TSG-RAN Meeting #15
Cheju, Korea, 5 - 8 March 2002

TSGRP#15(02) 0180

Title: **Agreed CRs to TS 25.415**

Source: **TSG-RAN WG3**

Agenda item: **7.3.3/7.3.4**

RP_Num	Tdoc_Num	Specification	CR_Num	Revision_Num	3G_Release	CR_Subject	CR_Category	Cur_Ver_Num	Workitem
RP-020180	R3-020368	25.415	092		Rel-4	Inclusion and extension of requirements removed from RANAP spec.	F	4.3.0	TEI
RP-020180	R3-020369	25.415	093		Rel-4	Support mode for predefined SDU sizes version 1 in REL4	F	4.3.0	TEI
RP-020180	R3-020512	25.415	094		Rel-4	Time based frame numbering	F	4.3.0	TEI
RP-020180	R3-020609	25.415	102		Rel-4	Removal of mechanism that violates Core Network principles	F	4.3.0	TEI

3GPP TSG-RAN WG3 Meeting #27
Orlando, USA, February 18th – 22nd, 2002

R3-020368

CR-Form-v5

CHANGE REQUEST

⌘ **25.415** **CR** **092** ⌘ **rev** **-** ⌘ Current version: **4.3.0** ⌘

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

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network **X** Core Network **X**

Title:	⌘	Inclusion and extension of requirements removed from RANAP spec.
Source:	⌘	R-WG3
Work item code:	⌘	TEI
Date:	⌘	2002-02-12
Category:	⌘	**F**
Release:	⌘	REL-4

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	Some user plane related requirements need to be moved from 25.413 to 25.415 and information when to initialise all RAB subflow combinations needs to be added.
Summary of change:	⌘	User plane related requirements removed from 25.413 are added to 25.415 and information when to initialise all RAB subflow combinations is added. Impact assessment towards the previous version of the specification (same release): This CR has isolated impact towards the previous version of the specification (same release). This CR has an impact under functional point of view. The impact can be considered isolated because the requirement only concerns the initialisation function.
Consequences if not approved:	⌘	User plane related requirements have to remain in RANAP and the requirements on user plane initialisation remains unclear.

Clauses affected:	⌘	6.5.2.1		
Other specs affected:	⌘	**X** Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	25.413 v4.3.0 CR408
Other comments:	⌘			

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

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

6.5.2 Initialisation procedure

6.5.2.1 Successful operation

This procedure is mandatory for RABs using the support mode for predefined SDU size. The purpose of the Initialisation procedure is to configure both termination points of the Iu UP with RAB Subflows Combinations, RFCIs, and associated RAB Sub Flows SDU sizes necessary to be supported during the transfer of user data phase. Additional parameters may also be passed, such as the Inter PDU Timing Interval (IPTI) information.

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

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

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

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

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

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

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

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

The first RAB sub-Flow Combination proposed in the list of RAB sub-Flow 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 RAB sub-Flow Combinations for rates below the guaranteed bit rate, e.g. SID or "NO_DATA" (defined by the length of all subflows set to "0") shall not be used as the first RFC in the proposed list of RAB sub-Flow Combinations.

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

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

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

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

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

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

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

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

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

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

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

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

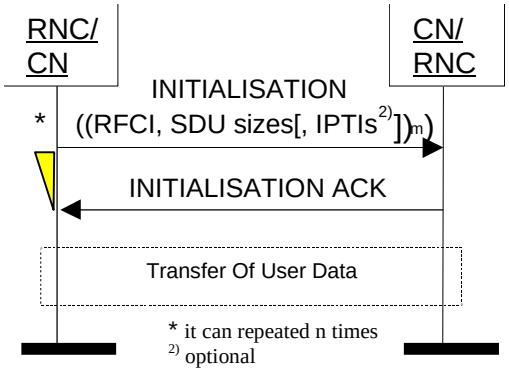

Figure 9: Successful Initialisation of Iu UP for m RFCIs

6.5.2.2 Unsuccessful operation

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

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

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

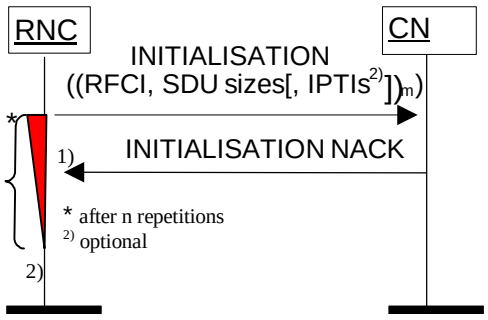

Figure 10: Unsuccessful initialisation of Iu UP: 1) N_{INIT} negative acknowledgement or 2) N_{INIT} expiries of timer T_{INIT}

3GPP TSG-RAN WG3 Meeting #27
Orlando, USA, February 18th – 22nd, 2002

Tdoc R3-020369

CR-Form-v5

CHANGE REQUEST

⌘ **25.415** **CR** **093** ⌘ **rev** **-** ⌘ Current version: **4.3.0** ⌘

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

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network **X** Core Network **X**

Title:	⌘	Support mode for predefined SDU sizes version 1 in REL4
Source:	⌘	R-WG3
Work item code:	⌘	TEI
Date:	⌘	2002-01-12
Category:	⌘	**F**
Release:	⌘	REL-4

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	The REL-4 Iu UP contains only version 2 of Support mode for predefined SDU sizes. This makes it possible for a REL-4 UTRAN to be compliant with the REL-4 specification even if UTRAN is not implementing version 1 of support mode for predefined SDU sizes. But for a release 4 implementation to work with a CN asking for only version 1 of support mode for predefined SDU sizes (e.g. rel 99 CN) also support mode for predefined SDU sizes version 1 has to be implemented by UTRAN.
Summary of change:		Addition of version 1 of support mode to REL-4. Impact assessment towards the previous version of the specification (same release): This CR has isolated impact towards the previous version of the specification (same release). This CR has an impact under protocol and functional point of view for implementations not supporting version 1 of support mode for predefined SDU sizes. The impact can be considered isolated because the change does not affect any functionality already existing in the previous version of the specification (same release).
Consequences if not approved:	⌘	Interworking with CN and UTRAN of different releases (REL-4 and REL-99) not possible.

Clauses affected:	⌘	4.2.2, 4.2.3
Other specs affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications
	⌘	

Other comments:	⌘

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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.

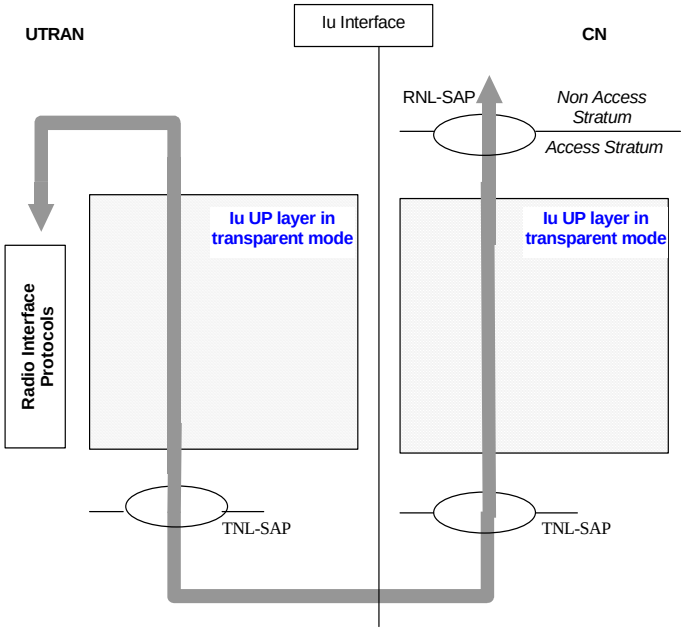

Figure 2: Iu UP protocol layer in transparent occurrence over Iu interface

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 exchanged between upper layers and transport network layer.

For instance, the transfer of GTP-U PDUs could utilise the transparent mode of the Iu UP protocol.

This release of the specification defines Transparent mode version 1, the same as in the release 99 specification.

4.2.3 Support mode

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

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

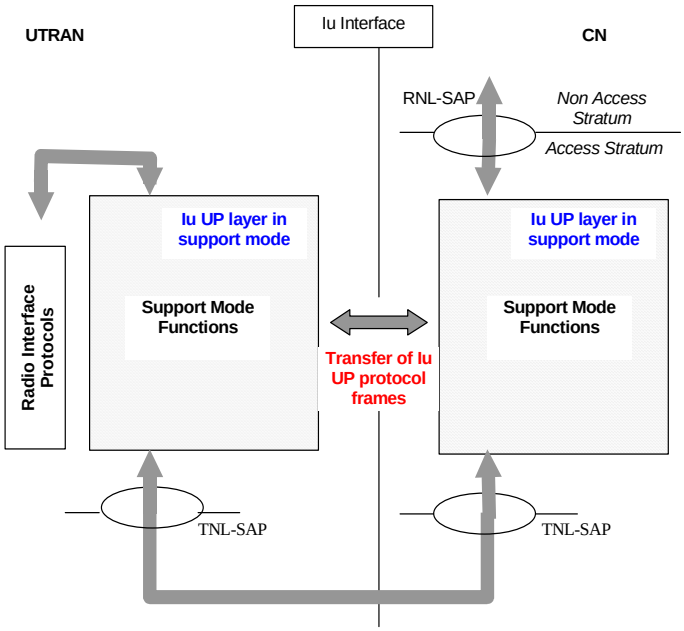

Figure 3: Iu UP protocol layer in support mode occurrence over Iu interface

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

The Iu UP support mode is prepared to support variations.

The only support mode defined here is the:

- Support mode for predefined SDU size (SMpSDU).

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

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

3GPP TSG-RAN WG3 Meeting #27 ***R3-020512***
Orlando, USA, 18th February– February 22th 2002

CR-Form-v3

CHANGE REQUEST

⌘ **25.415** **CR** **094** ⌘ rev ⌘ Current version: **4.3.0** ⌘

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

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network **X** Core Network X

Title:	⌘	Time Based Frame Numbering
Source:	⌘	R-WG3
Work item code:	⌘	TEI
Date:	⌘	18 February 02
Category:	⌘	**F**
Release:	⌘	REL-4

Use one of the following categories:
F *(essential correction)*
A *(corresponds to a correction in an earlier release)*
B *(Addition of feature),*
C *(Functional modification of feature)*
D *(Editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

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R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change: ⌘

In RAN3#23 it was agreed that the proper timing resolution for time based frame numbering clarification in uplink was valid and a CR shall be presented.

In Ran3#24, it was agreed to have the clarification that two packets consecutive at the source could not have the same frame number and that one way of doing this was to have the frame number set according to the time of the source of the signal (e.g. UE in uplink, TRAU time in downlink) instead of the timing of the Iu UP clock which can desynchronised from the nodeB clock. Other solutions were also called for investigation.

This CR proposes to standardize this functionality (i.e. have the frame number set according to the time of the source) since this is an essential correction and in the meantime no other solutions have been proposed. This is necessary to avoid any interworking issue in multi-vendor scenario where an RNC from one vendor would not implement this essential correction, the peer CN node from another vendor could not know which one of the two frames with same number it must use or which occurrence is the frame after a silence period. Also this improvement is called for release 4 onwards.

Summary of change: ⌘

The time based synchronisation option is made mandatory in release 4 in order to avoid the issues in the IOT multivendor calls.

Impact assessment towards the previous version of the specification (same release):

This CR has isolated impact with the previous version of the specification (same release) since the RNC shall with this correction base the frame numbering on the timing of the source.

This CR has an impact under functional point of view for implementations not behaving like indicated in the CR.
The impact can be considered isolated because the change affects only the function frame numbering.

Consequences if not approved:	⌘	Two uplink successive frames could still result in being sent on the Iu with the same frame number if one RNC does not implement the correct time-based numbering option resulting in degraded channel quality. Also, an ambiguity exists for the correct timing in uplink after a silence period.

Clauses affected:	⌘	6.6.3.3		
Other specs affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	
Other comments:	⌘			

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

6.6.3.3 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 set in the PDU header is incremented by one (modulo 16) at each new ITI. The Frame number set in the PDU header shall ~~may e.g~~. be based on the timing of the source. The source is where the original payload was created. Two packets that were consecutive at the source shall not have the same frame number assigned. In case the Frame number relates to sent Iu UP PDU 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.

In the case the Frame Number relates to sent Iu UP PDU, the following applies:

- Frame loss is when an incoming PDU frame has a frame number that is equal to (previous PDU frame number + 2) modulo [max. PDU frame number + 1]. This indicates that one and only one PDU frame has been lost.

- Unexpected frame number is when an incoming PDU does not have the expected frame number and is not considered as a Frame Loss.

Value range: {0-15}.

Field length: 4 bits.

3GPP TSG-RAN3 Meeting #27
Orlando, Florida, USA, 18 – 22 February 2002

Tdoc R3-020609

CR-Form-v5

CHANGE REQUEST

⌘ **25.415** **CR** **102** ⌘ **rev** **-** ⌘ Current version: **4.3.0** ⌘

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Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network **X** Core Network **X**

Title:	⌘	Removal of mechanism that violates Core Network principles
Source:	⌘	R-WG3
Work item code:	⌘	TEI
Date:	⌘	2002-02-19
Category:	⌘	**F**
Release:	⌘	REL-4

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
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Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	At RAN3#21 CR 063 (R3-011549) included a mechanism in 25.415 where the MGW used the reception of the first 'RATE CONTROL' control frame from the target RNC as an indication for switching the user plane from source RNC to target RNC. At RAN3#27 a liaison from CN4 clarified that this mechanism violates the Core Network principle of the MSC server (Media Gateway Controller) controlling the Media Gateway and this violation of CN principles could not be accepted by CN4. It was agreed by RAN3 to remove the mechanism.
Summary of change:	⌘	The text "*Further, the reception of the first RATE CONTROL control frame from the target RNC, which indicates the CN the successful relocation execution on user plane level, should cause the CN to switch the user plane from the source RNC to the target RNC*" is removed since it violates the CN principles. Impact assessment towards the previous version of the specification (same release): This CR has no impact towards the previous version of the specification (same release).
Consequences if not approved:	⌘	TS 25.415 will define a CN behaviour that violates the CN principles.

Clauses affected:	⌘	6.5.3.1
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications

	☐ O&M Specifications	
Other comments:	⌘	

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

6.5.3 Iu Rate Control procedure

6.5.3.1 Successful operation

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

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

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

The procedure can be signalled at any time when Transfer of User Data procedure is not suspended by another Procedure Control function. When the user plane was initiated due to SRNS relocation reasons no rate control shall be signalled before the reception of the relocation execution trigger (see [3]). At the reception of the relocation execution trigger the RNC shall start the Iu Rate Control procedure. This enables both TrFO partners to exchange current maximum rates and proceed user data transport based on latest rate decisions. ~~Further, the reception of the first RATE CONTROL control frame from the target RNC, which indicates the CN the successful relocation execution on user plane level, should cause the CN to switch the user plane from the source RNC to the target RNC.~~

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

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

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

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

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

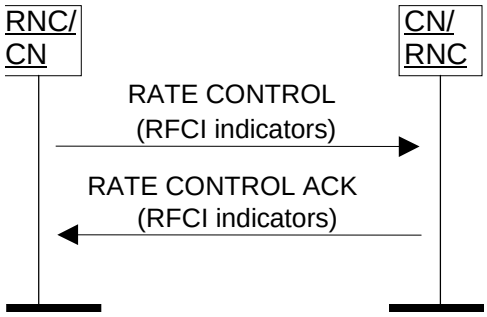

Figure 11: Successful Rate Control

Figure 12: Void