TSG-RAN Meeting #7 **_TSGRP#7(00)0096_**
Madrid, Spain, 13 - 15 March 2000

Title: **Agreed CRs to TS 25.415**

Source: **TSG-RAN WG3**

Agenda item: **6.4.3**

Tdoc_Num	Specification	CR_Num	Revision_Num	CR_Subject	CR_Category	WG_Status	Cur_Ver_Num	New_Ver_Num
R3-000348	25.415	002		Addition of spare extension	C	agreed	3.1.0	3.2.0
R3-000059	25.415	003		Correction of frame format and coding sections	F	agreed	3.1.0	3.2.0
R3-000060	25.415	004		Removal of AMR mapping table	D	agreed	3.1.0	3.2.0
R3-000063	25.415	005		Iu timing	C	agreed	3.1.0	3.2.0
R3-000607	25.415	010		Cleanup of 25.415	F	agreed	3.1.0	3.2.0
R3-000715	25.415	014		Removal of Rate Control from Iu-UP-Status Request primitive	F	agreed	3.1.0	3.2.0
R3-000781	25.415	006	1	O&M data addition	F	agreed	3.1.0	3.2.0
R3-000782	25.415	007	1	Modification of the CRC description	C	agreed	3.1.0	3.2.0
R3-000785	25.415	001	1	Time Alignment	B	agreed	3.1.0	3.2.0

R3-000783	25.415	008	1	Initialisation and rate control	C	agreed	3.1.0	3.2.0

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***Document* R3-000059**

e.g. for 3GPP use the format TP-99xxx
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25.415 CR 003 Current Version: 3.1.0

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

For submission to: TSG RAN #7 — for approval [X] — for information [ ] — strategic [ ] — non-strategic [ ] *(for SMG use only)*

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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 [X]
(at least one should be marked with an X)

Source: TSG-RAN WG3 **Date:** 18th Jan 2000

Subject: Correction of frame format and coding sections

Work item:

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

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

Release:

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

Reason for change: The description of the length of frame parts is not in a consistent way in the current specification. This CR proposes to remove some text to make the description consistent. This CR also proposes to add the description of the field 'length of subflow'. This CR also proposes to remove Abnormal event from the open issues in Annex C since error handling is in the current specification (contributed at last meeting).

Clauses affected: 6.6.2.3.2, 6.6.2.3.3, 6.6.3.20, Annex C

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: Note that the numbering of new subsections in section 6.6.3 is dependent on other CRs proposing new subsections. I.e. the new subsection 6.6.3.20 proposed in this CR may be some other number e.g. 6.6.3.23.

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6.6.2.3 PDU Type 14

6.6.2.3.1 General

PDU Type 14 is defined to perform control procedures over the Iu UP in support mode for pre-defined SDU sizes. The control procedure is identified by the procedure indicator. The Frame Payload contains the data information related to the control procedure.

Figure 21 below shows the Iu frame structure for PDU Type 14 of the Iu UP protocol at the SAP towards the transport layers (TNL-SAP):

<table>
<tr><td colspan="8">Bits</td><td rowspan="2">Number of Octets</td><td rowspan="2"></td></tr>
<tr><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr>
<tr><td colspan="4">PDU Type (=14)</td><td colspan="2">Ack/Nack (=0, i.e. procedure)</td><td colspan="2">PDU Type 14 Frame Number</td><td>1</td><td rowspan="2">Frame Control Part</td></tr>
<tr><td colspan="8">Procedure Indicator</td><td>1</td></tr>
<tr><td colspan="6">Header CRC</td><td colspan="2">Payload CRC</td><td>1</td><td rowspan="2">Frame Checksum Part</td></tr>
<tr><td colspan="8">Payload CRC</td><td>1</td></tr>
<tr><td colspan="8">Reserved for procedure data</td><td>0-n</td><td>Frame payload part</td></tr>
</table>

Figure 21: Iu UP PDU Type 14 Format for procedure sending

The Iu UP PDU Type 14 is made of three parts:

1) Iu UP Frame Control part (fixed size)

2) Iu UP Frame Check Sum part (fixed size)

3) Iu UP Frame Payload part (variable length, rounded up to octet)

The Iu UP Frame Control Part and the Iu UP Frame Check Sum constitute the Iu UP PDU Type 14 Frame Header.

6.6.2.3.2 Positive Acknowledgement

When the PDU Type 14 is used to positively acknowledge a control procedure, the PDU Type 14 frame takes the following structure at the TNL-SAP:

Bits								Number of Octets	
7	6	5	4	3	2	1	0		
PDU Type (=14)				Ack/Nack (=1, i.e. Ack)		PDU Type 14 Frame Number		1	Frame Control Part
Procedure Indicator (indicating the procedure being positively acknowledged)								1	
Header CRC						Spare		1	Frame Checksum Part
Spare								1	

Figure 22: Iu UP PDU Type 14 Format for positive acknowledgement

~~The Iu UP PDU Type 14 for positive acknowledgment is made of two parts:~~

~~1) Iu UP Frame Control part (fixed size)~~

~~2) Iu UP Frame Check Sum part (fixed size)~~

The Iu UP Frame Control Part and the Iu UP Frame Check Sum constitute the Iu UP PDU Type 14 Frame Header for positive acknowledgement.

6.6.2.3.3 Negative Acknowledgement

When the PDU Type 14 is used to negatively acknowledge a control procedure, the PDU Type 14 frame takes the following structure at the TNL-SAP:

Bits								Number of Octets	
7	6	5	4	3	2	1	0		
PDU Type (=14)				Ack/Nack (=2, i.e. Nack)		PDU Type 14 Frame Number		1	Frame Control Part
Procedure Indicator (indicating the procedure being negatively acknowledged)								1	
Header CRC						Spare		1	Frame Checksum Part
Spare								1	
Error Cause value						Spare		1	Frame payload part

Figure 23: Iu UP PDU Type 14 Format for negative acknowledgement

~~The Iu UP PDU Type 14 for negative acknowledgment is made of three parts:~~

~~1) Iu UP Frame Control part (fixed size)~~

2) ~~Iu UP Frame Check Sum part (fixed size)~~

3) ~~Iu UP Frame Payload part (fixed size)~~

The Iu UP Frame Control Part and the Iu UP Frame Check Sum constitute the Iu UP PDU Type 14 Frame Header for negative acknowledgement.

6.6.3.19 Padding

Description: This field is an additional field used to make the frame payload part an integer number of octets when needed. Padding is set to 0 by the sender and is not interpreted by the receiver.

Value range: {0–127}

Field length: 0–7 bits

6.6.3.20 Length of subflow

Description: This field indicates the length of the corresponding subflow as number of bits per SDU.

Value range: (0–255 if LI=0, 0–65535 if LI=1)

Field Length: 8 or 16 bits (depending on LI)

Annex C (Informative): Open Issues of the Iu UP

This annex contains information related to open issues left in the Iu UP protocol.

1) ~~Handling of Abnormal Event and Error Handling;~~

2) Timing over Iu, including Time Alignment.

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Document R3-000060

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25.415 CR 004 Current Version: 3.1.0

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

For submission to: TSG RAN #7	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑	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 [X]
(at least one should be marked with an X)

Source: TSG-RAN WG3 **Date:** 13th Jan 2000

Subject: Removal of AMR mapping table

Work item:

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

F	Correction		**Release:**	Phase 2	
A	Corresponds to a correction in an earlier release			Release 96	
B	Addition of feature			Release 97	
C	Functional modification of feature			Release 98	
D	Editorial modification	X		Release 99	X
				Release 00	

Reason for change: A reference to 26.102 is added instead of the example mapping table that is given in Annex A.

Clauses affected: 2, Annex A

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:

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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.

[1] UMTS 25.401, 3rd Generation Partnership Project (3GPP) Technical Specification Group (TSG) RAN; UTRAN Overall Description.

[2] UMTS 25.410, 3rd Generation Partnership Project (3GPP) Technical Specification Group (TSG) RAN; UTRAN Iu interface: general Aspects and Principles.

[3] UMTS 25.413, 3rd Generation Partnership Project (3GPP) Technical Specification Group (TSG) RAN; UTRAN Iu interface RANAP protocol.

[4] UMTS 25.414, 3rd Generation Partnership Project (3GPP) Technical Specification Group (TSG) RAN; Iu Interface Data Transport and Transport Signalling.

[5] UMTS 23.110, 3rd Generation Partnership Project (3GPP) Technical Specification Group (TSG) SSA, UMTS Access Stratum, services and functions.

[6] UMTS 23.121, 3rd Generation Partnership Project (3GPP) Technical Specification Group (TSG) SSA, Architectural requirements for Release 99.

[7] ITU-T Recommendation I.363.2 (1997) - B-ISDN ATM Adaptation Layer type 2 specification.

[8] ITU-T Recommendation I.366.1 (1998) - Segmentation and reassembly service specific convergence sublayer for the AAL type 2.

[9] UMTS 25.990, 3rd Generation Partnership Project (3GPP) Technical Specification Group (TSG) RAN; Vocabulary.

[10] UMTS 25.321, 3rd Generation Partnership Project (3GPP) Technical Specification Group (TSG) RAN; MAC Protocol Specification.

[11] UMTS 25.322, 3rd Generation Partnership Project (3GPP) Technical Specification Group (TSG) RAN; RLC Protocol Specification.

[12] UMTS 26.102, 3rd Generation Partnership Project (3GPP) Technical Specification Group (TSG) SA; Mandatory speech codec; AMR speech codec; Interface to Iu and Uu.

Annex A (Informative): Illustration of usage of RFCI for AMR speech RAB

This annex contains information related to usage of RFCIs in the context of AMR speech RAB.

The following figure illustrates the RFCI allocation and flow throughout the UTRAN.

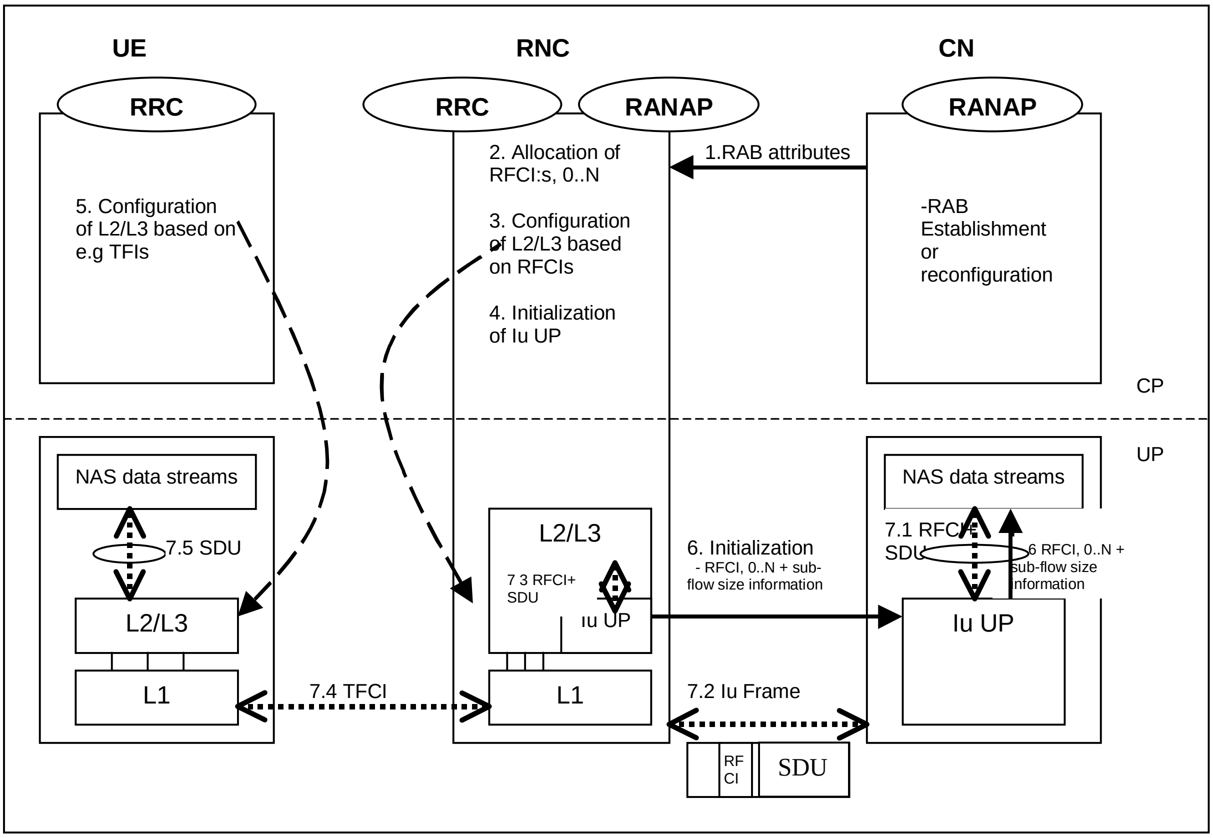

Figure A.1

1. **RAB Attributes**: at RAB establishment or reconfiguration, the SDU size information parameter is passed to UTRAN. The SDU information is organised per BER i.e. RAB sub Flow. For instance,. 12.2 kbits/s AMR codec is passed as RAB sub flow 1 SDU size: 81 bits –class A bits-, RAB sub flow 2 SDU size: 103 –class B bits, as RAB sub flow 3 SDU size: 60 –class C-), which makes one RAB sub Flow Combination. This is done for all rates (i.e. all codec modes, DTX also if included). The Iu UP is used in support mode for predefined SDU size.
2. **Allocation of RFCIs**: the RNC dynamically allocates an identification (RFCI) to each permitted/possible combinations it can offer. E.g. for 12.2. kbits/s, the RNC allocates RFCI 3 (according to the example ~~table 2~~Table A.1)
3. **Configuration of L2/3** based on RFCIs: RFCIs are used to configure the L23. RLC is used transparently. MAC configures its co ordinated DCHs with the RFCIs and associate one RFCI to one TFI
4. **Initialisation of Iu UP**: the RNC reports the permitted combinations it can offer to the transcoder using an inband Iu initialisation frame containing the RFCIs and associated RAB sub Flow sizes.
5. **Configuration of L2/3 based on e.g. TFCIs**: idem as 3. L23 may use e.g. TFI to communicate with the Codec about the RAB sub-Flow structure of the SDU received or to be sent.
6. **RFCIs+ SDU size information**: the RFCIs and associated RAB sub Flow sizes are received within the Iu initialisation frame are passed to the Codec for configuration.

7. Example of DL frame transfer:

7.1. The Codec encodes a 12.2 kbits/s frame. It sends down to the Iu UP and SDU with an associated RFCI equals to 3 (in this example)

7.2. The Iu UP packs a frame with a header containing an RFCI set to value 3, and the payload made of the SDU received from the Codec.

7.3. The Iu UP passes to L23, the Iu frame payload (the Codec SDU) and the RFCI. The L23 uses this RFCI to break the Iu frame onto the co-ordinated DCHs corresponding to the different bits protection classes. The corresponding TFI is selected.

7.4. The radio frame is sent with the TFCI chosen by MAC

7.5. The L23 receives the SDUs on the co-ordinated DCHs, combined them back and uses e.g. the TFCI to indicate to the codec the structure of the received frame.

~~The following table shows RAB sub-flow SDU sizes for a RAB with variable source rate as they are signalled in RAB assignment request in RANAP.~~

~~**Table A.1: Example of SDU sizes for AMR with DTX**~~

~~RAB sub-flows~~			~~Total size of bits/RAB sub-flows combi-nation~~	~~Source rate~~
~~RAB sub-Flow 1~~	~~RAB sub-Flow 2~~	~~RAB sub-Flow 3~~		
~~39~~	~~56~~	~~0~~	~~95~~	~~Source rate 1~~
~~49~~	~~54~~	~~0~~	~~103~~	~~Source rate 2~~
~~55~~	~~63~~	~~0~~	~~118~~	~~Source rate 3~~
~~55~~	~~79~~	~~0~~	~~134~~	~~Source rate 4~~
~~61~~	~~87~~	~~0~~	~~148~~	~~Source rate 5~~
~~75~~	~~84~~	~~0~~	~~159~~	~~Source rate 6~~
~~65~~	~~99~~	~~40~~	~~204~~	~~Source rate 7~~
~~81~~	~~103~~	~~60~~	~~244~~	~~Source rate 8~~
~~39~~	~~0~~	~~0~~	~~39~~	~~Source rate 9~~
⋮	⋮	⋮	⋮	⋮
~~0~~	~~0~~	~~0~~	~~0~~	~~Source rate M~~

~~NOTE 1: In the table above the greyed area shows what is signalled in RANAP RAB establishment request.~~

~~NOTE 2: In the table above the number of sub-flows is informative only.~~

For information on RAB subflow combinations used for AMR speech see reference [12].

SRNC allocates one or more possible/available RAB sub-flow combination(s) and generates RAB sub-flow combination set. RAB sub-flow combination number is dynamically generated by SRNC. This RAB sub-flow combination set is signalled towards CN with user plane signalling as described in [1]. The signalling towards UE is to be defined by TSG-RAN WG2.

RAB sub-flow combination set

A RAB sub-flow combination indicator, RFCI, indicates which RAB sub flow combination will be used for the Iu user frames. In the communication phase the RFCI is included in the user frame, and the RFCI state the structure of the user frame.

Table ~~A.2~~A.1 below exemplifies the allocation of 4 different RAB sub-flows combinations for 3 sub-flows and generating of RAB sub-flows combination set.

Table ~~A.2~~A.1: Example of Allocation of RAB sub-flows combination indicator

	RFCI (RAB sub-Flow Combination Indicator)	RAB sub-Flow 1	RAB sub-flow 2	RAB sub-flow 3	Total	Source rate
RAB sub-flows combination set	**0**	**0**	**0**	**0**	0	Source rate 1
	1	**39**	**0**	**0**	39	Source rate 2
	2	**39**	**56**	**0**	95	Source rate 3
	3	**81**	**103**	**60**	244	Source rate 4

NOTE: In the table above the greyed area shows the part that is sent in the initialisation procedure in Iu UP. This is what constitutes the RAB subflow combination set.

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***Document* R3-000063**
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25.415 CR 005 Current Version: 3.1.0

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

For submission to: TSG RAN #7 | for approval [X] | for information [ ] | strategic [ ] | non-strategic [ ] *(for SMG use only)*
list expected approval meeting # here ↑

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 [X]
(at least one should be marked with an X)

Source: TSG-RAN WG3 **Date:** 20th Jan 2000

Subject: Iu timing

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	X
D	Editorial modification	

Release:

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

Reason for change: To relate frame numbers to time. The current specification is presently a little vague concerning the frame numbers. At certain places, a consistency check is mentioned built on frame numbers that must come in sequence. At other places, “time-related” frame numbers are mentioned.

This contribution proposes to use time related frame numbers for data with traffic class conversational or streaming, i.e. which are real-time in nature. Other types of data it is proposed to use a Iu UP PDU oriented frame number for Iu frames.

Clauses affected: 3.1, 6.4.2, 6.5.1.2, 6.6.3.3, Annex C

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: This CR is dependent of CR for Time Alignment (R3-000064). If Time alignment is not approved, then this CR is not needed.

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3.1 Definitions

For the purposes of the present document, the following terms and definitions apply.

Iu Timing Interval (ITI):

The Iu Timing Interval is the minimum time interval between sent Iu UP PDUs for a specific RAB. The ITI can be calculated for conversational and streaming traffic classes by the following formula:

$$ITI = \frac{MaxSDUsize}{MaxBitrate}$$

Inter PDU Transmission Interval (IPTI):

The Inter PDU Transmission Interval is the actual interval at wich Iu UP PDUs can be sent at a certain time for a specific RAB. The IPTI of a RAB is calculated based on the RAB subflow combination size and the RAB subflow combination bitrate by dividing the RAB subflow combination size with the RAB subflow combination bitrate.

$$IPTI_g = \frac{RFC\_size_g}{RFC\_Bitrate_g}, \quad g = 1,\ldots,n, \quad n = number\ of\ subflowcombinations$$

Note: If RFC_Bitrate is not defined then IPTI=ITI. If RFC_size is not defined then RFC_size=MaxSDUsize

Non Access Stratum (NAS) Data Streams:

Non Access Stratum Data Streams is a generic term to identify these data streams exchanged at the Dedicated Service Access Points between the Non Access Stratum and the Access Stratum.

RAB sub-flows: A RAB as defined in [9] is realised by UTRAN through one to several sub-flows. These sub-flows correspond to the NAS service data streams that have QoS characteristics that differ in a predefined manner within a RAB e.g. different reliability classes.

RAB sub-flows characteristics:

1) The sub-flows of a RAB are established and released together at the RAB establishment and release, respectively;

2) The sub-flows of a RAB are submitted and delivered together at the RAB SAP;

3) The sub-flows of a RAB are carried over the same Iu transmission connection;

4) The sub-flows of a RAB are organised in a predefined manner at the RAB SAP and over the Iu interface. The organisation is imposed by the NAS as part of its co-ordination responsibility.

RAB sub-flows numbering (applies to support mode for predefined SDU size only):

1) RAB sub-flows are numbered from 1 to N (N is the number of sub-flows);

2) RAB sub-flow number 1 corresponds to the highest reliability class and the RAB sub-flow number N corresponds to the lowest reliability class;

NOTE: It is FFS whether numbering of subflows can be based on something else than reliability classes.

3) RAB sub-flows order inside the Iu frame is predefined so that RAB sub-flow number one comes first and the RAB sub-flow number N comes last.

RAB sub-Flow Combination (RFC): A RAB sub-flow combination is defined as an authorised combination of the

RAB sub-flows variable attributes (e.g. SDU sizes) of currently valid RAB sub-flows that can be submitted simultaneously to the Iu UP for transmission over Iu interface. Each combination is given by the CN and cannot be altered by the SRNC.

RAB sub-Flow Combination Indicator (RFCI): This indicator uniquely identifies a RAB sub-flow combination for the duration of the Iu UP peer protocol instances i.e. it is valid until the termination of the call or until a new initialisation is performed. Usage of RFCI applies only to Iu UP protocol operated in support mode for predefined SDU size.

Principles related to RFCI allocation and initialisation procedure:

1) RFCI value is present in every Iu user frame;

2) In the Initialisation procedure in Iu UP, the size of every RAB sub-flow SDU for each RFCI is signalled.

Syntactical error: A field is defined to be syntactically incorrect in a message if it contains at least one value defined as "reserved", or if its value part violates syntactic rules given in the specification of the value part. However it is not a syntactical error that a value specified as "spare" is being used.

Semantical error: A message is defined to have semantically incorrect contents if it contains information which, possibly dependant on the state of the receiver, is in contradiction to the resources of the receiver and/or to the procedural part.

3.2 Abbreviations

AMR	Adaptive Multi-Rate codec
AS	Access Stratum
CN	Core Network
DTX	Discontinuous Transmission
ITI	Iu Timing Interval
IPTI	Inter PDU Transmission Interval
NAS	Non Access Stratum
QoS	Quality of Service
PDU	Protocol Data Unit
PCE	Procedure Control Extension
PME	Procedure Control Bitmap Extension
RAB	Radio Access Bearer
RANAP	Radio Access Network Application Part
RFC	RAB sub Flow Combination
RFCI	RFC Indicator
RNL	Radio Network Layer
SAP	Service Access Point
SDU	Service Data Unit
SMpSDU	Support Mode for predefined SDU size
SRNC	Serving RNC
SRNS	Serving RNS
SSSAR	Service Specific Segmentation And Reassembly
TFI	Transport Format Identification
TFO	Tandem Free Operation
TNL	Transport Network Layer
TrFO	Transcoder Free Operation
TrM	Transparent Mode
UP	User Plane
UUI	User to User Information

6.4.2 Frame Handler function

This function is responsible for framing and de-framing the different parts of an Iu UP protocol frame. This function takes the different parts of the Iu UP protocol frame and set the control part field to the correct values, including the handling of the frame number. It also ensures that the frame control part is semantically correct. This function is responsible for interacting with the Transport layers. This function is also responsible for the CRC check of the Iu UP frame header. The Iu UP frame with header CRC check error is discarded.

6.5 Elementary procedures

6.5.1 Transfer of User Data procedure

6.5.1.1 Successful operation

The purpose of the transfer of user data procedure is to transfer Iu UP frames between the two Iu UP protocol layers at both ends of the Iu interface. Since an Iu UP instance is associated to a RAB and a RAB only, the user data being transferred only relate to the associated RAB.

The procedure is controlled at both ends of the Iu UP instance i.e. SRNC and the CN.

The transfer of user data procedure is invoked whenever user data for that particular RAB needs to be sent across the Iu interface.

The procedure is invoked by the Iu UP upper layers upon reception of the upper layer PDU and associated control information: RFCI.

In SRNC, the upper layers may deliver a frame quality classification information together with the RFCI.

The NAS Data streams functions makes the padding of the payload (if needed) so that the Iu UP frame payload will be an integer number of octets. Then the NAS Data streams functions perform, if needed, CRC calculation of the Iu frame payload and passes the Iu UP frame payload down to the frame handler together with the RFCI.

The frame handler function retrieves the frame number from its internal memory, format the frame header and frame payload into the appropriate PDU Type and sends the Iu UP frame PDU to the lower layers for transfer across the Iu interface.

For RABs with the traffic class conversational or streaming the frame number shall be based on time (stepped at each ITI). For RABs with another type of traffic class the frame numbering shall be based on sent Iu UP PDU (stepped at each sent Iu UP PDU). See description of Frame number.

Upon reception of a user data frame, the Iu UP protocol layer checks the consistency of the Iu UP frame as follows:

- The Frame handler checks the consistency of the frame header. If correct, the frame handler stores the frame number and passes the Iu UP frame payload and associated CRC, if any to the NAS Data Streams functions. The received RFCI is passed to the Procedure Control Function.

- The NAS Data Streams functions check the payload CRC, if any. If the RFCI is correct and matches the Iu UP frame payload as indicated by the Procedure Control functions, the NAS Data Streams removes the padding bits from the Iu UP frame payload based on the RFCI information. Then the NAS Data Streams forwards to the upper layers the RFCI and the payload.

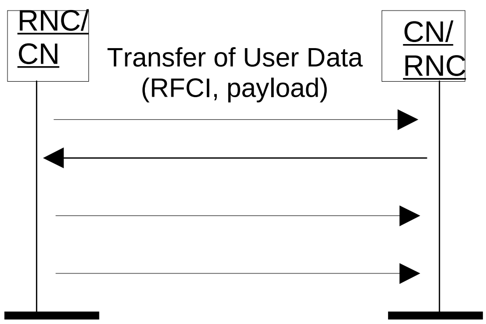

Figure 7. Successful Transfers of User Data

6.5.1.2 Unsuccessful operation

If the Iu UP frame carrying the user data is incorrectly formatted or cannot be correctly treated by the receiving Iu UP protocol layer, the Iu UP protocol layer shall either discard the frame or pass it to the upper layers with a frame classification indicating a corrupted frame. This decision is based on configuration data of the Iu UP instance for that particular RAB (i.e. if the RAB requests delivery of corrupted frame).

If the Iu UP protocol layer detects a frame loss because of a gap in the received frame number sequence while the frame number does not relate to time (see section ~~Time Alignment~~Frame Number), the receiving Iu UP protocol layer shall report this to the procedure control function.

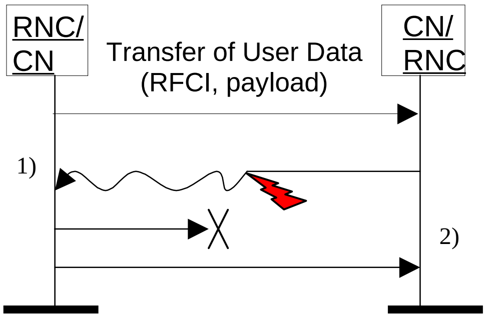

Figure 8. Unsuccessful Transfers of User Data: 1) Corrupted Frame, 2) Detection of Frame loss

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 the RFCIs and associated RAB Sub Flows SDU sizes necessary during the transfer of user data phase. Additional parameters may also be passed.

The initialisation procedure is always controlled by the entity in charge of establishing the Radio Network Layer User Plane i.e. SRNC.

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.

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

The SRNC allocates a RAB sub-Flow Combination indicator (RFCI) to each RAB sub-Flow Combination. The association of indicators to RAB Flow Combinations is valid 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 Flow Combination Indicators and their respective SDU sizes constitutes the RAB sub-Flow Combination set passed over the Iu UP in the initialisation frame i.e. into an appropriate Iu UP PDU Type.

The first RAB sub-Flow Combination proposed in the list of RAB sub-Flow Combination indicates the initial RAB sub-Flow Combination i.e. the first RAB sub-Flow Combination to be used when starting the communication phase i.e. the transfer of user data procedure.

The complete set of information is framed by the Iu UP Frame Handler function and transferred in an Iu UP initialisation frame. If needed, the initialisation 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 frame. This timer supervises the reception of the initialisation acknowledgement frame.

Upon reception of a frame indicating that an initialisation control procedure is active in the peer Iu UP entity, the Iu UP protocol layer forwards to the upper layers the RAB sub-Flow Combination set to be used by the Control procedure function. It also stores the RAB sub-Flow Combination 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).

If the initialisation frame is correctly formatted and treated by the receiving Iu UP protocol layer, this latter sends an initialisation acknowledgement frame.

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.

If several initialisation frames are used for the initialisation procedure, the next frame shall wait for the acknowledgement of the previous frame to be received before sending. The supervision timer is used individually for each frame in a chain.

The frame number is always set to zero for the first frame in a chain and it shall be incremented in the sending direction for each sent frame. The acknowledgement or negative acknowledgement carries the frame number of the frame being acknowledged.

Upon reception of an initialisation negative acknowledgement frame or at timer T_{INIT} expiry, the Iu UP protocol layer in the SRNC shall reset and restart the T_{INIT} supervision timer and repeat an initialisation frame. The repetition can be performed n times, n being chosen by the operator (default n=3).

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.

In the case where an SRNC receives an Iu frame indicating that an initialisation procedure is active at the other end of the Iu UP, RFCI is applied as follows:

- For the sending frame, i.e. UL direction, RNC uses the RAB sub-Flows Combination set indicated in Initialisation phase of the peer TFO or TrFO partner.
- For the receiving frame, i.e. DL direction, RNC uses the RAB sub-Flows Combination set as sent in its own initialisation frame.

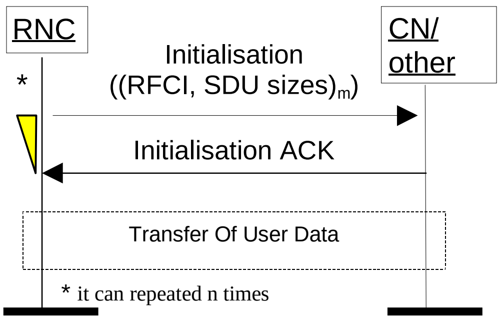

Figure 9: Successful Initialisation of Iu UP for m RFCIs

6.5.2.2 Unsuccessful operation

If the initialisation frame is incorrectly formatted and cannot be correctly treated by the receiving Iu UP protocol layer, this latter sends an initialisation negative acknowledgement frame.

If after n repetition, the initialisation procedure is unsuccessfully terminated (because of n negative acknowledgement or timer T_{INIT} expires), the Iu UP protocol layers (sending and receiving) take appropriate local actions.

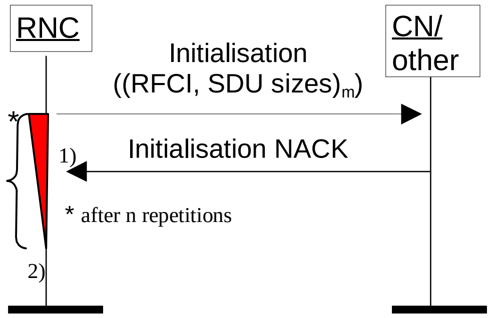

Figure 10: Unsuccessful initialisation of Iu UP: 1) n negative acknowledgement or 2) n timer expires

NOTE: The case where an SRNC receives an Iu frame indicating that an initialisation procedure is active at the other end of the Iu UP could be related to a TFO or TrFO negotiation. How TFO or TrFO protocol and codec negotiation is performed is FFS.

6.6.3 Coding of information elements in frames

6.6.3.1 PDU Type

Description: The PDU type indicates the structure of the Iu UP frame. The field takes the value of the PDU Type it identifies: i.e. 0 for PDU Type 0. The PDU type is in bit 4 to bit 7 in the first octet of the frame.

Value range: {0-14, 15=reserved for future PDU type extensions}

Field length: 4 bits

6.6.3.2 Ack/Nack

Description: The Ack/Nack field tells if the frame is:

- a control procedure frame
- a positive acknowledgement (ACK) of a control procedure frame
- a negative acknowledgement (NACK) of a control procedure frame.

Value range: {0=control procedure frame, 1=ACK, 2=NACK, 3=reserved}

Field length: 2 bits

6.6.3.3 Frame Number

Description: The Iu UP frame numbering is handled by a Frame Number. The frame numbering can be based on either time or sent Iu UP PDU. In case the frame numbering is based on time the purpose of the frame number is to be of help in handling the Time Alignment functionality. When the frame number is based on time, the Frame number is incremented by one (modulo 16) at each new ITI. In case the Frame number relates to sent Iu UP PDU ~~The~~ the purpose of the Frame Number is to provide the receiving entity with a mechanism to keep track of lost Iu UP frames. When the frame number is based on sent Iu UP PDU, the Frame number is incremented by one (modulo 16) for each sent Iu UP PDU. For a given user data connection, there is no relations between the frame numbers of frames sent in the downlink direction and the frame numbers of frames sent in the uplink direction.

Value range: {0-15}

Field length: 4 bits

6.6.3.4 PDU Type 14 Frame Number

Description: The Iu UP frame numbering is handled by a Frame Number. The purpose of the PDU Type 14 Frame Number is to provide the receiving entity with a mechanism to keep track of lost Iu UP frames.It is also used to relate the acknowledgment frame to the frame being acknowledged i.e. the same PDU Type 14 Frame Number is used in the acknowledgement frame as the one used in the frame being acknowledged.

Value range: {0-3}

Field length: 2 bits

Annex C (Informative): Open Issues of the Iu UP

This annex contains information related to open issues left in the Iu UP protocol.

1) Handling of Abnormal Event and Error Handling;
2) ~~Timing over Iu, including Time Alignment.~~

3GPP TSG-RAN Meeting #7
Madrid, Spain, 13 - 15 March 2000

Document R3-000348

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.

25.415 CR 002 Current Version: 3.1.0

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

For submission to:	TSG RAN #7	for approval	X	strategic	
list expected approval meeting # here ↑		for information		non-strategic	*(for SMG use only)*

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

Source: TSG-RAN WG3 **Date:** 27th Jan 2000

Subject: Addition of spare extension

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	X	
D	Editorial modification		

Release:

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

Reason for change:

At the previous RAN WG3 meeting (#9) a CR on 25.415, tdoc R3J99 (updated to R3K16), was presented concerning frame octet padding. A discussion of if the padding could be more than 7 bits long was kept at that meeting. The use of longer padding field was seen as a good possibility to add new fields to frames in the future.
It was at that time decided that this need some further investigation. This CR proposes to include a spare extension field at the end of each Iu UP frame used in support mode for predefined SDU sizes.
This new spare extension field can be of length 0. But when needed the spare field can be used for sending new fields in a backward compatible way, i.e. not having to step the version number. This can be used as a safety net if some corrections of release 99 of Iu UP are needed.
In this version of the specification the spare extension is of length 0. The spare extension should though be possible to be received, because it can be taken into use in a new version of the specification for transferring new fields. A receiver that does not yet know the interpretation of these new fields then discards these new fields. For such an old receiver it is just a spare extension field that is not interpreted. For a receiver that is updated according to the latest version of the specification the interpretation of these new fields are though clear.

Clauses affected: 6.5.1.1, 6.6.2.1, 6.6.2.2, 6.6.2.3.1, 6.6.2.3.2, 6.6.2.3.3, 6.6.2.3.4.1, 6.6.2.3.4.2, 6.6.2.3.4.3, 6.6.2.3.4.4, 6.6.3.20, 6.6.3.21, 6.6.3.22, 6.6.3.23

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: If new frames are introduced they should also include a similar spare extension field.

6.5 Elementary procedures

6.5.1 Transfer of User Data procedure

6.5.1.1 Successful operation

The purpose of the transfer of user data procedure is to transfer Iu UP frames between the two Iu UP protocol layers at both ends of the Iu interface. Since an Iu UP instance is associated to a RAB and a RAB only, the user data being transferred only relate to the associated RAB.

The procedure is controlled at both ends of the Iu UP instance i.e. SRNC and the CN.

The transfer of user data procedure is invoked whenever user data for that particular RAB needs to be sent across the Iu interface.

The procedure is invoked by the Iu UP upper layers upon reception of the upper layer PDU and associated control information: RFCI.

In SRNC, the upper layers may deliver a frame quality classification information together with the RFCI.

The NAS Data streams functions makes the padding of the payload (if needed) so that the Iu UP frame payload will be an integer number of octets. Then the NAS Data streams functions perform, if needed, CRC calculation of the Iu frame payload and passes the Iu UP frame payload down to the frame handler together with the RFCI.

The frame handler function retrieves the frame number from its internal memory, format the frame header and frame payload into the appropriate PDU Type and sends the Iu UP frame PDU to the lower layers for transfer across the Iu interface.

Upon reception of a user data frame, the Iu UP protocol layer checks the consistency of the Iu UP frame as follows:

- The Frame handler checks the consistency of the frame header. If correct, the frame handler stores the frame number and passes the Iu UP frame payload and associated CRC, if any to the NAS Data Streams functions. The received RFCI is passed to the Procedure Control Function.
- The NAS Data Streams functions check the payload CRC, if any. If the RFCI is correct (i.e. RFCI is used at Initialisation) and matches the Iu UP frame payload (i.e. frame payload is not too short for the RFCI) as indicated by the Procedure Control functions, the NAS Data Streams removes the padding bits and the spare extension field when present from the Iu UP frame payload based on the RFCI information. Then the NAS Data Streams forwards to the upper layers the RFCI and the payload.

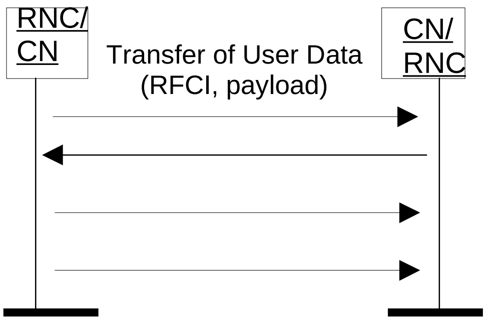

Figure 7. Successful Transfers of User Data

6.5.1.2 Unsuccessful operation

If the Iu UP frame carrying the user data is incorrectly formatted or cannot be correctly treated by the receiving Iu UP protocol layer, the Iu UP protocol layer shall either discard the frame or pass it to the upper layers with a frame classification indicating a corrupted frame. This decision is based on configuration data of the Iu UP instance for that particular RAB (i.e. if the RAB requests delivery of corrupted frame).

If the Iu UP protocol layer detects a frame loss because of a gap in the received frame number sequence while the frame number does not relate to time (see section Time Alignment), the receiving Iu UP protocol layer shall report this to the procedure control function.

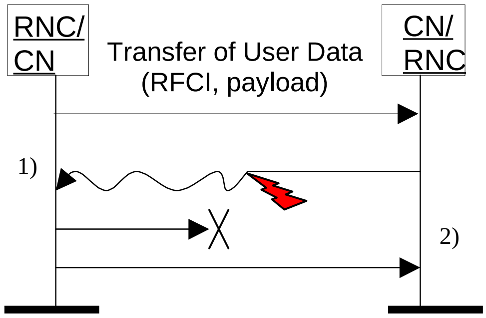

Figure 8. Unsuccessful Transfers of User Data: 1) Corrupted Frame, 2) Detection of Frame loss

6.6 Elements for Iu UP communication in Support mode

6.6.1 General

In this specification the structure of frames will be specified by using figures similar to Figure 18 below.

<table>
<tr><td colspan="8">Bits</td><td rowspan="2">Number of Octets</td><td></td><td></td></tr>
<tr><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td><td></td><td></td></tr>
<tr><td colspan="4">Field 1</td><td colspan="4">Field 2</td><td>1</td><td>Octet 1</td><td rowspan="3">Header part</td></tr>
<tr><td colspan="6">Field 3</td><td colspan="2">Field 4</td><td rowspan="2">2</td><td>Octet 2</td></tr>
<tr><td colspan="4">Field 4 continue</td><td colspan="4">Spare</td><td>Octet 3</td></tr>
<tr><td colspan="8">Field 6</td><td rowspan="2">2</td><td>Octet 4</td><td rowspan="2">Payload part</td></tr>
<tr><td colspan="4">Field 6 continue</td><td colspan="4">Padding</td><td>Octet 5</td></tr>
<tr><td colspan="8">Spare extension</td><td>0-m</td><td></td><td></td></tr>
</table>

Figure 18: Example frame format

Unless otherwise indicated, fields which consist of multiple bits within a octet will have the more significant bit located at the higher bit position (indicated above frame in Figure 18). In addition, if a field spans several octets, more significant bits will be located in lower numbered octets (right of frame in Figure 18).

On the Iu interface, the frame will be transmitted starting from the lowest numbered octet. Within each octet, the bits are sent according decreasing bit position (bit position 7 first).

Spare bits should be set to 0 by the sender and should not be checked by the receiver.

The header part of the frame is always an integer number of octets. The payload part is octet rounded (by adding 'Padding' when needed).

The receiver should be able to remove an additional spare extension field that may be present at the end of a frame. See description of Spare extension field.

6.6.2 Frame Format for predefined size SDUs

6.6.2.1 PDU Type 0

PDU Type 0 is defined to transfer user data over the Iu UP in support mode for pre-defined SDU sizes. Error detection scheme is provided over the Iu UP for the payload part.

The following shows the Iu frame structure for PDU type 0 of the Iu UP protocol at the SAP towards the transport layers (TNL-SAP):

Bits								Number of Octets	
7	6	5	4	3	2	1	0		
PDU Type (=0)				Frame Number				1	Frame Control Part
FQC		RFCI						1	
Header CRC						Payload CRC		2	Frame Check Sum Part
Payload CRC									
Payload Fields								0–n	Frame Payload part
Payload Fields				Padding					
Spare extension								0-m	

Figure 19: Iu UP PDU Type 0 Format

The Iu UP PDU Type 0 is made of three parts:

1) Iu UP Frame Control part (fixed size)

2) Iu UP Frame Check Sum part (fixed size)

3) Iu UP Frame Payload part (pre-defined SDU sizes rounded up to octets [Note: this does not concider the usage of spare extension field])

The Iu UP Frame Control Part and the Iu UP Frame Check Sum constitute the Iu UP PDU Type 0 Frame Header.

6.6.2.2 PDU Type 1

PDU Type 1 is defined to transfer user data over the Iu UP in support mode for pre-defined SDU sizes when no payload error detection scheme is necessary over Iu UP (i.e. no payload CRC).

The following shows the Iu frame structure for PDU type 1 of the Iu UP protocol at the SAP towards the transport layers (TNL-SAP):

<table>
<tr><td colspan="8">Bits</td><td rowspan="2">Number of Octets</td><td></td></tr>
<tr><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td><td></td></tr>
<tr><td colspan="4">PDU Type (=1)</td><td colspan="4">Frame Number</td><td>1</td><td rowspan="2">Frame Control Part</td></tr>
<tr><td colspan="2">FQC</td><td colspan="6">RFCI</td><td>1</td></tr>
<tr><td colspan="6">Header CRC</td><td colspan="2">Spare</td><td>1</td><td>Frame Check Sum Part</td></tr>
<tr><td colspan="8">Payload Fields</td><td rowspan="2">0-n</td><td rowspan="3">Frame Payload part</td></tr>
<tr><td colspan="4">Payload Fields</td><td colspan="4">Padding</td></tr>
<tr><td colspan="8">Spare extension</td><td>0-m</td></tr>
</table>

Figure 20: Iu UP PDU Type 1 Format

The Iu UP PDU Type 1 is made of three parts:

1) Iu UP Frame Control part (fixed size)

2) Iu UP Frame Check Sum part (fixed size)

3) Iu UP Frame Payload part (pre-defined SDU sizes, rounded up to octets [Note: this does not concider the usage of spare extension field])

The Iu UP Frame Control Part and the Iu UP Frame Check Sum constitute the Iu UP PDU Type 1 Frame Header.

6.6.2.3 PDU Type 14

6.6.2.3.1 General

PDU Type 14 is defined to perform control procedures over the Iu UP in support mode for pre-defined SDU sizes. The control procedure is identified by the procedure indicator. The Frame Payload contains the data information related to the control procedure.

Figure 21 below shows the Iu frame structure for PDU Type 14 of the Iu UP protocol at the SAP towards the transport layers (TNL-SAP):

Bits								Number of Octets	
7	6	5	4	3	2	1	0		
PDU Type (=14)				Ack/Nack (=0, i.e. procedure)		PDU Type 14 Frame Number		1	Frame Control Part
Procedure Indicator								1	
Header CRC						Payload CRC		1	Frame Checksum Part
Payload CRC								1	
Reserved for procedure data								0-n	Frame payload part
Spare extension								0-m	

Figure 21: Iu UP PDU Type 14 Format for procedure sending

The Iu UP PDU Type 14 is made of three parts:

1) Iu UP Frame Control part (fixed size)
2) Iu UP Frame Check Sum part (fixed size)
3) Iu UP Frame Payload part (variable length, rounded up to octet)

The Iu UP Frame Control Part and the Iu UP Frame Check Sum constitute the Iu UP PDU Type 14 Frame Header.

6.6.2.3.2 Positive Acknowledgement

When the PDU Type 14 is used to positively acknowledge a control procedure, the PDU Type 14 frame takes the following structure at the TNL-SAP:

Bits								Number of Octets	
7	6	5	4	3	2	1	0		
PDU Type (=14)				Ack/Nack (=1, i.e. Ack)		PDU Type 14 Frame Number		1	Frame Control Part
Procedure Indicator (indicating the procedure being positively acknowledged)								1	
Header CRC						Spare		1	Frame Checksum Part
Spare								1	
Spare extension								0-m	Frame Payload part

Figure 22: Iu UP PDU Type 14 Format for positive acknowledgement

The Iu UP PDU Type 14 for positive acknowledgment is made of two parts:

1) Iu UP Frame Control part (fixed size)
2) Iu UP Frame Check Sum part (fixed size)

The Iu UP Frame Control Part and the Iu UP Frame Check Sum constitute the Iu UP PDU Type 14 Frame Header for positive acknowledgement.

6.6.2.3.3 Negative Acknowledgement

When the PDU Type 14 is used to negatively acknowledge a control procedure, the PDU Type 14 frame takes the following structure at the TNL-SAP:

Bits								Number of Octets	
7	6	5	4	3	2	1	0		
PDU Type (=14)				Ack/Nack (=2, i.e. Nack)		PDU Type 14 Frame Number		1	Frame Control Part
Procedure Indicator (indicating the procedure being negatively acknowledged)								1	
Header CRC						Spare		1	Frame Checksum Part
Spare								1	
Error Cause value						Spare		1	Frame payload part
Spare extension								0-m	

Figure 23: Iu UP PDU Type 14 Format for negative acknowledgement

The Iu UP PDU Type 14 for negative acknowledgment is made of three parts:

1) Iu UP Frame Control part (fixed size)
2) Iu UP Frame Check Sum part (fixed size)
3) Iu UP Frame Payload part (fixed size)

The Iu UP Frame Control Part and the Iu UP Frame Check Sum constitute the Iu UP PDU Type 14 Frame Header for negative acknowledgement.

6.6.2.3.4 Procedures Coding

6.6.2.3.4.1 Initialisation

The figure below specifies how the initialisation procedure frame is coded.

Bits								Number of Octets	
7	6	5	4	3	2	1	0		
PDU Type (=14)				Ack/Nack (=0. I.e. Procedure)		PDU Type 14 Frame Number		1	Frame Control Part
Procedure Indicator (=0)								1	
Header CRC						Payload CRC		2	Frame Checksum part
Payload CRC									
Spare				Number of subflows per RFCI (N)			Chain Ind	1	Frame payload part
~~Spare~~ LRI	LI	1st RFCI						1	
Length of subflow 1								1 or 2 (dep. LI)	
Length of subflow 2 to N								(N-1)x(1 or 2)	
~~Spare~~ LRI	LI	2nd RFCI						1	
Length of subflow 1								1 or 2 (dep. LI)	
Length of subflow 2 to N								(N-1)x(1 or 2)	
…									
Spare extension								0-m	

Figure 24: Iu UP PDU Type 14 used for Initialisation

6.6.2.3.4.2 Rate Control

The Figure below specifies how the rate control procedure frame is coded when the rate control uses only RFCI indicators.

<table>
<tr><td colspan="8">Bits</td><td rowspan="2">Number of Octets</td><td></td></tr>
<tr><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td><td></td></tr>
<tr><td colspan="4">PDU Type (=14)</td><td colspan="2">Ack/Nack (=0, i.e. Procedure)</td><td colspan="2">PDU Type 14 Frame Number</td><td>1</td><td rowspan="2">Frame Control Part</td></tr>
<tr><td colspan="8">Procedure Indicator (=1)</td><td>1</td></tr>
<tr><td colspan="6">Header CRC</td><td colspan="2">Payload CRC</td><td>1</td><td rowspan="2">Frame Checksum Part</td></tr>
<tr><td colspan="8">Payload CRC</td><td>1</td></tr>
<tr><td>Spare</td><td>Rate control type (=0)</td><td colspan="6">Number of RFCIs (N)</td><td>1</td><td rowspan="3">Frame payload part</td></tr>
<tr><td>RFCI 0 Ind.</td><td>RFCI 1 Ind</td><td>…</td><td>RFCI N-1 Ind</td><td colspan="4">Padding</td><td>0–n</td></tr>
<tr><td colspan="8">Spare extension</td><td>0-m</td></tr>
</table>

Figure 25: Iu UP PDU Type 14 Format used for Rate Control

The Figure below specifies how the rate control procedure is coded when both RFCI indicators and Downlink send intervals are used.

<table>
<tr><td colspan="8">Bits</td><td rowspan="2">Number of Octets</td><td rowspan="2"></td></tr>
<tr><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr>
<tr><td colspan="4">PDU Type (=14)</td><td colspan="2">Ack/Nack (=0)</td><td colspan="2">PDU Type 14 Frame Number</td><td>1</td><td rowspan="2">Frame Control Part</td></tr>
<tr><td colspan="8">Procedure Indicator (=1)</td><td>1</td></tr>
<tr><td colspan="6">Header CRC</td><td colspan="2">Payload CRC</td><td>1</td><td rowspan="2">Frame Checksum Part</td></tr>
<tr><td colspan="8">Payload CRC</td><td>1</td></tr>
<tr><td>Spare</td><td>Rate Contr. Type (=1)</td><td colspan="6">Number of RFCI Indicators (N)</td><td>1</td><td rowspan="5">Frame payload part</td></tr>
<tr><td>RFCI 0 Ind.</td><td colspan="3">Downlink send interval (for RFCI 0)</td><td>RFCI 1 Ind.</td><td colspan="3">Downlink send interval (for RFCI 1)</td><td rowspan="3">0–n</td></tr>
<tr><td>…</td><td colspan="3">…</td><td>RFCI N-2 Ind</td><td colspan="3">Downlink send interval (for RFCI N-2)</td></tr>
<tr><td>RFCI N-1 Ind.</td><td colspan="3">Downlink send interval (for RFCI N-1)</td><td colspan="4">Padding</td></tr>
<tr><td colspan="8">Spare extension</td><td>0-m</td></tr>
</table>

Figure 26: Iu UP PDU Type 14 Format used for Rate Control

6.6.2.3.4.3 Time Alignment (FFS)

6.6.2.3.4.4 Error Event

The Figure below specifies how the Error Event procedure is coded.

<table>
<tr><td colspan="8">Bits</td><td rowspan="2">Number of Octets</td><td rowspan="2"></td></tr>
<tr><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr>
<tr><td colspan="4">PDU Type (=14)</td><td colspan="2">Ack/Nack(=0)</td><td colspan="2">PDU Type 14 Frame Number</td><td>1</td><td rowspan="2">Frame Control Part</td></tr>
<tr><td colspan="8">Procedure Indicator (=3)</td><td>1</td></tr>
<tr><td colspan="6">Header CRC</td><td colspan="2">Payload CRC</td><td>1</td><td rowspan="2">Frame Checksum Part</td></tr>
<tr><td colspan="8">Payload CRC</td><td>1</td></tr>
<tr><td colspan="2">Error distance</td><td colspan="6">Error Cause value</td><td>1</td><td rowspan="2">Frame payload part</td></tr>
<tr><td colspan="8">Spare extension</td><td>0-m</td></tr>
</table>

Figure 27: Iu UP PDU Type 14 Format used for Error Event

6.6.3.19 Padding

Description: This field is an additional field used to make the frame payload part an integer number of octets when needed. Padding is set to 0 by the sender and is not interpreted by the receiver.

Value range: {0–127}

Field length: 0–7 bits

6.6.3.20 Spare

Description: The spare field is set to 0 by the sender and should not be interpreted by the receiver.

Value range: (0–2^n-1)

Field Length: n bits

6.6.3.21 Spare extension

Description: The spare extension field shall not be sent. The receiver should be capable of receiving a spare extension. The spare extension should not be interpreted by the receiver. This since in later versions of this specification additional new fields might be added in place of the spare extension. The spare extension can be of an integer number of octets (m) carrying new fields or additional information.

Value range: 0–2^{m*8}-1

Field Length: 0–m octets

6.6.3.22 LRI, Last RFCI Indicator

Description: The Last RFCI Indicator is used to indicate which is the last RFCI in the current Initialisation frame. This makes it possible for a receiver to detect a spare extension field.

Value range: (0: Not last RFCI, 1: Last RFCI in current frame)

Field Length: 1 bit

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Sophia Antipolis, France, 28th Feb–3rd Mar 2000

***Document* R3-000607**
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.

25.415 CR 010 Current Version: 3.1.0

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

For submission to: RAN#7	for approval	X	strategic		*(for SMG use only)*
list expected approval meeting # here ↑	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 [X]
(at least one should be marked with an X)

Source: RAN-WG3 **Date:** 21st Feb 2000

Subject: Cleanup of 25.415

Work item:

Category:				**Release:**	
	F	Correction	X	Phase 2	
	A	Corresponds to a correction in an earlier release		Release 96	
(only one category	B	Addition of feature		Release 97	
shall be marked	C	Functional modification of feature		Release 98	
with an X)	D	Editorial modification		Release 99	X
				Release 00	

Reason for change: Editorial corrections and removing inconsistencies

Clauses affected: 3.1, 5.4.1, 6.4.4, 6.5.1.1, 6.5.3.2, 6.5.5.2, 6.6.3.1, 6.6.3.7, 6.6.3.16, B.2, B.2.3

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.

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply.

Non Access Stratum (NAS) Data Streams:

Non Access Stratum Data Streams is a generic term to identify these data streams exchanged at the Dedicated Service Access Points between the Non Access Stratum and the Access Stratum.

RAB sub-flows: A RAB as defined in [9] is realised by UTRAN through one to several sub-flows. These sub-flows correspond to the NAS service data streams that have QoS characteristics that differ in a predefined manner within a RAB e.g. different reliability classes.

RAB sub-flows characteristics:

1) The sub-flows of a RAB are established and released together at the RAB establishment and release, respectively;
2) The sub-flows of a RAB are submitted and delivered together at the RAB SAP;
3) The sub-flows of a RAB are carried over the same Iu transmission connection;
4) The sub-flows of a RAB are organised in a predefined manner at the RAB SAP and over the Iu interface. The organisation is imposed by the NAS as part of its co-ordination responsibility.

RAB sub-flows numbering (applies to support mode for predefined SDU size only):

1) RAB sub-flows are numbered from 1 to N (N is the number of sub-flows);
2) RAB sub-flow number 1 corresponds to the highest reliability class and the RAB sub-flow number N corresponds to the lowest reliability class;

~~NOTE: It is FFS whether numbering of subflows can be based on something else than reliability classes.~~

3) RAB sub-flows order inside the Iu frame is predefined so that RAB sub-flow number one comes first and the RAB sub-flow number N comes last.

RAB sub-Flow Combination (RFC): A RAB sub-flow combination is defined as an authorised combination of the RAB sub-flows variable attributes (e.g. SDU sizes) of currently valid RAB sub-flows that can be submitted simultaneously to the Iu UP for transmission over Iu interface. Each combination is given by the CN and cannot be altered by the SRNC.

RAB sub-Flow Combination Indicator (RFCI): This indicator uniquely identifies a RAB sub-flow combination for the duration of the Iu UP peer protocol instances i.e. it is valid until the termination of the call or until a new initialisation is performed. Usage of RFCI applies only to Iu UP protocol operated in support mode for predefined SDU size.

Principles related to RFCI allocation and initialisation procedure:

1) RFCI value is present in every Iu user frame;
2) In the Initialisation procedure in Iu UP, the size of every RAB sub-flow SDU for each RFCI is signalled.

Syntactical error: A field is defined to be syntactically incorrect in a message if it contains at least one value defined as "reserved", or if its value part violates syntactic rules given in the specification of the value part. However it is not a syntactical error that a value specified as "spare" is being used.

Semantical error: A message is defined to have semantically incorrect contents if it contains information which, possibly dependant on the state of the receiver, is in contradiction to the resources of the receiver and/or to the procedural part.

5.4 Elements for Iu UP communication in Transparent mode

5.4.1 Frame Format for transparent mode

The following shows the format of the PDU crossing the Iu UP protocol layer in transparent mode. This frame is transferred transparently between the Iu UP protocol upper layers and transport network layer (TNL-SAP).

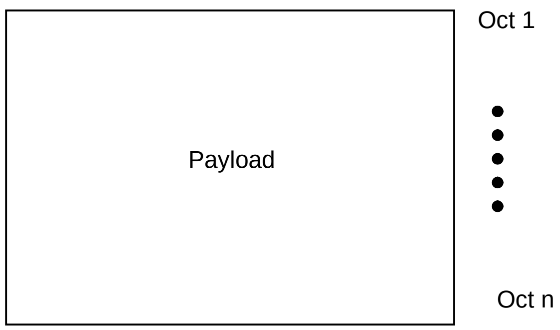


Figure 4: Frame format for transparent mode

This PDU has a variable length of n octets, whose maximum range depends on the type of user data (e.g. IP packet~~, Non Transparent CS data etc..~~). No explicit length indication is visible at the Iu UP protocol layer.

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 handles 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.

6.5 Elementary procedures

6.5.1 Transfer of User Data procedure

6.5.1.1 Successful operation

The purpose of the transfer of user data procedure is to transfer Iu UP frames between the two Iu UP protocol layers at both ends of the Iu interface. Since an Iu UP instance is associated to a RAB and a RAB only, the user data being transferred only relate to the associated RAB.

The procedure is controlled at both ends of the Iu UP instance i.e. SRNC and the CN.

The transfer of user data procedure is invoked whenever user data for that particular RAB needs to be sent across the Iu interface.

The procedure is invoked by the Iu UP upper layers upon reception of the upper layer PDU and associated control information: RFCI.

In SRNC, the upper layers may deliver a frame quality classification information together with the RFCI.

The NAS Data streams functions makes the padding of the payload (if needed) so that the Iu UP frame payload will be an integer number of octets. Then the NAS Data streams functions perform, if needed, CRC calculation of the Iu frame payload and passes the Iu UP frame payload down to the frame handler together with the RFCI.

The frame handler function retrieves the frame number from its internal memory, ~~format~~ formats the frame header and frame payload into the appropriate PDU Type and sends the Iu UP frame PDU to the lower layers for transfer across the Iu interface.

Upon reception of a user data frame, the Iu UP protocol layer checks the consistency of the Iu UP frame as follows:

- The Frame handler checks the consistency of the frame header. If correct, the frame handler stores the frame number and passes the Iu UP frame payload and associated CRC, if any to the NAS Data Streams functions. The received RFCI is passed to the Procedure Control Function.

- The NAS Data Streams functions check the payload CRC, if any. If the RFCI is correct and matches the Iu UP frame payload as indicated by the Procedure Control functions, the NAS Data Streams removes the padding bits from the Iu UP frame payload based on the RFCI information. Then the NAS Data Streams forwards to the upper layers the RFCI and the payload.

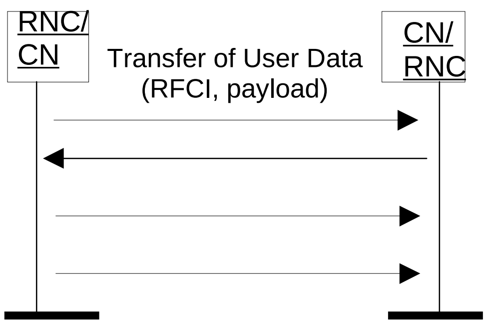


Figure 7. Successful Transfers of User Data

6.5.3.2 Unsuccessful operation

If the Iu UP in the SRNC detects that the rate control command has not been correctly interpreted or received (e.g. the rate is outside the set of permitted rates in the reverse direction of the rate control frame), the Iu UP shall retrigger a rate control procedure. If after "m" repetitions, the error situation persists, the Iu UP protocol layers (sending and receiving) take the appropriate local actions.

If the Iu UP protocol layer receives a rate control frame that is badly formatted or corrupted, it shall ignore the rate control frame.

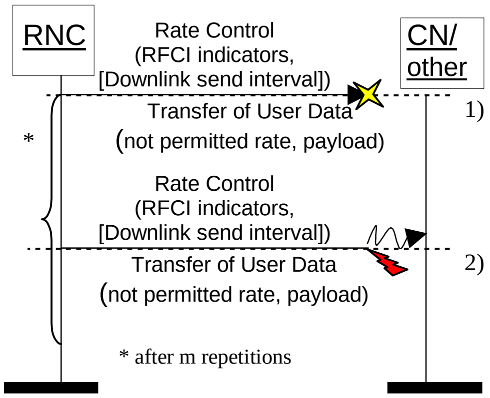


Figure 13: Unsuccessful Transfers of rate control from RNC: 1) Frame loss 2) Corrupted Frame

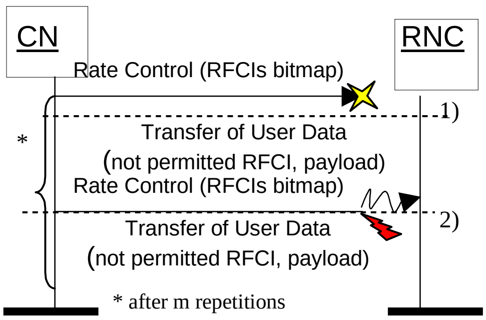


Figure 14: Unsuccessful Transfers of rate control from CN: 1) Frame loss 2) Corrupted Frame

6.5.4 Time Alignment procedure (FFS)

6.5.5 Handling of Error Event procedure

6.5.5.1 Successful operation

The purpose of the Error event procedure handles the error reporting. Over the Iu UP protocol the error reports are made with Error event frames. The Error event procedure in the Iu UP can be triggered by:

- an error detected by the Iu UP functions (by receiving an erroneous frame or by receiving a frame with unknown or unexpected data). In this case an Iu UP- Status Indication may be used to inform the upper layers.
- a request by the upper layers

When an Error event is reported by an Error event frame the following information shall be included:

- A cause value.
- Error distance (=0 if Iu UP function detected, =1 if requested by upper layers).

Upon reception of an Error report frame the Iu UP functions should take appropriate local actions based on the cause value. This may include to report the error to the upper layers with an Iu UP status indication.

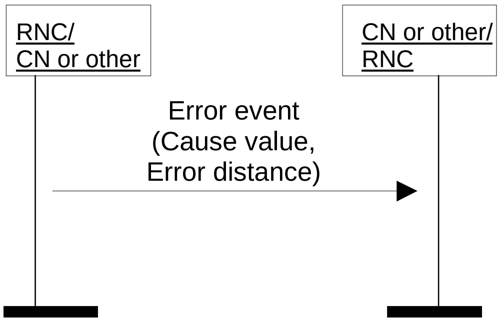


Figure 15: Successful Error event

6.5.5.2 Unsuccessful operation

If the error event frame is incorrectly formatted and cannot be correctly treated by the receiving Iu UP protocol layer appropriate local actions are taken (e.g. upper layers are informed). An error in an Error event frame should not generate the sending of an ~~ne~~ new Error event frame.

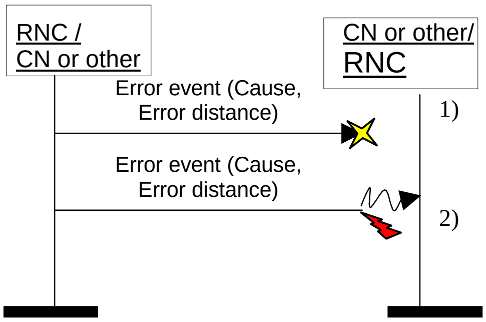


Figure 16: Unsuccessful Transfer~~s~~ of Error event frame: 1) Frame loss 2) Corrupted Frame

6.6.3 Coding of information elements in frames

6.6.3.1 PDU Type

Description: The PDU type indicates the structure of the Iu UP frame. The field takes the value of the PDU Type it identifies: i.e. 0 for PDU Type 0. The PDU type is in bit 4 to bit 7 in the first octet of the frame. PDU type is used in all frames in support mode for predefined SDU sizes version 1.

Value range: {0-14, 15=reserved for future PDU type extensions}

Field length: 4 bits

6.6.3.2 Ack/Nack

Description: The Ack/Nack field tells if the frame is:
- a control procedure frame
- a positive acknowledgement (ACK) of a control procedure frame
- a negative acknowledgement (NACK) of a control procedure frame.

Value range: {0=control procedure frame, 1=ACK, 2=NACK, 3=reserved}

Field length: 2 bits

6.6.3.3 Frame Number

Description: The Iu UP frame numbering is handled by a Frame Number. The purpose of the Frame Number is to provide the receiving entity with a mechanism to keep track of lost Iu UP frames. For a given user data connection, there is no relations between the frame numbers of frames sent in the downlink direction and the frame numbers of frames sent in the uplink direction.

Value range: {0-15}

Field length: 4 bits

6.6.3.4 PDU Type 14 Frame Number

Description: The Iu UP frame numbering is handled by a Frame Number. The purpose of the PDU Type 14 Frame Number is to provide the receiving entity with a mechanism to keep track of lost Iu UP frames.It is also used to relate the acknowledgment frame to the frame being acknowledged i.e. the same PDU Type 14 Frame Number is used in the acknowledgement frame as the one used in the frame being acknowledged.

Value range: {0-3}

Field length: 2 bits

6.6.3.5 Frame Quality Classification (FQC)

Description: Frame Quality Classification is used to classify the Iu UP frames depending on whether errors have occurred in the frame or not. Frame Quality Classification is dependent on the RAB attribute 'Delivery of erroneous SDUs'.

Value range: {0=frame good, 1=frame bad, 2=Frame bad due to radio, 3=spare}

Field length: 2 bits

6.6.3.6 RAB sub-Flow Combination Indicator (RFCI)

Description: The RFCI identifies the structure of the payload. This can be used to specify the sizes of the subflows.

Value range: {0-62, 63=RFCI not applicable}

Field length: 6 bits

6.6.3.7 Procedure Indicator

Description: The Procedure Indicator identifies the control procedure in the current frame.

Value range: {0=initialization, 1=rate control, 2=time alignment, 3=~~abnormal~~ error event, 4-255=reserved}

Field length: 8 bits

6.6.3.8 Header CRC

Description: This field contains the CRC of all fields in Frame Control Part. The CRC is a 6-bit checksum based on the generator polynom G(D) = $D^6+D^5+D^3+D^2+D^1+1$.With this CRC all error bursts shorter than 7 bits are detected, as well as all odd number of bits faulty (and two-bit faults) when the protected area is shorter than 24 bits, (max 3 octets).

Field length: 6 bits

6.6.3.9 Payload CRC

Description: This field contains the CRC of all the fields (including Padding) of the Frame Payload. The CRC is a 10-bit checksum based on the generator polynom G(D) = $D^{10}+ D^9+D^5+D^4+D^1+1$.With this CRC all error bursts shorter than 11 bits are detected, as well as all odd number of bits faulty (and two-bit faults) when the protected area is shorter than 500 bits (max 62 octets).

Field length: 10 bits

6.6.3.10 Chain Indicator

Description: Chain indicator is used to indicate whether the control procedure frame is the last frame related to the control procedure.

Value range: {0=this frame is the last frame for the procedure, 1=additional frames will be sent for the procedure}

Field length: 1 bit

6.6.3.11 Number of Subflows per RFCI

Description: Number of Subflows per RFCI field indicates the number of subflows the RAB is made of. It is used to decode the SDU size information data lengths. All RFCs consist of the same number of subflows within a specific RAB.

Value range: {0=reserved, 1-7}

Field length: 3 bits

6.6.3.12 Length Indicator (LI)

Description: Length Indicator, indicates if 1 or 2 octets is used for the RAB subflow size information.

Value range: {0=one octet used, 1=two octets used}

Field length: 1 bit

6.6.3.13 Number of RFCI Indicators

Description: Number of RFCI indicators indicates the number of RFCI indicators present in the control procedure frame.

Value range: {0-63}

Field length: 6 bits

6.6.3.14 RFCI n Indicator

Description: RFCI n Indicator points to an RFCI number e.g. RFCI 0 Indicator points to RFCI 0, RFCI 1 Indicator points to RFCI 1, etc…

Value range: {0=RFCI allowed, 1=RFCI barred}

Field length: 1 bit

6.6.3.15 Error distance

Description: Indicates if the error occurred at the error reporting entity (=0) or in a more distant entity. The error distance is incremented by one (or kept at its maximum value) when an error report is forwarded.

0: Reporting local error
1: First forwarding of error event report
2: Second forwarding of error event report
3: Reserved for future use

Value range: {0: Reporting local error, 1: First forwarding of error event report. 2: Second forwarding of error event, 3: Reserved for future use}

Field length: 2 bit

6.6.3.16 Error Cause value

Description: Cause value is used to indicate what kind of error caused the error. Error cause value is used in NACK and Error Event frames.

0: CRC error of frame header
1: CRC error of frame payload
2: Unexpected frame number
3: Frame loss
4: PDU type unknown
5: Unknown procedure
6: Unknown reserved value
7: Unknown field
8: Frame too short
9: Missing fields
10–15: spare

16: Unexpected PDU type
18: Unexpected procedure
19: Unexpected RFCI
20: Unexpected value
21–41: spare

42: Initialisation failure
43: Initialisation failure (timer expiry)
44: Initialisation failure (repeated NACK)
45: Rate control failure
46: Error event failure
47–63: spare

Value range: {0–15 Used for syntactical protocol errors, 16–41 Used for semantical protocol errors, 42–63 Used for other errors}

Field length: 6 bit

6.6.3.17 Rate Control Type

Description: Specifies the type of Rate control the current frame relates to. There are two types of Rate control:

- Rate control for fixed periodicity services. Only RFCI indicators present.

- Rate control for services with varying periodicity. RFCI indicators and Downlink send interval present.

Value range: {0=Rate control using only RFCI indicators, 1=Rate control including both RFCI indicators and Downlink send interval}

Field length: 1 bit

6.6.3.18 Downlink send interval

Description: Specifies the Interval the downlink frames should be sent.

Value range: {0=10ms, 1=20ms, 2=40ms, 3–7= Spare}

Field length: 3 bit

6.6.3.19 Padding

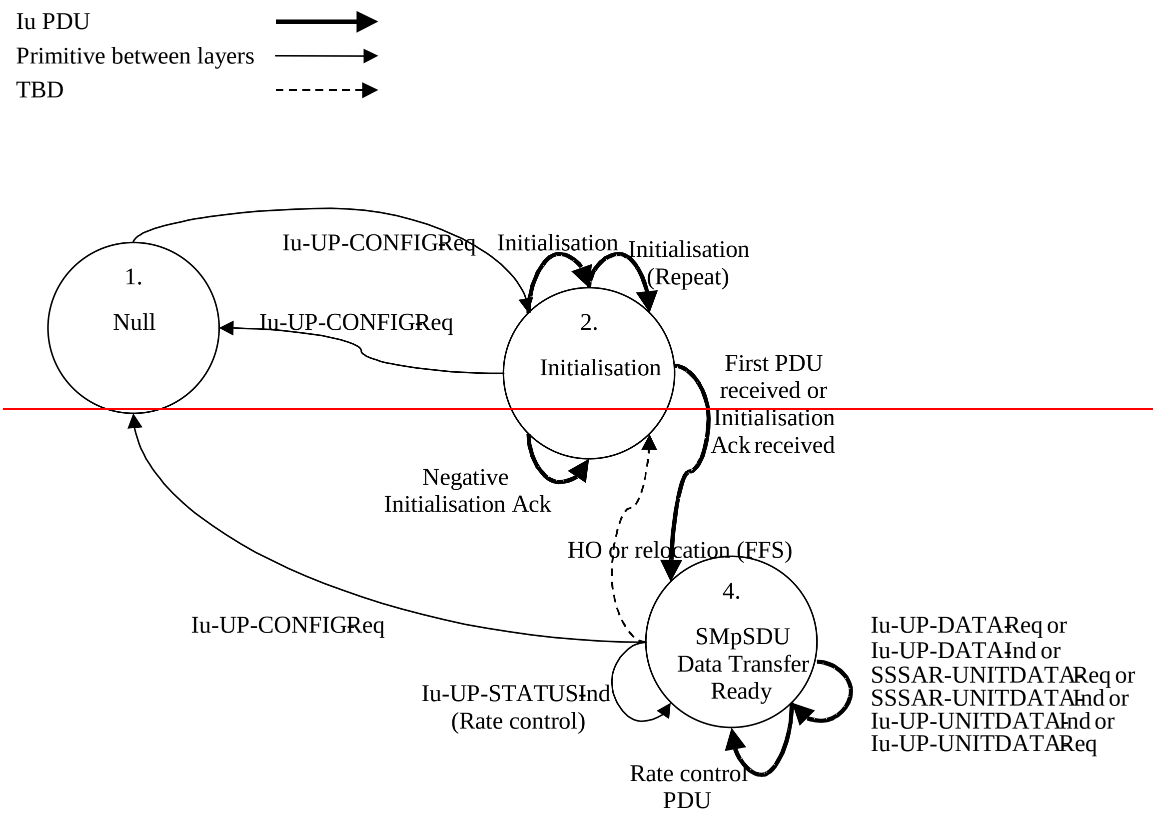
Description: This field is an additional field used to make the frame payload part an integer number of octets when needed. Padding is set to 0 by the sender and is not interpreted by the receiver.

Value range: {0–127}

Field length: 0–7 bits

B.2 Protocol state model for support mode for predefined SDU sizes

The following figure illustrates the state model for support mode Iu UP instances. A support mode instance can be in one of the following states.



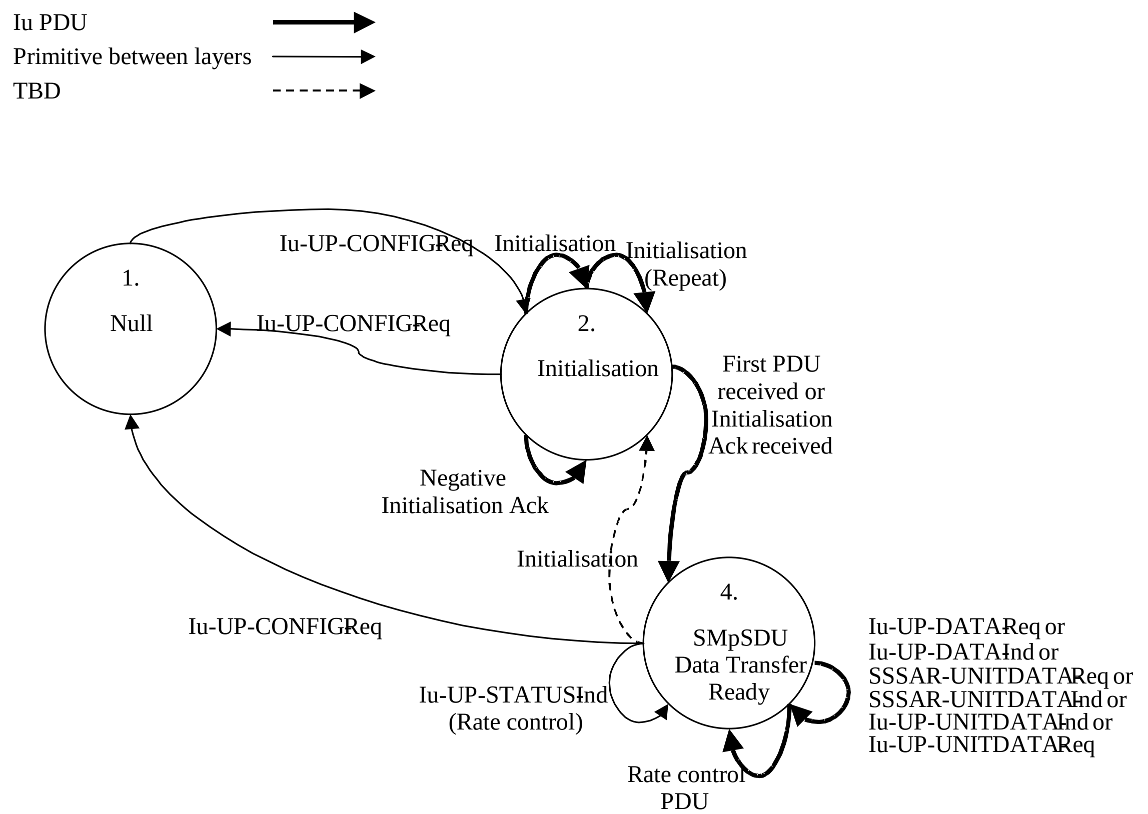


Figure: Protocol state model for support mode.

B.2.1 Null State

In the null state the Iu UP instance does not exist and therefore it is not possible to transfer any data through it.

Upon reception of a Iu-UP-CONFIG-Req from higher layer the Iu UP instance is created and initialisation state is entered. In the Iu-UP-CONFIG-Req e.g. the following information could be indicated:

- Support mode for predefined SDU sizes;
- Time alignment (FFS);
- Indication of delivery of erroneous SDUs;
- Periodicity.

B.2.2 Initialisation State

In the initialisation state the instance exchanges initialisation information with its peer Iu UP instance.

Upon reception of Iu-UP-CONFIG-Req indicating release from higher layer, the Iu UP instance is terminated and the null state is entered.

Upon sending or receiving of an initialisation frame the Iu UP instance remains in the Initialisation state. The sending side starts a supervision timer T_{INIT}. The receiving side acknowledges the initialisation frame with a positive acknowledgement or a negative acknowledgement. The Iu UP remains in initialisation state.

Upon reception of an initialisation acknowledgement frame, the supervision timer T_{INIT} is stopped and the Iu UP instance enters SMpSDU data transfer ready state.

Upon reception of a first PDU after sending a positive acknowledgement, the Iu UP instance enters SMpSDU data transfer ready state.

Upon reception of an initialisation negative acknowledgement frame (INIT NACK) initialisation frame can be repeated n times.

If after n repetitions, the initialisation procedure is unsuccessfully terminated (due to n negative acknowledgements or timer expires) the Error event procedure is used to report the Initialisation failure and the Iu UP instance remains in the initialisation state.

B.2.3 Support Mode Data Transfer Ready State

In the support mode data transfer ready state, support mode data can be exchanged between the peer Iu UP instances.

Upon reception of Iu-UP-DATA-Request from the upper layer or SSSAR-UNITDATA-Indication or Iu-UP-UNITDATA-Indication from TNL layer, appropriate user data transfer procedures are performed. Iu UP instance remains in the SMpSDU data transfer ready state.

Upon sending of Iu-UP-DATA- Indication or SSSAR-UNITDATA-Request or Iu-UP-UNITDATA-Request the Iu UP instance remains in the SMpSDU data transfer ready state.

Upon sending or receiving of a rate control PDU the Iu UP instance remains in the SMpSDU data transfer ready state.

Upon sending of a Iu-UP-STATUS-Indication (rate control) the Iu UP instance remains in the SMpSDU data transfer ready state.

Upon reception of Iu-UP-CONFIG-Req from higher layer the Iu UP instance is terminated and the null state is entered.

Upon detection of a protocol fault, Iu-UP-STATUS-Indication is sent to upper layer an error event frame may be sent over Iu UP.

~~TBD event (FFS):~~ In case of handover or relocation, initialisation procedures may have to be performed and Iu UP instance may have to enter the initialisation state.

3GPP TSG-RAN-WG3 meeting #11
Sophia Antipolis, France, 28th Feb–3rd Mar 2000

***Document* R3-000715**
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.

25.415 CR 014 Current Version: 3.1.0

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

For submission to: RAN#7	for approval	X	strategic		*(for SMG use only)*
list expected approval meeting # here ↑	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 [X]
(at least one should be marked with an X)

Source: RAN-WG3 **Date:** 23rd Feb 2000

Subject: Removal of Rate Control from Iu-UP-Status Request primitive

Work item:

Category:				**Release:**	
	F	Correction	X	Phase 2	
	A	Corresponds to a correction in an earlier release		Release 96	
(only one category	B	Addition of feature		Release 97	
shall be marked	C	Functional modification of feature		Release 98	
with an X)	D	Editorial modification		Release 99	X
				Release 00	

Reason for change: The RFCI bitmap was already agreed to be removed in CR002 on 25.415 v3.0.0. In v3.1.0 it is however present. This CR proposes to remove it.

Clauses affected: 7.2.1, 7.2.4

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.

7.2 Primitives towards the upper layers at the RNL SAP

7.2.1 General

The Iu UP protocol layer interacts with upper layers as illustrated in the figure above. The interactions with the upper layers are shown in terms of primitives where the primitives represent the logical exchange of information and control between the upper layer and the Iu UP protocol layer. They do not specify or constraint implementations.

The following primitives are defined:

- Iu-UP-DATA
- Iu-UP-STATUS
- Iu-UP-UNIT-DATA

Table 1: Iu UP protocol layer service primitives towards the upper layer at the RNL SAP

Primitive	Type	Parameters	Comments
Iu-UP-DATA	Request	Iu-UP-payload	
		Iu-UP-control	RFCI
	Indication	Iu-UP-payload	
		Iu-UP-control	RFCI
			FQC
Iu-UP-Status	Indication	Iu-UP-Procedure-Control	Error Cause, Error Distance
			Initialisation
			RFCI indicators, Downlink send intervals (when applicable)
			Time Alignment (FFS Note 1)
	Request	Iu-UP-Procedure-Control	Error Cause
			~~RFCI indicators,~~ ~~Downlink send intervals (when applicable)~~
Iu-UP-UNIT-DATA	Request	Iu-UP-payload	
	Indication	Iu-UP-payload	

Primitive usage is function of the mode of operation of the Iu UP protocol. The following table provides the association between Iu UP primitives towards the upper layers and the Iu UP mode of operation:

Table 2: Iu UP protocol layer service primitives related to the Iu UP mode of operation and function within the mode of operation

Primitive	Type	Mode of Operation
Iu-UP-DATA	Request	SMpSDU
	Indication	SMpSDU
Iu-UP-Status	Request	SMpSDU
	Indication	SMpSDU
Iu-UP-UNIT-DATA	Request	TrM
	Indication	TrM

7.2.2 Iu-UP-DATA-REQUEST

This primitive is used as a request from the upper layer Iu NAS Data Stream entity to send a RAB SDU on the established transport connection. This primitive also includes the RFCI of the payload information included in the primitive.

The Iu UP Frame protocol layer forms the Iu UP data frame, the Iu Data Stream DU being the payload of the Iu UP frame, and transfers the frame by means of the lower layer services.

7.2.3 Iu-UP-DATA-INDICATION

This primitive is used as an indication to the upper layer entity to pass the Iu NAS Data Stream User Plane information of a received Iu UP frame.

This primitive also includes the RFCI of the payload information included in the primitive.

At the RNL-SAP, this primitive may include an Frame Quality Classification indication.

This primitive may also include information aiming at informing the upper layers of a faulty situation that relates to the payload included in the primitive.

7.2.4 Iu-UP-STATUS-REQUEST

~~This primitive is used to pass down to the Iu UP, the rate control information necessary for changing the permitted rate(s) in the reverse direction over Iu. The rate control information consists of RFCI indicators and (when applicable) downlink send intervals.~~

This primitive is ~~also~~ used to report that a fault has been detected.

7.2.5 Iu-UP-STATUS-INDICATION

This primitive is used to report to the upper layer entity that a fault has been detected. The information concerning that fault is characterised by the Abnormal event information passed to the upper layer.

This primitive is also used in the context of the initialisation control procedure to pass to the upper Iu DS layer e.g. the RFC set and the associated RFCIs to be used in the communication phase.

This primitive is used to indicate to the upper layers the set of permitted rate(s) in the reverse direction over Iu. The set of permitted rate(s) is represented by RFCI indicators and (when applicable) downlink send intervals.

This primitive is also used to indicate when a frame has been dropped as a result of frame quality classification handling.

NOTE 1: Time Alignment is FFS.

7.2.6 Iu-UP-UNIT-DATA-REQUEST

This primitive is used as a request from the upper layer to send an Iu UP payload on the established transport connection.

The Iu UP protocol layer transfers the Iu Data Stream DU by means of the lower layer services without adding any protocol header overhead.

7.2.7 Iu-UP-UNIT-DATA-INDICATION

This primitive is used as an indication to the upper layer entity to pass the Iu UP payload.

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***Document* R3-000781**

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

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25.415	**CR**	**006r1**	Current Version:	3.1.0

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

For submission to:	RAN#7	for approval	X	strategic		(for SMG
list expected approval meeting # here ↑		for information		non-strategic		use only)

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: *(at least one should be marked with an X)*	(U)SIM		ME		UTRAN / Radio	X	Core Network	X

Source:	RAN WG3	**Date:**	29th Feb 2000
Subject:	Addition of section for maximum values of repetition counters		
Work item:			

Category:	F	Correction	X	**Release:**	Phase 2	
	A	Corresponds to a correction in an earlier release			Release 96	
(only one category	B	Addition of feature			Release 97	
shall be marked	C	Functional modification of feature			Release 98	
with an X)	D	Editorial modification			Release 99	X
					Release 00	

Reason for change:	To collect the maximum values of repetition counters used in the procedure descriptions. The maximum values for repetition counters are also renamed so that they have unambiguous names in the specification.
Clauses affected:	6.5.2.1, 6.5.2.2, 6.5.3.2, 6.6.5 (new)

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:	The changes needed for sections 6.5.4.1 and 6.5.4.2 is made in a new revision of CR001 originally with tdoc number R3-000347. The revised CR is CR001r1 tdoc R3-000785. If this CR006r1 is not approved then CR001r1 is also not to be approved (and instead the old revision CR001 is valid).

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

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 the RFCIs and associated RAB Sub Flows SDU sizes necessary during the transfer of user data phase. Additional parameters may also be passed.

The initialisation procedure is always controlled by the entity in charge of establishing the Radio Network Layer User Plane i.e. SRNC.

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.

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

The SRNC allocates a RAB sub-Flow Combination indicator (RFCI) to each RAB sub-Flow Combination. The association of indicators to RAB Flow Combinations is valid 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 Flow Combination Indicators and their respective SDU sizes constitutes the RAB sub-Flow Combination set passed over the Iu UP in the initialisation frame i.e. into an appropriate Iu UP PDU Type.

The first RAB sub-Flow Combination proposed in the list of RAB sub-Flow Combination indicates the initial RAB sub-Flow Combination i.e. the first RAB sub-Flow Combination to be used when starting the communication phase i.e. the transfer of user data procedure.

The complete set of information is framed by the Iu UP Frame Handler function and transferred in an Iu UP initialisation frame. If needed, the initialisation 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 frame. This timer supervises the reception of the initialisation acknowledgement frame.

Upon reception of a frame indicating that an initialisation control procedure is active in the peer Iu UP entity, the Iu UP protocol layer forwards to the upper layers the RAB sub-Flow Combination set to be used by the Control procedure function. It also stores the RAB sub-Flow Combination 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).

If the initialisation frame is correctly formatted and treated by the receiving Iu UP protocol layer, this latter sends an initialisation acknowledgement frame.

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.

If several initialisation frames are used for the initialisation procedure, the next frame shall wait for the acknowledgement of the previous frame to be received before sending. The supervision timer is used individually for each frame in a chain.

The frame number is always set to zero for the first frame in a chain and it shall be incremented in the sending direction for each sent frame. The acknowledgement or negative acknowledgement carries the frame number of the frame being acknowledged.

Upon reception of an initialisation negative acknowledgement frame or at timer T_{INIT} expiry, the Iu UP protocol layer in the SRNC shall reset and restart the T_{INIT} supervision timer and repeat an initialisation frame. The repetition can be performed ~~n~~ N_{INIT} times, ~~n~~ N_{INIT} being chosen by the operator (default ~~n~~ N_{INIT} =3).

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.

In the case where an SRNC receives an Iu frame indicating that an initialisation procedure is active at the other end of the Iu UP, RFCI is applied as follows:

- For the sending frame, i.e. UL direction, RNC uses the RAB sub-Flows Combination set indicated in Initialisation phase of the peer TFO or TrFO partner.
- For the receiving frame, i.e. DL direction, RNC uses the RAB sub-Flows Combination set as sent in its own initialisation frame.

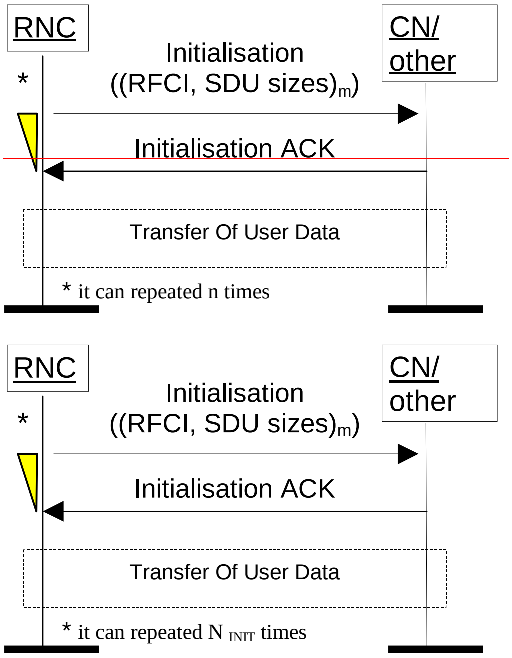
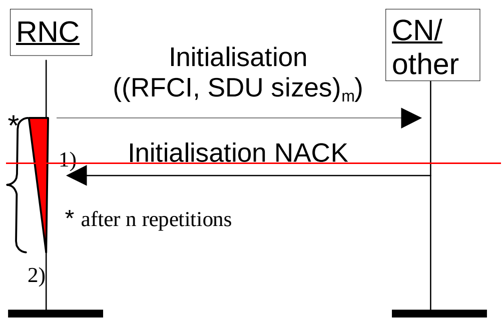


Figure 9: Successful Initialisation of Iu UP for m RFCIs

6.5.2.2 Unsuccessful operation

If the initialisation frame is incorrectly formatted and cannot be correctly treated by the receiving Iu UP protocol layer, this latter sends an initialisation negative acknowledgement frame.

If after ~~n~~ N_{INIT} repetition, the initialisation procedure is unsuccessfully terminated (because of ~~n~~ N_{INIT} negative acknowledgements or timer T_{INIT} expiries), the Iu UP protocol layers (sending and receiving) take appropriate local actions.



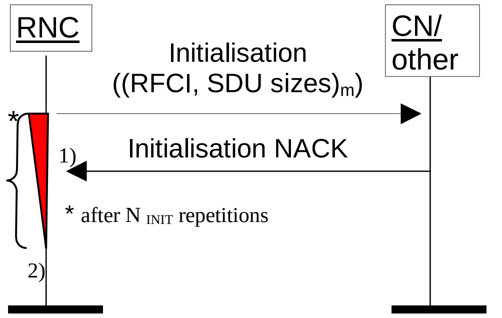


Figure 10: Unsuccessful initialisation of Iu UP: 1) ~~n~~ N_{INIT} negative acknowledgements or 2) ~~n~~ N_{INIT} timer expiries

NOTE: The case where an SRNC receives an Iu frame indicating that an initialisation procedure is active at the other end of the Iu UP could be related to a TFO or TrFO negotiation. How TFO or TrFO protocol and codec negotiation is performed is FFS.

6.5.3 Iu Rate Control procedure

6.5.3.1 Successful operation

The purpose of the rate control procedure is to signal to the peer Iu UP protocol layer the permitted rate(s) over Iu in the reverse direction of the sent rate control frame.

The rate control procedure over Iu UP is normally controlled by the entity controlling the rate control over UTRAN i.e. SRNC. In some cases, as TrFO and TFO, it is also controlled by the remote partner at the other end of the Iu UP.

The Iu rate control procedure is invoked whenever the SRNC decides that the set of downlink permitted rates over Iu shall be modified. This set can be made of only one permitted rate among the rates that are permitted for rate control or several rates among the rates that can be rate controlled by the SRNC.

The rates that can be controlled by the SRNC are indicated to the Iu UP at establishment in addition to the rates that cannot be controlled by the RNC e.g. such as DTX rates for certain RABs.

The procedure can be signalled at any time when transfer of user data is not suspended by another control procedure.

The Procedure control function upon request of upper layer prepares the Rate control frame payload containing the permitted rates of the reverse direction of the rate control frame. The permitted rate is given as RFCI indicators and (when applicable) the downlink send intervals.

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.

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

- The Frame handler checks the consistency of the frame header and associated CRC. If correct, the frame handler passes procedure control part to the procedure control functions.

- The procedure control functions check that the new permitted rate(s) are consistent with the RFCI set received at initialisation. They also verify that non-rate controllable rates are still permitted. 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 rate control information in a Iu-UP-Status indication primitive.

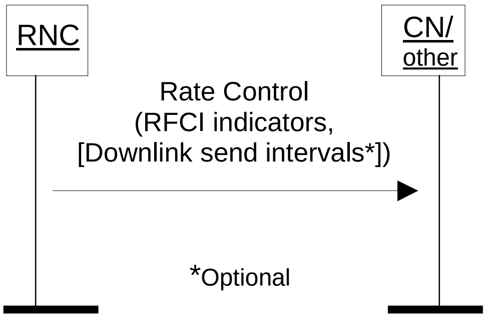


Figure 11: Successful Rate Control sent from SRNC

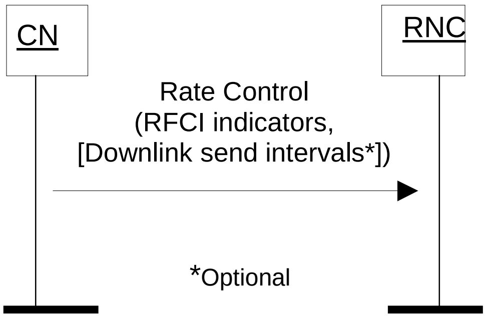


Figure 12: Successful Rate Control sent from CN

6.5.3.2 Unsuccessful operation

If the Iu UP in the SRNC detects that the rate control command has not been correctly interpreted or received (e.g. the rate is outside the set of permitted rates in the reverse direction of the rate control frame), the Iu UP shall retrigger a rate control procedure. If after ~~"m"~~ N_{RC} repetitions, the error situation persists, the Iu UP protocol layers (sending and receiving) take the appropriate local actions.

If the Iu UP protocol layer receives a rate control frame that is badly formatted or corrupted, it shall ignore the rate control frame.

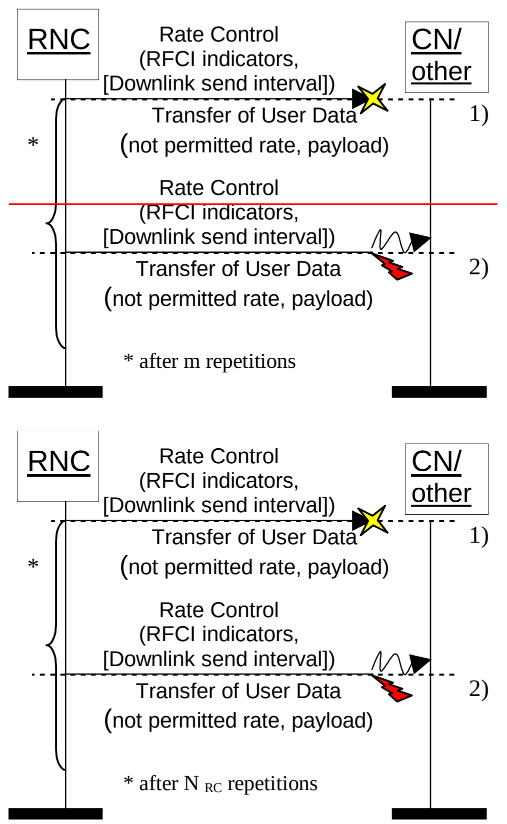


Figure 13: Unsuccessful Transfers of rate control from RNC: 1) Frame loss 2) Corrupted Frame

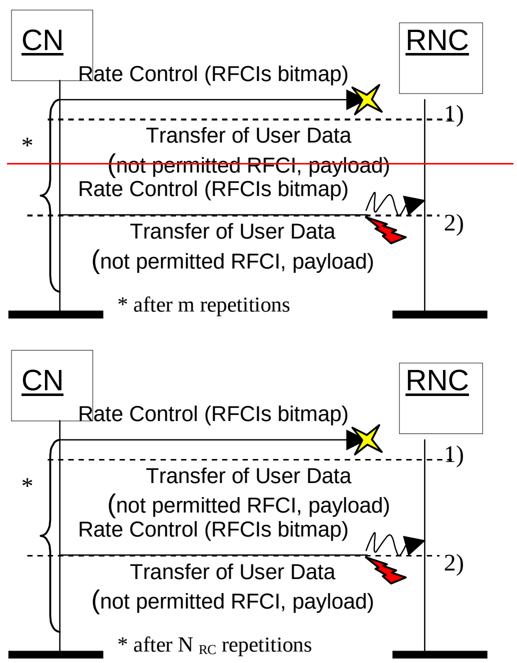


Figure 14: Unsuccessful Transfers of rate control from CN: 1) Frame loss 2) Corrupted Frame

6.6.5 Maximum values of repetition counters

N_{INIT}

Maximum number of repetitions of an Initialisation frame due to failure at the Initialisation procedure.

N_{RC}

Maximum number of repetitions of a Rate Control frame due to failure at the Rate Control procedure.

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

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25.415	**CR**	**007r1**	Current Version:	3.1.0

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

For submission to:	RAN#7	for approval	**X**	strategic		*(for SMG use only)*
list expected approval meeting # here ↑		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 [X]
(at least one should be marked with an X)

Source: R-WG3 **Date:** 29th Feb 2000

Subject: Modification of the CRC description.

Work item:

Category:				**Release:**	
	F	Correction		Phase 2	
	A	Corresponds to a correction in an earlier release		Release 96	
(only one category	B	Addition of feature		Release 97	
shall be marked	C	Functional modification of feature	X	Release 98	
with an X)	D	Editorial modification		Release 99	X
				Release 00	

Reason for change: To add an exact description of the CRC handling. This description is aligned with the description used in 25.435 specification and with the description of the radio frame CRC in the 25.212.

Clauses affected: 3.2, 6.6.3.8, 6.6.3.9, 6.7.7, 6.7.7.1, 6.7.7.2, 6.7.7.3

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:

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3.2 Abbreviations

AMR	Adaptive Multi-Rate codec
AS	Access Stratum
CN	Core Network
DTX	Discontinuous Transmission
GF	Galois Field
NAS	Non Access Stratum
QoS	Quality of Service
PDU	Protocol Data Unit
PCE	Procedure Control Extension
PME	Procedure Control Bitmap Extension
RAB	Radio Access Bearer
RANAP	Radio Access Network Application Part
RFC	RAB sub Flow Combination
RFCI	RFC Indicator
RNL	Radio Network Layer
SAP	Service Access Point
SDU	Service Data Unit
SMpSDU	Support Mode for predefined SDU size
SRNC	Serving RNC
SRNS	Serving RNS
SSSAR	Service Specific Segmentation And Reassembly
TFI	Transport Format Identification
TFO	Tandem Free Operation
TNL	Transport Network Layer
TrFO	Transcoder Free Operation
TrM	Transparent Mode
UP	User Plane
UUI	User to User Information

6.6.3.8 Header CRC

Description: This field contains the CRC of all fields in Frame Control Part. The CRC is a 6-bit checksum based on the generator polynom $G(D) = D^6+D^5+D^3+D^2+D^1+1$, see section 6.7.7.With this CRC all error bursts shorter than 7 bits are detected, as well as all odd number of bits faulty (and two-bit faults) when the protected area is shorter than 24 bits, (max 3 octets).

Field length: 6 bits

6.6.3.9 Payload CRC

Description: This field contains the CRC of all the fields (including Padding) of the Frame Payload. The CRC is a 10-bit checksum based on the generator polynom $G(D) = D^{10}+ D^9+D^5+D^4+D^1+1$, see section 6.7.7.With this CRC all error bursts shorter than 11 bits are detected, as well as all odd number of bits faulty (and two-bit faults) when the protected area is shorter than 500 bits (max 62 octets).

Field length: 10 bits

6.7.7 Error detection

6.7.7.1 General

Error detection is provided on frames through a Cyclic Redundancy Check. The CRC for the payload is 10 bits and for the header it is 6 bits.

6.7.7.2 CRC Calculation

The parity bits are generated by one of the following cyclic generator polynomials:

$g_{CRC6}(D) = D^6 + D^5 + D^3 + D^2 + D^1 + 1$

$g_{CRC10}(D) = D^{10} + D^9 + D^5 + D^4 + D^1 + 1$

Denote the bits to be protected of a frame by $a_1, a_2, a_3, \ldots, a_{A_i}$ (a_1 being the bit with the highest bit position in the first octet), and the parity bits by $p_1, p_2, p_3, \ldots, p_{L_i}$. A_i is the length of the protected data and L_i is 6 or 10 depending on the CRC length.

The encoding is performed in a systematic form, which means that in GF(2), the polynomial

$$a_1 D^{A_i+5} + a_2 D^{A_i+4} + \ldots + a_{A_i} D^6 + p_1 D^5 + p_2 D^4 + \ldots + p_5 D^1 + p_6$$

yields a remainder equal to 0 when divided by $g_{CRC6}(D)$ and the polynomial

$$a_1 D^{A_i+9} + a_2 D^{A_i+8} + \ldots + a_{A_i} D^{10} + p_1 D^9 + p_2 D^8 + \ldots + p_9 D^1 + p_{10}$$

yields a remainder equal to 0 when divided by $g_{CRC10}(D)$.

6.7.7.3 Relation between input and output of the Cyclic Redundancy Check

The protected bits are left unchanged in the frame. The parity bits for the Header CRC are put in the Header CRC field with p_1 being the highest bit position of the first octet of the Header CRC field. The parity bits for the Payload CRC are put in the Payload CRC field with p_1 being the highest bit position of the first octet of the Payload CRC field.

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Sophia Antipolis, France, 28th Feb–3rd Mar 2000

***Document* R3-000783**

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

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25.415	**CR**	**008r1**	Current Version:	3.1.0

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

For submission to:	RAN#7	for approval	X	strategic		*(for SMG use only)*
list expected approval meeting # here ↑		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: *(at least one should be marked with an X)*

(U)SIM	ME	UTRAN / Radio	Core Network
		X	X

Source: R-WG3 **Date:** 29th Feb 2000

Subject: Initialisation and rate control

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	X
D	Editorial modification	

Release:

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

Reason for change: To cleanup and describe the usage of rate control and initialisation. To specify the rates that are controllable with rate control. To specify the first used rate in case of single SDU size. To simplify rate control so that RFCI always defines the rate.

Clauses affected: 6.5.2.1, 6.5.2.2, 6.5.3.1, 6.5.3.2, 6.6.2.3.4.1, 6.6.2.3.4.2, 6.6.3.20, 6.6.3.21

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: Note that other changes to figure 9, 11 and 13 are also proposed in CR006 “O&M data addition”.

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

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 the RFCIs and associated RAB Sub Flows SDU sizes necessary during the transfer of user data phase. Additional parameters may also be passed, as the Inter PDU Timing Interval (IPTI) information.

The initialisation procedure is always controlled by the entity in charge of establishing the Radio Network Layer User Plane i.e. SRNC.

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.

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

The SRNC allocates a RAB sub-Flow Combination indicator (RFCI) to each RAB sub-Flow Combination. The association of indicators to RAB Flow Combinations is valid 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 frame i.e. into an appropriate Iu UP PDU Type.

The first RAB sub-Flow Combination proposed in the list of RAB sub-Flow Combination indicates the initial RAB sub-Flow Combination i.e. the first RAB sub-Flow Combination to be used when starting the communication phase i.e. the transfer of user data procedure.

The complete set of information is framed by the Iu UP Frame Handler function and transferred in an Iu UP initialisation frame. If needed, the initialisation 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 frame. This timer supervises the reception of the initialisation acknowledgement frame.

Upon reception of a frame indicating that an initialisation control procedure is active in the peer Iu UP entity, the Iu UP protocol layer forwards to the upper layers the RAB sub-Flow Combination set to be used by the Control procedure function. It also stores the RAB sub-Flow Combination 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).

If the initialisation frame is correctly formatted and treated by the receiving Iu UP protocol layer, this latter sends an initialisation acknowledgement frame.

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.

If several initialisation frames are used for the initialisation procedure, the next frame shall wait for the acknowledgement of the previous frame to be received before sending. The supervision timer is used individually for each frame in a chain.

The frame number is always set to zero for the first frame in a chain and it shall be incremented in the sending direction for each sent frame. The acknowledgement or negative acknowledgement carries the frame number of the frame being acknowledged.

Upon reception of an initialisation negative acknowledgement frame or at timer T_{INIT} expiry, the Iu UP protocol layer in the SRNC shall reset and restart the T_{INIT} supervision timer and repeat an initialisation frame. The repetition can be performed n times, n being chosen by the operator (default n=3).

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.

In the case where an SRNC receives an Iu frame indicating that an initialisation procedure is active at the other end of the Iu UP, RFCI is applied as follows:

- For the sending frame, i.e. UL direction, RNC uses the RAB sub-Flows Combination set indicated in Initialisation phase of the peer TFO or TrFO partner.
- For the receiving frame, i.e. DL direction, RNC uses the RAB sub-Flows Combination set as sent in its own initialisation frame.

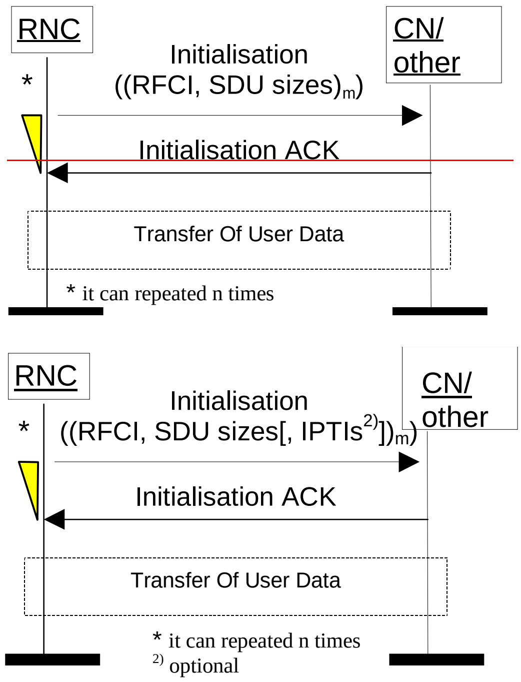

Figure 9: Successful Initialisation of Iu UP for m RFCIs

6.5.2.2 Unsuccessful operation

If the initialisation frame is incorrectly formatted and cannot be correctly treated by the receiving Iu UP protocol layer, this latter sends an initialisation negative acknowledgement frame.

If after n repetition, the initialisation procedure is unsuccessfully terminated (because of n negative acknowledgement or timer T_{INIT} expires), the Iu UP protocol layers (sending and receiving) take appropriate local actions.

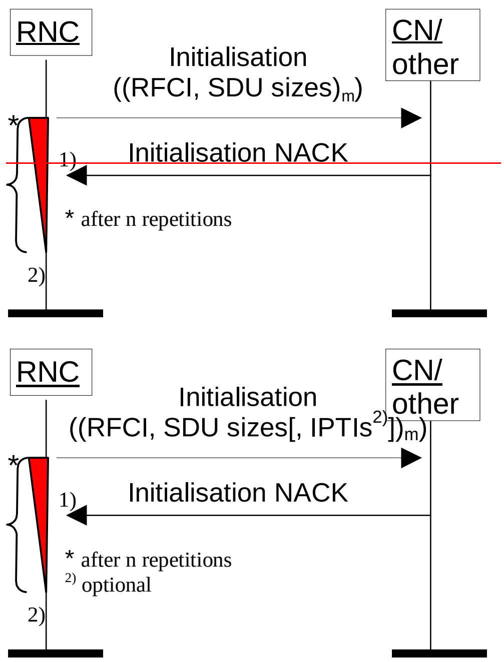

Figure 10: Unsuccessful initialisation of Iu UP: 1) n negative acknowledgement or 2) n timer expires

NOTE: The case where an SRNC receives an Iu frame indicating that an initialisation procedure is active at the other end of the Iu UP could be related to a TFO or TrFO negotiation. How TFO or TrFO protocol and codec negotiation is performed is FFS.

6.5.3 Iu Rate Control procedure

6.5.3.1 Successful operation

The purpose of the rate control procedure is to signal to the peer Iu UP protocol layer the permitted rate(s) over Iu in the reverse direction of the sent rate control frame.

The rate control procedure over Iu UP is normally controlled by the entity controlling the rate control over UTRAN i.e. SRNC. In some cases, as TrFO and TFO, it is also controlled by the remote partner at the other end of the Iu UP.

The Iu rate control procedure is invoked whenever the SRNC decides that the set of downlink permitted rates over Iu shall be modified. This set can be made of only one permitted rate among the rates that are permitted for rate control or several rates among the rates that can be rate controlled by the SRNC.

The rates that can be controlled by the SRNC are the rates that are above the guaranteed bitrate (indicated to the Iu UP at establishment) Rates below the guaranteed bitrate, e.g. SID frames, in addition to the rates that cannot be controlled by the RNC e.g. such as DTX rates for certain RABs.

The procedure can be signalled at any time when transfer of user data is not suspended by another control procedure.

The Procedure control function upon request of upper layer prepares the Rate control frame payload containing the permitted rates of the reverse direction of the rate control frame. The permitted rate is given as RFCI indicators and (when applicable) the downlink send intervals.

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.

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

- The Frame handler checks the consistency of the frame header and associated CRC. If correct, the frame handler passes procedure control part to the procedure control functions.

- The procedure control functions check that the new permitted rate(s) are consistent with the RFCI set received at initialisation. They also verify that non-rate controllable rates are still permitted. 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 rate control information in a Iu-UP-Status indication primitive.

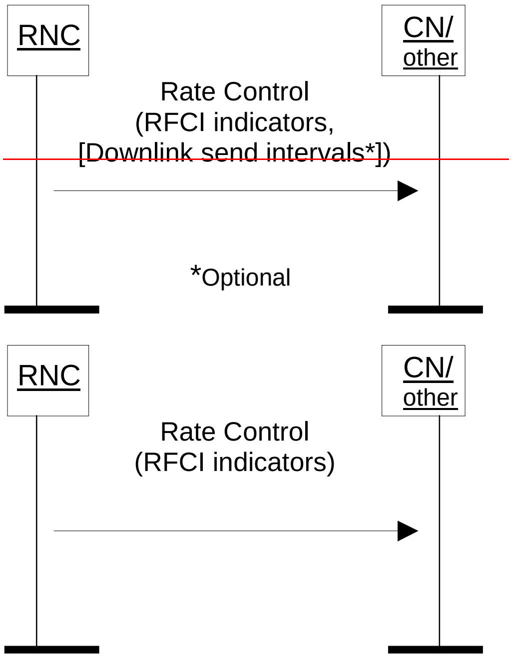

Figure 11: Successful Rate Control sent from SRNC

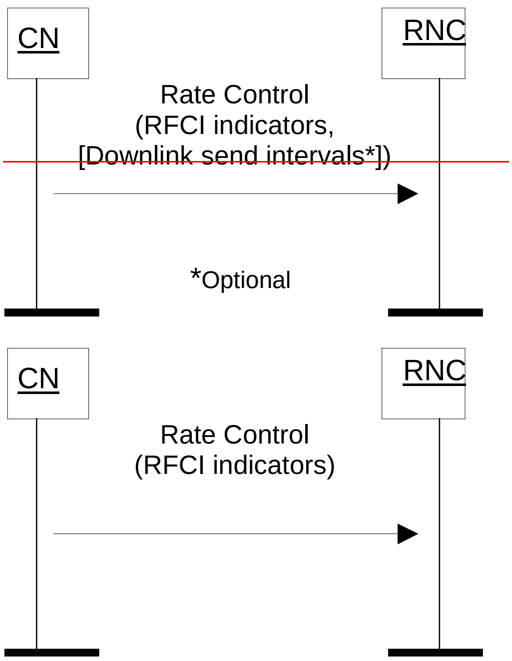

Figure 12: Successful Rate Control sent from CN

6.5.3.2 Unsuccessful operation

If the Iu UP in the SRNC detects that the rate control command has not been correctly interpreted or received (e.g. the rate is outside the set of permitted rates in the reverse direction of the rate control frame), the Iu UP shall retrigger a rate control procedure. If after "m" repetitions, the error situation persists, the Iu UP protocol layers (sending and receiving) take the appropriate local actions.

If the Iu UP protocol layer receives a rate control frame that is badly formatted or corrupted, it shall ignore the rate control frame.

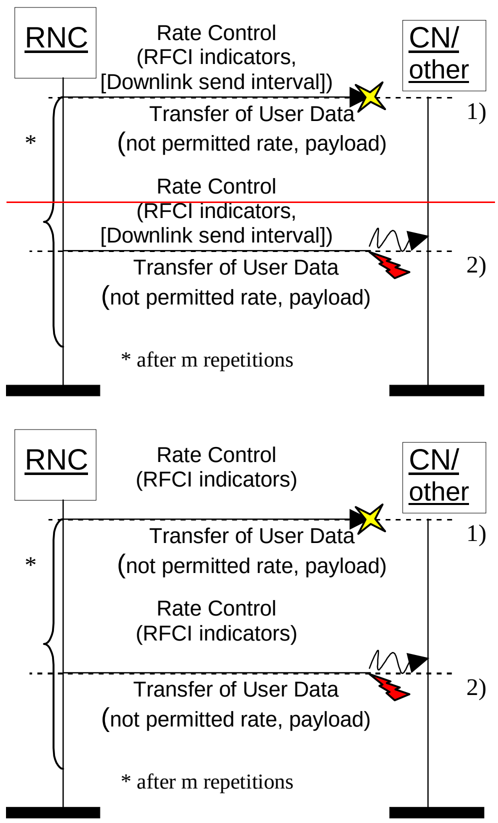

Figure 13: Unsuccessful Transfers of rate control from RNC: 1) Frame loss 2) Corrupted Frame

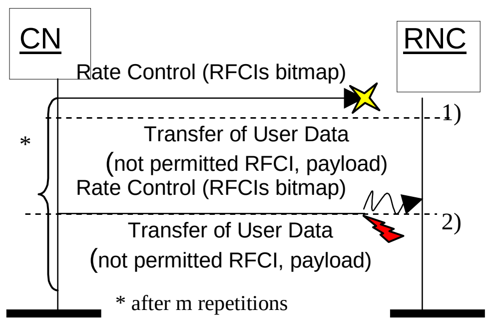

Figure 14: Unsuccessful Transfers of rate control from CN: 1) Frame loss 2) Corrupted Frame

6.6.2.3.4 Procedures Coding

6.6.2.3.4.1 Initialisation

The figure below specifies how the initialisation procedure frame is coded.

Bits								Number of Octets	
7	6	5	4	3	2	1	0		
PDU Type (=14)				Ack/Nack (=0. I.e. Procedure)		PDU Type 14 Frame Number		1	Frame Control Part
Procedure Indicator (=0)								1	
Header CRC						Payload CRC		2	Frame Checksum part
Payload CRC									
Spare			TI	Number of subflows per RFCI (N)			Chain Ind	1	Frame payload part
Spare	LI	1st RFCI						1	
Length of subflow 1								1 or 2 (dep. LI)	
Length of subflow 2 to N								(N-1)x(1 or 2)	
Spare	LI	2nd RFCI						1	
Length of subflow 1								1 or 2 (dep. LI)	
Length of subflow 2 to N								(N-1)x(1 or 2)	
…									
IPTI of 1st RFCI				IPTI of 2nd RFCI				0 or N/2	
IPTI of 3rd RFCI				…					
Spare extension								0-M	

Figure 24: Iu UP PDU Type 14 used for Initialisation

6.6.2.3.4.2 Rate Control

The Figure below specifies how the rate control procedure frame is coded~~ when the rate control uses only RFCI indicators~~.

<table>
<tr><td colspan="8">Bits</td><td rowspan="2">Number of Octets</td><td></td></tr>
<tr><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td><td></td></tr>
<tr><td colspan="4">PDU Type (=14)</td><td colspan="2">Ack/Nack (=0, i.e. Procedure)</td><td colspan="2">PDU Type 14 Frame Number</td><td>1</td><td rowspan="2">Frame Control Part</td></tr>
<tr><td colspan="8">Procedure Indicator (=1)</td><td>1</td></tr>
<tr><td colspan="6">Header CRC</td><td colspan="2">Payload CRC</td><td>1</td><td rowspan="2">Frame Checksum Part</td></tr>
<tr><td colspan="8">Payload CRC</td><td>1</td></tr>
<tr><td colspan="2">Spare
~~Rate control type (=0)~~</td><td colspan="6">Number of RFCIs (N)</td><td>1</td><td rowspan="2">Frame payload part</td></tr>
<tr><td>RFCI 0 Ind.</td><td>RFCI 1 Ind</td><td>…</td><td>RFCI N-1 Ind</td><td colspan="4">Padding</td><td>0–n</td></tr>
</table>

Figure 25: Iu UP PDU Type 14 Format used for Rate Control

~~The Figure below specifies how the rate control procedure is coded when both RFCI indicators and Downlink send intervals are used.~~

Bits								Number of Octets	
7	6	5	4	3	2	1	0		
PDU Type (=14)				Ack/Nack (=0)		PDU Type 14 Frame Number		1	Frame Control Part
Procedure Indicator (=1)								1	
Header CRC						Payload CRC		1	Frame Checksum Part
Payload CRC								1	
Spare	Rate Contr. Type (=1)	Number of RFCI Indicators (N)						1	Frame payload part
RFCI 0 Ind.	Downlink send interval (for RFCI 0)			RFCI 1 Ind.	Downlink send interval (for RFCI 1)			0-n	
...	...			RFCI N-2 Ind	Downlink send interval (for RFCI N-2)				
RFCI N-1 Ind.	Downlink send interval (for RFCI N-1)			Padding					

Figure 26: Iu UP PDU Type 14 Format used for Rate Control

6.6.3.16 Error Cause value

Description: Cause value is used to indicate what kind of error caused the error.

0: CRC error of frame header
1: CRC error of frame payload
2: Unexpected frame number
3: Frame loss
4: PDU type unknown
5: Unknown procedure
6: Unknown reserved value
7: Unknown field
8: Frame too short
9: Missing fields
10–15: spare

16: Unexpected PDU type
18: Unexpected procedure
19: Unexpected RFCI
20: Unexpected value
21–41: spare

42: Initialisation failure
43: Initialisation failure (timer expiry)
44: Initialisation failure (repeated NACK)
45: Rate control failure
46: Error event failure
47–63: spare

Value range: {0–15 Used for syntactical protocol errors, 16–41 Used for semantical protocol errors, 42–63 Used for other errors}

Field length: 6 bit

~~6.6.3.17 Rate Control Type~~

~~**Description:** Specifies the type of Rate control the current frame relates to. There are two types of Rate control:~~

- ~~Rate control for fixed periodicity services. Only RFCI indicators present.~~
- ~~Rate control for services with varying periodicity. RFCI indicators and Downlink send interval present.~~

~~**Value range:** {0=Rate control using only RFCI indicators, 1=Rate control including both RFCI indicators and Downlink send interval}~~

~~**Field length:** 1 bit~~

~~6.6.3.18 Downlink send interval~~

~~**Description:** Specifies the Interval the downlink frames should be sent.~~

~~**Value range:** {0=10ms, 1=20ms, 2=40ms, 3–7= Spare}~~

~~**Field length:** 3 bit~~

6.6.3.19 Padding

Description: This field is an additional field used to make the frame payload part an integer number of octets when needed. Padding is set to 0 by the sender and is not interpreted by the receiver.

Value range: {0–127}

Field length: 0–7 bits

6.6.3.20 TI

Description: This field indicates if Timing Information is included in the Initialisation frame.

Value range: {0: IPTIs not present, 1: IPTIs present in frame}

Field length: 1 bit

6.6.3.21 IPTI of n^{th} RFCI

Description: This field indicates the IPTI value in number of ITIs for the corresponding RFCI (in the same order as the RFCIs occur in the Initialisation frame).

Value range: {0–15}

Field length: 4 bits

3GPP TSG-RAN-WG3 meeting #11
Sophia Antipolis, France, 28–3 March 2000

***Document* R3-000785**
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.

25.415 CR 001r1 Current Version: 3.1.0

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

For submission to: RAN#7	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑	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 [X]
(at least one should be marked with an X)

Source: RAN WG3 **Date:** 28th Feb 2000

Subject: Time Alignment

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	X
C	Functional modification of feature	
D	Editorial modification	

Release:

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

Reason for change: Inclusion of Time Alignment feature. Time Alignment have been lower prioritised for RAN#6. It has been decided to be contributed on for RAN#7. At last RAN WG3 meeting NTT DoCoMo had a contribution (Tdoc R3-99j42) on Time Alignment that was not treated due to lower prioritisation. This CR is partly based on the ideas in that contribution, supplemented with the handling of acknowledgement and negative acknowledgement.

Clauses affected: 6.2, 6.4.3, 6.5.4, 6.5.4.1, 6.6.2.3.4.3, 6.6.3.16, 6.6.3.20, 6.6.4, 6.6.5 (new), 6.7.6, 7.2.4, 7.2.5, Annex C

Other specs affected:

Other 3G core specifications	X	→ List of CRs:	R3-000065 CR on 25.402 regarding Time Alignment.
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: If the CR for spare extension is not accepted (Tdoc R3-000348) then the spare extension field in this CR should be removed.
The new revision CR001r1 is dependent of the CR 006. If CR006 is not accepted then the old revision CR001 is still valid.

help.doc

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

6.2 Iu UP Protocol layer Services in Support mode

Support mode for predefined SDU size Service

The following functions are needed to support this mode:

- Transfer of user data;
- Initialisation;
- Rate Control;
- Time Alignment ~~(FFS)~~;
- Handling of error event;
- Frame Quality Classification.

6.4.3 Procedure Control functions

This set of functions offers the control of a number of procedures handled at the Iu UP protocol level. These functions are responsible for the procedure control part of the Iu UP frames.

Namely, these procedures are:

- **Rate Control**: is the procedure which controls over the Iu UP the set of permitted rates among the rates that can be controled. The set of rates is represented by RFCI indicators and (when applicable) downlink send intervals. The function controlling this procedure interacts with functions outside of the Iu UP protocol layer.

- **Initialisation:** is the procedure which controls the exchange of initialisation information that is required for operation in support mode for predefined SDU size. Such information can contain the RFCI Set to be used until termination of the connection or until the next initialisation procedure.

- **Time Alignment (FFS)**: is the procedure that controls the timing of the downlink data to the RNC over Iu.information exchanged over the Iu related to the sending time of Iu UP frames. The function controlling this procedure interacts with functions outside of the Iu UP protocol layer.

- **Handling of Error Event:** is the procedure that controls the information exchanged over the Iu related to detection of a fault situation. The function controlling this procedure interacts with functions outside of the Iu UP protocol layer.

6.5.4 Time Alignment procedure ~~(FFS)~~

6.5.4.1 Successful operation

The purpose of the time alignment procedure is to minimise the buffer delay in RNC by controlling the transmission timing in the peer Iu UP protocol layer entity.

The time alignment procedure over Iu UP is controlled by SRNC.

The time alignment procedure is invoked whenever the SRNC detects the reception of Iu UP PDU at an inappropriate timing that leads to an unnecessary buffer delay. The actual detection of the trigger in SRNC is an internal SRNC matter and is out of the scope of this specification.

The Iu UP protocol layer entity in SRNC indicates the peer entity the necessary amount of the delay or advance adjustment in the number of 500 µs steps.

A supervision timer T_{TA} is started after sending the Iu UP time alignment frame. This timer supervises the reception of the time alignment acknowledgement frame.

The requested Iu UP protocol layer entity in the peer node adjusts the transmission timing by the amount as indicated by SRNC.

If the time alignment frame is correctly formatted and treated by the receiving Iu UP protocol layer and the time alignment is treated correctly by the upper layers, this latter sends an time alignment acknowledgement frame.

Upon reception of a time alignment acknowledgement frame, the Iu UP protocol layer in the SRNC stops the supervision timer T_{TA}.

The procedure can be signalled at any time when transfer of user data is not suspended by another control procedure.

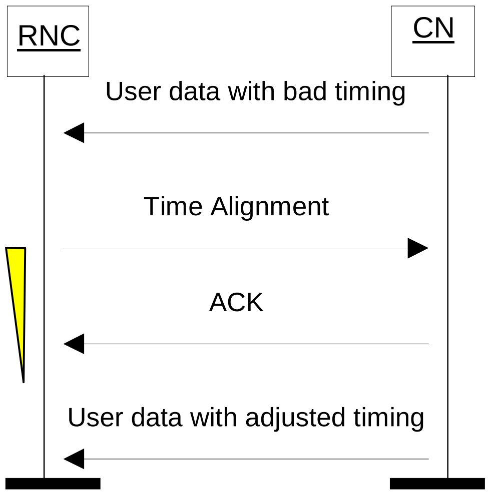

Figure 15. Successful Time Alignment

6.5.5.2 Unsuccessful operation

If the Time Alignment could not be handled by the peer side, the peer side should send a NACK with a corresponding cause. When the Iu UP in the SRNC receives a NACK with cause "Time Alignment not supported", then the SRNC shall not send additional Time Alignment frames for that RAB (unless the Iu UP conditions change for that RAB). The cause value "Requested Time Alignment not possible" is used to indicate that the requested time alignment was not possible at that moment. At a later moment the SRNC may initiate a new Time Alignment command when needed.

If the Iu UP in the SRNC detects that the time alignment command has not been correctly interpreted or received, i.e

NACK received or timer expires, and the time alignment need still persists, the Iu UP should retrigger a time alignment procedure. If after N_{TA} repetitions, the error situation persists, the Iu UP protocol layers take appropriate local actions.

Upon reception of a time alignment negative acknowledgement frame, the Iu UP protocol layer in the SRNC stops the supervision timer T_{TA}.

If the Iu UP protocol layer in RNC receives a Time Alignment frame (e.g. at TrFO case) a NACK shall be sent with the cause value "Time Alignment not supported".

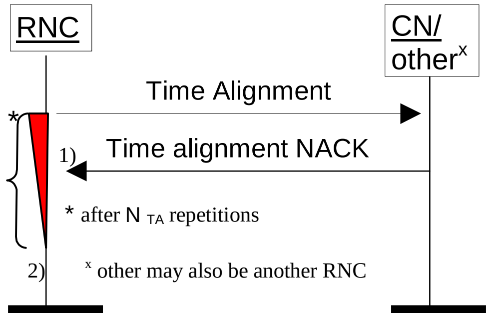

Figure 16. Unsuccessful Time Alignment: 1) N_{TA} negative acknowledgements or 2) N_{TA} timer expiries

6.6.2.3.4.3 Time Alignment ~~(FFS)~~

The Figure below specifies how the time alignment procedure is coded.

<table>
<tr><td colspan="8">Bits</td><td rowspan="2">Number of Octets</td><td rowspan="2"></td></tr>
<tr><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr>
<tr><td colspan="4">PDU Type (=14)</td><td colspan="2">Ack/Nack(=0)</td><td colspan="2">PDU Type 14 Frame Number</td><td>1</td><td rowspan="2">Frame Control Part</td></tr>
<tr><td colspan="4">Spare</td><td colspan="4">Procedure Indicator (=2)</td><td>1</td></tr>
<tr><td colspan="6">Header CRC</td><td colspan="2">Payload CRC</td><td>1</td><td rowspan="2">Frame Checksum Part</td></tr>
<tr><td colspan="8">Payload CRC</td><td>1</td></tr>
<tr><td colspan="8">Time alignment</td><td>1</td><td rowspan="2">Frame payload part</td></tr>
<tr><td colspan="8">Spare extension</td><td>0-m</td></tr>
</table>

Figure X: Iu UP PDU Type 14 Format used for Time Alignment

6.6.3.16 Error Cause value

Description: Cause value is used to indicate what kind of error caused the error.

0: CRC error of frame header
1: CRC error of frame payload
2: Unexpected frame number
3: Frame loss
4: PDU type unknown
5: Unknown procedure
6: Unknown reserved value
7: Unknown field
8: Frame too short
9: Missing fields
10–15: spare

16: Unexpected PDU type
18: Unexpected procedure
19: Unexpected RFCI
20: Unexpected value
21–41: spare

42: Initialisation failure
43: Initialisation failure (timer expiry)
44: Initialisation failure (repeated NACK)
45: Rate control failure
46: Error event failure
47: Time Alignment not supported
48: Requested Time Alignment not possible
~~47~~49–63: spare

Value range: {0–15 Used for syntactical protocol errors, 16–41 Used for semantical protocol errors, 42–63 Used for other errors}

Field length: 6 bit

6.6.3.17 Rate Control Type

Description: Specifies the type of Rate control the current frame relates to. There are two types of Rate control:

- Rate control for fixed periodicity services. Only RFCI indicators present.
- Rate control for services with varying periodicity. RFCI indicators and Downlink send interval present.

Value range: {0=Rate control using only RFCI indicators, 1=Rate control including both RFCI indicators and Downlink send interval}

Field length: 1 bit

6.6.3.18 Downlink send interval

Description: Specifies the Interval the downlink frames should be sent.

Value range: {0=10ms, 1=20ms, 2=40ms, 3–7= Spare}

Field length: 3 bit

6.6.3.19 Padding

Description: This field is an additional field used to make the frame payload part an integer number of octets when needed. Padding is set to 0 by the sender and is not interpreted by the receiver.

Value range: {0–127}

Field length: 0–7 bits

6.6.3.20 Time alignment

Description: Time alignment indicates the amount the sending time should be advanced or delayed.
0: Reserved
1: Delay 1*500µs
…
80: Delay 80*500µs
81–127 Reserved
128: Reserved
129: Advance 1*500µs
…
208: Advance 80*500µs
209–255 Reserved

Value range: {0: Reserved, 1–80: used for delay, 81–128: Reserved, 129-208 used for advance, 209–255: Reserved}

Field length: 8 bit

6.6.4 Timers

T_{INIT}

This Timer is used to supervise the reception of the initialisation acknowledgement frame from the peer Iu UP instance. This Timer is set by O&M.

T_{TA}

This Timer is used to supervise the reception of the time alignment acknowledgement frame from the peer Iu UP instance. This Timer is set by O&M.

6.6.5 Maximum values of repetition counters

N_{INIT}

Maximum number of repetitions of an Initialisation frame due to failure at the Initialisation procedure.

N_{RC}

Maximum number of repetitions of a Rate Control frame due to failure at the Rate Control procedure.

N_{TA}

Maximum number of repetitions of a Time Alignment frame due to failure at the Time Alignment procedure.

6.7.6 List of errors in Iu UP

Error Type	Error Cause	Recommended action by Error event procedure	Possibly detected by function	Comment
Syntactical	Bit error in Frame payload (CRC check)	No action	NAS data streams functions	Handled by Frame Quality Classification, when applied
	Bit error in Frame Header (CRC check)	Iu-UP-Status-Indication(Error event)	Frame handler functions	Frame trashed
	Unexpected Frame Number	Iu-UP-Status-Indication(Error event)	NAS data streams functions	
	Frame loss	Iu-UP-Status-Indication(Error event) and Error event frame	NAS data streams functions	
	Unknown PDU type	Iu-UP-Status-Indication(Error event) and Error event frame	Frame handler functions	
	Unknown procedure	Iu-UP-Status-Indication(Error event) and Error event frame	Frame handler functions	
	Unknown or unexpected value	Iu-UP-Status-Indication(Error event) and Error event frame	Procedure control functions	
	Frame too short	Iu-UP-Status-Indication(Error event) and Error event frame	Frame handler functions	
	Missing fields	Iu-UP-Status-Indication(Error event) and Error event frame	Frame handler functions	
Semantical	Unexpected PDU type	Iu-UP-Status-Indication(Error event) and Error event frame	Frame handler functions	
	Unexpected procedure	Iu-UP-Status-Indication(Error event) and Error event frame	Frame handler functions	
	Unexpected RFCI	Iu-UP-Status-Indication(Error event) and Error event frame	NAS data streams functions	
	Unexpected value	Iu-UP-Status-Indication(Error event) and Error event frame	Procedure control functions	
Other error	Initialisation failure (outside Iu UP)	Error event frame	Function outside Iu UP	
	Initialisation failure (network error, timer expiry)	Iu-UP-Status-Indication(Error event)	Procedure control functions	
	Initialisation failure (Iu UP function error, repeated NACK)	Iu-UP-Status-Indication(Error event)	Procedure control functions	
	Rate control failure	Iu-UP-Status-Indication(Error event)	Procedure control functions	
	Error event failure	Iu-UP-Status-Indication(Error event)	Procedure control functions	
	Time Alignment not supported	Iu-UP-Status-Indication(Error event)	Procedure control functions	
	Requested Time Alignment not possible	Iu-UP-Status-Indication(Error event)	Function outside Iu UP	

7.2 Primitives towards the upper layers at the RNL SAP

7.2.1 General

The Iu UP protocol layer interacts with upper layers as illustrated in the figure above. The interactions with the upper layers are shown in terms of primitives where the primitives represent the logical exchange of information and control between the upper layer and the Iu UP protocol layer. They do not specify or constraint implementations.

The following primitives are defined:

- Iu-UP-DATA
- Iu-UP-STATUS
- Iu-UP-UNIT-DATA

Table 1: Iu UP protocol layer service primitives towards the upper layer at the RNL SAP

Primitive	Type	Parameters	Comments
Iu-UP-DATA	Request	Iu-UP-payload	
		Iu-UP-control	RFCI
	Indication	Iu-UP-payload	
		Iu-UP-control	RFCI
			FQC
Iu-UP-Status	Indication	Iu-UP-Procedure-Control	Error Cause, Error Distance
			Initialisation
			RFCI indicators, Downlink send intervals (when applicable)
			Time Alignment ~~(FFS Note 1)~~
	Request	Iu-UP-Procedure-Control	Error Cause
			RFCI indicators, Downlink send intervals (when applicable)
			Time Alignment ACK/NACK
Iu-UP-UNIT-DATA	Request	Iu-UP-payload	
	Indication	Iu-UP-payload	

Primitive usage is function of the mode of operation of the Iu UP protocol. The following table provides the association between Iu UP primitives towards the upper layers and the Iu UP mode of operation:

Table 2: Iu UP protocol layer service primitives related to the Iu UP mode of operation and function within the mode of operation

Primitive	Type	Mode of Operation
Iu-UP-DATA	Request	SMpSDU
	Indication	SMpSDU
Iu-UP-Status	Request	SMpSDU
	Indication	SMpSDU
Iu-UP-UNIT-DATA	Request	TrM
	Indication	TrM

7.2.2 Iu-UP-DATA-REQUEST

This primitive is used as a request from the upper layer Iu NAS Data Stream entity to send a RAB SDU on the established transport connection. This primitive also includes the RFCI of the payload information included in the primitive.

The Iu UP Frame protocol layer forms the Iu UP data frame, the Iu Data Stream DU being the payload of the Iu UP frame, and transfers the frame by means of the lower layer services.

7.2.3 Iu-UP-DATA-INDICATION

This primitive is used as an indication to the upper layer entity to pass the Iu NAS Data Stream User Plane information of a received Iu UP frame.

This primitive also includes the RFCI of the payload information included in the primitive.

At the RNL-SAP, this primitive may include an Frame Quality Classification indication.

This primitive may also include information aiming at informing the upper layers of a faulty situation that relates to the payload included in the primitive.

7.2.4 Iu-UP-STATUS-REQUEST

This primitive is used to pass down to the Iu UP, the rate control information necessary for changing the permitted rate(s) in the reverse direction over Iu. The rate control information consists of RFCI indicators and (when applicable) downlink send intervals.

This primitive is also used to report that a fault has been detected.

This primitive is also used for acknowledgement and negative acknowledgement of the timing alignment.

7.2.5 Iu-UP-STATUS-INDICATION

This primitive is used to report to the upper layer entity that a fault has been detected. The information concerning that fault is characterised by the Abnormal event information passed to the upper layer.

This primitive is also used in the context of the initialisation control procedure to pass to the upper Iu DS layer e.g. the RFC set and the associated RFCIs to be used in the communication phase.

This primitive is used to indicate to the upper layers the set of permitted rate(s) in the reverse direction over Iu. The set of permitted rate(s) is represented by RFCI indicators and (when applicable) downlink send intervals.

This primitive is also used to indicate when a frame has been dropped as a result of frame quality classification handling.

This primitive is also used to indicate to the upper layers the Time alignment information, i.e. the amount of delay or advance the frame sending should be adjusted with.

~~NOTE 1: Time Alignment is FFS.~~

7.2.6 Iu-UP-UNIT-DATA-REQUEST

This primitive is used as a request from the upper layer to send an Iu UP payload on the established transport connection.

The Iu UP protocol layer transfers the Iu Data Stream DU by means of the lower layer services without adding any protocol header overhead.

7.2.7 Iu-UP-UNIT-DATA-INDICATION

This primitive is used as an indication to the upper layer entity to pass the Iu UP payload.

Annex C (Informative): Open Issues of the Iu UP

This annex contains information related to open issues left in the Iu UP protocol.

1) Handling of Abnormal Event and Error Handling;

2) Timing over Iu~~, including Time Alignment~~.