# TSG-RAN Meeting #6
# Nice, France, 13 – 15 December 1999

*TSGRP#6(99)750*

**Title:** **Agreed CRs of category "B" (New feature) to TS 25.415**

**Source:** **TSG-RAN WG3**

**Agenda item:** **5.4.3**

| Doc # | Status- | Spec | CR | Rev | Subject | Cat | Versio | Versio |
|---|---|---|---|---|---|---|---|---|
| R3-99j96 | agreed | 25.415 | 007 | | Error event and error handling | B | 3.0.0 | 3.1.0 |
| R3-99j97 | agreed | 25.415 | 008 | | Iu UP protocol evolution | B | 3.0.0 | 3.1.0 |
| R3-99i85 | agreed | 25.415 | 010 | | Enhancement of Rate control | B | 3.0.0 | 3.1.0 |

**3GPP TSG-RAN-WG3 meeting #9**
**Paris, France, 6–10 Dec 1999**

***Document R3-99J96***
*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 | 007 | Current Version: | 3.0.0 |
|---|---|---|---|---|

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

| For submission to: | TSG-RAN#6 | 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 | X | Core Network | X |
|---|---|---|---|---|---|---|---|---|

**Source:** TSG-RAN WG3 **Date:** 8th Dec 1999

**Subject:** Error event and error handling

**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 | X | | Release 97 | |
| C | Functional modification of feature | | | Release 98 | |
| D | Editorial modification | | | Release 99 | X |
| | | | | Release 00 | |

**Reason for change:** In current version there is the no description Error event or error handling. This CR shows changes that are needed to describe the Error event procedure and error handling.

**Clauses affected:** 3.1, 6.2, 6.4.3, 6.5.3.2, 6.5.4.2, 6.5.6, 6.6.1.3.3, 6.6.1.3.4.4, 6.6.2, 6.7, 7.2.1, Annex B

**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 in the CN and the Terminal domains, 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 initialization procedure: :

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

2) In the Initialization 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.

## 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 ~~abnormal~~ error event ~~(TBD)~~;
- Frame Quality Classification.

## 6.3 Services Expected from the UP Data Transport layer

The Iu UP protocol layer expects the following services from the Transport Network Layer:

- Transfer of user data.

## 6.4 Functions of the Iu UP Protocol Layer in Support mode

### 6.4.1 Functional model of the Iu UP Protocol Layer in Support mode

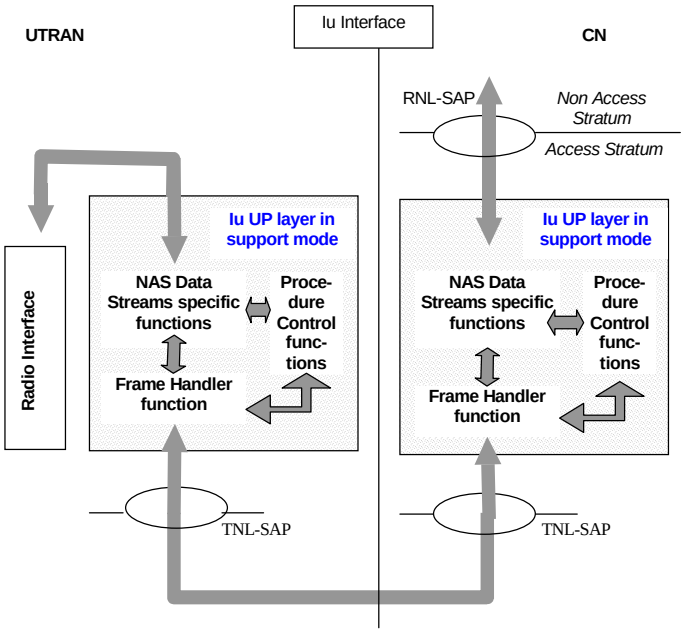



**Figure 4: Functional model of the Iu UP protocol layer in Support mode**

The Iu UP protocol layer in Support mode is made of three sets of functions:

1) Frame Handler function
2) Procedure Control functions
3) Non Access Stratum Data Streams specific functions.

## 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 part of the Iu UP protocol frame and set the control part field to the correct values. 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.

## 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 downlink rates among the rates that can be controled by UTRAN. The set of rates is represented by an RFCI bitmap. 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 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 ~~Abnormal~~Error Event ~~(TBD)~~:** 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 Elementary procedures

## 6.5.1 General

It shall be possible to perform any of the control procedures regardless of the user data transmission.

## 6.5.2 Transfer of User Data procedure

### 6.5.2.1 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 accross 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 perform, if needed, CRC calculation of the uper layer PDU and passes 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 and matches the Iu UP frame payload as indicated by the Procedure Control functions, the NAS Data Streams forwards to the upper layers RFCI and Iu UP frame payload.

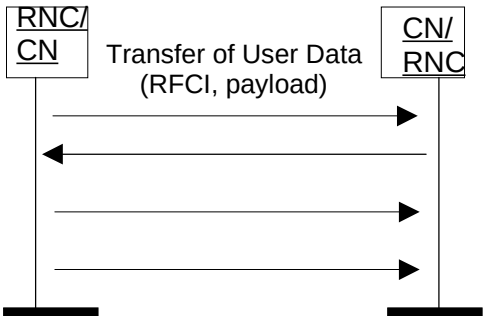



**Figure 6. Successful Transfers of User Data**

### 6.5.2.2 Unsuccessful operation

If the Iu UP frame carrying the user data is uncorrectly 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 to the procedure control function.

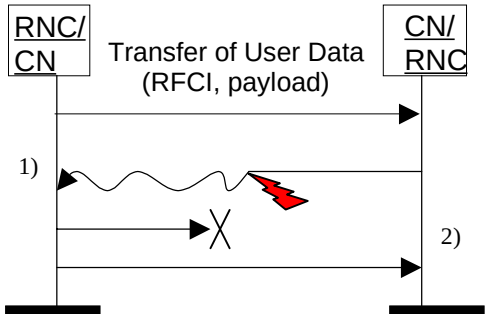



**Figure 7. Unsuccessful Transfers of User Data: 1) Corrupted Frame, 2) Detection of Frame loss**

## 6.5.3 Initialisation procedure

### 6.5.3.1 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 an indicator to each RAB sub-Flow Combination (RFCI). 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 acknowledgment 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 acknowledgment frame.

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

Upon reception of an initialisation negative acknowledgment frame or at timer $T_{INIT}$ expiry, the Iu UP protocol layer in the SRNC 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.

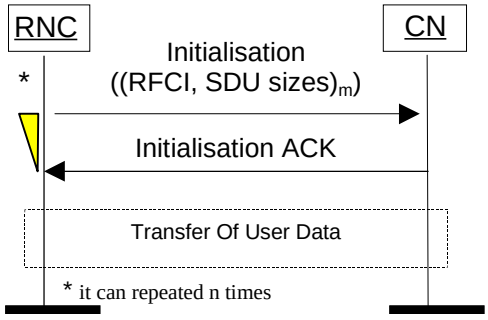



**Figure 8: Successful Initialisation of Iu UP for m RFCIs**

### 6.5.3.2 Unsuccessful operation

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

If after n repetition, the initialisation procedure is unsuccesfully terminated (because of n negative acknowledgment or timer $T_{INIT}$ expiries), the Iu UP protocol layers (sending and receiving) take ~~the appropriate actions (Abnormal Event is TBD)~~~~Abnormal event procedure reports the 'Initialisation failure' error~~appropriate local actions.

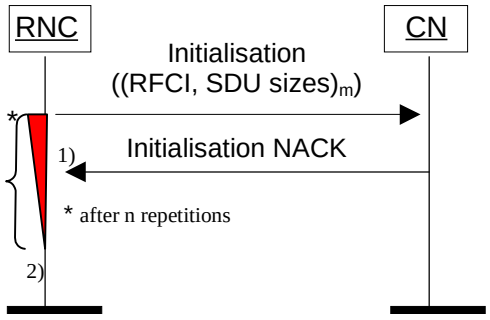



**Figure 9: Unuccessful initialisation of Iu UP: 1) n negative acknowledgment or 2) n timer expiries**

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.

## 6.5.4 Iu Downlink Rate Control procedure

### 6.5.4.1 Successful operation

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

The rate control procedure over Iu UP is controlled by the entity controlling the rate control over UTRAN i.e. SRNC.

The Iu downlink 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 RFCI bitmap of downlink permitted rates.

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 trasnfer 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 downlink 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 rate control information in a Iu-UP-Status indication primitive.

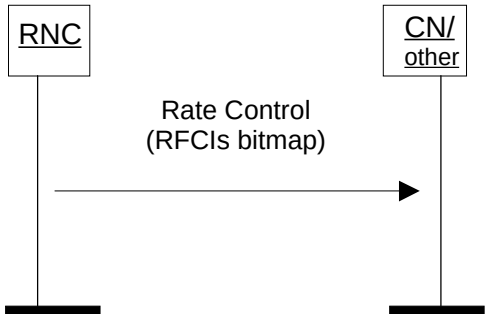



**Figure 10: Successful Rate Control**

### 6.5.4.2 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 downlink rate is outside the set of permitted downlink rate), 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.~~abnormal event procedure is started to~~~~Iu UP informs the upper layers~~.

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

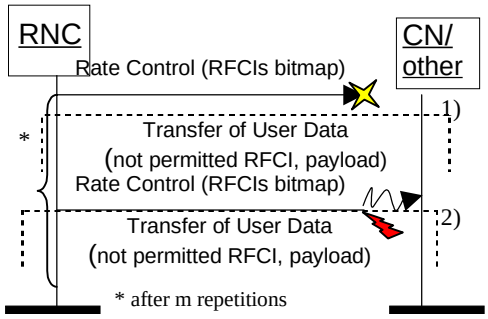



**Figure 11: Unsuccessful Transfers of rate control: 1) Frame loss 2) Corrupted Frame**

## 6.5.5 Time Alignment procedure (FFS)

## 6.5.6 Handling of ~~Abnormal~~**Error** Event procedure ~~(TBD)~~

~~The details of this procedure are to be defined.~~

### 6.5.6.1 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:

~~1.~~• 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.

~~2.~~• 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.

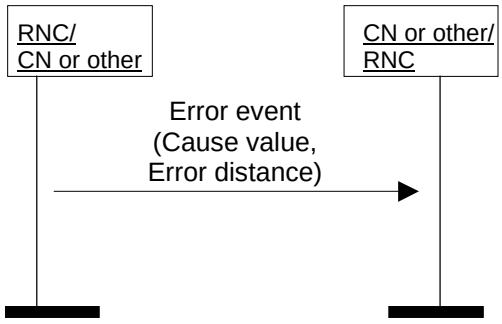



**Figure 10: Successful Error event**

### 6.5.6.5 Unsuccessful operation

If the ~~abnormal~~error event frame is uncorrectly 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 Error event frame.

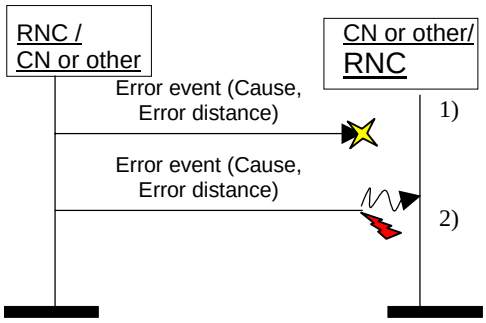



**Figure 11: Unsuccessful Transfers of Error event frame: 1) Frame loss 2) Corrupted Frame**

### 6.6.1.3 PDU Type 15

#### 6.6.1.3.1 General

PDU Type 15 is defined to perform control procedures over the Iu UP in support for pre-defined SDU sizes mode. The control procedure is identified by the procedure indicator. The Frame Payload contains the data information related to the control procedure.

Figure 15 below shows the Iu frame structure for PDU Type 15 of the Iu UP protocol at the SAP towards the transport layers (TNL-SAP):

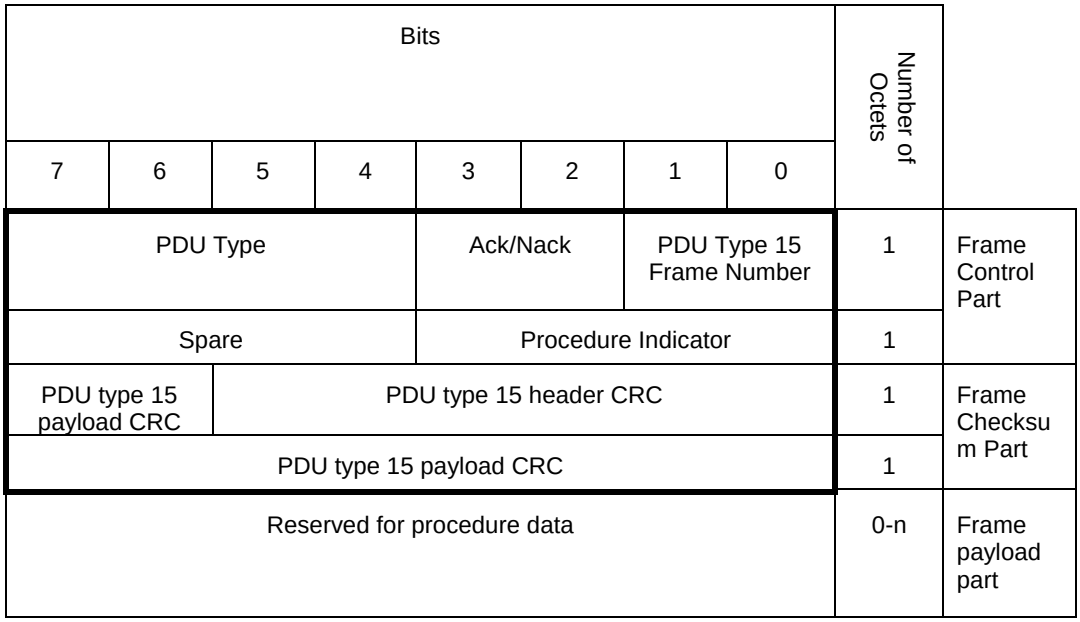



**Figure 15: Iu UP PDU Type 15 Format for procedure sending**

The Iu UP PDU Type 15 is made of three parts:

1) Iu UP Frame Control part (fixed size)
2) Iu UP Frame Check Sum (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 15 Frame Header.

#### 6.6.1.3.2 Positive Acknowledgement

When the PDU Type 15 is used to positively acknowledge a control procedure, the PDU Type 15 takes the following structure at the TNL-SAP:

| Bits | | | | | | | | Number of Octets | |
|---|---|---|---|---|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| PDU Type | | | | Ack | | PDU Type 15 Frame Number | | 1 | Frame Control Part |
| Spare | | | | Procedure Indicator | | | | 1 | |
| Spare | | | | PDU type 15 header CRC | | | | 1 | Frame Checksum Part |
| Spare | | | | | | | | 1 | |

**Figure 16: Iu UP PDU Type 15 Format for positive acknowledgment**

The Iu UP PDU Type 15 for positive acknowledgment is made of two parts:

1) Iu UP Frame Control part (fixed size)

2) Iu UP Frame Check Sum (fixed size)

The Iu UP Frame Control Part and the Iu UP Frame Check Sum constitute the Iu UP PDU Type 15 Frame Header for positive acknowledgment.

### 6.6.1.3.3 Negative Acknowledgement

When the PDU Type 15 is used to negatively acknowledge a control procedure, the PDU Type 15 takes the following structure at the TNL-SAP:

| Bits | | | | | | | | Number of Octets | |
|---|---|---|---|---|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| PDU Type | | | | Nack | | PDU Type 15 Frame Number | | 1 | Frame Control Part |
| Spare | | | | Procedure Indicator | | | | 1 | |
| Spare | | | | PDU type 15 header CRC | | | | 1 | Frame Checksum Part |
| Spare | | | | | | | | 1 | |
| Error Cause ~~Indicator~~Value | | | | | | | | 1 | Frame payload part |
| Spare | | | | | | | | | |

**Figure 17: Iu UP PDU Type 15 Format for negative acknowledgment**

The Iu UP PDU Type 15 for negative acknowledgment is made of three parts:

1) Iu UP Frame Control part (fixed size)

2) Iu UP Frame Check Sum (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 15 Frame Header for negative acknowledgment.

### 6.6.1.3.4 Procedures Coding

#### 6.6.1.3.4.1 Initialization

The figure below specifies how the initialization procedure is coded.

| Bits | | | | | | | | Number of Octets | |
|---|---|---|---|---|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| PDU Type (=15) | | | | Ack/Nack | | PDU Type 15 Frame Number | | 1 | Frame Control Part |
| Spare | | | | Procedure Indicator (=0) | | | | 1 | |
| PDU type 15 payload CRC | PDU type15 header CRC | | | | | | | 2 | Frame Checksum part |
| PDU type15 payload CRC | | | | | | | | | |
| Spare | | | | Number of subflows (N) | | | Chain ind | 1 | Frame payload part |
| Spare | LI | 1st RFCI | | | | | | 1 | |
| Data of length of subflow 1 for RFCI | | | | | | | | 1 or 2 (dep. LI) | |
| Data of length of subflow 2 to N for RFCI | | | | | | | | (N-1)x(1 or 2) | |
| Spare | LI | 2nd RFCI | | | | | | 1 | |
| Data of length of subflow 1 for RFCI | | | | | | | | 1 or 2 (dep. LI) | |
| Data of length of subflow 2 to N for RFCI | | | | | | | | (N-1)x(1 or 2) | |
| … | | | | | | | | | |

**Figure 18: Iu UP PDU Type 15 used for Initialization**

#### 6.6.1.3.4.2 Rate Control

The Figure below specifies how the rate control procedure is coded.

| Bits | | | | | | | | Number of Octets | |
|---|---|---|---|---|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| PDU Type | | | | Ack/Nack | | PDU Type 15 Frame Number | | 1 | Frame Control Part |
| Spare | | | | Procedure Indicator | | | | 1 | |
| PDU type 15 payload CRC | | PDU type 15 header CRC | | | | | | 1 | Frame Checksum Part |
| PDU type 15 payload CRC | | | | | | | | 1 | |
| Spare | | Number of RFCIs Indicator (N) | | | | | | 0-n | Frame payload part |
| Padding when needed (0) | | | RFCI N-1 Ind | … | RFCI 2 Ind | RFCI 1 Ind | RFCI0 Ind | | |

**Figure 19: Iu UP PDU Type 15 Format used for Rate Control**

6.6.1.3.4.3 Time Alignment (FFS)

6.6.1.3.4.4 ~~Abnormal~~Error Event ~~(TBD)~~

~~This is to be defined~~

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

| 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 |
| Spare | | | | Procedure Indicator (=3) | | | | 1 | |
| Header CRC | | | | | | Payload CRC | | 1 | Frame Checksum Part |
| Payload CRC | | | | | | | | 1 | |
| Error distance | | Error Cause value | | | | | | 1 | Frame payload part |

**Figure 20: Iu UP PDU Type 14 Format used for ~~Abnormal~~Error Event**

## 6.6.2 Frames content definition and Frames coding

### 6.6.2.1 Frame Number

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.

The frame number is in bit 0 to bit 3 in the first octet of the frame the value varying from 0 to 15.

### 6.6.2.2 PDU Type 15 Frame Number

The Iu UP frame numbering is handled by a Frame Number. The purpose of the PDU Type 15 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 15 Frame Number is used in the acknowledgement frame as the one used in the frame being acknowledged.

The value range of the PDU Type 15 Frame number is 0-3.

### 6.6.2.3 PDU Type

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.

### 6.6.2.4 RAB sub-Flow Combination Indicator (RFCI)

The RFCI is stored in bit 0 to bit 5 of the second octet of the frame control part. The RFCI can get values ranging from 0 to 62. The value 63 is reserved for indicating that RFCI is not applicable for the current PDU.

### 6.6.2.5 Ack/Nack

The Ack/Nack field tells if the frame is a control procedure frame or an acknowledgement for a control procedure frame.

| Value | Definition |
|---|---|
| 0 | Procedure sending |
| 1 | Ack |
| 2 | Nack |
| 3 | Spare |

### 6.6.2.6 Procedure Indicator

The Procedure Indicator identifies the control procedure in the current frame. The meaning of the Procedure Indicator is given in the table below.

| Value | Definition |
|---|---|
| 0 | Initialization procedure |
| 1 | Rate control |
| 2 | FFS (Time Alignment) |
| 3 | ~~TBD (Abnormal~~Error Event~~)~~ |
| 4-15 | Spare |

### 6.6.2.7 PDU type 0 Header CRC

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).

#### 6.6.2.8 PDU type 0 Payload CRC

This field contains the CRC 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).

#### 6.6.2.9 PDU type 1 Header CRC

Same as PDU Type 0 Header CRC.

#### 6.6.2.10 PDU type 15 Header CRC

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).

#### 6.6.2.11 PDU type 15 Payload Check Sum

This field contains the CRC of the Frame Payload part. 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).

#### 6.6.2.12 Chain Indicator

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

The Chain Indicator is set to 0 when this is the last frame.

The Chain Indicator is set to 1 when this is not the last frame.

#### 6.6.2.13 Number of Subflows

Number of Subflows field indicates the number of subflows the RAB is made of. It is used to decode the SDU size information data lengths.

The Number of Subflows can range from 1 to 7.

#### 6.6.2.14 Length Indicator (LI)

LI: Length Indicator, indicates if 1 (LI=0) or 2 (LI=1) octets is used for the RAB subflow size information.

LI is 1 when more than 255 bits is used for a subflow.

#### 6.6.2.15 Number of RFCIs Indicator

Number of RFCI Indicator indicates the number of RFCI Indicators present in the control procedure frame.

Number of RFCI Indicator can range from 0 to 63.

### 6.6.2.16 RFCI Indicator

RFCI Indicator points to an RFCI number e.g. RFCI Indicator 0 points to RFCI 0, RFCI Indicator 1 points to RFCI 1, etc.

RFCI Indicator set to 0 indicates that the corresponding RFCI number is punctured out of the RFCI set.

RFCI Indicator set to 1 indicates that the corresponding RFCI number remains in the RFCI set.

### 6.6.2.17 Frame Quality Classification (FQC)

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'.

The meaning of the FQC field is specified below:

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

### ~~6.6.2.18 Cause Indicator~~

~~Cause field is used to indicate the reason for the control procedure execution.~~

~~The meaning of the Cause Indicator is given in the table below.~~

| ~~Value~~ | ~~Definition~~ |
|---|---|
| ~~0~~ | ~~Reserved~~ |
| ~~1~~ | ~~Frame Format Error~~ |
| ~~2-15~~ | ~~Spare~~ |
| ~~16~~ | ~~Unknown field~~ |
| ~~17-31~~ | ~~Spare~~ |
| ~~32-255~~ | ~~Spare~~ |

### 6.6.2.18 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 ~~abnormal~~error event report
2: Second forwarding of ~~abnormal~~error event report
3: Reserved for future use

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

**Field length:** 2 bit

### 6.6.2.19 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: ~~Abnormal~~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 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.

## 6.7 Handling of unknown, unforeseen and erroneous protocol data

~~TBD.~~

### 6.7.1 General

Error handling in Iu UP protocol is applicable only for Iu UP in Support mode.

The Error Event procedure is the procedure handling error reporting. 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)
- a request by the upper layers
- an Error event frame over the Iu UP protocol

The error can be reported either by:

- an Error event frame over the Iu UP protocol
- an Iu UP Status Indication to upper layers (e.g. to be used by O&M)

When an Error event is reported, either by an Iu-UP-Status-Indication, or by an Error event frame the following information shall be included:

- Type of the error (syntactical error, semantical error or other error)
- Error distance, i.e. information where the error occurred

## 6.7.2 Error detected by Iu UP functions

When an error is detected within the Iu UP functions (by receiving a frame containing erroneous, unknown or unexpected data) one of the following actions is taken depending on the type of the error

1. Error indicated to upper layers by sending a Iu-UP-Status-Indication primitive
2. Error event frame sent
3. Error event frame sent and error indicated to upper layers by sending a Iu-UP-Status-Indication primitive
4. No action

## 6.7.3 Request by upper layers

When the IU UP receives an Iu-UP-Status-Request indicating Error event then an Error event frame should be sent over the Iu UP protocol indicating the appropriate error type.

## 6.7.4 Error event frame over the Iu UP protocol

When an Error event frame is received over the Iu UP protocol an Iu-Status-Indication with 'Error event' information indicating the error type should be made to the upper layers. The Error event report contains an 'Cause value' that tells the type of the error. The Error event report also contains a field 'Error distance' that tells the distance to the entity reporting the error event. The 'Error distance' is 0 when the error is originally sent. When an Error event report is forwarded the 'Error distance' is incremented by one.

## 6.7.5 Handling of error reports

### 6.7.5.1 General

The Figure X below shows the external error case when the error event procedure is originally triggered by an Iu-UP-Status-Request. As an action on this the error event procedure sends an error event frame over the Iu UP. On the other side the reception of error event frame triggers the error event procedure, and an Iu-UP-Status-Indication is sent to upper layers. The handling is symmetrical over the Iu UP protocol.

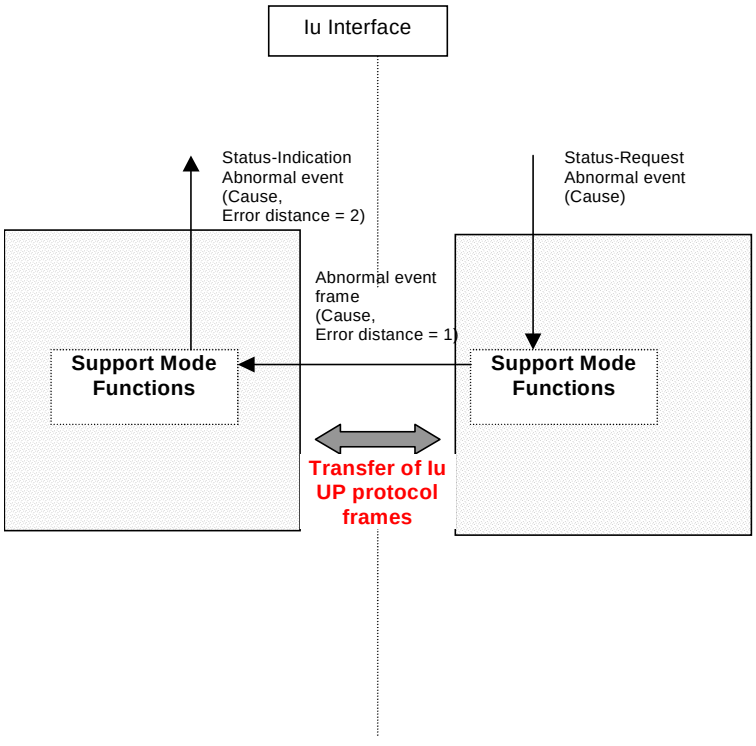



**Figure X: External error**

The figure below shows the internal error case when the error event procedure is originally triggered by the Iu UP functions. As an action on this the error event procedure sends an error event frame over the Iu UP. On the other side the reception of error event frame triggers the error event procedure, and an Iu-UP-Status-Indication is sent to the upper layers. The handling is symmetrical over the Iu UP protocol.

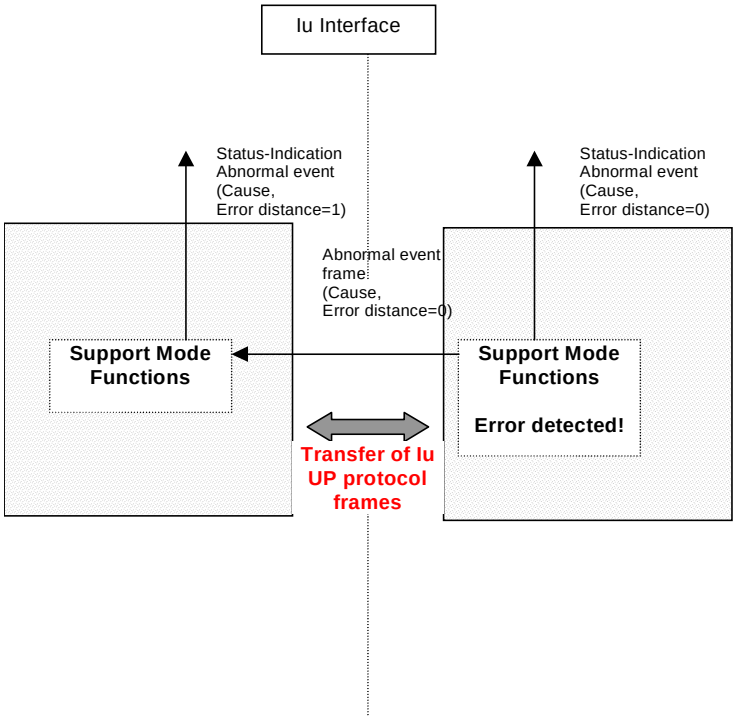



**Figure Y: Internal error**

### 6.7.5.2 Error distance

In an error event frame the error distance has the following meaning:
0: Error report relates to an Iu UP function error at the other side
1: Error report relates to an error at the other side reported by the upper layers

In an Iu UP-Status indication the error distance has the following meaning:
0: Error report relates to an local Iu UP function error
1: Error report relates to an Iu UP function error at the other side
2: Error report relates to an error at the other side reported by the upper layers

## 6.7.6 List of errors in Iu UP

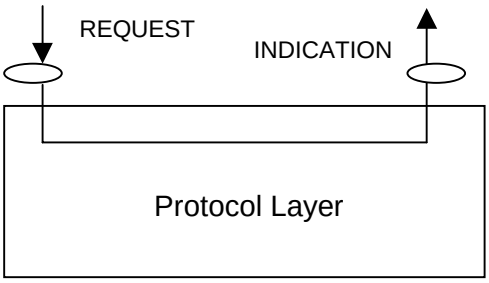
| Error Type | Error Cause | Recommended action by ~~Abnormal~~Error event procedure | Possibly detected by function | Comment |
|---|---|---|---|---|
| Syntactical | Bit error in Frame payload (CRC check) | No action | NAS data streams functions | Handled by Frame Quality Classification, when applied |
| | Bit error in Frame Header (CRC check) | Iu-UP-Status-Indication(~~Abnormal~~Error event) | Frame handler functions | Frame trashed |
| | Unexpected Frame Number | Iu-UP-Status-Indication(~~Abnormal~~Error event) | NAS data streams functions | |
| | Frame loss | Iu-UP-Status-Indication(~~Abnormal~~Error event) and ~~Abnormal~~Error event frame | NAS data streams functions | |
| | Unknown PDU type | Iu-UP-Status-Indication(~~Abnormal~~Error event) and ~~Abnormal~~Error event frame | Frame handler functions | |
| | Unknown procedure | Iu-UP-Status-Indication(~~Abnormal~~Error event) and ~~Abnormal~~Error event frame | Frame handler functions | |
| | Unknown or unexpected value | Iu-UP-Status-Indication(~~Abnormal~~Error event) and ~~Abnormal~~Error event frame | Procedure control functions | |
| | Frame too short | Iu-UP-Status-Indication(~~Abnormal~~Error event) and ~~Abnormal~~Error event frame | Frame handler functions | |
| | Missing fields | Iu-UP-Status-Indication(~~Abnormal~~Error event) and ~~Abnormal~~Error event frame | Frame handler functions | |

| | | | | |
|---|---|---|---|---|
| Semantical | Unexpected PDU type | Iu-UP-Status-Indication(~~Abnormal~~Error event) and ~~Abnormal~~Error event frame | Frame handler functions | |
| | Unexpected procedure | Iu-UP-Status-Indication(~~Abnormal~~Error event) and ~~Abnormal~~Error event frame | Frame handler functions | |
| | Unexpected RFCI | Iu-UP-Status-Indication(~~Abnormal~~Error event) and ~~Abnormal~~Error event frame | NAS data streams functions | |
| | Unexpected value | Iu-UP-Status-Indication(~~Abnormal~~Error event) and ~~Abnormal~~Error event frame | Procedure control functions | |
| Other error | Initialisation failure (outside Iu UP) | ~~Abnormal~~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(~~Abnormal~~Error event) | Procedure control functions | |
| | ~~Abnormal~~Error event failure | Iu-UP-Status-Indication(~~Abnormal~~Error event) | Procedure control functions | |

# 7 Communication Primitives for the Iu UP protocol layer

## 7.1 Modelling Principle

The principle illustrated by the figure below is used for modelling the primitives towards the protocol layer:




## 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~~Abnormal Event (TBD)~~ |
| | | | Initialisation |
| | | | RFCI bitmap |
| | | | *Time Alignment (FFS Note 1)* |
| | Request | Iu-UP-Procedure-Control | Error Cause~~Abnormal Event~~ |
| | | | RFCI bitmap |
| 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 |

# Annex B (Informative): Illustration of protocol states in the Iu UP

This annex contains inflormation related to possible protocol states for operation of the Iu UP. This annex does not constraint implementation and is for illustration purposes only.

The state model is common for both ends of the Iu UP so that the protocol machines are operating symetrically. This approach is taken to facilitate state description for all cases including TFO and TrFO .

## B.1 Protocol state model for transparent mode

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

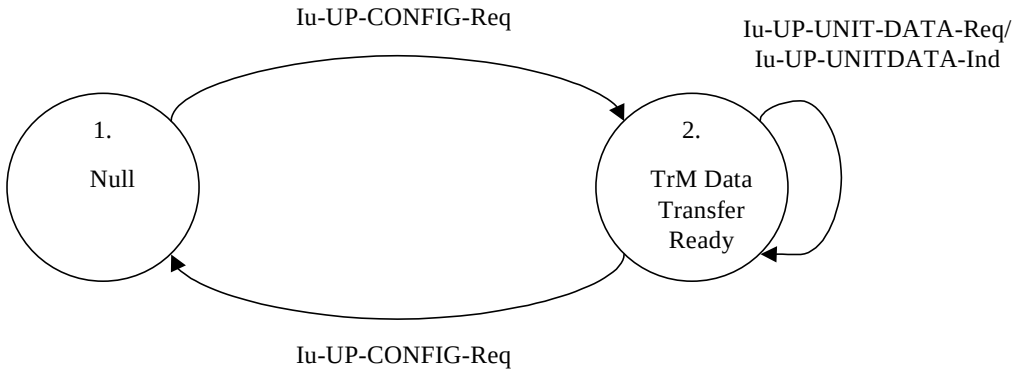



**Figure B.1: Protocol state model for transparent mode**

### B.1.1 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 transparent mode data transfer ready state is entered. The mode information is received either through RANAP signalling or directly in the CN node. In the Iu-UP-CONFIG-Req e.g. the following information will be indicated:

- Transparent mode.

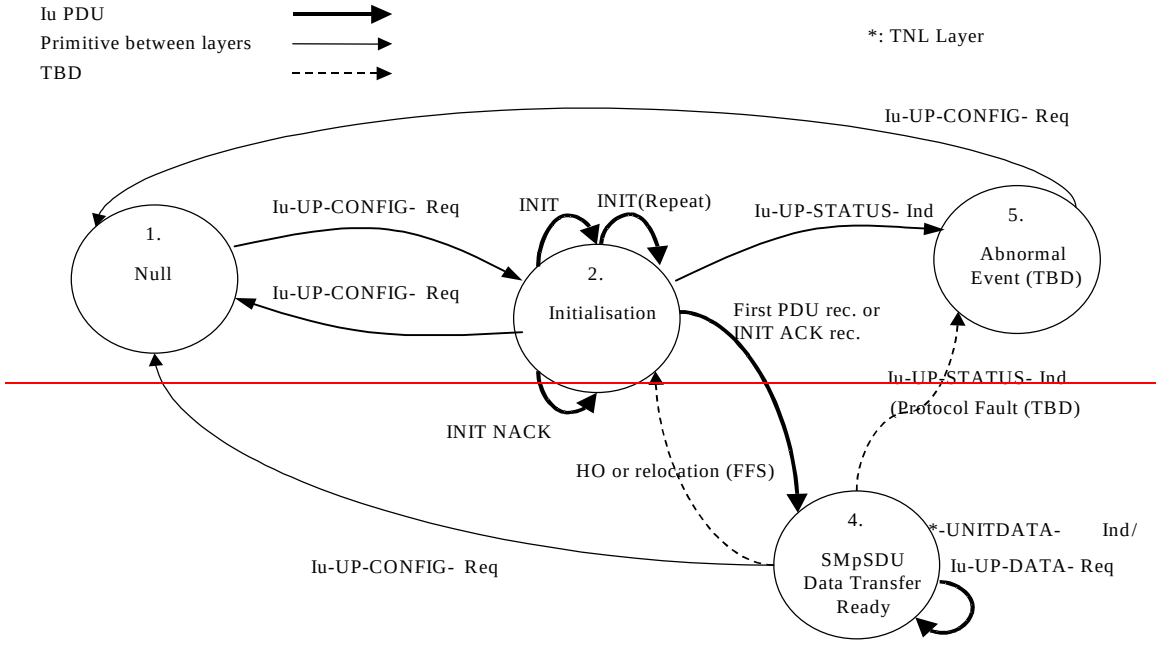
### B.1.2 Transparent Mode Data Transfer Ready State

In the transparent mode data transfer ready state, transparent mode data can be exchanged between the entities.

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

## 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.



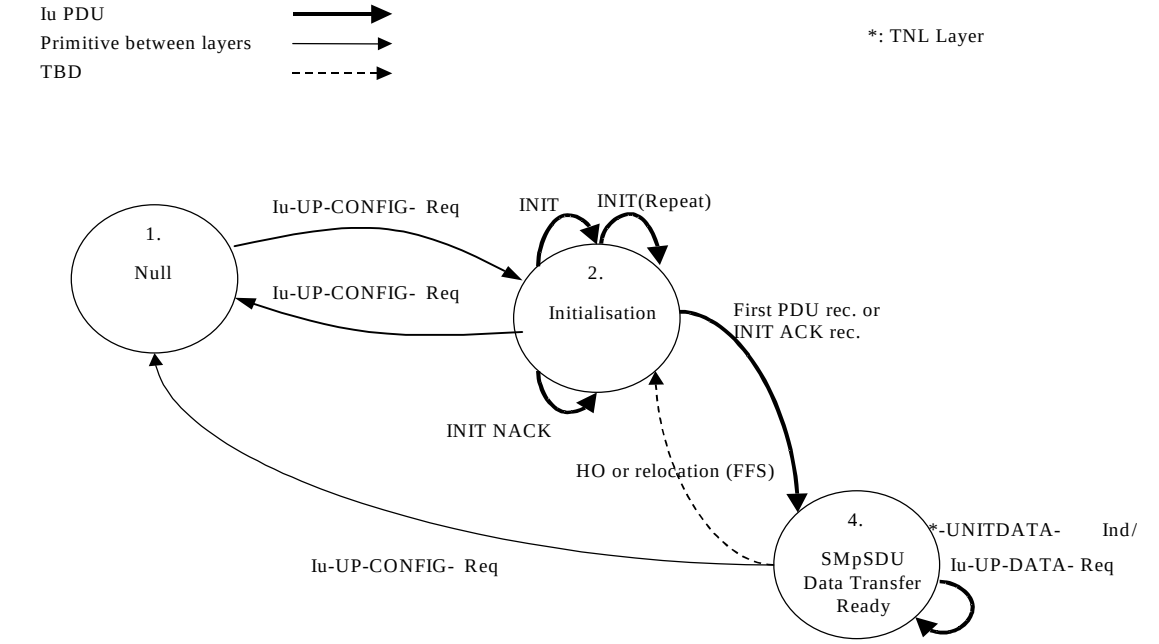




**Figure B.2: Protocol state model for support mode**

## 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;
- 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 (INIT) the Iu UP instance remains in the Initialisation state. The sending side starts a supervision timer $T_{INIT}$. The receiving side acknowledges the INIT frame with a positive acknowledgement (INIT ACK) or a negative acknowledgement (INIT NACK). The Iu UP remains in initialisation state.

Upon reception of an initialisation acknowledgement frame (INIT ACK), 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 (INIT ACK), the Iu UP instance enters SMpSDU data transfer ready state.

Upon reception of an initialisation negative acknowledgement frame (INIT NACK) or at the expiry of timer $T_{INIT}$, the initialisation frame is repeated and the timer $T_{INIT}$ is restarted. The initialisation frame can be repeated VT(Init) times.

If after VT(Init) repetitions, the initialisation procedure is unsuccessfully terminated (due to VT(Init) negative acknowledgements or timer expiries) the ~~Abnormal~~Error event procedure is used to report the Initialisation failure and the Iu UP instance remains in the initialisation state.~~, Iu UP Status Indication primitive is sent to the higher layers and abnormal event state is entered.~~

## 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 or UNITDATA-Indication from TNL layer, appropriate user data transfer procedures are performed. 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 and an ~~abnormal~~error event ~~state is entered~~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.

## ~~B.2.4 Abnormal Event State (TBD)~~

~~Abnormal event state is (TBD). However, an assumption can be made that upon reception of Iu-UP-CONFIG-Req from higher layer the Iu UP instance is terminated and the null state is entered.~~

~~This timer is used to supervise the reception of the time alignment acknowledgement frame from the peer Iu UP instance.~~

**3GPP TSG-RAN Meeting #6**
**Nice, France, 13-15 December 1999**

***Document* *R3-99J97***

# CHANGE REQUEST

**25.415** **CR** **008** Current Version: 3.0.0

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

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

for approval [X] for information [ ]

strategic [ ] non-strategic [ ] *(for SMG 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:** TSG-RAN WG3 **Date:** 8th of Dec 1999

**Subject:** Iu UP protocol evolution

**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:**

The motivation of this CR is described thoroughly in an associated contribution Tdoc R3-99ERIC-Iu16. Related to that contribution this CR proposes the following changes:

- 'spare' values in two fields are proposed to be changed to 'reserved'

- It is proposed the icrease the Procedure Indicator field by four bits

- principles are proposed for the following evolution issues for the Iu UP protocol:
  - Adding a new value in an existing field
  - Adding a new field in an existing frame
  - Adding a new PDU type
  - Protocol version handling

**Clauses affected:** 6.6.3.2, 6.6.3.7, 6.6.2.3.1, 8 (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 change proposals to subclauses 6.6.3.2, 6.6.3.7 and 6.6.2.3.1 refer to CR R3-99F99 which was approved by Iu SWG in the last meeting , but not yet by plenary

### 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= ~~spare~~ reserved}

**Field length:** 2 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-~~15~~ 255=reserved~~spare}~~

**Field length:** ~~4~~ 8bits

### 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 15 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 |
| ~~Spare~~ | | | Procedure Indicator | | | | | 1 | |
| Header CRC | | | | | | Payload CRC | | 1 | Frame Checksum Part |
| Payload CRC | | | | | | | | 1 | |
| Reserved for procedure data | | | | | | | | 0-n/8 | Frame payload part |

Figure 15: Iu UP PDU Type 14 Format for procedure sending

# 8 Evolution of Iu UP Protocol

## 8.1 Principles for Protocol Evolution

### 8.1.1 Unknown field value

The Iu UP protocol may be evolved by taking into use field values that have been specified to be reserved for future use or have been specified as spare values. When a UP protocol entity receives an unknown field value, it can react differently depending whether the unknown value is reserved for future use or if it is a spare value. The following principles are recommended for receiver reactions :

- If a spare value is used by the sender, but not understood by the receiver, there should be a default action for the receiver. This default action should be defined on a field basis
- If a value that is reserved for future use is used by the sender, but not understood by the receiver, the value should be rejected by the receiver. This should be done by sending a Negative Acknowledgement to the peer entity, if possible. Otherwise an ~~Abnormal~~Error Event should be generated in order to inform the upper layers and the peer entity.
- A received ~~Abnormal~~Error Event message shall not trigger another ~~Abnormal~~Error Event message back to the sender, even though e.g. the Cause value in the received ~~Abnormal~~Error Event message would not be understood

In the following the recommended actions of the receiver are handled field by field when an unknown field value is received

**PDU Type**

Value range: {0-1 in use, 2-13 reserved for future use, 14 in use, 15 reserved for future use}

Recommended action if reserved values used: Generate ~~Abnormal~~Error Event, i.e. the upper layers and the peer entity are informed about the ~~abnormal~~error event with Cause : Unknown PDU Type

**FQC**

Value range: {0-1 in use, 2-3 spare}

Recommended action if spare values used: Ignore the field and pass it onwards

**ACK/NACK**

Value range: {0-2 in use, 3 reserved}

Proposed action if reserved values used: Generate an ~~Abnormal~~Error Event, i.e. the upper layers and the peer entity are informed about the ~~abnormal~~error event with Cause : Unknown reserved value

**Procedure Indicator**

Value range: {0-3 in use, 4-15 reserved}

Recommended action if reserved values used: Generate an ~~Abnormal~~Error Event, i.e. the upper layers and the peer entity are informed about the ~~abnormal~~error event with Cause : Unknown procedure

**Cause Indicator**

Value range: {0 reserved, 1, 16 in use, 2-15 and 17-255 spare}

Recommended action if reserved values used: Generate ~~Abnormal~~Error Event, i.e. the upper layers and the peer entity are informed about the ~~abnormal~~error event with Cause : Unknown reserved value

Recommended action if spare values used: Ignore the field and pass it onwards

### 8.1.2 Adding a new field to an existing frame

If there is a need to add a new field to an existing procedure, the following principles shall be applied:

- The PDU type defines the header mask. Therefore, a new field shall not be added to the header part of an existing frame and possible spare bits in the header shall not be taken into use since these would be violations of the header mask.
- The Procedure Indicator shall define the fields that should be in a control frame.
- There shall be only one Procedure Indicator for each procedure.
- If a new field needs to be introduced to an existing procedure (i.e. existing procedure that is defined in an existing UP version), the new field shall not be *added* to the payload part. Instead, the new field may be introduced by placing it to a spare field in the payload part of the frame, if possible
- However, if a new field needs to be introduced to an existing procedure, but spare fields(s) in the payload part cannot be used to introduce the new field, then a new procedure shall be created and hence a new Procedure Indicator value shall be allocated for the new procedure
- To enable simple protocol evolution, when a new Procedure Indicator will be introduced, the new frame shall include both the new fields and the fields of the old frame.
- When an implementation receives an unknown Procedure Indicator it may use the Error Event message with Cause: Unknown procedure to report this. This ~~may~~ indicates to the sender that the procedure was not understood and it may try with an older procedure.

### 8.1.3 Adding a new PDU type

In the future, the Iu UP protocol may evolve so that there is a need to add a new PDU type. The criteria for introducing a new PDU type could be e.g.:

- The Procedure Indicators may run out and there is a need to have more
- There is a need to change the header mask, e.g. the Frame Number field may need to be increased or the CRC field needs to be modified

While the PDU type 15 is reserved for future PDU type extensions, there may be ‘subtypes’ under PDU type 15 in the future and there also may be new procedures in these ‘subtypes’.

Thus it has to be ensured that if the same Procedure Indicator value is used under several PDU types, it should be made clear e.g. in the ~~Abnormal~~Error Event cause element, which PDU type it concerns.

### 8.1.4 Protocol version handling

In the future, new versions of the Iu UP protocol may be introduced. A reason for a new version of the protocol could be, e.g.

- The earlier introduced new features or functions are required to be mandatory in the new version
- Due to technical development, the new version of the protocol could be totally different (and incompatible) from the earlier version

The following principles shall be applied to version handling of Iu UP protocol:

- It shall be possible to introduce additional modes of operation
- It shall be possible to evolve the operation modes independently of each other
- There shall be independent version numbers for each mode of operation
- The mode of operation of an Iu UP protocol instance is decided by the CN, but the version of the mode shall be negotiated between the CN and UTRAN during RAB Assignment and Relocation Resource Allocation procedures

- The version number of a UP operation mode may change or be unchanged between different releases
- When the protocol is evolved it shall be made clear in the specification, which features belong to which versions
- A new version may be an evolution (i.e. compatible) of the old version or the new version may be totally different from the old version

**3GPP TSG-RAN Meeting #6**
**Nice, France, 13-15 December 1999**

***Document* R3-99i85**
*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: | 3.0.0 |
|---|---|---|---|---|

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

| For submission to: | TSG-RAN#6 | 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:** 1st of Dec 1999

**Subject:** Enhancement of Rate control

**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 | X | | Release 97 | |
| C | Functional modification of feature | | | Release 98 | |
| D | Editorial modification | | | Release 99 | X |
| | | | | Release 00 | |

**Reason for change:** To add the possibility to change the downlink send interval. The rate control procedure is enhanced to be able to include downlink send intervals for the RFCIs.
This will be needed by non-transparent for CS data services.

**Clauses affected:** 4.2.2, 6.4.3, 6.5.4, 6.6.1.3.4, 6.6.2, 7.2

**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.

# 4.2 Operational and Functional aspects

## 4.2.1 Iu UP protocol modes of operation

The Iu UP protocol operates in mode according to the concept described in earlier section.

Modes of operation of the protocol are defined:

1) Transparent mode (TrM)

2) Support mode for predefined SDU size (SMpSDU)

Determination of the Iu UP protocol instance mode of operation is a CN decision taken at RAB establishment based on e.g. the RAB characteristics. It is signalled in the Radio Network layer control plane at RAB asiggnment and relocation for each RAB. It is internally indicated to the Iu UP protocol layer at user plane establishment.

The choice of a mode is bound to the nature of the associated RAB and cannot be changed unless the RAB is changed.

## 4.2.2 Transparent mode (TrM)

The transparent mode is intended for those RABs that do not require any particular feature from the Iu UP protocol other than transfer of user data.

The following figure illustrates the transparent mode of operation of the Iu UP protocol layer:

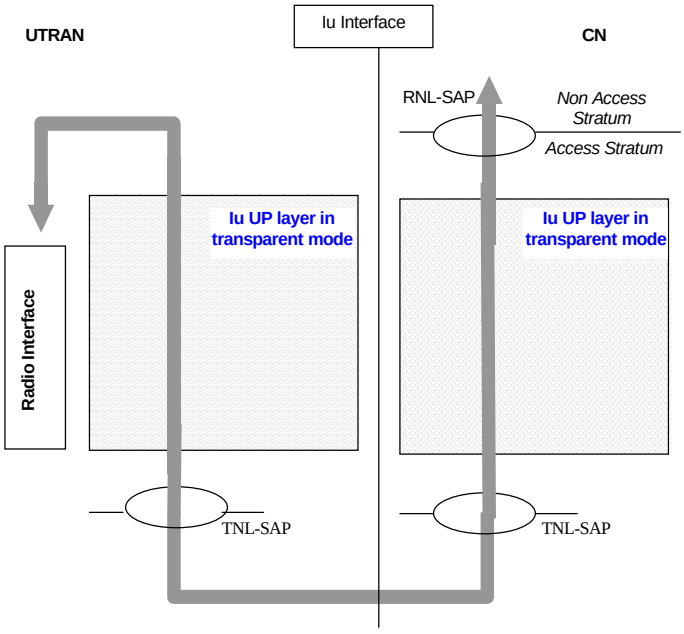



**Figure 2: Iu UP protocol layer in transparent occurrence over Iu interface**

In this mode, the Iu UP protocol instance does not perform any Iu UP protocol information exchange with its peer over the Iu interface: no Iu frame is sent. The Iu UP protocol layer is crossed through by PDUs being exchnaged between upper layers and transport network layer.

For instance, the transfer of GTP-U PDUs ~~or Non Transparent CS data~~ could utilise the transparent mode of the Iu UP protocol.

## 4.2.3 Support mode

The support modes are intended for those RABs that do require particular features from the Iu UP protocol in addition to transfer of user data. When operating in a support mode, the peer Iu UP protocol instances exchange Iu UP frames

whereas in transparent mode, no Iu UP frames are generated.

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

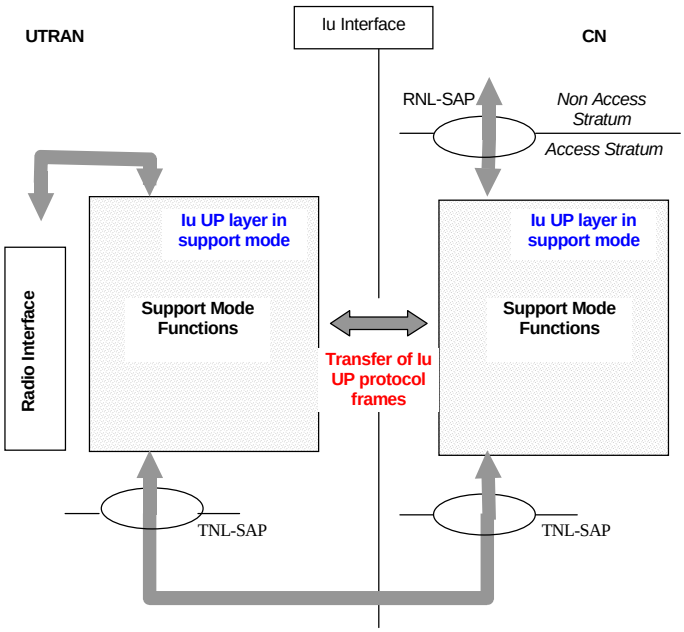



**Figure 3: Iu UP protocol layer in support mode occurrence over Iu interface**

Some RABs requesting Iu UP protocol support, constrain the Iu UP protocol and possibly the radio interface protocols in specific ways. For instance, certain RABs can have variable predefined rates while other RABs can have totally variable rates within a range, as signalled in the RNL control plane.

The Iu UP support and the usage of the radio interface protocols for these kinds of RABs differ significantly. Consequently, the Iu UP support mode is prepared to support variations.

The only suport mode defined here is the:

1) Support mode for predefined SDU size (SMpSDU).

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

The choice of a support mode is bound to the nature of the associated RAB and cannot be changed unless the RAB is changed.

### 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 downlink rates among the rates that can be controled by UTRAN. The set of rates is represented by ~~an~~ RFCI ~~bitmap~~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 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 Abnormal Event (TBD):** 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 Iu Downlink Rate Control procedure

### 6.5.4.1 Successful operation

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

The rate control procedure over Iu UP is controlled by the entity controlling the rate control over UTRAN i.e. SRNC.

The Iu downlink 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 ~~RFCI bitmap~~Rate control frame payload ~~of~~ containing the downlink permitted rates. 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 trasnfer 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 downlink 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 rate control information in a Iu-UP-Status indication primitive.

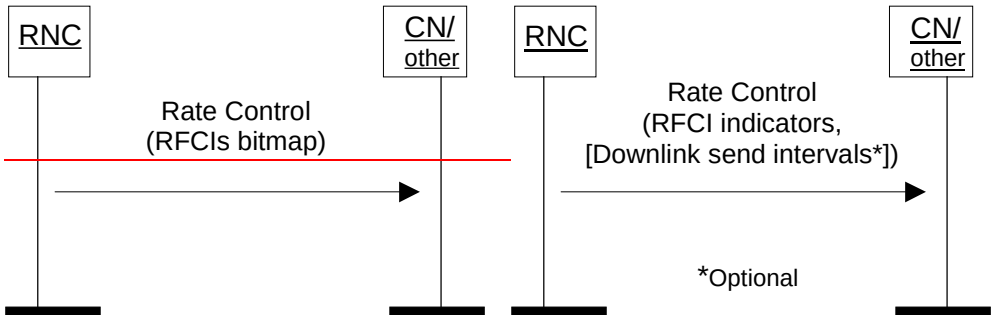



**Figure 10: Successful Rate Control**

### 6.5.4.2 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 downlink rate is outside the set of permitted downlink rate), the Iu UP shall retrigger a rate control procedure. If after "m" repetitions, the error situation persists, the Iu UP informs the upper layers with an Iu-UP-Status-Indication indicating Abnormal event.

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

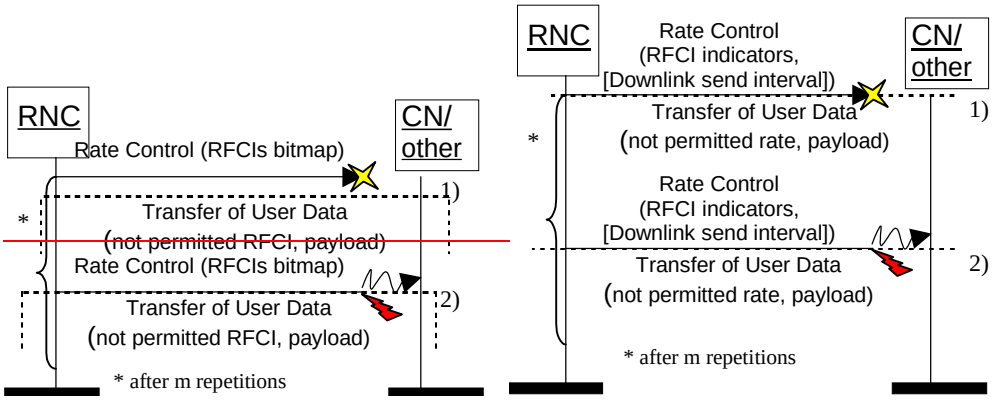



**Figure 11: Unsuccessful Transfers of rate control: 1) Frame loss 2) Corrupted Frame**

### 6.6.1.3.4 Procedures Coding

#### 6.6.1.3.4.1 Initialization

The figure below specifies how the initialization procedure is coded.

| Bits | | | | | | | | Number of Octets | |
|---|---|---|---|---|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| PDU Type (=15) | | | | Ack/Nack | | PDU Type 15 Frame Number | | 1 | Frame Control Part |
| Spare | | | | Procedure Indicator (=0) | | | | 1 | |
| PDU type 15 payload CRC | | PDU type15 header CRC | | | | | | 2 | Frame Checksum part |
| PDU type15 payload CRC | | | | | | | | | |
| Spare | | | | Number of subflows (N) | | | Chain ind | 1 | Frame payload part |
| Spare | LI | 1st RFCI | | | | | | 1 | |
| Data of length of subflow 1 for RFCI | | | | | | | | 1 or 2 (dep. LI) | |
| Data of length of subflow 2 to N for RFCI | | | | | | | | (N-1)x(1 or 2) | |
| Spare | LI | 2nd RFCI | | | | | | 1 | |
| Data of length of subflow 1 for RFCI | | | | | | | | 1 or 2 (dep. LI) | |
| Data of length of subflow 2 to N for RFCI | | | | | | | | (N-1)x(1 or 2) | |
| … | | | | | | | | | |

**Figure 18: Iu UP PDU Type 15 used for Initialization**

#### 6.6.1.3.4.2 Rate Control

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

| 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 |
| Spare | | | | Procedure Indicator (=1) | | | | 1 | |
| Header CRC | | | | | | Payload CRC | | 1 | Frame Checksum Part |
| Payload CRC | | | | | | | | 1 | |
| Spare | Rate control type (=0) | Number of RFCIs (N) | | | | | | 1 | Frame payload part |
| RFCI 0 Ind. | RFCI 1 Ind | ... | RFCI N-1 Ind | | | | | 0–N/8 | |

**Figure 19: 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~~ | | | | ~~Ack/Nack~~ | | ~~PDU Type 15 Frame Number~~ | | ~~1~~ | ~~Frame Control Part~~ |
| ~~Spare~~ | | | | ~~Procedure Indicator~~ | | | | ~~1~~ | |
| ~~PDU type 15 payload CRC~~ | | | | ~~PDU type 15 header CRC~~ | | | | ~~1~~ | ~~Frame Checksum Part~~ |
| ~~PDU type 15 payload CRC~~ | | | | | | | | ~~1~~ | |
| ~~Spare~~ | | | ~~Number of RFCIs Indicator (N)~~ | | | | | ~~0 n~~ | ~~Frame payload part~~ |
| ~~Padding when needed (0)~~ | | | ~~RFCI N-1 Ind~~ | ~~...~~ | ~~RFCI 2 Ind~~ | ~~RFCI 1 Ind~~ | ~~RFCI0 Ind~~ | | |

| 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 |
| Spare | | | | 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/2 | |
| ... | ... | | | RFCI N-2 Ind | Downlink send interval (for RFCI N-2) | | | | |
| RFCI N-1 Ind. | Downlink send interval (for RFCI N-1) | | | | | | | | |

**Figure 19: Iu UP PDU Type ~~15~~14 Format used for Rate Control**

### 6.6.2.15 Number of RFCIs Indicators

Number of RFCI Indicators indicates the number of RFCI Indicators present in the control procedure frame.

Number of RFCI Indicators can range from 0 to 63.

### 6.6.2.16 RFCI Indicator

RFCI Indicator points to an RFCI number e.g. RFCI Indicator 0 points to RFCI 0, RFCI Indicator 1 points to RFCI 1, etc.

RFCI Indicator set to 0 indicates that the corresponding RFCI number is punctured out of the RFCI set.

RFCI Indicator set to 1 indicates that the corresponding RFCI number remains in the RFCI set.

### 6.6.2.17 Frame Quality Classification (FQC)

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'.

The meaning of the FQC field is specified below:

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

### 6.6.2.18 Cause Indicator

Cause field is used to indicate the reason for the control procedure execution.

The meaning of the Cause Indicator is given in the table below.

| Value | Definition |
|---|---|
| 0 | Reserved |
| 1 | Frame Format Error |
| 2-15 | Spare |
| 16 | Unknown field |
| 17-31 | Spare |
| 32-255 | Spare |

### 6.6.2.19 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

### 6.6.2.20 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.

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

**Field length:** 1 bit

#### 6.6.2.21 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 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.

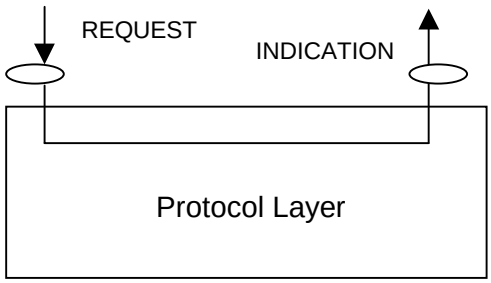
## 6.7 Handling of unknown, unforeseen and erroneous protocol data

TBD.

# 7 Communication Primitives for the Iu UP protocol layer

## 7.1 Modelling Principle

The principle illustrated by the figure below is used for modelling the primitives towards the protocol layer:




## 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 | Abnormal Event (TBD) |
| | | | Initialisation |
| | | | RFCI ~~bitmap~~indicators, Downlink send intervals (when applicable) |
| | | | *Time Alignment (FFS Note 1)* |
| | Request | Iu-UP-Procedure-Control | Abnormal Event |
| | | | RFCI ~~bitmap~~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.

NOTE 1: Time Alignment is FFS.

### 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 downlink rate(s) over Iu. The rate control information consists of ~~the~~ RFCI ~~bitmap~~indicators and (when applicable) downlink send intervals.

### 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 downlink direction over Iu. The set of permitted rate(s) is represented by ~~the~~ RFCI ~~bitmap~~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.

### 7.2.6 Iu-UP-UNIT-DATA-REQUEST

This primitive is used as a request from the upper layer to send an Iu UP payloadon 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.