TSG-RAN Meeting #11
Palm Springs, CA, U.S.A., 13-16 March 2001

RP-010158

Title: **Agreed CRs to WI "TRFO-OOBTC-UTRAN"**

Source: **TSG-RAN WG3**

Agenda item: **5.3.3**

Tdoc_Num	Specification	CR_Num	Revision_Num	CR_Subject	CR_Category	WG_Status	Cur_Ver_Num	New_Ver_Num	Workitem
R3-010981	25.415	057		RNL-SAP Primitives necessary for TrFO	B	agreed	3.5.0	4.0.0	TRFO-OOBTC-UTRAN
R3-010982	25.415	058		TrFO impacts on Rate Control	B	agreed	3.5.0	4.0.0	TRFO-OOBTC-UTRAN
R3-010983	25.415	059		General changes for WI TrFO	B	agreed	3.5.0	4.0.0	TRFO-OOBTC-UTRAN
R3-010984	25.415	060		TrFO Impacts on IuUP initialisation	B	agreed	3.5.0	4.0.0	TRFO-OOBTC-UTRAN
R3-010980	25.413	271		Changes on RANAP due to WI TrFO	B	agreed	3.4.0	4.0.0	TRFO-OOBTC-UTRAN

3GPP TSG-RAN WG3 Meeting #19 ***R3-010980***
Cardiff, UK, 26th February – 2nd March 2001

CR-Form-v3

CHANGE REQUEST

⌘ **25.413** **CR** **271** ⌘ rev **-** ⌘ Current version: **3.4.0** ⌘

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

Title:	⌘	Changes on RANAP due to WI TrFO
Source:	⌘	R-WG3
Work item code:	⌘	TrFO
Date:	⌘	2001-02-14
Category:	⌘	**B**
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.

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:	⌘	If the CN requests the RNC to execute the user plane initialisation for the *support mode for predefined SDU sizes* it is essential for TrFO, that the RNC is not allowed to puncture out any subflow for the user plane initialisation. Further it is essential for the relocation procedure that the UP initialisation takes part before reporting the successful outcome of the relocation resource allocation. Similar text is already existing for the RAB Assignment procedure, which have been adapted and reused for the Relocation Resource allocation chapter.
Summary of change:	⌘	RANAP – TrFO impacts
Consequences if not approved:	⌘	

Clauses affected:	⌘	8.2.2, 8.7.2		
Other specs affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	
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://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 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.

8.2.2 Successful Operation

***** procedural text partially omitted *****

UTRAN shall report the outcome of a specific RAB to establish or modify only after the transport network control plane signalling, which is needed for RAB establishment or modification, has been executed. The transport network control plane signalling shall use the *Transport Layer Address* IE and *Iu Transport Association* IE. At a RAB modification, it is up to the RNC to decide if any transport network control plane signalling shall be performed for the possibly included *Transport Layer Address* IE and *Iu Transport Association* IE or if the already existing transport bearer shall be used. If the RNC decides to establish a new transport bearer, then the switch over to this new transport bearer shall be done immediately after transport bearer establishment and initialisation of the user plane mode.

Before reporting the successful outcome of a specific RAB to establish or modify, the RNC shall have executed the initialisation of the user plane mode as requested by the CN in the *User Plane Mode* IE. If the RNC is requested to execute the user plane initialisation for the *User Plane Mode* "support mode for predefined SDU sizes", it shall initialise all RAB subflow combinations on Iu as indicated in the *RAB parameters* IE. If not all of the indicated RAB subflow combinations can be initialised the RAB Assignment fails with the cause value "RNC unable to establish all RFCs". The~~is~~ user plane initialisation is described in ref.[6].

8.7.2 Successful Operation

***** procedural text partially omitted *****

If the *NAS Synchronisation Indicator* IE is contained in the RELOCATION REQUEST message, the target RNC shall pass it to the source RNC within the *RRC Container* IE contained in the *Target RNC to Source RNC Transparent Container* IE.

Transmission and reception of RELOCATION REQUEST ACKNOWLEDGE message terminates the procedure in the UTRAN and the CN respectively.

Before reporting the successful outcome of the Relocation Resource allocation procedure, the RNC shall have executed the initialisation of the user plane mode as requested by the CN in the *User Plane Mode* IE. If the RNC is requested to execute the user plane initialisation for the *User Plane Mode* "support mode for predefined SDU sizes", it shall initialise all RAB subflow combinations on Iu as indicated in the *RAB parameters* IE. If not all of the indicated RAB subflow combinations can be initialised the RAB Assignment fails with the cause value "RNC unable to establish all RFCs". The user plane initialisation is described in ref.[6].

9.2.1.4 Cause

The purpose of the *Cause* IE is to indicate the reason for a particular event for the RANAP protocol.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Choice **Cause**				
>Radio Network Layer Cause			INTEGER (RAB pre-empted(1), Trelocoverall Expiry(2), Trelocprep Expiry(3), Treloccomplete Expiry(4), Tqueing Expiry(5), Relocation Triggered(6), Unable to Establish During Relocation(8), Unknown Target RNC(9), Relocation Cancelled(10), Successful Relocation(11), Requested Ciphering and/or Integrity Protection Algorithms not Supported(12), Change of Ciphering and/or Integrity Protection is not supported(13), Failure in the Radio Interface Procedure(14), Release due to UTRAN Generated Reason(15), User Inactivity(16), Time Critical Relocation(17), Requested Traffic Class not Available(18), Invalid RAB Parameters Value(19), Requested	Value range is 1 – 64.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Choice **Cause**				
			Maximum Bit Rate not Available(20), Requested Maximum Bit Rate for DL not Available(33), Requested Maximum Bit Rate for UL not Available(34), Requested Guaranteed Bit Rate not Available(21), Requested Guaranteed Bit Rate for DL not Available(35), Requested Guaranteed Bit Rate for UL not Available(36), Requested Transfer Delay not Achievable(22), Invalid RAB Parameters Combination(23), Condition Violation for SDU Parameters(24), Condition Violation for Traffic Handling Priority(25), Condition Violation for Guaranteed Bit Rate(26), User Plane Versions not Supported(27), Iu UP Failure(28), TRELOCalloc Expiry (7), Relocation Failure in Target CN/RNC or Target System (29), Invalid RAB ID(30),	

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Choice **Cause**				
			No remaining RAB(31), Interaction with other procedure(32), Repeated Integrity Checking Failure(37), Requested Report Type not supported(38), Request superseded(39), Release due to UE generated signalling connection release(40), Resource Optimisation Relocation(41), Requested Information Not Available(42), Relocation desirable for radio reasons (43), Relocation not supported in Target RNC or Target system(44), Directed Retry (45), Radio Connection With UE Lost(46) …, RNC unable to establish all RFCs (47))	

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Choice **Cause**				
>Transport Layer Cause			INTEGER (Signalling Transport Resource Failure(65), Iu Transport Connection Failed to Establish(66), …)	Value range is 65 – 80.
>NAS Cause			INTEGER (User Restriction Start Indication(81), User Restriction End Indication(82), Normal Release(83), …)	Value range is 81 – 96.
>Protocol Cause			INTEGER (Transfer Syntax Error(97), Semantic Error (98), Message not compatible with receiver state (99), Abstract Syntax Error (Reject) (100), Abstract Syntax Error (Ignore and Notify) (101), Abstract Syntax Error (Falsely Constructed Message) (102), …)	Value range is 97 – 112.
>Miscellaneous Cause			INTEGER (O&M Intervention(113), No Resource Available(114), Unspecified Failure(115), Network Optimisation(116), …)	Value range is 113 – 128.
>Non-standard Cause			INTEGER	Value range is 129 – 256.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
Choice **Cause**				
			(…)	

The meaning of the different cause values is described in the following table. In general, "not supported" cause values indicate that the concerning capability is missing. On the other hand, "not available" cause values indicate that the concerning capability is present, but insufficient resources were available to perform the requested action.

Radio Network Layer cause	Meaning
Change Of Ciphering And/Or Integrity Protection Is Not Supported	The UTRAN and/or the UE are/is unable to support the requested change of ciphering and/or integrity protection algorithms.
Condition Violation For Guaranteed Bit Rate	The action was not performed due to condition violation for guaranteed bit rate.
Condition Violation For SDU Parameters	The action was not performed due to condition violation for SDU parameters.
Condition Violation For Traffic Handling Priority	The action was not performed due to condition violation for traffic handling priority.
Directed Retry	The reason for action is Directed Retry
Failure In The Radio Interface Procedure	Radio interface procedure has failed.
Interaction With Other Procedure	Relocation was cancelled due to interaction with other procedure.
Invalid RAB ID	The action failed because the RAB ID is unknown in the RNC.
Invalid RAB Parameters Combination	The action failed due to invalid RAB parameters combination.
Invalid RAB Parameters Value	The action failed due to invalid RAB parameters value.
Iu UP Failure	The action failed due to Iu UP failure.
No remaining RAB	The reason for the action is no remaining RAB.
RAB Pre-empted	The reason for the action is that RAB is pre-empted.
Radio Connection With UE Lost	The action is requested due to losing radio connection to the UE
Release Due To UE Generated Signalling Connection Release	Release requested due to UE generated signalling connection release.
Release Due To UTRAN Generated Reason	Release is initiated due to UTRAN generated reason.
Relocation Cancelled	The reason for the action is relocation cancellation.
Relocation Desirable for Radio Reasons	The reason for requesting relocation is radio related.
Relocation Failure In Target CN/RNC Or Target System	Relocation failed due to a failure in target CN/RNC or target system.
Relocation Not Supported In Target RNC Or Target System	Relocation failed because relocation was not supported in target RNC or target system.
Relocation Triggered	The action failed due to relocation.
Repeated Integrity Checking Failure	The action is requested due to repeated failure in integrity checking.
Request Superseded	The action failed because there was a second request on the same RAB.
Requested Ciphering And/Or Integrity Protection Algorithms Not Supported	The UTRAN or the UE is unable to support the requested ciphering and/or integrity protection algorithms.
Requested Guaranteed Bit Rate For DL Not Available	The action failed because requested guaranteed bit rate for DL is not available.
Requested Guaranteed Bit Rate For UL Not Available	The action failed because requested guaranteed bit rate for UL is not available.
Requested Guaranteed Bit Rate Not Available	The action failed because requested guaranteed bit rate is not available.
Requested Information Not Available	The action failed because requested information is not available.
Requested Maximum Bit Rate For DL Not Available	The action failed because requested maximum bit rate for DL is not available.
Requested Maximum Bit Rate For UL Not Available	The action failed because requested maximum bit rate for UL is not available.
Requested Maximum Bit Rate Not Available	The action failed because requested maximum bit rate is not available.
Requested Report Type Not Supported	The RNC is not supporting the requested location report type.
Requested Traffic Class Not Available	The action failed because requested traffic class is not available.
Requested Transfer Delay Not Achievable	The action failed because requested transfer delay is not achievable.
Resource Optimisation Relocation	The reason for requesting relocation is resource optimisation.
Successful Relocation	The reason for the action is completion of successful relocation.
Time Critical Relocation	Relocation is requested for time critical reason.

$T_{QUEUING}$ Expiry	The action failed due to expiry of the timer $T_{QUEUING}$.
$T_{RELOCalloc}$ Expiry	Relocation Resource Allocation procedure failed due to expiry of the timer $T_{RELOCalloc}$.
$T_{RELOCcomplete}$ Expiry	The reason for the action is expiry of timer $T_{RELOCcomplete}$.
$T_{RELOCoverall}$ Expiry	The reason for the action is expiry of timer $T_{RELOCoverall}$.
$T_{RELOCprep}$ Expiry	Relocation Preparation procedure is cancelled when timer $T_{RELOCprep}$ expires.
Unable To Establish During Relocation	RAB failed to establish during relocation because it cannot be supported in the target RNC.
Unknown Target RNC	Relocation rejected because the target RNC is not known to the CN.
User Inactivity	The action is requested due to user inactivity.
User Plane Versions Not Supported	The action failed because requested user plane versions were not supported.
RNC unable to establish all RFCs	RNC couldn't establish all RAB subflow combinations indicated within the *RAB Parameters* IE.

Transport Layer cause	**Meaning**
Iu Transport Connection Failed to Establish	The action failed because the Iu Transport Network Layer connection could not be established.
Signalling Transport Resource Failure	Signalling transport resources have failed *(e.g. processor reset).*

NAS cause	**Meaning**
Normal Release	The release is normal.
User Restriction Start Indication	A location report is generated due to entering a classified area set by O&M.
User Restriction End Indication	A location report is generated due to leaving a classified area set by O&M.

Protocol cause	**Meaning**
Abstract Syntax Error (Reject)	The received message included an abstract syntax error and the concerning criticality indicated "reject".
Abstract Syntax Error (Ignore And Notify)	The received message included an abstract syntax error and the concerning criticality indicated "ignore and notify".
Abstract Syntax Error (Falsely Constructed Message)	The received message contained IEs or IE groups in wrong order or with too many occurrences.
Message Not Compatible With Receiver State	The received message was not compatible with the receiver state.
Semantic Error	The received message included a semantic error.
Transfer Syntax Error	The received message included a transfer syntax error.

Miscellaneous cause	**Meaning**
Network Optimisation	The action is performed for network optimisation.
No Resource Available	No requested resource is available.
O&M Intervention	The action is due to O&M intervention.
Unspecified Failure	Sent when none of the specified cause values applies.

9.3.4 Information Element Definitions

***** unchanged ASN.1 Code partly ommitted *****

```
-- C


Cause ::= CHOICE {
    radioNetwork            CauseRadioNetwork,
    transmissionNetwork     CauseTransmissionNetwork,
    nAS             CauseNAS,
    protocol            CauseProtocol,
    misc                CauseMisc,
    non-Standard            CauseNon-Standard,
    ...
}

CauseMisc ::= INTEGER {
    om-intervention (113),
    no-resource-available (114),
    unspecified-failure (115),
    network-optimisation (116)
} (113..128)

CauseNAS ::= INTEGER {
    user-restriction-start-indication (81),
    user-restriction-end-indication (82),
    normal-release (83)
} (81..96)

CauseProtocol ::= INTEGER {
    transfer-syntax-error (97),
    semantic-error (98),
    message-not-compatible-with-receiver-state (99),
    abstract-syntax-error-reject (100),
    abstract-syntax-error-ignore-and-notify (101),
    abstract-syntax-error-falsely-constructed-message (102)

} (97..112)

CauseRadioNetwork ::= INTEGER {
    rab-pre-empted (1),
    trelocoverall-expiry (2),
    trelocprep-expiry (3),
    treloccomplete-expiry (4),
    tqueing-expiry (5),
    relocation-triggered (6),
    trellocalloc-expiry(7),
    unable-to-establish-during-relocation (8),
    unknown-target-rnc (9),
    relocation-cancelled (10),
    successful-relocation (11),
    requested-ciphering-and-or-integrity-protection-algorithms-not-supported (12),
    change-of-ciphering-and-or-integrity-protection-is-not-supported (13),
    failure-in-the-radio-interface-procedure (14),
    release-due-to-utran-generated-reason (15),
    user-inactivity (16),
    time-critical-relocation (17),
    requested-traffic-class-not-available (18),
    invalid-rab-parameters-value (19),
    requested-maximum-bit-rate-not-available (20),
    requested-guaranteed-bit-rate-not-available (21),
    requested-transfer-delay-not-achievable (22),
    invalid-rab-parameters-combination (23),
    condition-violation-for-sdu-parameters (24),
    condition-violation-for-traffic-handling-priority (25),
    condition-violation-for-guaranteed-bit-rate (26),
    user-plane-versions-not-supported (27),
    iu-up-failure (28),
    relocation-failure-in-target-CN-RNC-or-target-system(29),
    invalid-RAB-ID (30),
    no-remaining-rab (31),
    interaction-with-other-procedure (32),
    requested-maximum-bit-rate-for-dl-not-available (33),
    requested-maximum-bit-rate-for-ul-not-available (34),
```

```
    requested-guaranteed-bit-rate-for-dl-not-available (35),
    requested-guaranteed-bit-rate-for-ul-not-available (36),
    repeated-integrity-checking-failure (37),
    requested-report-type-not-supported (38),
    request-superseded (39),
    release-due-to-UE-generated-signalling-connection-release (40),
    resource-optimisation-relocation (41),
    requested-information-not-available (42),
    relocation-desirable-for-radio-reasons (43),
    relocation-not-supported-in-target-RNC-or-target-system (44),
    directed-retry (45),
    radio-connection-with-UE-Lost (46),
    rNC-unable-to-establish-all-RFCs  (47)
} (1..64)

CauseNon-Standard ::= INTEGER (129..256)

CauseTransmissionNetwork ::= INTEGER {
    signalling-transport-resource-failure (65),
    iu-transport-connection-failed-to-establish (66)
} (65..80)


CriticalityDiagnostics ::= SEQUENCE {
    procedureCode           ProcedureCode           OPTIONAL,
    triggeringMessage       TriggeringMessage       OPTIONAL,
    procedureCriticality        Criticality         OPTIONAL,
    iEsCriticalityDiagnostics       CriticalityDiagnostics-IE-List  OPTIONAL,
    iE-Extensions           ProtocolExtensionContainer { {CriticalityDiagnostics-ExtIEs} } OPTIONAL,
    ...
}

CriticalityDiagnostics-ExtIEs RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

CriticalityDiagnostics-IE-List ::= SEQUENCE (SIZE (1..maxNrOfErrors)) OF
    SEQUENCE {
        iECriticality       Criticality,
        iE-ID               ProtocolIE-ID,
        repetitionNumber        RepetitionNumber        OPTIONAL,
        iE-Extensions           ProtocolExtensionContainer { {CriticalityDiagnostics-IE-List-ExtIEs}
} OPTIONAL,
        ...
    }

CriticalityDiagnostics-IE-List-ExtIEs RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

CGI ::= SEQUENCE {
    pLMN-ID             PLMN-ID,
    lAC             LAC,
    cI              CI,
    iE-Extensions           ProtocolExtensionContainer { {CGI-ExtIEs} } OPTIONAL
}

CGI-ExtIEs RANAP-PROTOCOL-EXTENSION ::= {
    ...
}

ChosenEncryptionAlgorithm       ::= EncryptionAlgorithm

ChosenIntegrityProtectionAlgorithm  ::= IntegrityProtectionAlgorithm

CI                  ::= OCTET STRING (SIZE (2))

ClassmarkInformation2           ::= OCTET STRING

ClassmarkInformation3           ::= OCTET STRING

CN-DomainIndicator ::= ENUMERATED {
    cs-domain,
    ps-domain
}
```

```
-- D
```

3GPP TSG-RAN WG3 Meeting #19 ***R3-010981***
Cardiff, UK, 26th February – 2nd March 2001

CR-Form-v3

CHANGE REQUEST

⌘ **25.415** **CR** **057** ⌘ rev **-** ⌘ Current version: **3.5.0** ⌘

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

Title:	⌘	RNL-SAP Primitives necessary for TrFO
Source:	⌘	R-WG3
Work item code:	⌘	TrFO
Date:	⌘	2001-02-14
Category:	⌘	**B**
Release:	⌘	REL-4

Use one of the following categories:
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A *(corresponds to a correction in an earlier release)*
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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:	⌘	In Rel4 cs CN a call context (note: context is meant to be H.248 specific) within a MGW with two terminations with Iu/Nb UP properties may exist. For TrFO it is essential that Iu/Nb UP framing information is allowed to be relayed between the UP protocol entities. This CR implements enhancements to TS 25.415 for the TrFO WI.
Summary of change:	⌘	RNL-SAP Primitives for TrFO
Consequences if not approved:	⌘	

Clauses affected:	⌘	7.2
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.

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 constrain 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	Subflow 1 SDU, ..., Subflow n SDU
		Iu-UP-control	RFCI
			FQC
			Frame Number
	Indication	Iu-UP-payload	Subflow 1 SDU, ..., Subflow n SDU
		Iu-UP-control	RFCI
			FQC
			Frame Number
Iu-UP-Status	Indication	Iu-UP-Procedure-Control	Error Cause, Error Distance
			complete protocol data for Initialisation, Rate Control, Time alignment and Error Event
			~~RFCI indicators, Downlink send intervals (when applicable)~~
			~~Time Alignment~~
	Request	Iu-UP-Procedure-Control	Error Cause
			complete protocol data for Initialisation, Rate Control, Time alignment and Error Event
			~~Time Alignment ACK/NACK~~
Iu-UP-UNIT-DATA	Request	Iu-UP-payload	
	Indication	Iu-UP-payload	

Primitive usage is function of the mode of operation of the Iu UP protocol. Table 2 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 the RAB subflow SDU(s) on the established transport connection. This primitive ~~also~~ includes the RFCI, the frame number and FQC information 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, the frame number and FQC information of the payload ~~information included in the primitive~~.

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

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

7.2.4 Iu-UP-STATUS-REQUEST

This primitive is used to pass procedural information from the upper layer ~~report that a fault has been detected~~.

~~This primitive is also used for acknowledgement and negative acknowledgement of the timing alignment.~~ This primitive shall contain the complete protocol data for the respective procedure.

7.2.5 Iu-UP-STATUS-INDICATION

This primitive is used to pass procedural information to the upper layer ~~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 shall contain the complete protocol data for the respective procedure.

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

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

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

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

7.2.6 Iu-UP-UNIT-DATA-REQUEST

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

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

7.2.7 Iu-UP-UNIT-DATA-INDICATION

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

3GPP TSG-RAN3 Meeting #19 **R3-010982**
Cardiff, UK, 25th February – 2nd March 2001

CR-Form-v3

CHANGE REQUEST

⌘ **25.415** **CR** **058** ⌘ rev **-** ⌘ Current version: **3.5.0** ⌘

*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:	⌘	TrFO impacts on Rate Control
Source:	⌘	R-WG3
Work item code:	⌘	TrFO
Date:	⌘	2001-02-15
Category:	⌘	**B**
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.

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:	⌘	This CR contains major changes for following rate control mechanisms necessary for TrFO (these mechanism are described on stage 2 level within 3GPP TS 23.153): Maximum Rate Control, Immediate Rate Control and Distributed Rate Control. It also contains the changes necessary for an acknowledged Rate Control procedure.
Summary of change:	⌘	TrFO impacts on Rate Control
Consequences if not approved:	⌘	

Clauses affected:	⌘	6.4.3, 6.5.3, 6.5.3.x (new), 6.6.2.3.4.2, 6.6.4, Annex X (new)
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
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://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 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.

6.4.3 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 maximum rate that is allowed to be sent downlink~~set of permitted rates~~ among the rates that can be controlled. The set of rates is represented by RFCI indicators and (when applicable) downlink send intervals. The function controlling this procedure interacts with functions outside of the Iu UP protocol layer.

- **Initialisation:** is the procedure which controls the exchange of initialisation information that is required for operation in support mode for predefined SDU size. Such information can contain the RFCI Set to be used until termination of the connection or until the next initialisation procedure. This procedure is also used for negotiating the version of the Iu UP Mode requested for the related RAB.

- **Time Alignment:** is the procedure that controls the timing of the downlink data to the RNC over Iu. The function controlling this procedure interacts with functions outside of the Iu UP protocol layer.

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

6.5.3 Iu Rate Control procedure

6.5.3.1 Successful operation

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

The rate control procedure over Iu UP is normally controlled by the entity controlling the rate control over UTRAN i.e. the SRNC. The Iu rate control procedure is invoked whenever the SRNC decides that the ~~set of~~ maximum rate~~downlink~~ permitted downlink~~rates~~ over Iu shall be modified, or when a rate control command is received from the CN. ~~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.~~ Within the context of TrFO the SRNC may also receive rate 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 is not suspended by another control procedure. 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. At the reception of the relocation execution trigger the RNC shall start the rate control procedure.

The Procedure control function upon request of upper layer prepares the Rate control frame payload containing the maximum~~permitted~~ rate~~s~~ of the reverse direction of the rate control frame. To align the Rate Control procedure with version 1 of the Iu UP protocol ~~T~~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 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 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 frame, the Iu UP protocol layer checks the consistency of the Iu UP frame as follows:

- the Frame handler checks the consistency of the frame header and associated CRC. If correct, the frame handler passes procedure control part to the procedure control functions;
- the procedure control functions check that the new permitted rate(s) are consistent with the RFCI set received at initialisation. They also verify that non-rate controllable rates are still permitted. If the whole rate control information is correct, the procedure control functions passes the rate control information to the NAS Data Streams specific functions;
- the NAS data streams specific functions forward to the upper layers the complete protocol data ~~rate control information~~ 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 including maximum rate control information. If the entity receiving the rate control frame is not the TrFO partner, it shall not acknowledge the rate control frame.

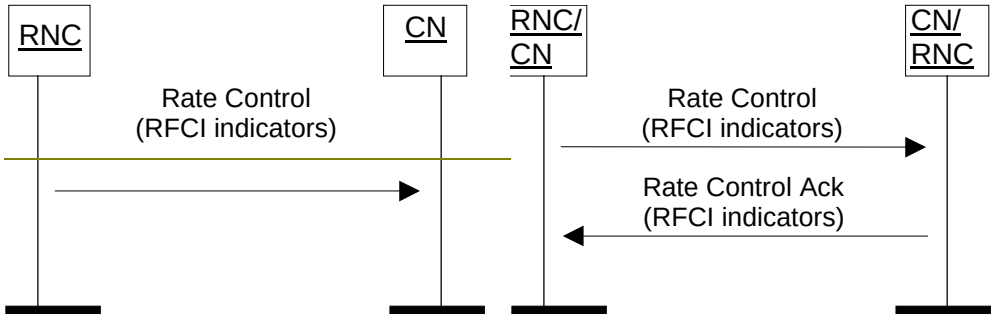

Figure 11: Successful Rate Control ~~sent from SRNC~~

6.5.3.2 Unsuccessful operation

If the Iu UP protocol layer receives a rate control frame that is badly formatted or corrupted, it shall ignore the rate control frame, but sent a negative rate control acknowledgement frame back (figure 13a).

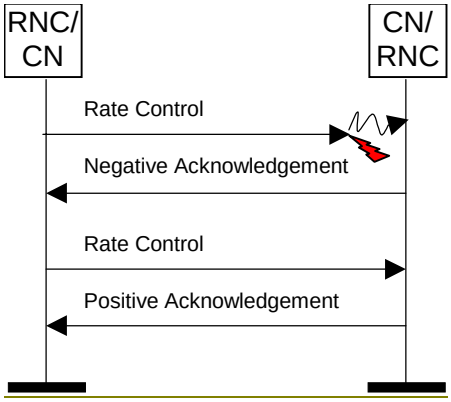

Figure 13a: Negative Acknowledgement received from the peer

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

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

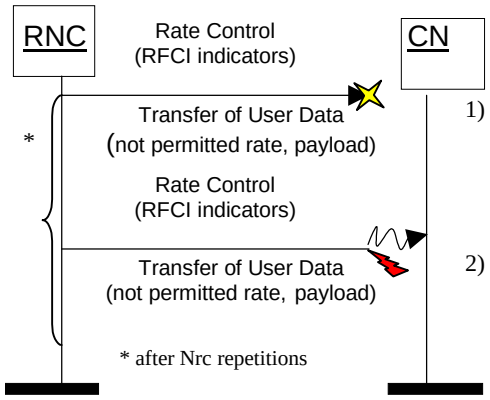

Figure 13: Unsuccessful Transfer of rate control from RNC: 1) Frame loss 2) Corrupted Frame

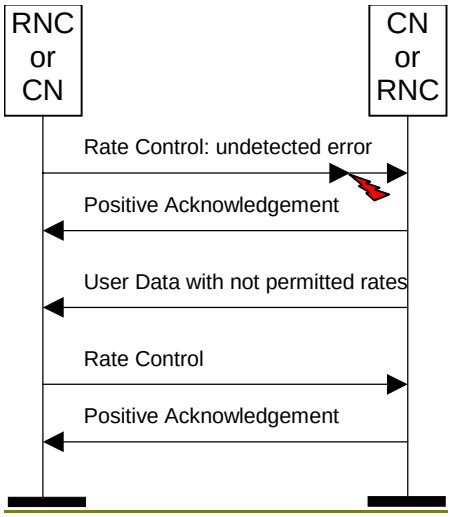

Figure 13b: Unsuccessful Transfer of rate control: undetected error

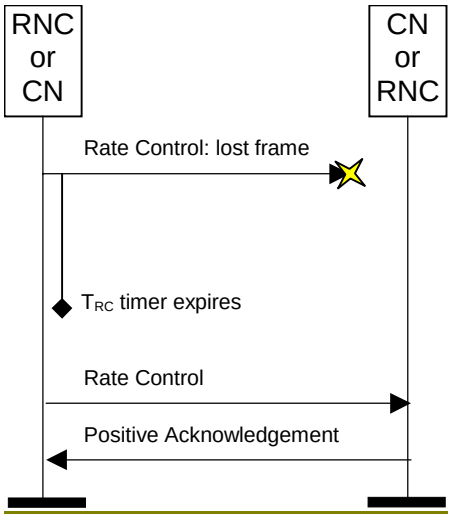

Figure 13c: Unsuccessful Transfer of rate control: lost rate control

6.5.3.x Frequent Rate Control Procedures

Typically a new rate control command should not be sent in the same direction before the previous rate control procedure was terminated successfully.

If for some reasons (e.g. frequently received rate control commands from the CN in a TFO connection to GSM) a rate control command has to be sent before the previous rate control procedure was terminated successfully, then the previous rate control procedure is defined as terminated successfully: the supervision timer T_{RC} shall be stopped and acknowledgement frames (positive or negative) for the previous rate command shall be ignored, i.e. only the most recent rate control procedure shall be active in the same direction.

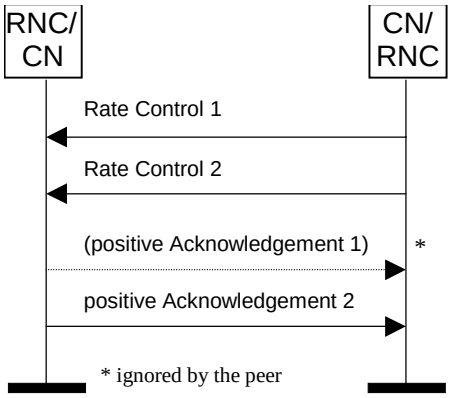

Figure 14: Frequent Rate Control: only most recent one is important

6.6.2.3.4.2 Rate Control

6.6.2.3.4.2.1 Rate Control procedure

Figure 25 specifies how the rate control procedure frame is coded.

Bits								Number of Octets	
7	6	5	4	3	2	1	0		
PDU Type (=14)				Ack/Nack (=0, i.e. Procedure)		PDU Type 14 Frame Number		1	Frame Control Part
Iu UP Mode version				Procedure Indicator (=1)				1	
Header CRC						Payload CRC		1	Frame Checksum Part
Payload CRC								1	
Spare				Number of RFCI Indicators (M)				1	Frame payload part
RFCI 0 Ind.	RFCI 1 Ind	…	RFCI M-1 Ind	Padding				0–n	
Spare extension								0-32	

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

6.6.2.3.4.2.2 Rate Control positive acknowledgement

Figure xx specifies how the rate control positive acknowledgement frame is coded.

Bits								Number of Octets	
7	6	5	4	3	2	1	0		
PDU Type (=14)				Ack/Nack (=1, i.e. Ack)		PDU Type 14 Frame Number		1	Frame Control Part
Iu UP Mode version				Procedure Indicator (indicating the procedure being positively acknowledged)				1	
Header CRC						Spare		1	Frame Checksum Part
Spare								1	
Spare		Number of RFCI Indicators (M)						1	
RFCI 0 Ind.	RFCI 1 Ind	...	RFCI M-1 Ind	Padding				0-n	
Spare extension								0 - (31-n)	Frame Payload part

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

6.6.4 Timers

T_{INIT}

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

T_{TA}

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

T_{RC}

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

Annex X (informative): Distributed rate decision within RNC

This annex contains information related to the distributed rate decision within an RNC (see also within [13])

The rate control procedure over Iu UP is normally controlled by the entity controlling the rate control over UTRAN i.e. the SRNC. The SRNC may send rate control commands in uplink (to the CN) to control the rates in downlink. The SRNC may also send rate control commands in downlink (to the UE) to control the rates in uplink. The rate control procedures for both directions are independent of each other, i.e. different rates may be permitted in uplink and downlink, see Figure xy.

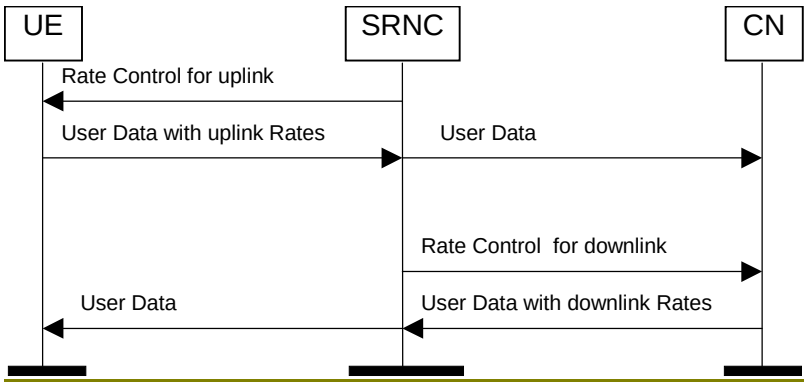

Figure xy: Rate Control for uplink and downlink

The rates associated with the service could be rank ordered from "lower" to "higher" according to their SDU bit rates and RFCI values, with RFCI=0 having the lowest rate. A rate lower than the currently allowed maximum rate shall not be forbidden while a higher rate is forbidden. In order to stabilise the rate control procedure and its influences on the radio link and the network, typically only one additional rate shall be forbidden or permitted in subsequent rate control commands.

In some cases, as TrFO and TFO, the rate is also controlled by the remote partner at the other end of the Iu UP. The SRNC may then also receive rate control commands in downlink (from the CN) controlling the rates in uplink. Only rates that are permitted by both sides for one direction shall be used in that direction. The SRNC shall therefore combine these rate commands from the CN with its own control commands for the uplink direction by taking the rate control command with the lowest maximum rate and shall sent this rate control command downlink to the UE. This combination is denoted in Figure xz with "Rate Control (CN ⊕ RNC)".

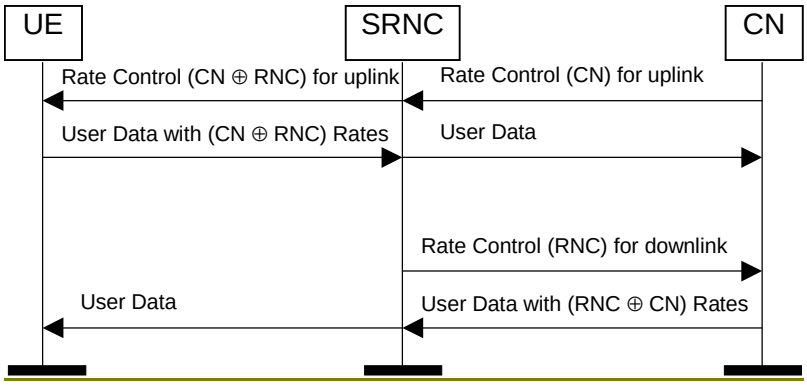

Figure xz: Distributed Rate Control for uplink and downlink

3GPP TSG-RAN3 Meeting #19 **R3-010983**
Cardiff, UK, 26th February – 2nd March 2001

CR-Form-v3

CHANGE REQUEST

⌘ **25.415** **CR** **059** ⌘ rev **-** ⌘ Current version: **3.5.0** ⌘

*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:	⌘	General changes for WI TrFO
Source:	⌘	R-WG3
Work item code:	⌘	TrFO
Date:	⌘	2001-03-01
Category:	⌘	**B**
Release:	⌘	REL-4

Use one of the following categories:
F *(essential correction)*
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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:	⌘	This CR contains general changes for the TrFO WI. In particular - changes made within R3-003038 are “changed back” - changes for FQC handling and user data transport. The most important change is proposed within chapter 4.1, where the case is described, that the partner peer entity of the Iu UP protocol instance may be located within a network node, that is not the serving CN node.
Summary of change:	⌘	General Changes for WI ‘TrFO’
Consequences if not approved:	⌘	

Clauses affected:	⌘	2, 3.2, 3.3, 4.1, 6, 6.4.4.1, 6.5.1, 6.5.4
Other specs affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	Changes within section ‘6.4.4.1.2 Handling of FQC information’ contains already changes based on CR 50 (R3-010222, marked with different user-info) to ease CR implementation.

How to create CRs using this form:
Comprehensive information and tips about how to create CRs can be found at:
http://www.3gpp.org/3G_Specs/CRs.htm. Below is a brief summary:

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

3GPP TS 25.415 V4.03.5.0 (2000-12)

Technical Specification

3rd Generation Partnership Project;
Technical Specification Group Radio Access Network;
UTRAN Iu Interface User Plane Protocols
(Release 41999)

1 Scope

The present document defines the Radio Network Layer user plane protocol being used over the Iu interface.

2 References

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

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

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

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

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

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

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

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

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

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

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

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

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

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

[13] 3GPP TS 23.153: "3rd Generation Partnership Project (3GPP) Technical Specification Group Core Network; Out of Band Transcoder Control - Stage 2".

3 Definitions and abbreviations

3.1 Definitions

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

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

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

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

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

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

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

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

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

Principles related to RFCI allocation and initialisation procedure:

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

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

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

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

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

3.3 Concepts

Iu UP mode of operation:

One objective of the Iu User Plane (UP) protocol is to remain independent of the CN domain (Circuit Switched or Packet Switched) and to have limited or no dependency with the Transport Network Layer. Meeting this objective provides the flexibility to evolve services regardless of the CN domain and to migrate services across CN domains.

The Iu UP protocol is therefore defined with modes of operation that can be activated on a RAB basis rather than on a CN domain basis or (tele)service basis. The Iu UP mode of operation determines if and which set of features shall be provided to meet e.g. the RAB QoS requirements.

Iu UP protocol PDU Type:

The Iu UP protocol PDU Types are defined for a given Iu UP mode of operation. An Iu UP PDU Type represents a defined structure of an Iu UP protocol frame. For instance, a frame made of a certain Frame Header mask part and a Frame Payload part would be specified as a certain PDU type valid for a given Iu UP mode of operation.

Tandem Free Operation (TFO):

Configuration of a Speech or Multimedia call for which Transcoders are physically present in the communication path but transcoding functions are disabled or partially disabled. The Transcoders may perform control and/or protocol conversion functions.

Transcoder (TC):

Physical device present in the network responsible for the transcoding of the speech data between two speech codecs or coding schemes (The Transcoder may also include other functions, i.e. Rate Adaptation in GSM).

Transcoder Free Operation (TrFO):

Configuration of a Speech or Multimedia call for which Transcoders are not present in the communication path.

4 General

4.1 General aspects

The Iu UP protocol is located in the User plane of the Radio Network layer over the Iu interface: the Iu UP protocol layer.

The Iu UP protocol is used to convey user data associated to Radio Access Bearers.

One Iu UP protocol instance is associated to one RAB and one RAB only. If several RABs are established towards one given UE, then these RABs make use of several Iu UP protocol instances.

In general, Iu UP protocol instances exist at Iu access point as defined [2] i.e. at CN and UTRAN. However, as described in [13], if TrFO is possible and the Iu UP protocol instances operate in support mode the Iu UP protocol instance in CN may resume performing Iu UP specific functions or vanish completely during stable call states. In this case the partner peer entity actually interacting with the UTRAN Iu UP protocol instance (i.e performing all Iu UP specific functions except UP initialisation) may either be located within another UTRAN or within a CN node that is not the serving CN node of the UTRAN.

Whenever a RAB requires transfer of user data in the Iu UP, an Iu UP protocol instance exists at each Iu interface access points. These Iu UP protocol instances are established, relocated and released together with the associated RAB.

Whether these peer protocol instances perform some RAB related function depends on the mode of operation of the Iu UP as defined below.

The following figure illustrates the logical placement of the Iu UP protocol layer and the placement of the Data Streams sources outside of the Access Stratum.

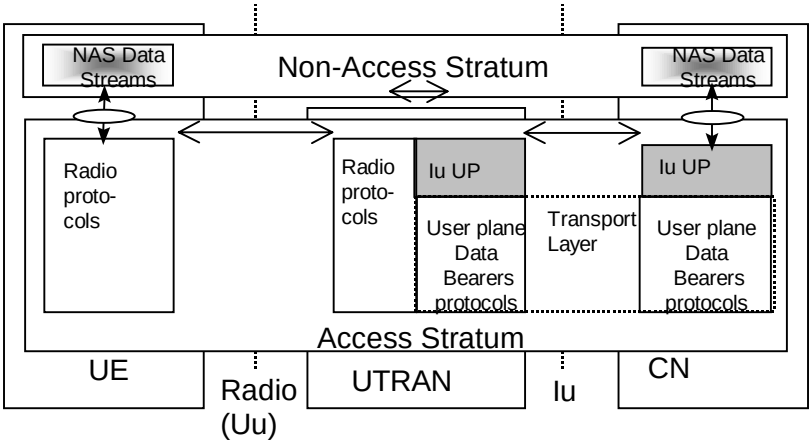

Figure 1: Iu UP protocol layer occurrence in UTRAN overall architecture (User Plane View)

6 Support mode for predefined SDU sizes, version 2~~1~~

6.1 General

6.1.1 Operation of the Iu UP in Support mode

The Iu UP protocol layer in Support mode is present for data streams that need frame handling in the UP.

The two strata communicate through a Service Access Point for Non Access Stratum (NAS) Data Streams transfer.

6.1.2 Interfaces of the Iu UP protocol layer in Support mode

As part of the Access Stratum responsibility, the Iu UP protocol layer in support mode provides the services and functions that are necessary to handle non access stratum data streams. The Iu UP protocol layer in support mode is providing these services to the UP upper layers through a Dedicated Service Access Point used for Information Transfer as specified in [5].

The Iu UP protocol layer in support mode is using services of the Transport layers in order to transfer the Iu UP PDUs over the Iu interface.

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;
- handling of error event;
- 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

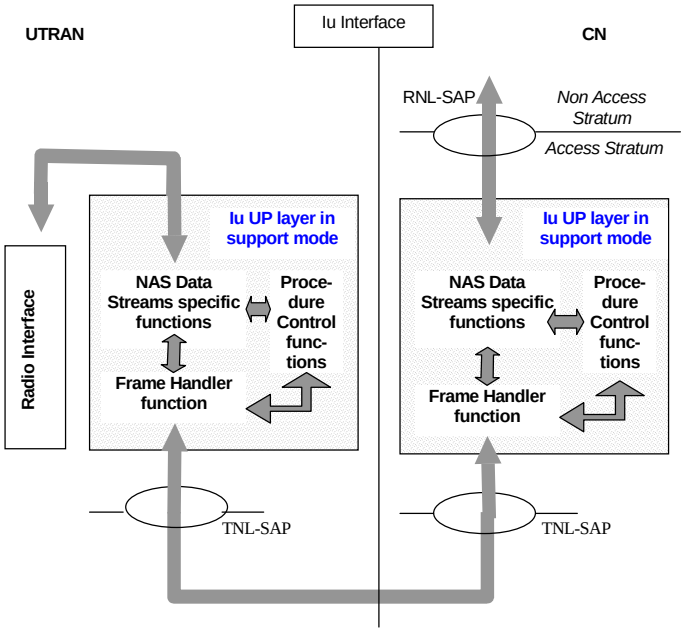

Figure 5: Functional model of the Iu UP protocol layer in Support mode

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

6.4.3 Procedure Control functions

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

Namely, these procedures are:

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

- **Initialisation:** is the procedure which controls the exchange of initialisation information that is required for operation in support mode for predefined SDU size. Such information can contain the RFCI Set to be used until termination of the connection or until the next initialisation procedure. This procedure is also used for negotiating the version of the Iu UP Mode requested for the related RAB.

- **Time Alignment:** is the procedure that controls the timing of the downlink data to the RNC over Iu. The function

controlling this procedure interacts with functions outside of the Iu UP protocol layer.

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

6.4.4 Non Access Stratum Data Streams specific function(s)

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

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

These functions interact with the procedure control functions.

These functions provide service access to the upper layers for the procedure control functions.

6.4.4.1 Frame Quality Classification function

6.4.4.1.1 General

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

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

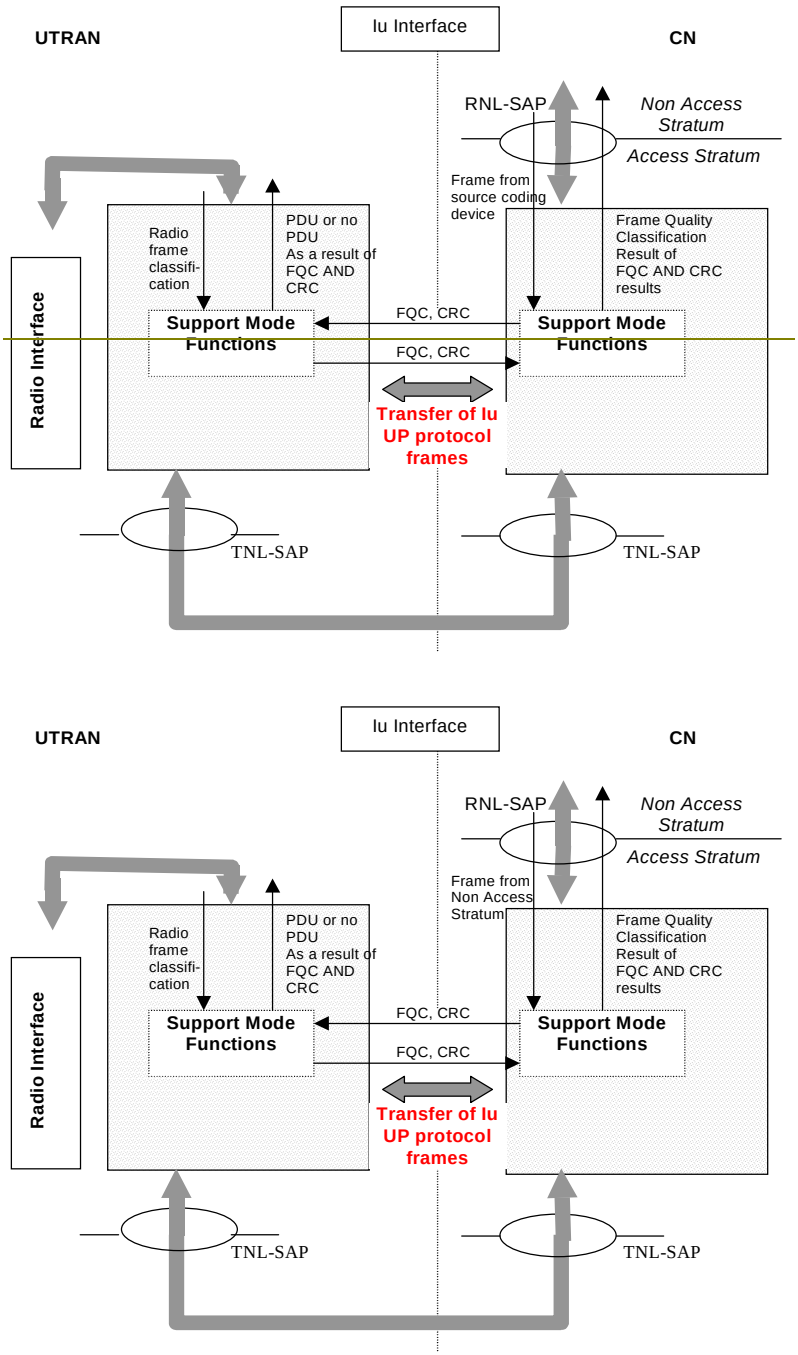

Figure 6: Frame quality classification in Iu UP

6.4.4.1.2 Handling of FQC information in uplink path

6.4.4.1.2.1 Handling of FQC information at RNC

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

a) If there is at least one subflow with the “Delivery of erroneous SDUs” set to “No” and for at least one of those subflows the radio frame classification is “Bad” then the Iu UP frame shall not be sent,

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

c) Otherwise the Iu UP frame shall be sent with FQC set to "frame good".

Table 1: FQC handling in RNC on uplink

INPUT (for each subflow)		ACTION (on Iu UP frame)
Delivery of erroneous SDUs	Radio Frame Classification	Action taken in SRNC on the sending side
Yes	Bad	Set FQC to 'bad radio'
No	Bad	Frame not sent
no-error-detection-consideration	Any value	Set FQC to good
Any value	Good	Set FQC to good

In the table above if for any of the subflows the 'Delivery of erroneous SDUs' is set to 'No' and for that subflow the Radio frame classification is 'Bad' then the Iu UP frame shall not be sent.

6.4.4.1.2.1 Handling of FQC information at CN

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

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

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

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

Table 2: FQC handling in CN on uplink

INPUT		ACTION (on Iu UP frame)
Delivery of erroneous SDUs (for each subflow)	Payload CRC check result (on Iu UP frame)	Actions taken at CN on the receiving side
Yes (at least one of the subflows have this value but none have 'No')	Not OK	Frame forwarded with FQC set to 'bad'
No (at least one of the subflows have this value)	Not OK	Drop frame, send Iu-UP-Status primitive indicating 'No data' at the RNL-SAP
no-error-detection-consideration (All subflows have this value)	Any result	Frame forwarded with FQC as set by UTRAN
Any value	OK	Frame forwarded with FQC as set by UTRAN

6.4.4.1.3 Handling of FQC information in downlink path

The Support Mode Functions in CN on the sending side adds a CRC, if necessary to the frame payload and passes it together with the FQC. (If the payload stems from a transcoding unit of the NAS within the CN the FQC is in the

~~transcoded case~~ always set to good~~)~~. Otherwise it may be set by a partner peer entity residing in another RNC.

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

a) If a CRC is available and the CRC check indicates that the Iu UP is “Bad” then the frame shall be dropped,

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

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

~~**Table 3: FQC handling in RNC on downlink**~~

~~**INPUT**~~		~~**ACTION (on Iu UP frame)**~~
~~**Delivery of erroneous SDUs (for each subflow)**~~	~~**CRC check (if payload CRC present) (on Iu UP frame)**~~	~~**Actions taken at SRNC on the receiving side**~~
~~Yes~~	~~Not OK~~	~~Drop frame~~
~~No~~	~~Not OK~~	~~Drop frame~~
~~no-error-detection-consideration~~	~~Any result~~	~~Pass the frame to radio interface protocols~~
~~Any value~~	~~OK~~	~~Pass the frame to radio interface protocols~~

~~In the table above if any of the subflows have the ‘Delivery of erroneous SDUs’ set to ‘Yes’ or ‘No’, and the CRC check indicates that the Iu UP is bad, then the Iu UP frame should be dropped.~~

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

6.5 Elementary procedures

6.5.1 Transfer of User Data procedure

6.5.1.1 Successful operation

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

The procedure is controlled at both ends of the Iu UP instance i.e. SRNC and the CN. Exceptions in case of TrFO, where the partner peer entity does not reside within the serving CN node are described in chapter 4.1 and [13].

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

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

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

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

The frame handler function retrieves the frame number from its internal memory, formats the frame header and frame payload into the appropriate PDU Type and sends the Iu UP frame PDU to the lower layers for transfer across the Iu interface. The selection of the PDU type (in both directions) shall be made by UTRAN based on the reliability attributes (see [3]) for the RAB. If the reliability attribute 'Delivery of erroneous SDUs' equals 'no-error-detection-consideration' for all subflows then PDU type 1 shall be used, otherwise PDU type 0 shall be used.

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

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

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

- the NAS Data Streams functions check the payload CRC, if any. If the RFCI is correct (i.e. RFCI is used at Initialisation) and matches the Iu UP frame payload (i.e. frame payload is not too short for the RFCI) as indicated by the Procedure Control functions, the NAS Data Streams removes the padding bits and the spare extension field when present from the Iu UP frame payload based on the RFCI information. Then the NAS Data Streams forwards to the upper layers the RFCI and the payload.

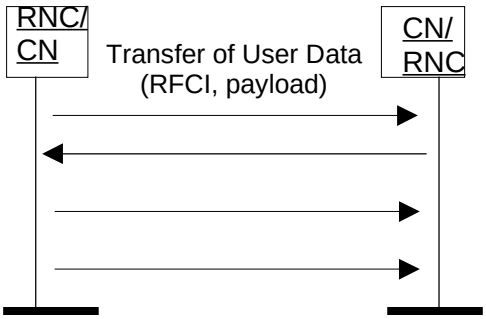

Figure 7: Successful Transfers of User Data

6.5.1.2 Unsuccessful operation

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

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

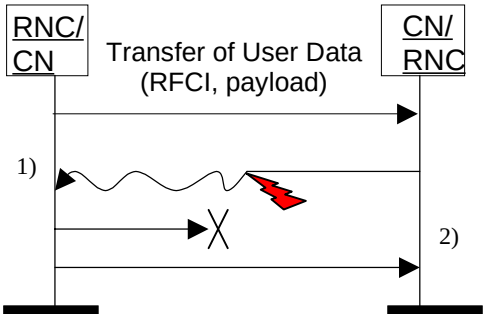

Figure 8: Unsuccessful Transfers of User Data: 1) Corrupted Frame, 2) Detection of Frame loss

6.5.4 Time Alignment procedure

6.5.4.1 Successful operation

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

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

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

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

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

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

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

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

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

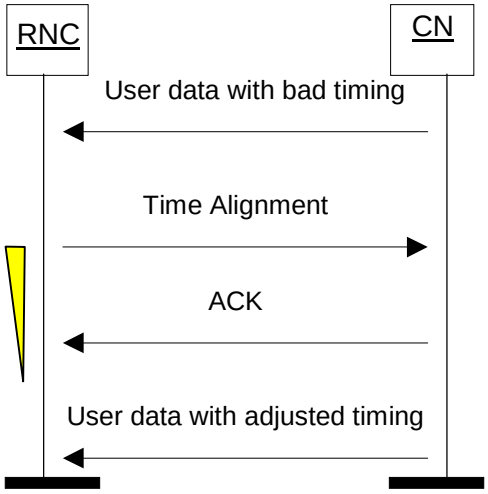

Figure 15a: Successful Time Alignment

6.5.4.2 Unsuccessful operation

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

If the Iu UP in the SRNC detects that the time alignment command has not been correctly interpreted or received, i.e NACK received or timer expires, and the time alignment need still persists, the Iu UP should retrigger a time alignment procedure. If after N_{TA} repetitions, the error situation persists, the Iu UP protocol layers take appropriate local actions.

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

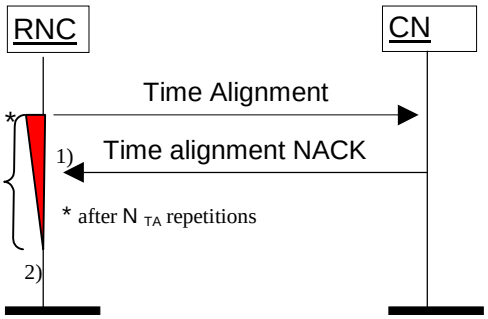

Figure 16a: Unsuccessful Time Alignment: 1) N_{TA} negative acknowledgements or 2) N_{TA} timer expiries

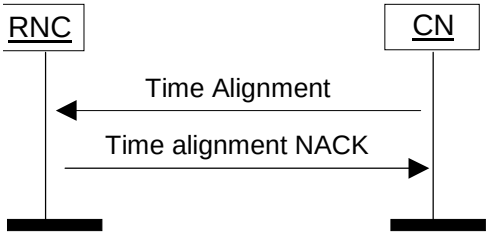

Figure xy: Time Alignment received by the RNC

3GPP TSG-RAN3 Meeting #19 **R3-010984**
Cardiff, UK, 26th February – 2nd March 2001

CR-Form-v3

CHANGE REQUEST

⌘ **25.415** **CR** **060** ⌘ rev **-** ⌘ Current version: **3.5.0** ⌘

*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:	⌘	TrFO Impacts on IuUP initialisation
Source:	⌘	R-WG3
Work item code:	⌘	TrFO
Date:	⌘	2001-02-15
Category:	⌘	**B**
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.

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:	⌘	It is essential for TrFO to allow the Iu UP initialisation procedure to be invoked both from the CN and the UTRAN. This changes are reflected within this CR.
Summary of change:	⌘	TrFO Impacts on IuUP initialisation
Consequences if not approved:	⌘	

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

How to create CRs using this form:
Comprehensive information and tips about how to create CRs can be found at: http://www.3gpp.org/3G_Specs/CRs.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.
2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 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 Elementary procedures

6.5.1 Transfer of User Data procedure

6.5.1.1 Successful operation

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

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

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

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

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

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

The frame handler function retrieves the frame number from its internal memory, formats the frame header and frame payload into the appropriate PDU Type and sends the Iu UP frame PDU to the lower layers for transfer across the Iu interface. If the UTRAN initialises the RAB it shall base ~~T~~the selection of the PDU type (in both directions) ~~shall be made by UTRAN based~~ on the reliability attributes (see [3]) for the RAB. If the reliability attribute 'Delivery of erroneous SDUs' equals 'no-error-detection-consideration' for all subflows then PDU type 1 shall be used, otherwise PDU type 0 shall be used.

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

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

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

- the NAS Data Streams functions check the payload CRC, if any. If the RFCI is correct (i.e. RFCI is used at Initialisation) and matches the Iu UP frame payload (i.e. frame payload is not too short for the RFCI) as indicated by the Procedure Control functions, the NAS Data Streams removes the padding bits and the spare extension field when present from the Iu UP frame payload based on the RFCI information. Then the NAS Data Streams forwards to the upper layers the RFCI and the payload.

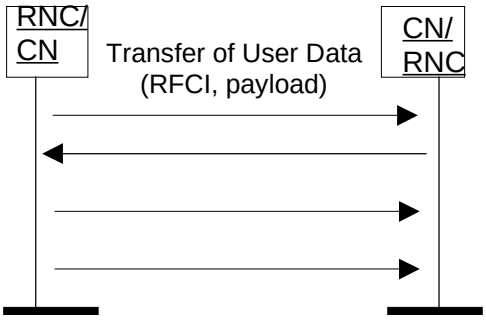

Figure 7: Successful Transfers of User Data

6.5.1.2 Unsuccessful operation

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

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

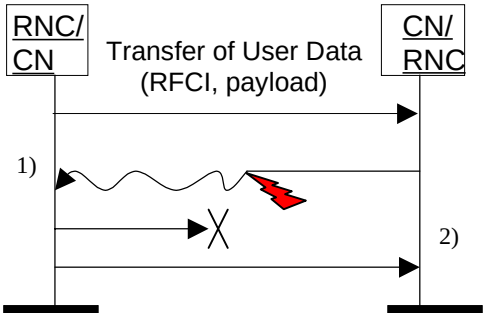

Figure 8: Unsuccessful Transfers of User Data: 1) Corrupted Frame, 2) Detection of Frame loss

6.5.2 Initialisation procedure

6.5.2.1 Successful operation

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

The initialisation procedure may be ~~is always~~ controlled ~~by~~at both end of the Iu access point, i.e the CN and UTRAN~~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 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~~RNC~~ indicates the Iu UP Mode version it uses for the initialisation as well as the Iu UP Mode versions it supports 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~~SRNC~~ allocates a RAB sub-Flow Combination indicator (RFCI) to each RAB sub-Flow Combination it initialises. The association of indicators to RAB Flow Combinations is valid in the Iu UP until a new initialisation procedure is performed or the connection is terminated.

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

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

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

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

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

Upon reception of a frame indicating that an initialisation control procedure is active in the peer Iu UP entity, the Iu UP protocol layer forwards the whole protocol information contained in the initialisation frame 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). The ~~CN~~ peer Iu UP entity receiving the initialisation message shall choose a version that it supports and for which it has enough initialisation information.

If the initialisation 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.

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

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

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

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

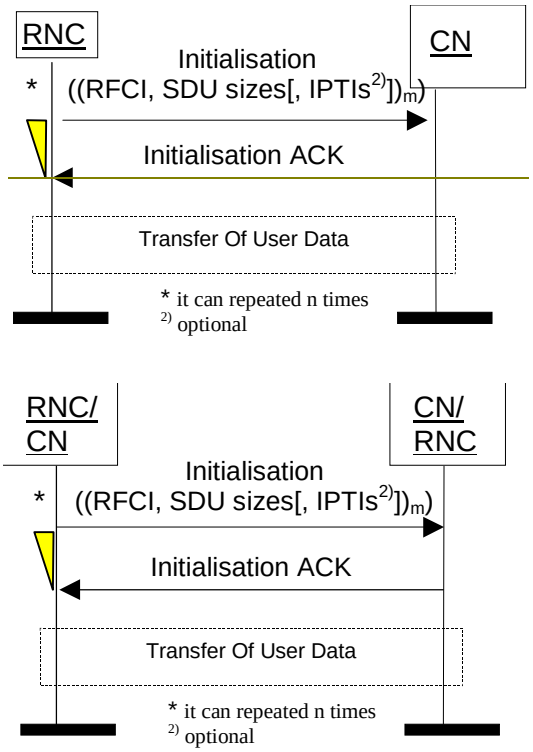

Figure 9: Successful Initialisation of Iu UP for m RFCIs

6.5.2.2 Unsuccessful operation

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

If 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.

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

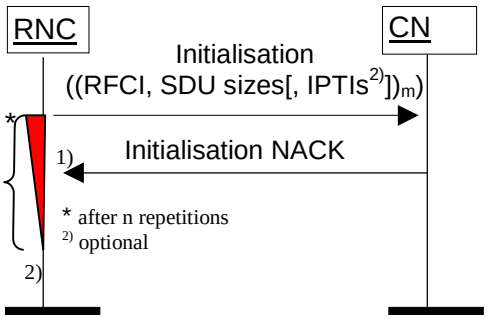

Figure 10: Unsuccessful initialisation of Iu UP: 1) N_{INIT} negative acknowledgement or 2) N_{INIT} timer expires