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Technical Specification

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Foreword

This Technical Specification (TS) has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of this TS are subject to continuing work within 3GPP TSG RAN and may change following formal TSG RAN approval. Should the TSG modify the contents of this TS, it will be re-released with an identifying change of release date and an increase in version number as follows:

Version m.t.e

where:

m indicates [major version number]

x the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

y the third digit is incremented when editorial only changes have been incorporated into the specification.

1 Scope

This document shall provide a description of the UTRAN RNS-RNS (Iur) interface user plane protocols for Common Transport Channel data streams as agreed within the TSG-RAN working group 3.

2 References

References may be made to:

a) specific versions of publications (identified by date of publication, edition number, version number, etc.), in which case, subsequent revisions to the referenced document do not apply;

b) all versions up to and including the identified version (identified by "up to and including" before the version identity);

c) all versions subsequent to and including the identified version (identified by "onwards" following the version identity); or

d) publications without mention of a specific version, in which case the latest version applies.

A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

[1] ITU-T Recommendation I.361 B-ISDN ATM Layer Specification (11/95)

[2] ITU-T Recommendation I.363.2 B-ISDN ATM Adaptation Layer type 2 (9/97)

[3] ITU-T Recommendation I.366.1 Segmentation and Reassembly Service Specific Convergence Sublayer for the AAL type 2 (6/98)

[4] 3GPP TS 25.427 Iub/Iur User Plane Protocols for DCH Data Streams

[5] TS 25.401 UTRAN overall description

[6] TS 25.990 UTRAN vocabulary

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purpose of the present document, the following terms and definition apply:

Common Transport Channel: it is defined as a transport channel that is shared by several users i.e. RACH, FACH.

Transport Connection: Service provided by the transport layer and used by Frame Protocol for the delivery of FP PDU.

For other definitions, please refer to [5]

3.2 Symbols

3.3 Abbreviations

AAL2	ATM Adaptation Layer type 2
ATM	Asynchronous Transfer Mode
CFN	Connection Frame Number
CmCH	CoMmon transport CHannel
CPS	Common Part Sublayer
C-RNC	Controlling Radio Network Controller
CRC	Cyclic Redundancy Checksum
DCH	Dedicated Transport Channel
DL	Downlink
D-RNTI	Drift RNTI
FACH	Forward Access CHannel
FP	Frame Protocol
FT	Frame Type
PC	Power Control
RACH	Random Access CHannel
RNC	Radio Network Controller
RNTI	Radio Network Temporary Identity
SRNC	Serving Radio Network Controller
S-RNTI	Serving RNTI
SSCS	Service Specific Convergence Sublayer
SSSAR	Service Specific Segmentation and Reassembly sublayer
TB	Transport Block
TBS	Transport Block Set
TFI	Transport Format Indicator
ToA	Time of arrival
TTI	Transmission Time Interval
UE	User Equipment
UL	Uplink

4 General aspects

4.1 Common Transport Channel Data Streams User Plane Protocol Services

This chapter describes the services that the User Plane Protocols provide such as data transfer, flow control.

4.1.1 RACH/FACH Data Streams User Plane Protocol Services

RACH/FACH frame protocol provides the following services:

- Transport of MAC-c SDUs between the SRNC and the DRNC for RACH and FACH common transport channels
- Flow Control between MAC-d and MAC-c

4.2 Services expected from data transport

The following services are expected from the transport layer:

- In sequence delivery of Frame Protocol PDUs

5 Common Transport Channel Data Streams User Plane Procedures

This chapter specifies the user plane procedures for Common Transport Channels data streams. Typical related scenarios at Iur interface should be described.

For the user plane of the radio network layer there are two Common Transport Channel frame handling protocols:

- Random Access Channel Frame Protocol (RACH FP) for transport of Iur data streams carried on RACH on the Uu-interface.
- Forward Access Channel Frame Protocol (FACH FP) for transport of Iur data streams carried on FACH on the Uu-interface.

5.1 Data Transfer

5.1.1 RACH Data Transfer

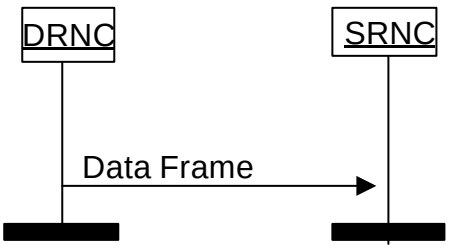

Figure 1: RACH data transfer

Data received on the RACH transport channel is transmitted from the DRNC to the SRNC using RACH data frames. The data is protected by a mandatory payload CRC. Multiple MAC-c SDUs of same length may be transmitted in the same RACH data frame.

5.1.2 FACH data transfer

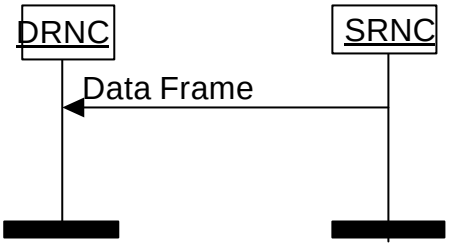

Figure 2: FACH data transfer

Data to be transmitted on the FACH transport channel is transmitted from the SRNC to the DRNC using FACH data frames. Multiple MAC-c SDUs of same length may be transmitted in the same FACH data frame.

The *S-CCPCH Indicator* IE indicates if the data in the payload shall be sent on the S-CCPCH coupled to the PRACH (i.e. the payload contains the Cell Update Confirm message), or if it shall be sent on the S-CCPCH selected by the DRNC for subsequent user data. The S-CCPCH selected for subsequent user data may be the S-CCPCH coupled to the PRACH or another S-CCPCH.

5.2 Flow Control

5.2.1 FACH Flow Control

The FACH flow control frame is used by the DRNC to control the user data flow. The *Credits* IE indicates the number of MAC-c SDUs the SRNC is allowed to transmit for the UE identified by the *SRNTI* IE and the associated priority class indicated by the *Common Transport Channel Priority Indicator* IE.

The *Credits* IE indicates the total amount of credits granted. Any credits previously granted are withdrawn.

If *Credits* IE = 0 (e.g. due to congestion in the DRNC), the SRNC shall immediately stop transmission of MAC-c SDUs.

Credits IE = ‘unlimited’ indicates that the SRNC may transmit an unlimited number of MAC-c SDUs.

6 Frame Structure and Coding

6.1 General

The general structure of a Common Transport Channel frame consists of a header and a payload. This structure is depicted in the table below:

Header	Payload: Data or Control Information

Figure 1: General Frame Structure

The header shall contain the frame type field and information related to the frame type.

There are two types of frames (indicated by the Frame Type field).

- Data frame

- Control frame

In this specification the structure of frames will be specified by using pictures similar to the following figure:

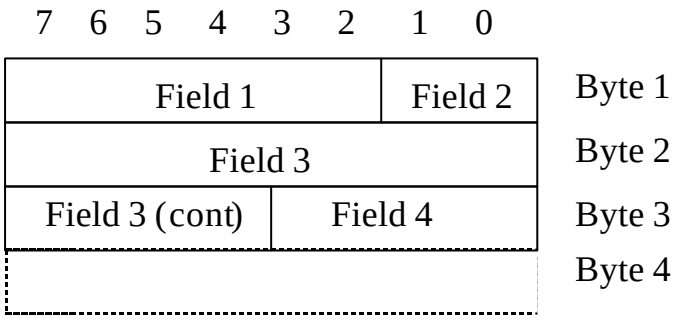

Figure 2: Example frame structure

Unless otherwise indicated, fields which consist of multiple bits within a byte will have the more significant bit located at the higher bit position (indicated above frame in picture 1). In addition, if a field spans several bytes, more significant bits will be located in lower numbered bytes (right of frame in picture 1).

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

The parameters are specified giving the value range and the step (if not 1). The coding is done as follows (unless otherwise specified):

- Lower value (in the range) coded as a sequence of 0's
- Higher value in the range coded as a sequence of 1's

6.2 Data frame structure

6.2.1 RACH Channels

RACH Iur data stream corresponds to the data stream of one specific UE. The used transport bearer for the transport of FACH/RACH is bi-directional.

The RACH/FACH FP does not facilitate multiplexing of data streams from different UEs onto the same data frame, but does allow multiple UEs to share the same transport bearer.

The RACH Data frame structure is defined as common for FDD and TDD with conditional fields.

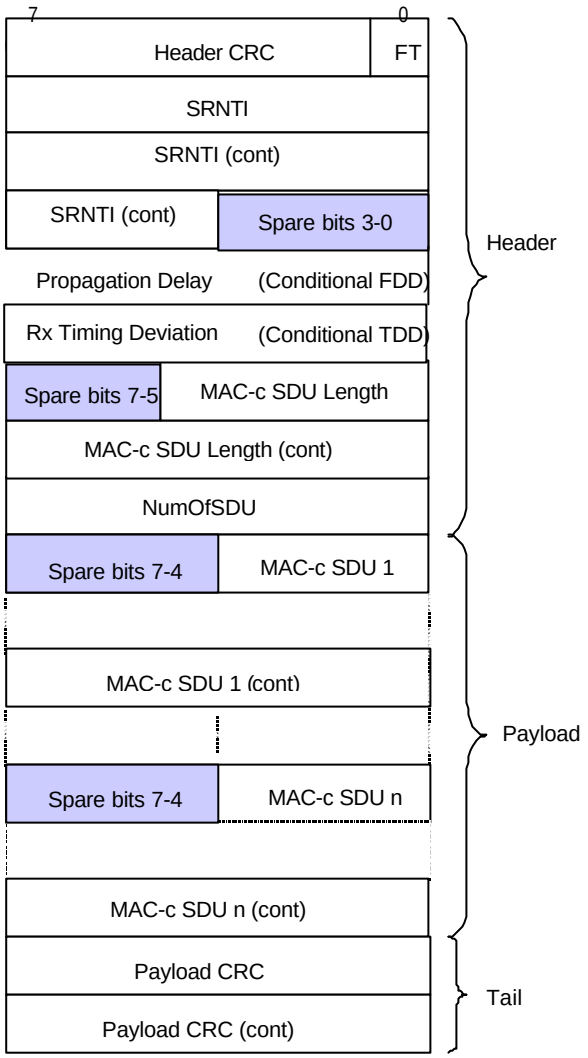

Figure 3. RACH Data Frame structure

Propagation delay is a conditional Information Element which is only present when the Cell supporting the RACH Transport Channel is a FDD Cell.

Rx Timing Deviation is a conditional Information Element which is only present when the Cell supporting the RACH Transport Channel is a TDD Cell.

Spare bits shall be set to 0 and ignored by the receiver.

6.2.2 FACH Channels

FACH Iur data stream corresponds to the data stream of one specific UE. The used transport bearer for the transport of FACH/RACH is bi-directional.

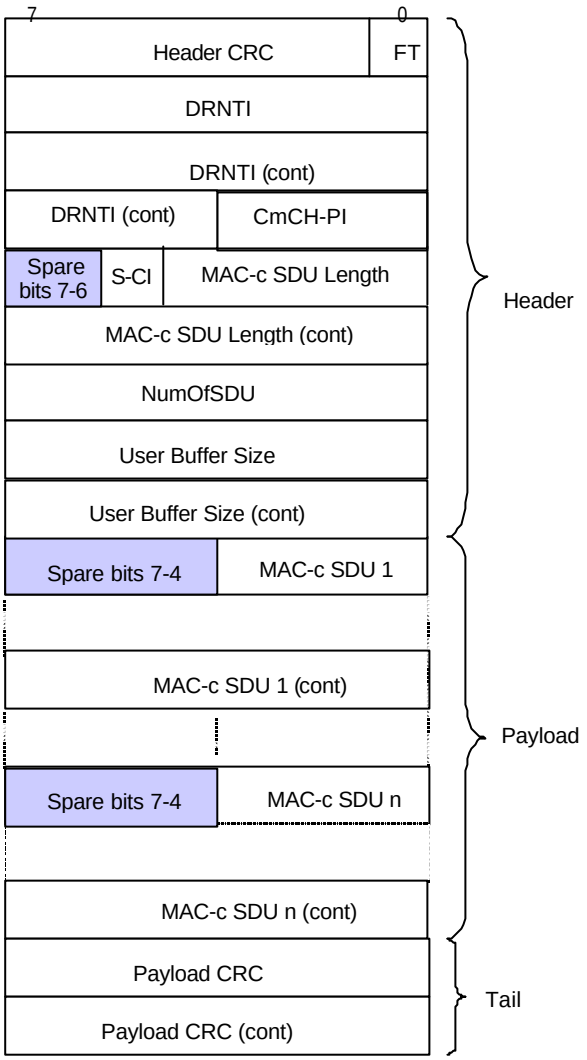

Figure 4. FACH Data Frame structure

Spare bits shall be set to 0 and ignored by the receiver.

6.2.3 Coding of information elements in data frames

6.2.3.1 Header CRC

Description: Cyclic Redundancy Polynomial calculated on the header of a data frame with polynom X^7+X^6+X^2+1. The CRC calculation shall cover all bits in the header, starting from bit 0 in the first byte (FT field) up to the end of the header.

Value range: {0-127}

Field length: 7 bits

6.2.3.2 Frame Type (FT)

Description: describes if it is a control frame or a data frame.

Value range: {0=data, 1=control}.

Field Length: 1 bit

6.2.3.3 DRNTI

Description: Identifies the UE in the DRNC.

Value range: {0-1048575}

Field length: 20 bits

6.2.3.4 S-RNTI

Description: S-RNTI is defined in [5]. S-RNTI is used in UL control frames to identify the UE context in the SRNC.

Value range: {0-1048575}

Field length: 20 bits

6.2.3.5 S-CCPCH Indicator (S-CI)

Description: Indicates the S-CCPCH to be used for transmission of the user data.

Value range: {0=S-CCPCH coupled to PRACH, 1=S-CCPCH selected by DRNC}.

Field Length: 1 bit

6.2.3.6 Common Transport Channel Priority Indicator (CmCH-PI)

Description: CmCH-PI is the relative priority of the data frame.

Value range: {0-15}

Field length: 4 bits

6.2.3.7 MAC-c SDU Length

Description: The value of that field indicates the length of every MAC-c SDU in the payload of the FACH data frame in number of bits.

Value range: {0-5000}.

Field Length: 13 bits

6.2.3.8 NumOfSDU

Description: Indicates the number of MAC-c SDUs in the payload.

Value range: {1-255}

Field Length: 8 bits

6.2.3.9 [FDD — Propagation delay]

Description: One-way air interface delay as measured during RACH access

Value range: {0 – 765 chips}

Granularity: 3 chips

Field length: 8 bits

6.2.3.10 [TDD — Rx Timing Deviation]

Description: Measured Rx Timing Deviation as a basis for timing advance

Value range: {0-1020 chips}

Granularity: 4 chips

Field length: 8 bits

6.2.3.11 User Buffer Size

Description: Indicates the users' buffer size (i.e. the amount of data in the buffer) in octets for a given Common Transport Channel Priority.

Value range: {0-65535}

Field length : 16 bits

6.2.3.12 MAC-c SDU

Description: A MAC-c SDU contains the C/T field of the MAC header followed by one RLC PDU.Field length : See the value of the *MAC-c SDU Length* IE.

6.2.3.13 Payload CRC

Description: Cyclic Redundancy Polynomial calculated on the payload of a data frame with polynom X^16+X^15+X^2+1. The CRC calculation shall cover all bits in the data frame payload, starting from bit 7 in the first byte up to bit 0 in the byte before the payload CRC.

Field length: 16 bits

6.3 Control frame structure

6.3.1 Introduction

Control Frames are used to transport control information between SRNC and DRNC.

The figure below defines the Control Frame structure for common transport channels.

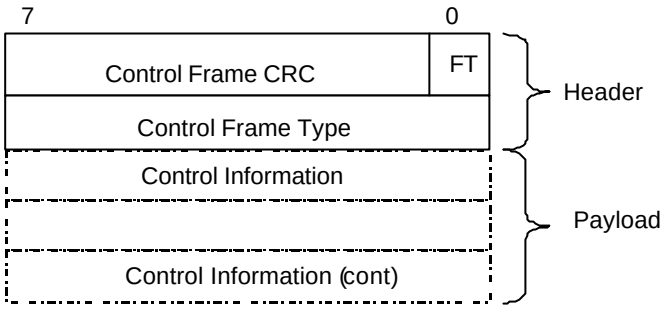

Figure 5. Iur Common Transport Channel Control Frame Format

The *Control Frame Type* IE defines the type of the control frames.

The length of the payload is variable accordingly to the control frame type.

The structure of the header and the payload of the control frames is defined in the following sections:

6.3.2 Header structure of the control frames

6.3.2.1 Control frame CRC

Description: Cyclic Redundancy Polynomial calculated on a control frame with polynomial X^7+X^6+X^2+1. The CRC calculation shall cover all bits in the control frame, starting from bit 0 in the first byte (FT field) up to the end of the control frame.

Value range: {0-127}

Field length: 7 bits

6.3.2.2 Frame type (FT)

Refer to section 6.2.3.2.

6.3.2.3 Control Frame Type

Description: Indicates the type of the control information (information elements and length) contained in the payload (=type of control frame).

Value: values of the *Control Frame Type* IE parameter are defined in the following table:

Type of control frame	Value
FACH Flow Control	0000 0010

6.3.3 Payload structure and information elements

6.3.3.1 FACH Flow Control

. The figure below shows the payload structure when the control frame is used for the above mentioned purpose. This control information is sent in the UL only.

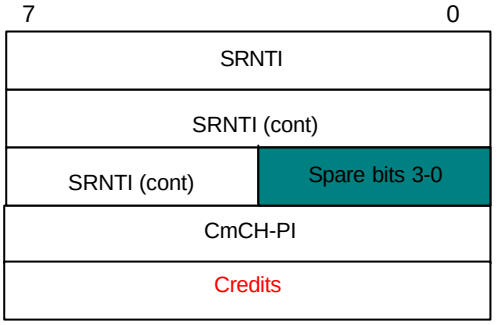

Figure 6: FACH Flow Control Payload structure

6.3.3.1.1 S-RNTI

Refer to section 6.2.3.4.

6.3.3.1.2 Common Transport Channel Priority Indicator (CmCH-PI)

Refer to section 6.2.3.6.

6.3.3.1.3 Credits

Description: The *Credits* IE indicates the number of MAC-c SDUs that a user may transmit

Value range: {0-255, where 0=stop transmission, 255=unlimited}

Field length: 8 bits

7 History

Document history		
0.0.1	February 1999	Document structure proposal
0.0.2	February 1999	Introduction of the related content of Merged description of Iur interface.

0.0.3	March 1999	Revision bars removed. Modifications of the title. CCH have been changed into "Common Transport Channel". Addition of a definition of Common Transport Channels.
0.0.4	April 1999	Removal of temporary reference to Merged Iur specification
0.1.0	April 1999	Removal of revision bars
0.1.1	April 1999	Changes after the 1st review in TSG RAN WG3 #3 meeting.
0.2.0	June 1999	Version approved at TSG RAN WG3#4 meeting. No change.
0.2.1	August 1999	Addition of text on Data Frame structure coming from tdoc R3-99734 section 5.1 agreed with modifications at RAN WG3#5 meeting.
0.2.2	September 99	Version approved at RAN3#6 with modifications: - FACH/RACH frame structure: Move of data frame checksum to the tail; Replacing CRNTI by DRNTI.
0.2.3	September 99	- Addition of section 7: stability assessment table and open points.
0.2.4	September 99	- Addition of FACH/RACH data frame structure for TDD mode. - Modification of FACH data frame structure and addition of FACH control frame structures for flow control.
0.2.5	September 99	Restructuring of the specification in order to get aligned with TS 25.427 and TS 25.435 presentation. Corrections of errors.
0.3.0	October 99	Version agreed at RAN3#8 meeting in Abiko: - Ref. 5 is changed into "UTRAN Overall Description" - Ref. 6 (vocabulary) has been added. - FFS has been added to DSCH flow control in 6.3.1.3
0.3.1	November 99	Modifications agreed at RAN3#8 in Abiko according to tdoc R3-99e92, and partially to tdoc R3-99e04. - Text for USCH is added - Rx timing deviation is removed from FACH TDD data stream. - No flow control on USCH - New structure for data frames - DSCH and USCH as FFS in 4.1.2 and 4.1.3
0.4.0	December 99	Agreed at RAN3#9 with the following modifications: - Note in section 6.2.5.3 is removed. - Placeholders and text related to DSCH and USCH are removed since it has been decided to remove DSCH and USCH from Release 99.
0.4.1	December 99	Modifications agreed at RAN3#9: - FACH data frame structure is updated according to tdoc R3-99I04 ;Frame Sequence Number is removed. - Same FACH frame layout is adopted for FDD and TDD - RACH frame structure is updated according to agreed tdoc R3-99i11; credits IE is added. - Same RACH frame layout is adopted for FDD and TDD

0.4.2	December 99	Modifications agreed at RAN3#9: - RACH and FACH Data transfer procedure description is added according to tdoc R3-99i11. - FACH flow control description procedure is added according to tdoc R3-99i11. - DRNTI is removed from the control frame - In RACH data frame, MAC-d SDU length is padded with 3 spare bits - The definition of MAC-c SDU length has been modified - The use of S-CCPCH has been moved from section 6.2.3.4 to the FACH data transfer procedure description. - Editor's notes have been removed.
0.4.3	December 99	Further modifications agreed at RAN3#9: - section 5.2.1: "user" is replaced by "SRNC". - Reintroducing "range" in section 6.2.3.7 - Annex A is removed
2.0.0	December 99	Editorial updates agreed at RAN3#9:
Editor for 3GPP RAN 25.425 is:		
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