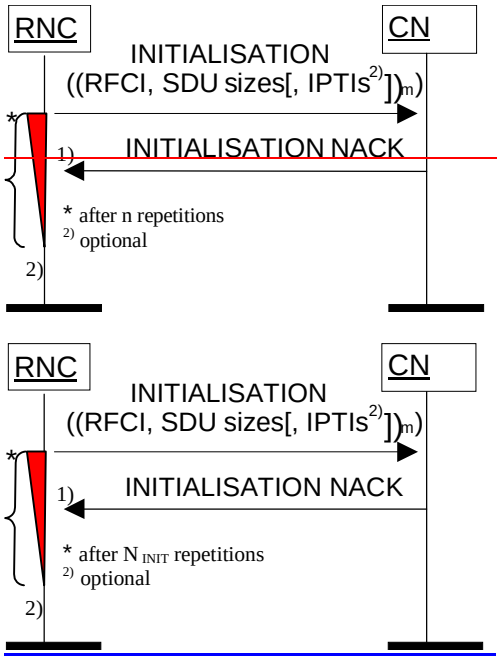

Figure 10: Unsuccessful initialisation of Iu UP: 1) N_{INIT} negative acknowledgement or 2) N_{INIT} expiries of timer T_{INIT}

6.5.3 Iu Rate Control procedure

6.5.3.1 Successful operation

The purpose of the Iu Rate Control procedure is to signal to the peer Iu UP protocol layer the maximum rate over Iu in the reverse direction of the sent RATE CONTROL control frame.

The Rate Control procedure over Iu UP is normally controlled by the entity controlling the rate control over UTRAN i.e. the SRNC. The Iu Rate Control procedure is invoked whenever the SRNC decides that the maximum rate permitted downlink over Iu shall be modified, or when a RATE CONTROL control frame is received from the CN. Within the context of TrFO the SRNC may also receive RATE CONTROL control frames from the TrFO partner.

The rates that can be controlled by the SRNC are all the rates that are defined by the Iu-Initialisation procedure and which are above the guaranteed bitrate specified in the RAB parameters (indicated to the Iu UP at the RNC) Rates below or equal to the guaranteed bitrate, e.g. the lowest speech rate or the SID frames, cannot be controlled (i.e. cannot be forbidden) by the SRNC.

The procedure can be signalled at any time when Transfer of User Data procedure is not suspended by another Procedure Control function. When the user plane was initiated due to SRNS relocation reasons no rate control shall be signalled before the reception of the relocation execution trigger (see [3]). At the reception of the relocation execution trigger the RNC shall start the Iu Rate Control procedure. This enables both TrFO partners to exchange current maximum rates and proceed user data transport based on latest rate decisions.

The Procedure Control function upon request of upper layer prepares the RATE CONTROL control frame payload containing the maximum rate of the reverse direction of the RATE CONTROL control frame. To align the Iu Rate Control procedure with version 1 of the Iu UP protocol the permitted maximum rate is given as a set of RFCI indicators, that shall contain the maximum rate and all rates below the maximum rate, i.e. all rate controllable and non rate controllable rates. In the context of TrFO and TFO the Iu Rate Control procedure may also be controlled by a remote peer.

The Frame Handler function calculates the frame CRC, formats the frame header into the appropriate PDU Type and sends the Iu UP frame PDU to the lower layers for transfer across the Iu interface.

A supervision timer T_{RC} is started after sending the Iu UP RATE CONTROL control frame. This timer supervises the reception of the rate control acknowledgement frame. Upon reception of a rate control acknowledgement frame, the Iu UP protocol layer in the SRNC stops the supervision timer T_{RC}.

Upon reception of a RATE CONTROL control frame, the Iu UP protocol layer checks the consistency of the Iu UP frame as follows:

- The Frame Handler function checks the consistency of the frame header and associated CRC. If correct, the Frame Handler function passes Procedure Control part to the procedure control functions;
- The Procedure Control functions check that all RFCIs in the initial RFCI set are indicated as either allowed or barred. If the whole rate control information is correct, the Procedure Control functions passes the rate control information to the NAS Data Streams specific functions;
- The NAS Data Streams specific functions forward to the upper layers the complete protocol data in a Iu-UP-Status indication primitive;
- Upon reception of the Iu-UP-Status request primitive, the Procedure Control functions shall acknowledge the RATE CONTROL control frame by including it's own maximum rate control information.

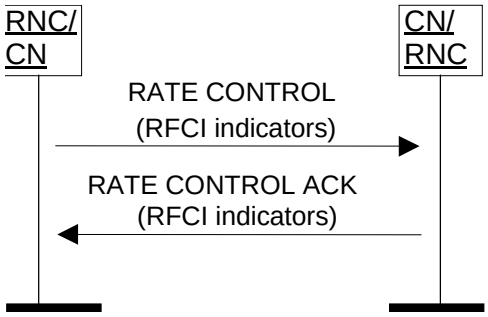

Figure 11: Successful Rate Control

Figure 12: Void

6.5.3.2 Unsuccessful operation

If the Iu UP protocol layer receives a RATE CONTROL control frame that is badly formatted or corrupted, it shall ignore the RATE CONTROL control frame, but send a RATE CONTROL NEGATIVE ACKNOWLEDGEMENT control frame back (figure 13a).

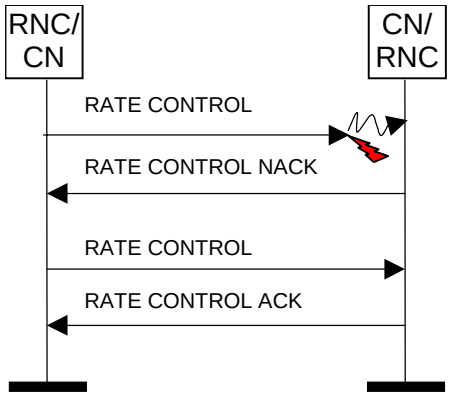

Figure 13a: Negative Acknowledgement received from the peer

If the Iu UP in the SRNC detects that the RATE CONTROL control frame has not been correctly interpreted or received (e.g. the observed rate is outside the set of permitted rates in the reverse direction of the RATE CONTROL control frame (figure 13b), or a RATE CONTROL NEGATIVE ACKNOWLEDGEMENT control frame has been received, or no RATE CONTROL POSITIVE ACKNOWLEDGEMENT control frame was received before the supervision timer T_{RC} expires (Figure 13c)), the Iu UP shall retrigger a Iu Rate Control procedure. If after N_{RC} repetitions, the error situation persists, the Iu UP protocol layers (sending and receiving) take the appropriate local actions.

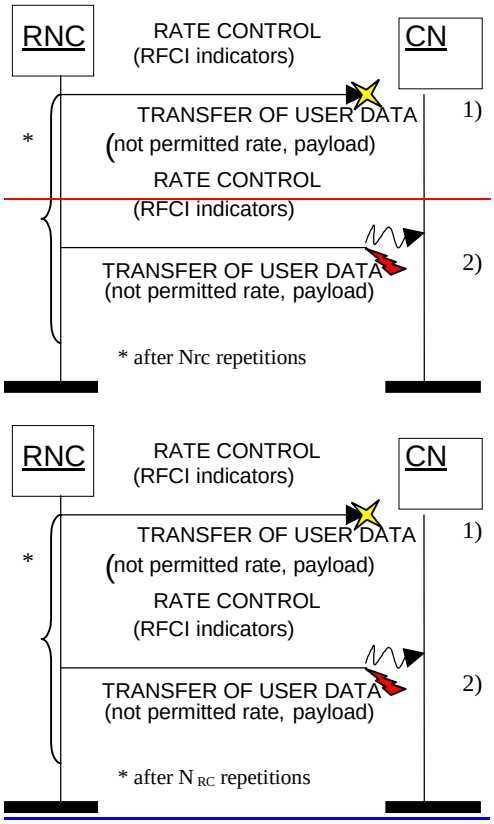

Figure 13: Unsuccessful Transfer of rate control from RNC: 1) Frame loss 2) Corrupted Frame

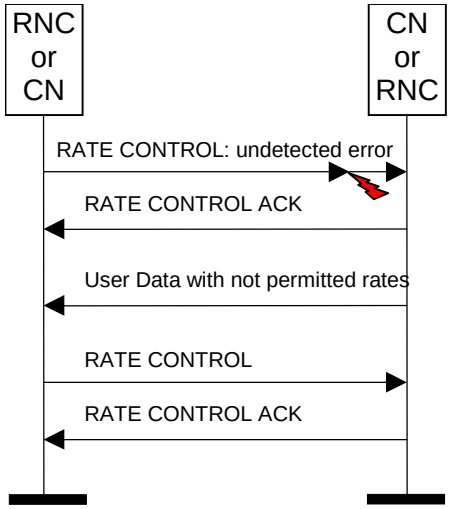

Figure 13b: Unsuccessful Transfer of rate control: undetected error

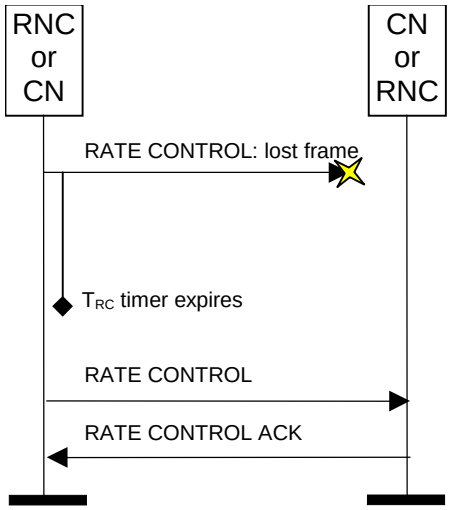

Figure 13c: Unsuccessful Transfer of rate control: lost rate control