3GPP TSG CN Plenary Meeting #18 **NP-020617**
4th - 6th December 2002. New Orleans, USA.

Source: TSG CN WG3

Title: CRs on Rel5 Work Item CS Data

Agenda item: 8.9

Document for: APPROVAL

Introduction:

This document contains **7** CRs on **Rel-5 WI CS Data,** including the corresponding mirror CRs (as required).

These CRs have been agreed by TSG CN WG3 and are forwarded to TSG CN Plenary meeting #18 for approval.

WG_tdoc	Title	Spec	CR	Rev	Cat	Rel	Version_old
N3-020801	CS Data Services (including HSCSD and EDGE) for GERAN Iu mode	23.910	039	1	B	Rel-5	5.1.0
N3-020802	CS Data Services (including HSCSD and EDGE) for GERAN Iu mode	24.022	007	1	B	Rel-5	5.0.0
N3-020804	CS Data Services (including HSCSD and EDGE) for GERAN Iu mode	27.001	081	1	B	Rel-5	5.2.0
N3-020803	CS Data Services (including HSCSD and EDGE) for GERAN Iu mode	29.007	056	1	B	Rel-5	5.3.0
N3-020800	CS Data Services (including HSCSD and EDGE) for GERAN Iu mode	43.010	007	1	B	Rel-5	5.1.0
N3-020805	CS Data Services (including HSCSD and EDGE) for GERAN Iu mode	44.021	004	1	B	Rel-5	5.1.0
N3-020950	CS Data Services (including HSCSD and EDGE) for GERAN Iu mode	48.020	003	4	B	Rel-5	5.1.0

3GPP TSG-CN WG3 Meeting #25
Miami, USA, 23rd - 27th September 2002.

Tdoc ⌘N3-020800

CR-Form-v7

CHANGE REQUEST

⌘ **43.010** **CR** **007** ⌘ **rev** **1** ⌘ Current version: **5.1.0** ⌘

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

Proposed change affects: UICC apps⌘ [ ] ME [X] Radio Access Network [X] Core Network [X]

Title:	⌘	CS Data Services (including HSCSD and EDGE) for GERAN Iu mode
Source:	⌘	TSG_CN WG3
Work item code:	⌘	CS Data
Date:	⌘	19/09/2002
Category:	⌘	**B**
Release:	⌘	Rel-5

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

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
Rel-4 (Release 4)
Rel-5 (Release 5)
Rel-6 (Release 6)

Reason for change:	⌘	The provision of CS data services in GERAN Iu mode requires changes in 43.010 as proposed in this CR.
Summary of change:	⌘	See attached pages
Consequences if not approved:	⌘	Feature is incomplete.

Clauses affected:	⌘	1, 4.2, 6.1.1, 6.3.11, 6.4, 6.5, 7.5				
		Y	**N**			
Other specs affected:	⌘	**X**		Other core specifications	⌘	23.910, 44.021, 48.020, 44.022, 29.007, 27.001
			X	Test specifications		
			X	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/specs/CR.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://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

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

1 Scope

This specification is only applicable for a GERAN PLMN. In the 2nd generation is this a GSM PLMN. In the 3rd generation is this a PLMN that uses a GERAN as radio access network operating either in A/Gb mode or Iu mode.

A PLMN may be described by a limited set of access interfaces (refer to 3GPP TS 24.002 and 22.001) and a limited set of PLMN connection types to support the telecommunication services described in the 3GPP 22-series of specifications. This Technical Specification (TS) identifies and defines these connection types in so far as they relate to the particular network capabilities for a PLMN.

The basic lower layer capabilities of a PLMN are represented by a set of PLMN connection types. The definition of a set of PLMN connection types provides the necessary input to identify network capabilities of a PLMN. In addition to describing network capabilities of a PLMN, the identification of connection types facilitates the specification of network-to-network interfaces. It may also assist in the allocation of network performance parameters.

This specification should be considered in conjunction with other 3GPP specifications with particular reference to 3GPP TS 22.001, 22.002, 22.003, 23.002, 24.002 and 44.004.

This specification provides a bridge between the service specification in the 3GPP TS 22-series of specifications and the more detailed specifications such as the 3GPP TS 43, 44, 23, 24, 27 and 29 series. As such, it establishes a framework for the specification and understanding of the more detailed specifications. It is therefore not a specification against which detailed conformance testing can be performed. However, it shall be considered mandatory for the understanding of the more detailed specifications and used to resolve issues of conflict in these specifications.

From R99 onwards the following services are no longer required by a PLMN:

- the dual Bearer Services “alternate speech/data” and “speech followed by data”
- the dedicated services for PAD and Packet access
- the single asynchronous and synchronous Bearer Services (BS 21..26, BS 31..34)

From Release 4 onwards the following services are no longer required by a PLMN:

- the synchronous Bearer Service non-transparent (BS 30 NT).
- the Basic Packet access
- the Teleservice Facsimile non-transparent (TS 61/62 NT).

If a PLMN network still provides these services it has to fulfil the specification of former releases.

Next section modified

4.2 Transparent and non-transparent lower layer capabilities

Two classes of low layer capabilities have been identified (see 3GPP TS 22.002 and 3GPP TS 22.003):

- a transparent class which is characterized by constant throughput, constant transit delay and variable error rate;
- a non-transparent class for which an ARQ technique is used (see 3GPP TS 24.022) on the radio path and extended to an appropriate interworking function. This class is characterized by improved error rate with variable transit delay and throughput. Data compression can optionally be used in combination of non-transparent lower layer capability, to increase the data rate on the DTE/DCE interface (or the equivalent interface depending on the TE type).

The considerations described above provide the basis for the definition of a limited set of connection types to be implemented by ~~an A/Gb mode~~a GERAN PLMN.

Next section modified

6.1.1 Rate adaptation

The RA0 rate adaptation is only used with asynchronous interfaces. Incoming asynchronous data is padded by the addition of stop elements to fit the same or nearest higher synchronous rate defined by 2 to the power n (where n≤ 6) times 600 bit/s, 14.4 kbit/s or 28.8 kbit/s. Thus 300 bit/s user data signalling rate shall be adapted to a synchronous 600 bit/s stream. This function is described in 3GPP TS 44.021. The RA0 used in the PLMN is not identical to that described in ITU-T Recommendation V.110 which converts the 14,4 and 28,8 kbit/s user rates to 19,2 and 38,4 kbit/s, respectively.

The intermediate rate adaptation function (RA1) is a rate adaptation function which turns either the output of the RA0 function or a synchronous user data stream into a data stream at 8, 16, or 32 kbit/s by bit repetition and frame addition. This function is described in 3GPP TS 48.020.

The adaptation of intermediate rates to 64 kbit/s (RA2) performs the final conversion from the intermediate rates generated by the RA1 function to 64 kbit/s.

The radio interface intermediate rate adaptation function (RA1') is in the case of transparent data transmission a variant of the RA1 function and it adapts synchronous user data stream or the output of the RA0 function to one of the following data rates: 3.6, 6.0 or 12.0 or 14.5 kbit/s over the radio path. In case of a TCH/F28.8 channel two 14.5 kbit/s substreams produced by the RA1' function are multiplexed into a 29.0 kbit/s air interface channel by an EDGE multiplexing function. For the non-transparent case, the RA1' function provides direct access to the 12.0 or 6.0 kbit/s data rates. This is achieved by allowing the V.110 frame status bits to be used as additional data bits. This function is described in 3GPP TS 44.021 and 3GPP TS 48.020. RA1’ is not applied in TCH/F14.4 or EDGE non-transparent operation.

For TCH/F14.4 channel coding ~~four~~ five PLMN-specific adaptation functions are used: namely, RA1’/RAA’, RAA’, RA1’/RAA”, RAE and RAA’’ (3GPP TS 48.020). On the network side of the air interface, the 14.5 kbit/s substreams multiplexed into a 29.0 or 43.5 kbit/s air interface channel are transferred just as in a multislot connection of TCH/F14.4 substreams. RA1’/RAA’ adapts between the 14.5 kbit/s air-interface rate and the 16 kbit/s rate used across the Abis-interface. RAA’ adapts between the 16 kbit/s Abis Interface-rate and 16.0 kbit/s A-interface substream. (Up to four such A-interface substreams may be multiplexed into the 64kbit/s A-interface stream). RAA’’ converts between the A-interface data substream(s) and the overall synchronous stream. In non-transparent operation the RAA’’ converts between the A-interface stream and the 290-bit blocks containing bits M1, M2, and 288 data bits as described in 3GPP TS 44.021. The RA1’/RAA” function shall be used for channel codings TCH/F14.4 if the AIUR is equal to 64 kbit/s. It adapts between the 64 kbit/s data stream and the 14.5 kbit/s air-interface rate. For GERAN Iu mode exists another PLMN specific rate adaptation function, namely RAE. This function is the subsequent execution of RAA’ and RAA”, i.e., it adapts between the 16 kbit/s Abis Interface rate and the overall synchronous stream.

In multislot data configurations the intermediate rates 16, 32, and 64 kbit/s are supported on those sections of the network where the overall data stream is not split into multiple channels (3GPP TS 44.021 and 48.020). RA1-adaptation is not applied to rates higher than 38.4 kbit/s. Instead, a PLMN-specific rate adaptation function RA1’’ to user rates 48 and 56 kbit/s is applied; this function adapts between these rates and the 64 kbit/s "intermediate" rate. The RA2 function passes rate 64 kbit/s on as such.

In multislot data connections, the rate adaptation functions are performed per TCH/F between the Split/Combine-functions. On the A-interface up to four TCH/Fs are multiplexed into one 64 kbit/s channel according to the procedures defined in 3GPP TS 48.020. However, multiplexing is not applied to those user rates which make use of more than four TCH/Fs; for such rates the Split/Combine-function is located at the BSS.

The splitting and recombining of the data flow into/from TCH/Fs takes place at the RA1-function or RAA“ function (transparent service) at the MSC/IWF and at the MS’s RA1’-function, or between the RLP and RA1’ (RA1’ not applied to TCH/F14.4) (non-transparent service) at the MS and between RA1 or RAA”and RLP at MSC/IWF (figures 6 and 7). The TCH/Fs are treated as independent channels between the Split/Combine-functions.

For user rates requiring more than four TCH/Fs (transparent only) the Split/Combine-function is located at the RA1’-function at the MS and at the RA1’/RA1 or RA1’/RAA”-function at the BSS (figures 6 and 7). The rate adaptation functions for the various user data rates are summarized in tables 1 to 3. It should be noted that in the case of synchronous data transmission, the RA0 is not present.

For 56 and 64 kbit/s connections using a 2×TCH/F32.0 channel configuration across the radio interface, no rate adaptation is applied as the PLMN offers a '64 kbit/s pipe' between TE and an external network.

For 32 kbit/s connections using a 1×TCH/F32.0 channel configuration across the radio interface, the ITU-T I.460 rate adaptation is applied as described in 3GPP TS 44.021.

Table 1: Rate adaptation functions for the support of TE2 in the transparent case

R I/F	RA0		RA1'	Radio I/F
async	<------>	sync		
≤ 2.4	<------>	≤ 2.4	<---------->	3.6
4.8	<------>	4.8	<---------->	6.0
9.6	<------>	9.6	<---------->	12.0 or 2 × 6.0
14.4	<------>	14.4	<---------->	14.5 or 2 × 12.0 or 3 × 6.0
19.2	<------>	19.2	<---------->	2 × 12.0 or 4 × 6.0
28.8	<------>	28.8	<---------->	1 x 29.0 or 2 x 14.5 or 3 × 12.0
		32	<---------->	1 × 32
38.4	<------>	38.4	<---------->	3 x 14.5 or 4 × 12.0
		48.0	<---------->	4 x 14.5 or 5 × 12.0
		56.0	<---------->	2 x 32.0 or 4 x 14.5 or 5 × 12.0 note 1
		64.0	<---------->	2 x 32.0 or 5 x 14.5 or 6 × 12.0 note 1

NOTE 1: AIUR of 11.2 kbit/s per 12.0 kbit/s air interface channel (3GPP TS 44.021).

Table 2: void

Table 3: RA1' function in the non-transparent case

	RA1'	
6.0	<------>	6.0
12.0	<------>	12.0

NOTE: RA1' not applicable to TCH/F14.4, TCH/F28.8, or TCH/F43.2

Next section modified

6.4 PLMN connection types for GERAN A/Gb mode

6.4.1 Limited set of PLMN connection types (~~all~~ for TCH/F4.8 and TCH/F9.6 channel codings ~~excluding TCH/F14.4 and EDGE~~)

From the two connection elements defined in subclause 6.2, the list of attributes and their possible values given in subclause 6.3, and from the service requirements defined in 3GPP TS 22.002 and 22.003, a limited set of PLMN connection types have been identified (see also table 5 and table 6 for the relationship between connection elements and telecommunication services).

Figure 6 gives the information transfer protocol models for the identified set of PLMN connection types. The S bits correspond to status bits and the D bits to data bits (3GPP TS 44.021); S* indicates that S bits are used only when 3.1 kHz audio ex PLMN. D' bits corresponds to user bits passed in the place of status bits in the non transparent case Moreover, it should be noted that the RLP rate of 6 and 12 kbit/s correspond to the 8 and 16 kbit/s intermediate rate in the transparent case.

Protocol Models 1 b and e are the models for asynchronous data transmission in the transparent mode.

Protocol Models 2 b and e are the models for synchronous data transmission in the transparent mode.

Protocol Models 3 b and e are the models for character "asynchronous" mode data transmission in the non-transparent mode. In this case, L2RCOP represents the protocol used between the Layer 2 Relay functions (L2R) to convey characters between the MS and the IWF (see 3GPP TS 27.002). The data compression function is located in the L2R COP function.

In all of the above models, the b variants are for singleslot, the e variants are for multislot data configurations.

Protocol Model 5a is the model for the transparent support of group 3 facsimile transmission. Model 5b is for transparent support of group 3 facsimile transmission in multislot data configurations.

Protocol Model 6 is the model for speech transmission.

In the multislot-data models the data is split into parallel substreams between the Split/Combine-functions (S/C). These substreams are transmitted through parallel TCH/Fs which are treated as independent channels. Between the S/C-functions parallel RA- and FEC-functions are used.

For all the models, only the minimum functionality of the IWF is shown. Additional functions will be required for various interworking situations. These additional functions are described in specification 3GPP TS 29.007.

It should be noted that, in Figure 6, the representation of the transcoding and rate adaptation from the intermediate rate on the radio interface to the 64 kbit/s rate required by the MSC is not intended to indicate a particular implementation. The annex B to 3GPP TS 43.010 identifies alternative arrangements.

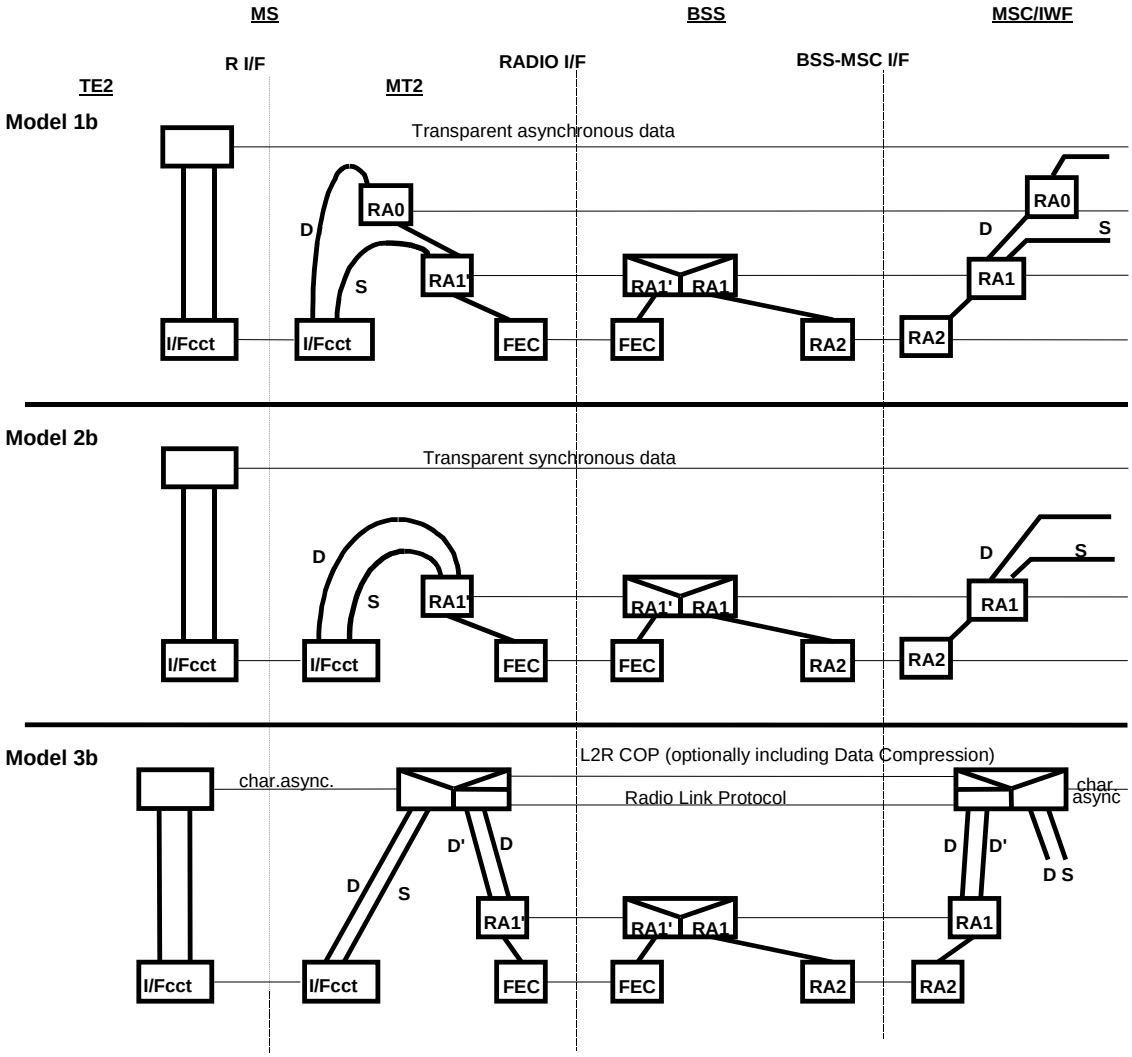


Figure 6: Information transfer protocol models for PLMN connections

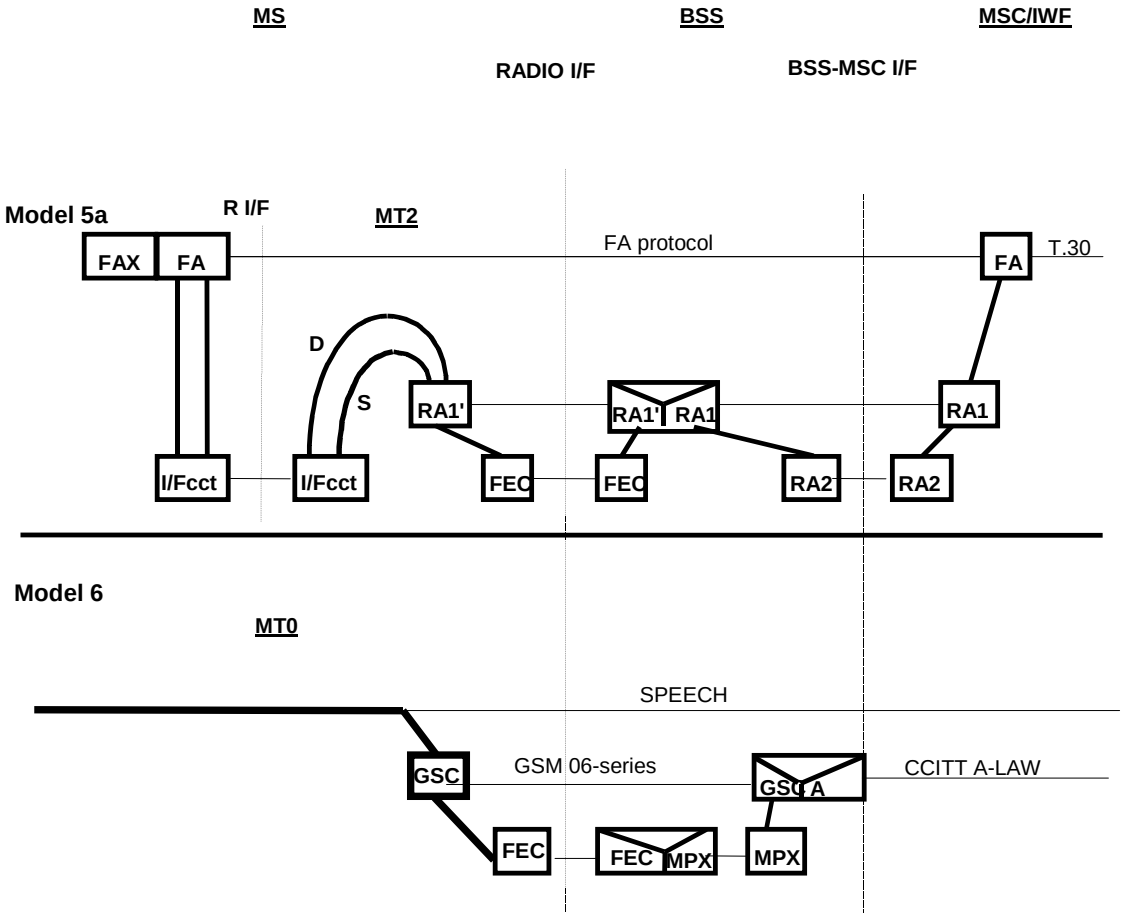


Figure 6 (continued): Information transfer protocol models for PLMN connections

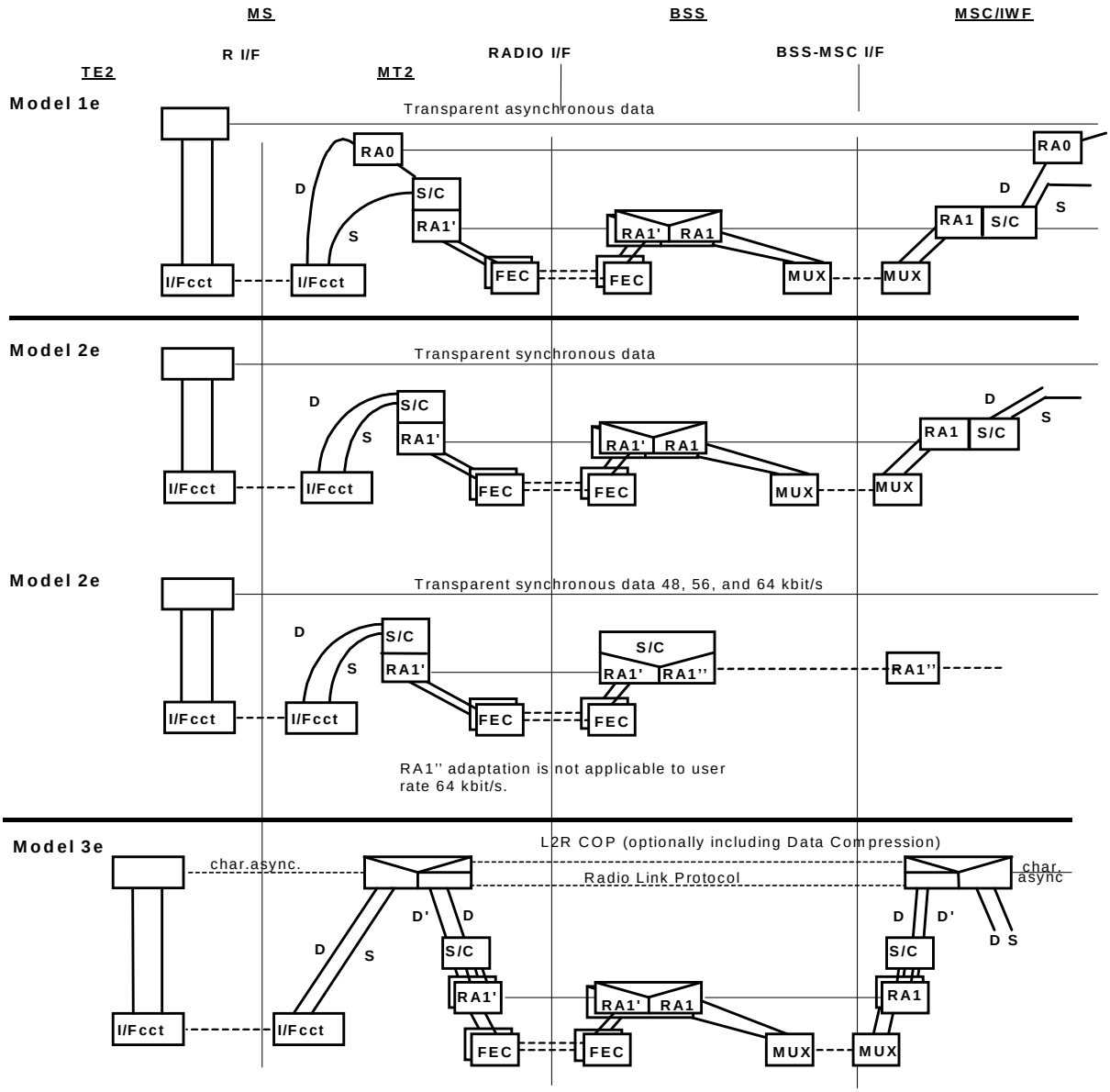


Figure 6 (continued): Information transfer protocol models for PLMN connections

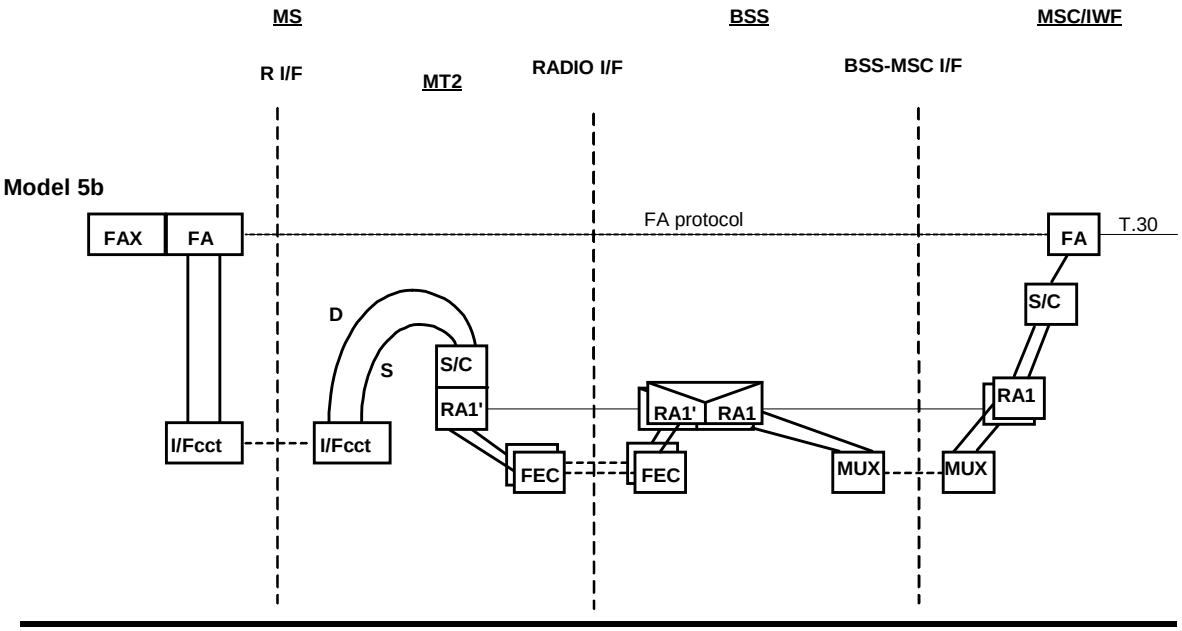


Figure 6 (concluded): Information transfer protocol models for PLMN connections

Legend	to Figure 6:
FA	= Fax Adaptor
GSC	= GSM Speech Codec
FEC	= Forward Error Correction
MPX	= Multiplex/Demultiplex
MUX	= Multiplex/Demultiplex
S/C	= Split/ Combine

~~6.5~~6.4.2 Limited set of PLMN connection types (for TCH/F14.4 channel coding)

Figure 7 provides the information transfer protocol models for the identified set of PLMN connection types for support of TCH/F14.4. The description of models given in subclause 6.4.1 applies also to figure 7.

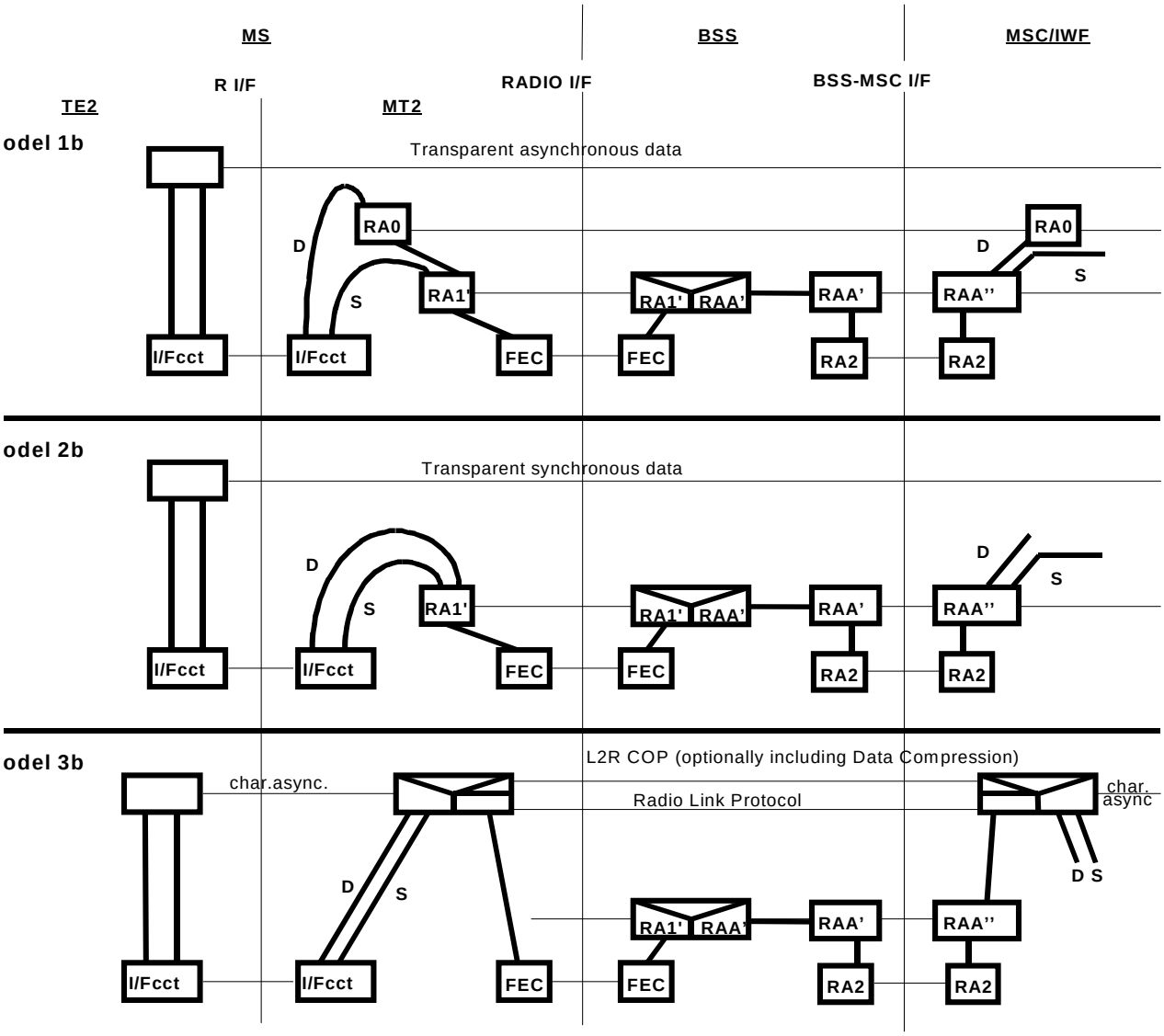


Figure 7 : Information transfer protocol models for PLMN connections using 14.4 channels

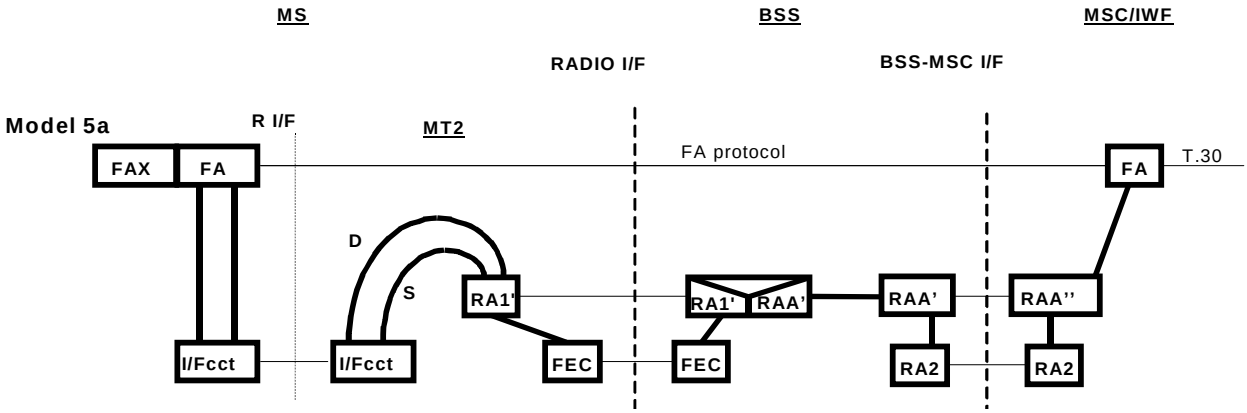


Figure 7 (continued) : Information transfer protocol models for PLMN connections using 14.4 channels

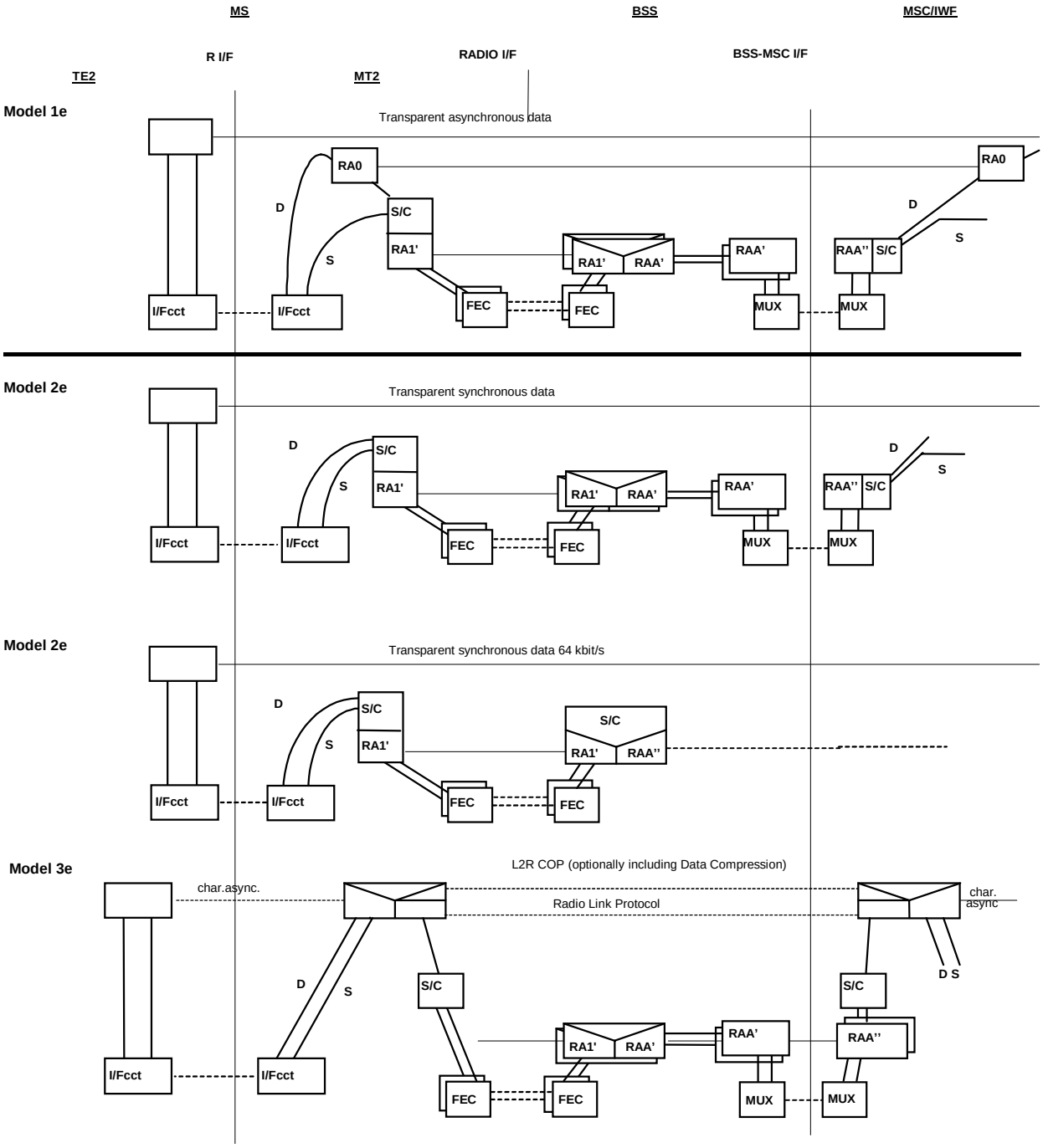


Figure 7 (continued) : Information transfer protocol models for PLMN connections using 14.4 channels

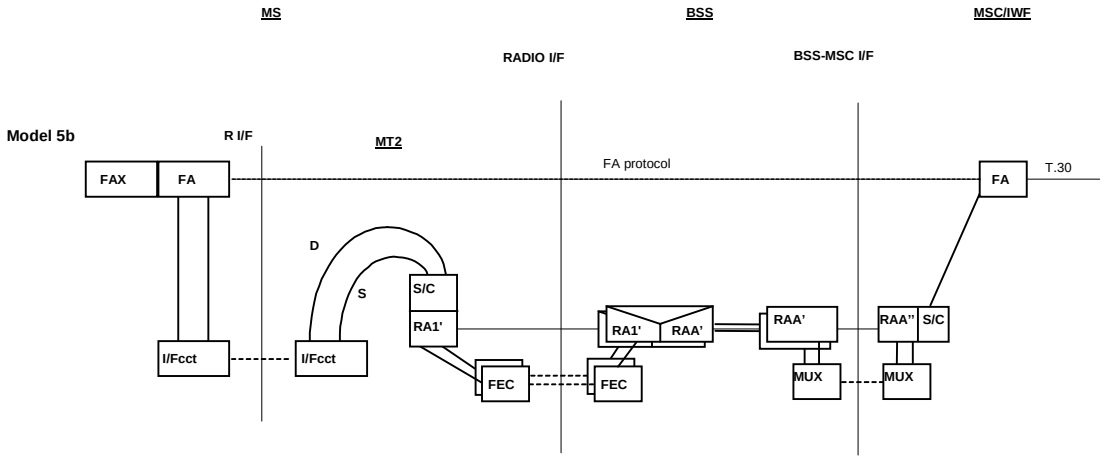


Figure 7 (concluded) : Information transfer protocol models for PLMN connections using 14.4 channels

Legend	to Figure 7:
FA	= Fax Adaptor
GSC	= GSM Speech Codec
FEC	= Forward Error Correction
MPX	= Multiplex/Demultiplex
MUX	= Multiplex/Demultiplex
S/C	= Split/ Combine

~~6.6~~6.4.3 Limited set of PLMN connection types (for EDGE channels)

Figure 8 provides the information transfer protocol models for the identified set of PLMN connection types for support of TCH/F28.8 or TCH/F43.2 and figure 9 the models for the support of TCH/F32.0. The description of models given in subclause 6.4.1 applies also to figures 8 and 9.

When a TCH/F28.8 channel is used in multislot configurations, multiple EDGE multiplexing functions are applied on both sides of the air-interface; i.e. one multiplexing function — on each side of the air interface — is associated with each air-interface channel.

When TCH/F32.0 channels are used in double slot configurations, no rate adaptation is applied as the PLMN offers a '64 kbit/s pipe' between TE and an external network. When TCH/F32.0 channels are used in single slot configurations, the ITU-T I.460 rate adaptation is applied. (For details refer to 3GPP TS 44.021).

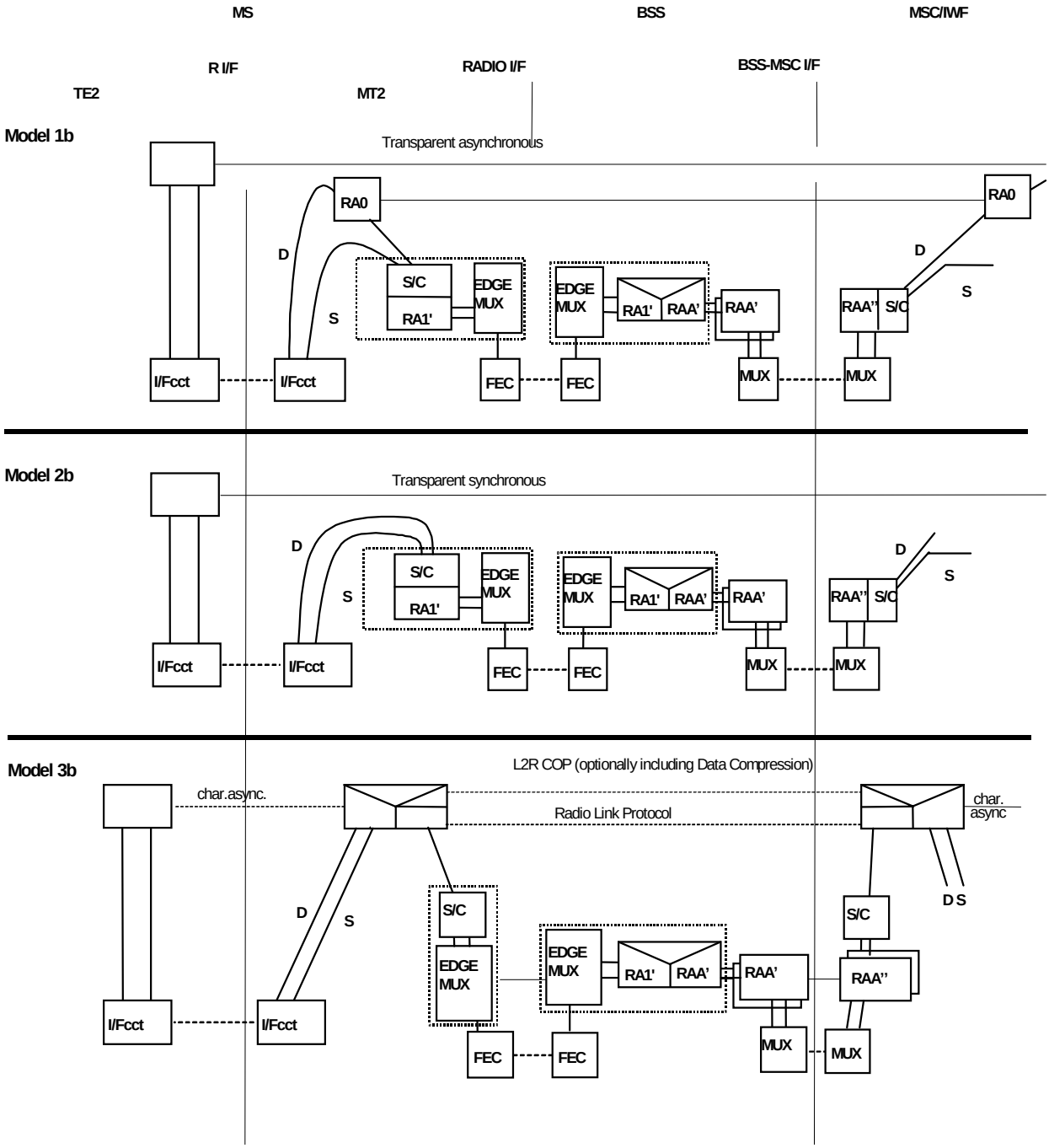


Figure 8: Information transfer protocol models for PLMN connections using EDGE channels

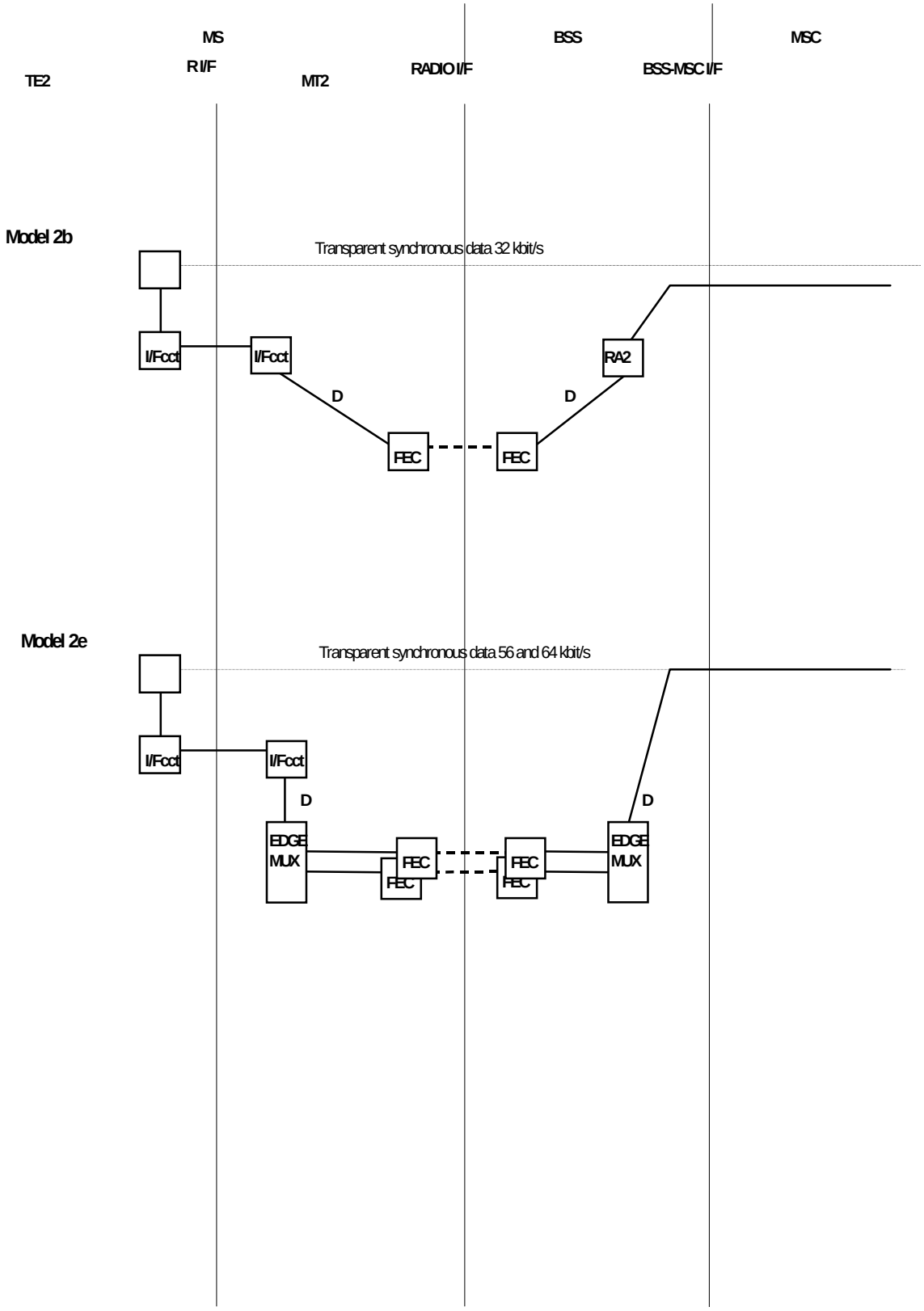


Figure 9: Information transfer protocol models for PLMN connections using TCH/F32.0 EDGE channels

6.5 PLMN connection types for GERAN Iu mode

6.5.1 Limited set of PLMN connection types (for TCH/F9.6 channel coding)

Figure 10 provides the information transfer protocol models for the identified set of PLMN connection types for TCH/F9.6 channel coding. The description of models given in subclause 6.4.1 applies also to figure 10.

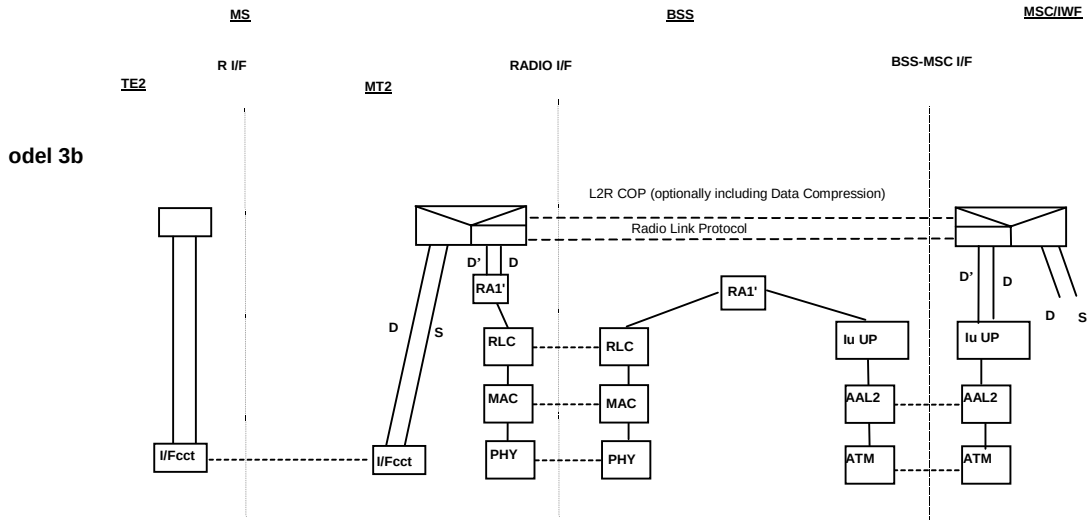
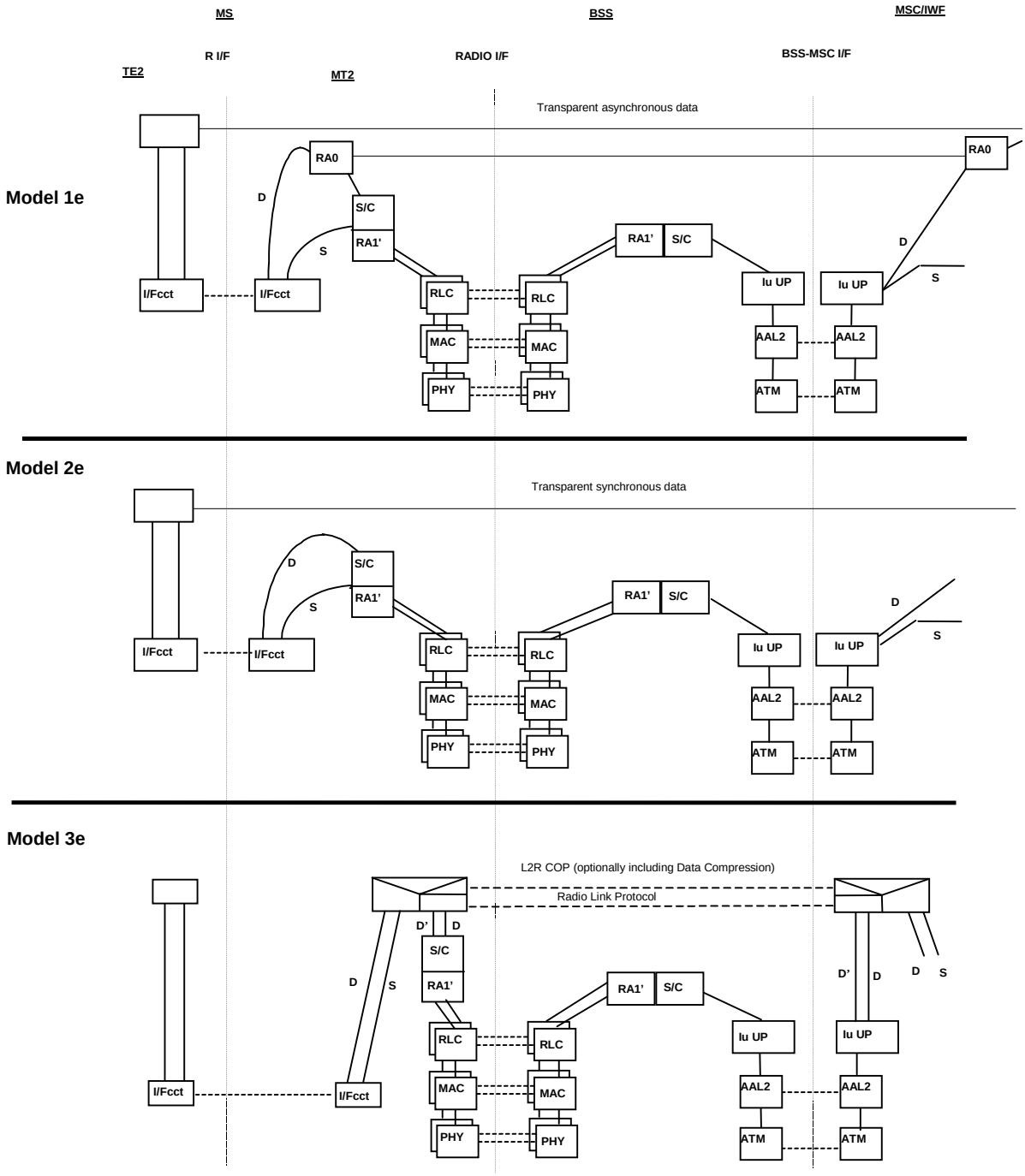


Figure 10: Information transfer protocol models for PLMN connections



Legend	to Figure 10:
RLC	= Radio Link Control
MAC	= Medium Access Control
PHY	= Physical Layer
S/C	= Split/ Combine function
Iu UP	= Iu User Plane protocol
ATM	= Asynchronous Transfer Mode

Figure 10 (concluded): Information transfer protocol models for PLMN connections

6.5.2 Limited set of PLMN connection types (for TCH/F14.4 channel coding)

Figure 11 provides the information transfer protocol models for the identified set of PLMN connection types for support of TCH/F14.4. The description of models given in subclause 6.4.1 applies also to figure 11.

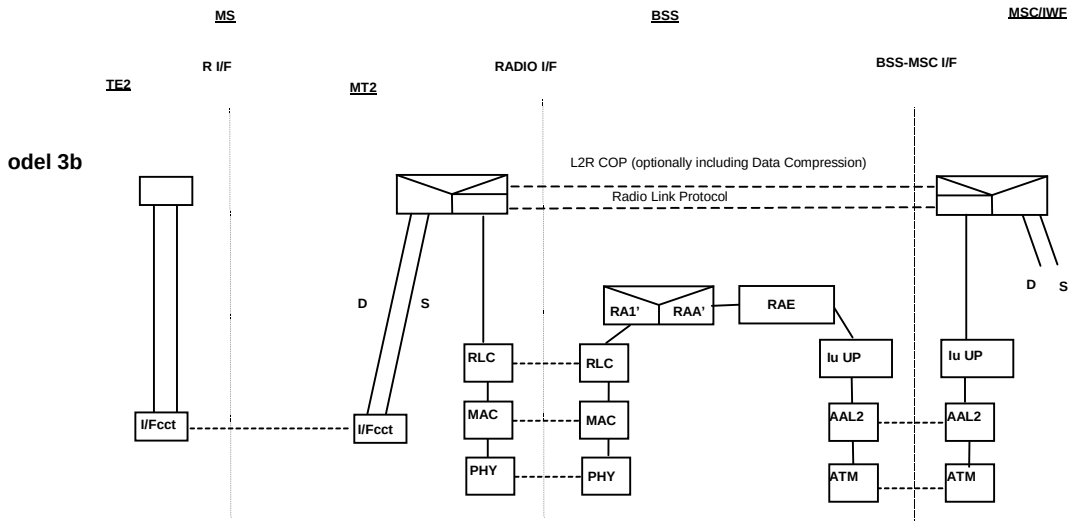


Figure 11: Information transfer protocol models for PLMN connections using 14.4 channels

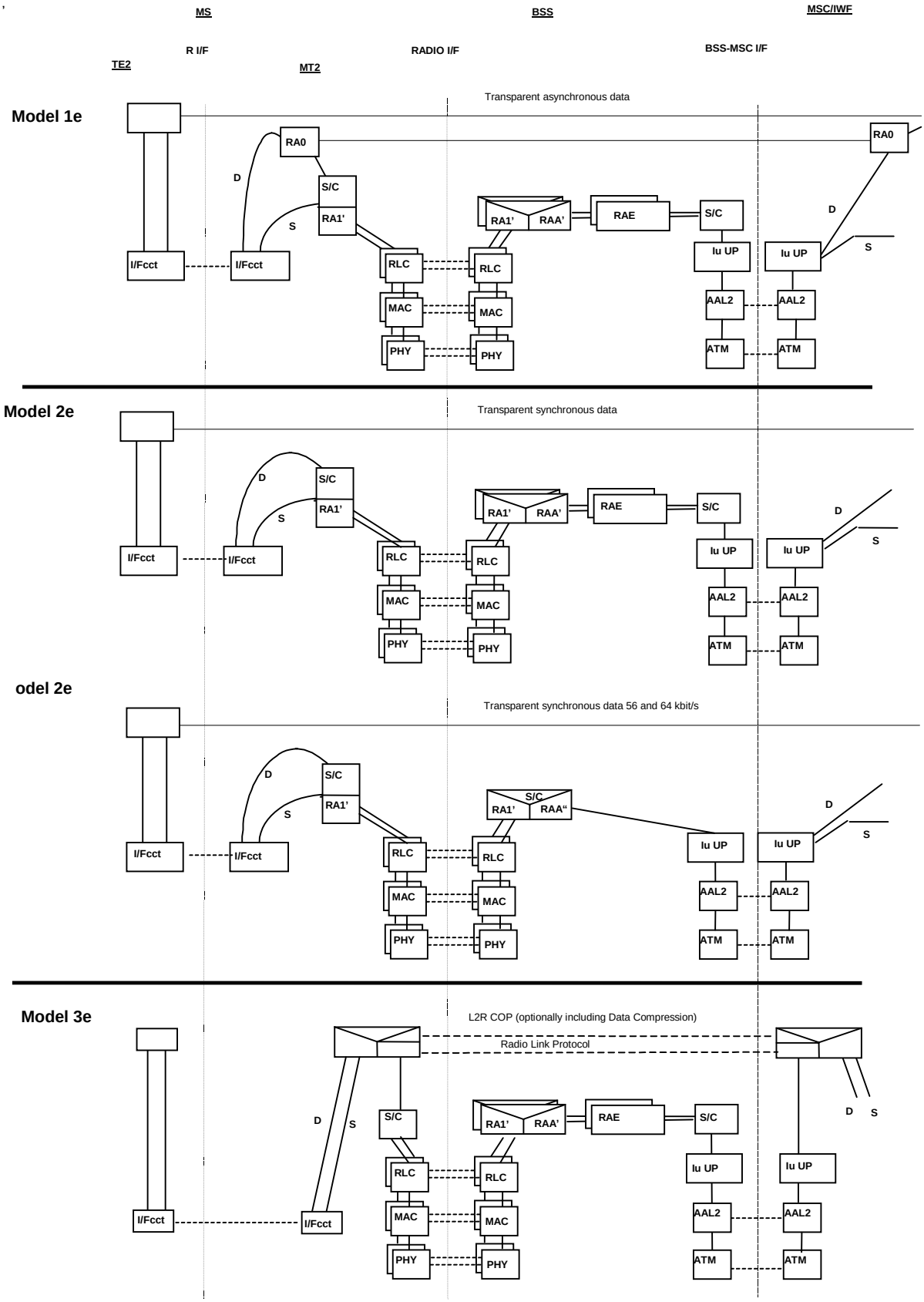


Figure 11 (concluded): Information transfer protocol models for PLMN connections using 14.4 channels

6.5.3 Limited set of PLMN connection types (for EDGE channels)

Figure 12 provides the information transfer protocol models for the identified set of PLMN connection types for support of TCH/F28.8 or TCH/F43.2 and figure 13 the models for the support of TCH/F32.0. The description of models given in subclause 6.4.1 applies also to figures 12 and 13.

When a TCH/F28.8 channel is used in multislot configurations, multiple EDGE multiplexing functions are applied on both sides of the air-interface; i.e. one multiplexing function — on each side of the air interface — is associated with each air-interface channel.

When TCH/F32.0 channels are used in double slot configurations, no rate adaptation is applied as the PLMN offers a '64 kbit/s pipe' between TE and an external network. When TCH/F32.0 channels are used in single slot configurations, the ITU-T I.460 rate adaptation is applied. (For details refer to 3GPP TS 44.021).

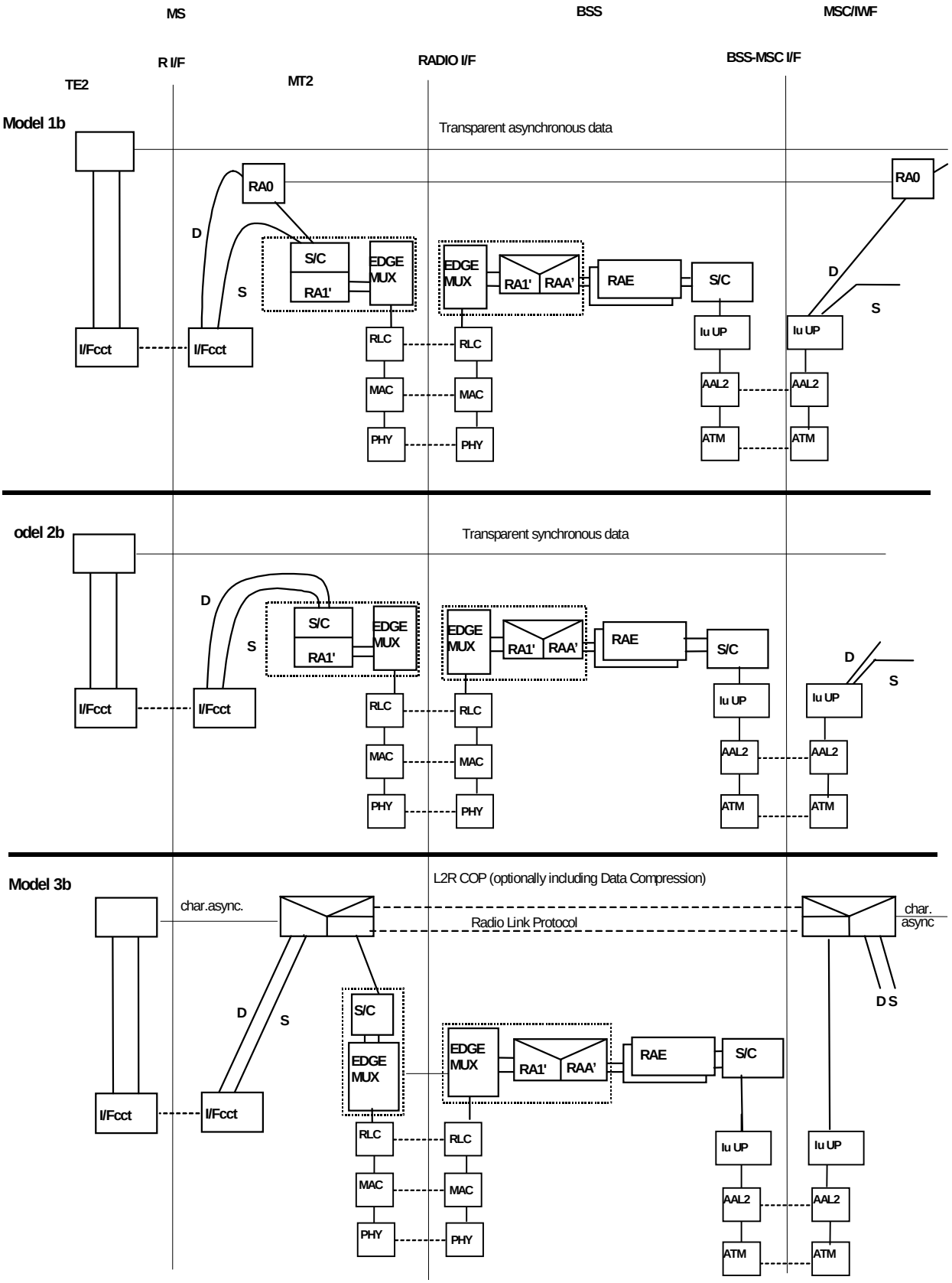


Figure 12: Information transfer protocol models for PLMN connections using EDGE channels

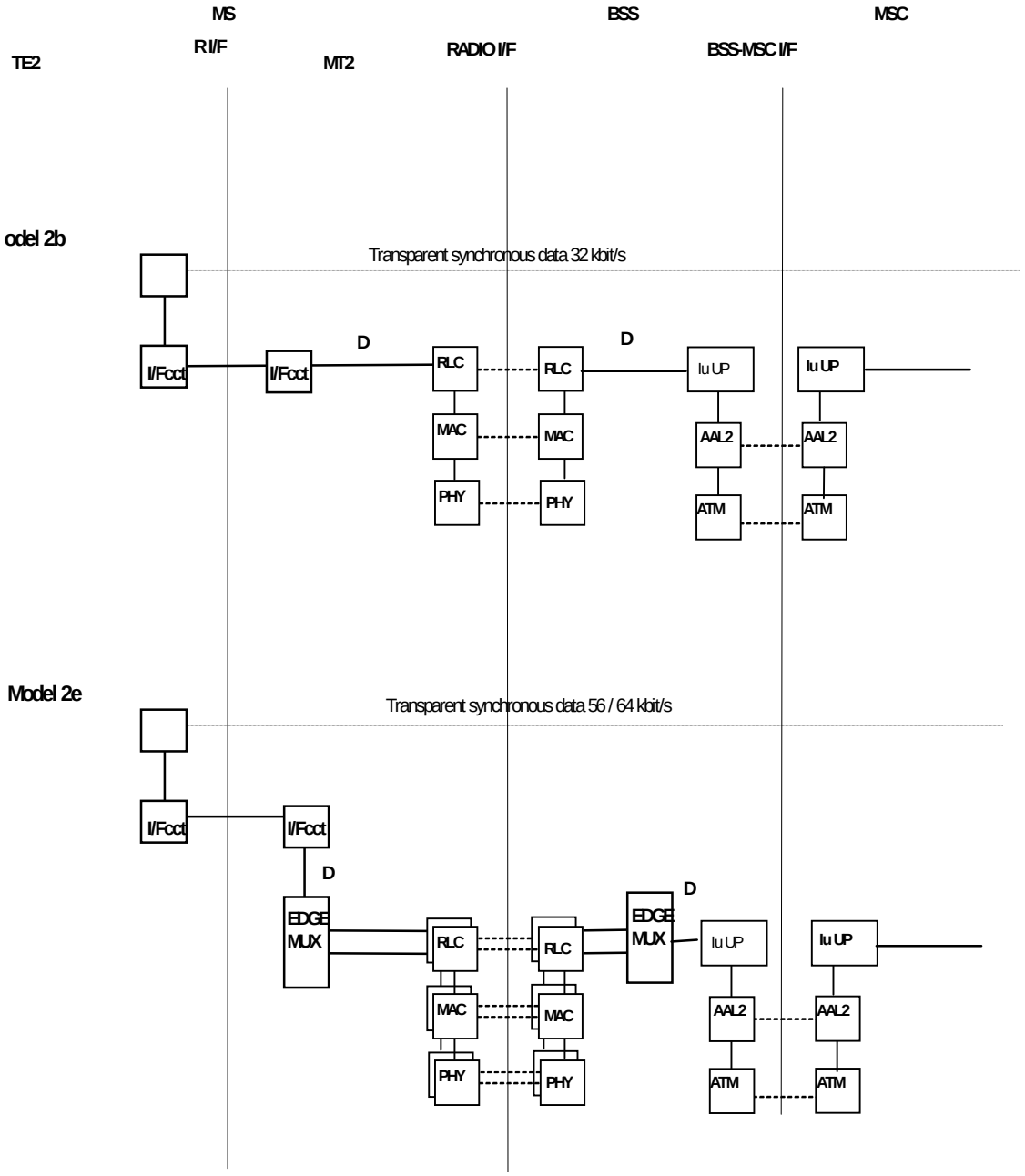


Figure 13: Information transfer protocol models for PLMN connections using TCH/F32.0 EDGE channels

Next section modified

7.5 Network capability to support channel mode modification

Specification 3GPP TS 43.045 (Technical Realization of the Group 3 Facsimile Teleservice) identifies a need for a PLMN to support channel mode modification within the facsimile phase of the alternate speech and facsimile group 3 service. The network capability to support channel modification is described in 3GPP TS 24.008. Channel mode modification is not possible for other services. A channel mode modification results in a change of connection element over the radio interface with resultant change in access at the mobile station.

Table 5: Relationship between Bearer services and PLMN Connection elements

Connection description	Bearer service user data rate	Radio interface connection element	Intermediate rate at the BSS-MSC interface	BSS-MSC connection element	Protocol model in figure 6, 7, 8, 9, 10, 11, 12 or ~~8~~13
Circuit mode unstructured with unrestricted digital capability transparent.	Data circuit duplex async n × 4 800 (n ≤ 4) or n × 9 600 bit/s (n ≤ 4). Data circuit duplex sync n × 4 800 (n ≤ 4) or n × 9 600 bit/s (n ≤ 5) or n × 1 1200 bit/s (n = 5 or 6).	cct mode unstructured unrestricted n × 6 kbit/s (n ≤ 4) or n × 12 kbit/s (n ≤ 6) on n full rate channels.	8 or 16 kbit/s per TCH/F. For data connections using 5 or 6 TCH/Fs no intermediate rate(s) .	cct mode unstructured unrestricted 64 kbit/s.	Fig 6 : 1 e, 2 e Fig 10 : 1 e, 2 e
	Data circuit duplex async n × 14 400 bit/s (n ≤ 3). Data circuit duplex sync n × 14 400 bit/s (n ≤ 5)	cct mode unstructured unrestricted n x 14.5 kbit/s (n ≤ 5) on n full rate channels	16 kbit/s per TCH/F.	cct mode unstructured unrestricted 64 kbit/s.	Fig 7 : 1 e, 2 e Fig 11 : 1 e, 2 e
	Data circuit duplex async 28 800 bit/s. Data circuit duplex sync 28 800 bit/s	cct mode unstructured unrestricted 29.0 kbit/s on full rate channel	16 kbit/s per TCH/F.	cct mode unstructured unrestricted 64 kbit/s.	Fig 8 : 1 b, 2 b Fig 12 : 1 b, 2 b
	Data circuit duplex Sync 32 000 bit/s	cct mode unstructured unrestricted 32 kbit/s on full rate channel	32 kbit/s		Fig 9 : 2 b Fig 13 : 2 b ~~None~~
	Data circuit duplex sync 64 000 bit/s	cct mode unstructured unrestricted 2 x 32.0 kbit/s on full rate channels	No intermediate rate for the 64 000 bit/s rate		Fig 9 : 2 e Fig 13 : 2 e
	Data circuit duplex async 14 400 bit/s Data circuit duplex sync 14 400 bit/s	cct mode unstructured unrestricted 14.5 kbit/s on full rate Channel	16 kbit/s	cct mode unstructured unrestricted 64 kbit/s.	Fig 7 : 1 b, 2 b Fig 11 : 1 b, 2 b
	Data circuit duplex async 9 600 bit/s. Data circuit duplex sync 9 600 bit/s.	cct mode unstructured unrestricted 12 kbit/s on full rate channel.	16 kbit/s.	cct mode unstructured unrestricted 64 kbits/s.	Fig 6 : 1 b ~~Fig 6~~ 2 b
	Data circuit duplex async 4 800 bit/s. Data circuit duplex sync 4 800 bit/s.	cct mode unstructured unrestricted 6 kbit/s on full rate channel and half rate channel.	8 kbit/s.	cct mode unstructured unrestricted 64 kbits/s.	Fig 6 1 b ~~Fig 6~~ 2 b
	Data circuit duplex async 300. Data circuit duplex async 1 200. Data circuit duplex async 2 400. Data circuit duplex sync 1 200. Data circuit duplex sync 2 400.	cct mode unstructured unrestricted 3.6 kbit/s on full rate channel and half rate channel.	8 kbit/s.	cct mode unstructured unrestricted 64 kbits/s.	Fig 6 : 1 b ~~Fig 6 1 b~~ ~~Fig 6 1 b~~ ~~Fig 6 2 b~~ ~~Fig 6 2 b~~

Connection description	**Bearer service user data rate**	**Radio interface connection element**	**Intermediate rate at the BSS-MSC interface**	**BSS-MSC connection element**	**Protocol model in figure 6, 7, 8, 9, 10, 11, 12 or ~~8~~13**
Circuit mode unstructured with unrestricted digital capability non transparent.	Data circuit duplex async n × 4 800 (n ≤ 4) or n × 9 600 bit/s (n ≤ 4).	cct mode SDU unrestricted n × 6 kbit/s (n ≤ 4) or n × 12 kbit/s (n ≤ 4) on full rate channels.	8 or 16 kbit/s per TCH/F.	cct mode unstructured unrestricted 64 kbit/s.	Fig 6 : 3 e Fig 10 : 3 e
	Data circuit duplex async n × 14 400 bit/s (n ≤ 4).	cct mode SDU unrestricted n × 14.5 kbit/s (n ≤ 4) on full rate channels.	16 kbit/s	cct mode unstructured unrestricted 64 kbit/s.	Fig 7 : 3 e Fig 11 : 3 e
	Data circuit duplex async n x 28 800 bit/s (n ≤ 2). Data circuit duplex async 43 200 bit/s	cct mode SDU unrestricted n × 29.0 kbit/s (n ≤ 2) on full rate channels. cct mode SDU unrestricted 43.5 kbit/s on a full rate channel.	16 kbit/s per TCH/F. 16 kbit/s per TCH/F.	cct mode unstructured unrestricted 64 kbit/s.	Fig 8 : 3 b Fig 12 : 3 b
	Data circuit duplex async 14 400 bit/s	cct mode SDUunrestricted 14.5 kbit/s on full rate channel	16 kbit/s	cct mode unstructured unrestricted 64 kbit/s.	Fig 7 : 3 b Fig 11 : 3 e
	Data circuit duplex async 9 600 bit/s.	cct mode SDU unrestricted 12 kbit/s on full rate channel.	16 kbit/s.	cct mode unstructured unrestricted 64 kbits/s.	Fig 6 : 3 b Fig 10 : 3 b
	Data circuit duplex async 4 800 bit/s.	cct mode SDU unrestricted full rate channel, 12 kbit/s or half rate channel, 6 kbit/s.	16 kbit/s FR 8 kbit/s HR.	cct mode unstructured unrestricted 64 kbits/s.	Fig 6 : 3 b Fig 10 : 3 b
	Data circuit duplex async 300. Data circuit duplex async 1 200. Data circuit duplex async 2 400.	cct mode SDU unrestricted full rate channel, 12 kbit/s or half rate channel, 6 kbit/s.	16 kbit/s FR 8 kbit/s HR.	cct mode unstructured unrestricted 64 kbits/s.	Fig 6 : 3 b ~~Fig 6 : 3 b~~ ~~Fig 6 3 b~~ Fig 10 : 3 b

Connection description	Bearer service user data rate	Radio interface connection element	Intermediate rate at the BSS-MSC interface	BSS-MSC connection element	Protocol model in figure 6, 7, 8, 9, 10, 11, 12 or 813
Circuit mode unstructured with 3.1 kHz audio ex PLMN transparent.	Data circuit duplex async n × 4 800 bit/s (n ≤ 4) or n × 9 600 bit/s (n ≤ 3). Data circuit duplex sync n × 4 800 bit/s (n ≤ 4) or n × 9 600 bit/s (n ≤ 3).	cct mode unstructured unrestricted n × 6 kbit/s (n ≤ 4) or n × 12 kbit/s (n ≤ 3) on n full rate channels.	8 or 16 kbit/s TCH/F.	cct mode unstructured unrestricted 64 kbit/s.	Fig 6 : 1 e, 2 e Fig 10 : 1 e, 2 e
	Data circuit duplex async n × 14 400 bit/s (n ≤ 2). Data circuit duplex sync n × 14 400 bit/s (n ≤ 2)	cct mode unstructured unrestricted x 14.5 kbit/s (n ≤ 2) on n full rate channels	16 kbit/s per TCH/F	cct mode unstructured unrestricted 64 kbit/s.	Fig 7 : 1 e, 2 e Fig 11 : 1 e, 2 e
	Data circuit duplex async 28 800 bit/s. Data circuit duplex sync 28 800 bit/s	cct mode unstructured unrestricted 29.0 kbit/s on a full rate channel	16 kbit/s per TCH/F.	cct mode unstructured unrestricted 64 kbit/s.	Fig 8 : 1 b, 2 b Fig 12 : 1 b, 2 b
	Data circuit duplex asynch 14 400 bit/s synch 14 400 bit/s	cct mode unstructured unrestricted 14.5 kbit/s on full rate channels	16 kbit/s	cct mode unstructured unrestricted 64 kbit/s.	Fig 7 : 1 b for async Fig 7 :2 b for synch
	Data circuit duplex async 9.6 kbit/s sync 9.6 kbit/s.	cct mode unstructured unrestricted 12 kbit/s full rate channel.	16 kbit/s.	cct mode unstructured unrestricted 64 kbit/s.	Fig 6 : 1 b for asynch. Fig 6 : 2 b for synch.
	Data circuit duplex async 4.8 kbit/s sync 4.8 kbit/s.	cct mode unstructured unrestricted 6 kbit/s full and half rate channel.	8 kbit/s.		
	Data circuit duplex async ≤ 2 400 sync ≤ 2 400.	cct mode unstructured unrestricted 3.6 kbit/s full and half rate channel.	8 kbit/s.		

Connection description	Bearer service user data rate	Radio interface connection element	Intermediate rate at the BSS-MSC interface	BSS-MSC connection element	Protocol model in figure 6, 7, 8, 9, 10, 11, 12 or 8 13
Circuit mode unstructured with 3.1 kHz audio ex PLMN non transparent.	Data circuit duplex async n × 4 800 (n ≤ 4) or n × 9 600 (n ≤ 4) bit/s.	cct mode SDU unrestricted n × 6 kbit/s (n ≤ 4) or n × 12 kbit/s (n ≤ 4) on full rate channels.	8 or 16 kbit/s per TCH/F.	cct mode unstructured unrestricted 64 kbits/s.	Fig 6 : 3 e Fig 10 : 3 e
	Data circuit duplex async n × 14 400 bit/s (n ≤ 4).	cct mode SDU unrestricted n x 14.5 kbit/s (n ≤ 4) on n full rate channels	16 kbit/s per TCH/F	cct mode unstructured unrestricted 64 kbits/s.	Fig 7 : 3 e Fig 11 : 3 e
	Data circuit duplex async 28 800 bit/s. Data circuit duplex async 43 200 bit/s	cct mode SDU unrestricted 29.0 kbit/s on a full rate channel. cct mode SDU unrestricted 43.5 kbit/s on a full rate channel.	16 kbit/s per TCH/F. 16 kbit/s per TCH/F.	cct mode unstructured unrestricted 64 kbits/s.	Fig 8 : 3 b Fig 12 : 3 e
	Data circuit duplex asynch 14 400 bit/s	cct mode SDU unrestricted 14.5 kbit/s full rate channel	16 kbit/s	cct mode unstructured unrestricted 64 kbits/s.	Fig 7 : 3 b Fig 11 : 3 b
	Data circuit duplex async 9.6 kbit/s	cct mode SDU unrestricted 12 kbit/s full rate channel.	16 kbit/s.	cct mode unstructured unrestricted 64 kbit/s.	Fig 6 : 3 b Fig 10 : 3 b
	Data circuit duplex async 4.8 kbit/s	cct mode SDU unrestricted half rate channel, 6 kbit/s or full rate channel, 12 kbit/s.	16 kbit/s FR 8 kbit/s HR.		
	Data circuit duplex async ≤ 2 400	cct mode SDU unrestricted half rate channel, 6 kbit/s or full rate channel, 12 kbit/s.			

Table 6: Relationship between Teleservices and PLMN connection types

Teleservice in a PLMN	**Access at mobile station**	**Radio interface connection element**	**Intermediate rate at the BSS-MSC interface**	**BSS-MSC connection element**	**Protocol model in figure 6 or 7**
Telephony.		cct mode speech.	NA.	cct mode structured 64 kbit/s speech.	Fig 6 : 6
Emergency calls.		cct mode speech.	NA.	cct mode structured 64 kbit/s speech.	Fig 6 : 6
Alternate Speech/ Facsimile Group 3.	Data cct duplex synchronous access alternate speech/ group 3 fax.	cct mode speech alternating with unstructured unrestricted 3.6 or 6 or 12 kbit/s or n × 6 kbit/s (n ≤ 3) or n × 12 kbit/s (n ≤ 2) on FR transparent.	Speech NA 8 or 16 kbit/s per TCH/F.	cct mode structured 64 kbit/s alternate speech/unrestricted.	Fig 6 : 5a or 5b and 6
		cct mode speech alternating with unstructured unrestricted 14.5 kbit/s or n × 14.5 kbit/s (n ≤ 2) on FR transparent	Speech NA 16 kbit/s per TCH/F.		Fig 7 : 5a or 5b and 6
Automatic Facsimile Group 3.	Data cct duplex synchronous access group 3 fax.	cct mode unstructured unrestricted 3.6 or 6 or 12 kbit/s or n × 6 kbit/s (n ≤ 3) or n × 12 kbit/s (n ≤ 2) on FR transparent.	8 or 16 kbit/s per TCH/F.	cct mode structured 64 kbit/s unrestricted.	Fig 6 : 5a, 5b
		cct mode unstructured unrestricted 14.5 kbit/s or n × 14.5 kbit/s (n ≤ 2) on FR transparent	16 kbit/s per TCH/F.		

NA: Not Applicable

NOTE: The multislot data connections and the connections using TCH/F14.4 coding belong to the General Bearer Services (Classes 20 and 30 in 3GPP TS 22.002).

3GPP TSG-CN WG3 Meeting #25
Miami, USA, 23rd - 27th September 2002.

Tdoc ⌘N3-020801

CR-Form-v7

CHANGE REQUEST

⌘ **23.910** **CR** **039** ⌘ **rev** **1** ⌘ Current version: **5.1.0** ⌘

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

Proposed change affects: UICC apps⌘ [ ] ME [X] Radio Access Network [X] Core Network [X]

Title:	⌘	CS Data Services (including HSCSD and EDGE) for GERAN Iu mode
Source:	⌘	TSG_CN WG3
Work item code:	⌘	CS Data
Date:	⌘	19/09/2002
Category:	⌘	**B**
Release:	⌘	Rel-5

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

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
Rel-4 (Release 4)
Rel-5 (Release 5)
Rel-6 (Release 6)

Reason for change:	⌘	The provision of CS data services in GERAN Iu mode requires changes in 23.910 as proposed in this CR.
Summary of change:	⌘	See attached pages
Consequences if not approved:	⌘	Feature is incomplete.

Clauses affected:	⌘	1, 2, 3, 4, 5, 6, 7, 8, 10				
		Y	**N**			
Other specs affected:	⌘	**X**		Other core specifications	⌘	44.021, 48.020, 44.022, 29.007, 27.001, 43.010
			X	Test specifications		
			X	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/specs/CR.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://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

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

1 Scope

The present document provides an overview of the architecture and issues related to the provision of Circuit Switched Bearer Services in a 3G mobile network (UMTS) operating in UTRAN or GERAN Iu mode. Handover to GERAN A/Gb mode is also considered.

NOTE: Please note that the Gb interface does not play any role in the scope of the present document although the term “A/Gb mode” is used. ~~GERAN Iu mode is for further study.~~

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. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document in the same Release as the present document.

[1] 3GPP TS 43.010: "GSM Public Land Mobile Network (PLMN) connection types".

[2] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications ".

[3] 3GPP TS 22.100: "UMTS Phase 1".

[4] 3GPP TS 22.002: "Bearer Services Supported by a GSM PLMN".

[5] 3GPP TS 22.101: "Service Principles".

[6] 3GPP TS 22.105: "Services and Service Capabilities".

[7] 3GPP TS 23.002: "Network Architecture".

[8] 3GPP TS 23.034: "High Speed Circuit Switched Data (HSCSD) -Stage 2".

[9] 3GPP TS 23.101: "General UMTS Architecture".

[10] 3GPP TS 23.107: "Quality of Service, Concept and Architecture".

[11] 3GPP TS 24.022: " Radio Link Protocol (RLP) for circuit switched bearer and teleservices ".

[12] 3GPP TS 25.322: "Radio Link Control (RLC) Protocol Specification".

[13] 3GPP TS 25.415: "UTRAN Iu Interface user plane protocols".

[14] 3GPP TS 27.001: "General on Terminal Adaption Functions (TAF) for Mobile Station (MS)".

[15] 3GPP TS 29.007: "General Requirements on Interworking between PLMN and ISDN or PSTN".

[16] ITU-T Recommendation V.90: "A digital modem and analogue modem pair for use on the Public Switched Telephone Network (PSTN) at data signalling rates of up to 56 000 bit/s downstream and up to 33 600 bit/s upstream".

[17] ITU-T Recommendation T.30 "Procedures for document facsimile transmission in the general switched telephone network".

[18] 3GPP TS 44.021: " Rate adaption on the Mobile Station - Base Station System (MS - BSS) interface".

[19] 3GPP TS 48.020: " Rate adaption on the Base Station System - Mobile-services Switching Centre (BSS - MSC) interface".

[20] ITU-T Recommendation I.366.1: "Segmentation and Reassembly Service Specific Convergence Sublayer for the AAL type 2".

[21] ITU-T Recommendation Q.2630.1: "AAL Type 2 Signalling Protocol (Capability Set 1)".

[22] 3GPP TS 43.051: “GSM/EDGE Radio Access Network (GERAN) overall description, stage 2”

[23] 3GPP TS 43.010: “GSM PLMN connection types”

3 Definitions and abbreviations

3.1 Definitions

The term 'mobile station' (MS) in the present document is synonymous with the term 'user equipment' (UE) as defined in 3GPP TR 21.905 [2].

For the purposes of the present document the following internal, definitions apply in addition to those given in 3GPP TS 21.905 [2].

A/Gb mode: indicates that the text applies only to a system or sub-system which operate in A/Gb mode of operation, i.e. with a functional division that is in accordance with the use of an A or a Gb interface between the radio access network and the core network

Iu mode: indicates that the text applies only to a system or a sub-system which operates in Iu mode of operation, i.e. with a functional division that is in accordance with the use of an Iu-CS or Iu-PS interface between the radio access network and the core network

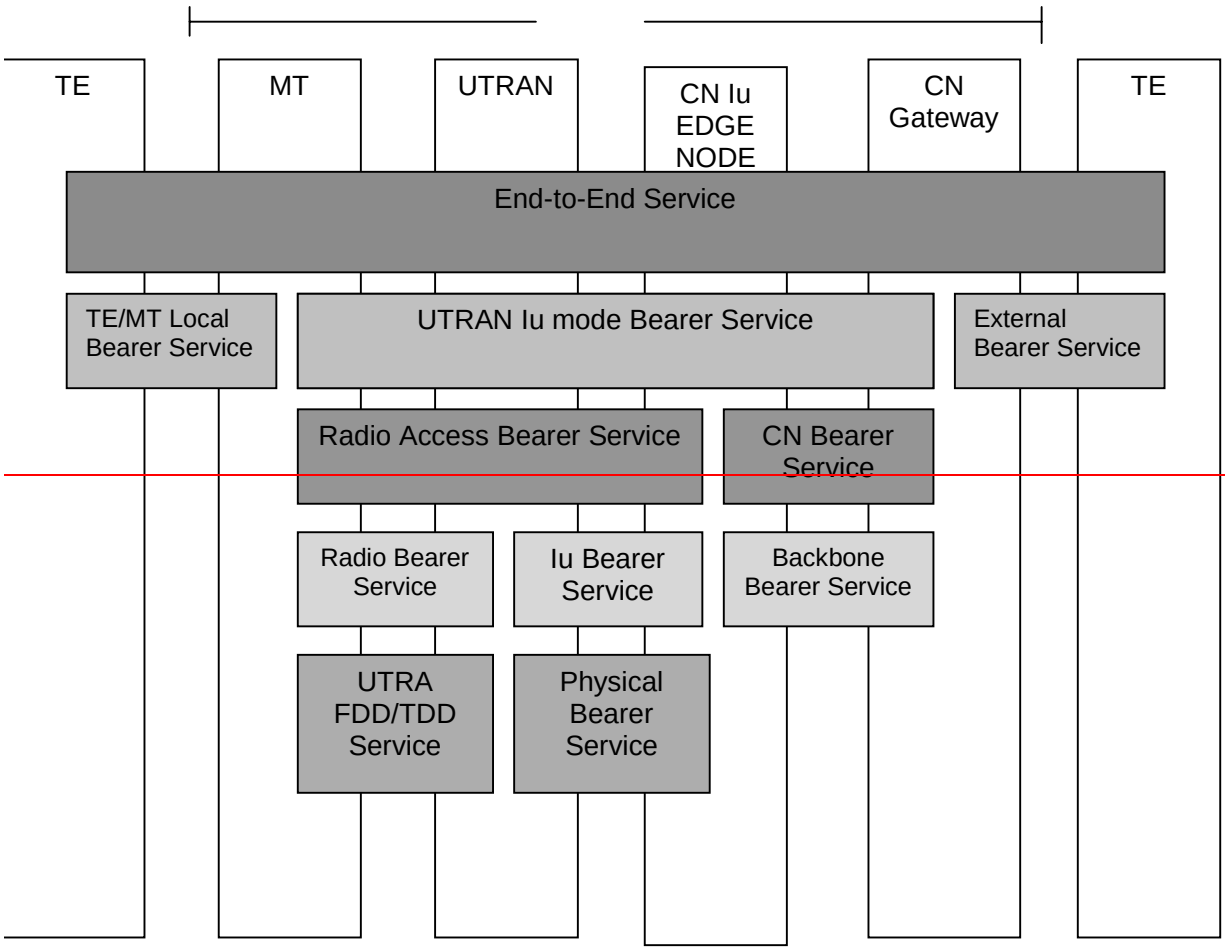
3.2 Abbreviations

For the purposes of the present document the following internal abbreviations apply in addition to those given in 3GPP TS 21.905 [2].

BC	Bearer Capability
CE	Connection Element
CT	Circuit
GBR	Guaranteed Bitrate
MBR	Maximum Bitrate
RA	Rate Adaptation Functions
RNL	Radio Network Layer
S/C	Split/Combine Function
WAIUR	Wanted Air Interface User Rate

4 General

CS data services in ~~UTRAN Iu mode (UTRAN Iu mode Bearer Services)~~ UMTS are build on services provided by the Access Network. These Radio Access Bearer Services are invoked through the RNL-SAP provided by the Iu User Plane to the Non-access stratum on the Core Network side, and the corresponding SAP provided by the RLC to the Non-access stratum on the Terminal side. Transport within the CN (the CN Bearer services) is outside the scope of this document. Interworking with External Bearer services is within the scope of this document. See figure 1.



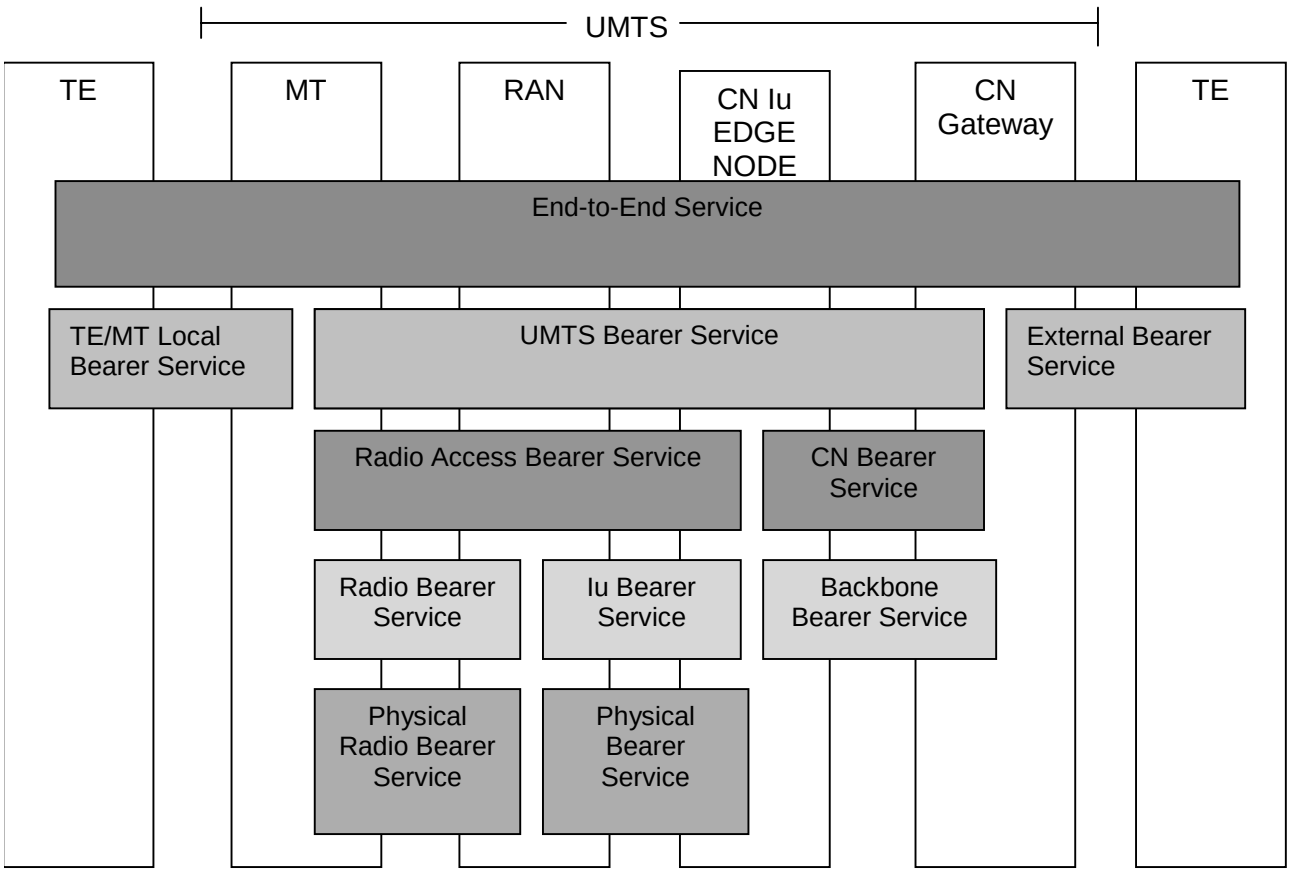


Figure 1: Service architecture

4.1 Limited set of UTRAN Iu mode PLMN connection models

4.1.1 Transparent data

Figure 2 shows the connection model for synchronous transparent CS data. In general all the user data bits are conveyed between the MT and the IWF as they are received from the TE. This implies that the RLC SDU/ Iu UP frame is transparent.

Figure 3 shows the connection model for asynchronous transparent CS data. The rate adaptation function RA0 from 3GPP TS ~~04.21~~ 44.021(adapted to the RLC SDU size) is used for converting between asynchronous data and a synchronous bit stream. End-to-end flow control is not applicable in UTRAN Iu mode, thus no status bits are conveyed over RAN/UTRAN (see 3GPP TS 27.001).

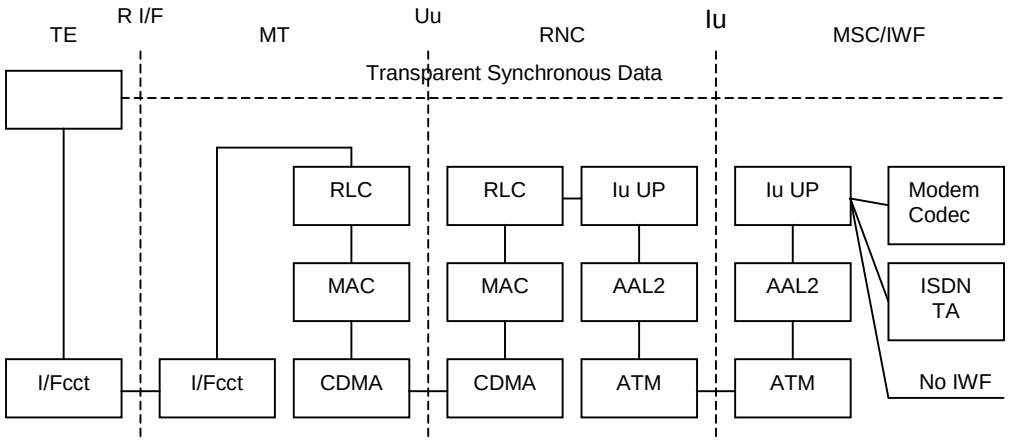


Figure 2: Connection model for Synchronous T CS data

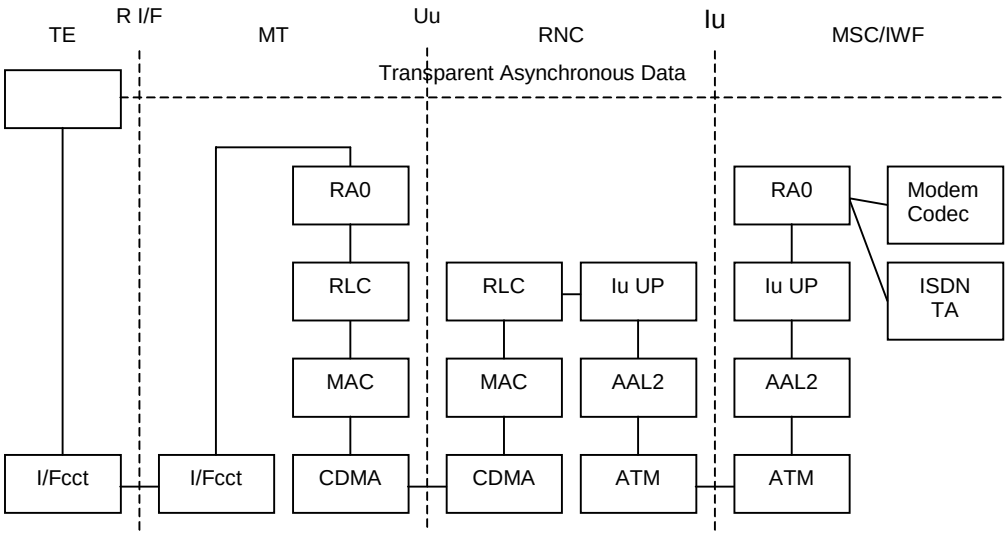


Figure 3: Connection model for Asynchronous T CS data

4.1.2 Non-transparent data

Figure 4 shows the connection model for asynchronous non-transparent CS data.

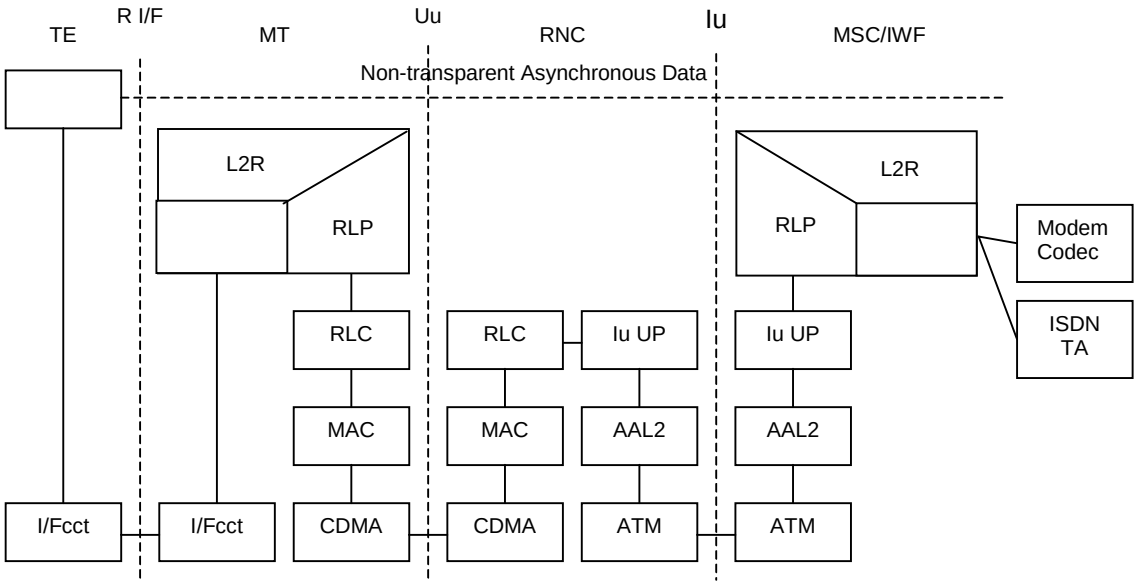


Figure 4: Connection model for Asynchronous NT CS data

4.2 Limited set of GERAN Iu mode PLMN connection models

This subclause gives an overall overview on the PLMN connection models for circuit switched data services in GERAN Iu mode. The stage 2 description is given in 3GPP TS 43.051 [22]. For details concerning the PLMN connection models please refer to 3GPP TS 43.010 [23].

4.2.1 Transparent data

Figure 5 shows the connection model for synchronous transparent CS data. In general all the user data bits are conveyed between the MT and the IWF as they are received from the TE. This implies that the RLC SDU/ Iu UP frame is transparent.

Figure 6 shows the connection model for asynchronous transparent CS data. The rate adaptation function RA0 from 3GPP TS 44.021 (adapted to the RLC SDU size) is used for converting between asynchronous data and a synchronous bit stream. End-to-end flow control is not applicable in GERAN Iu mode, thus no status bits are conveyed over RAN/GERAN (see 3GPP TS 27.001).

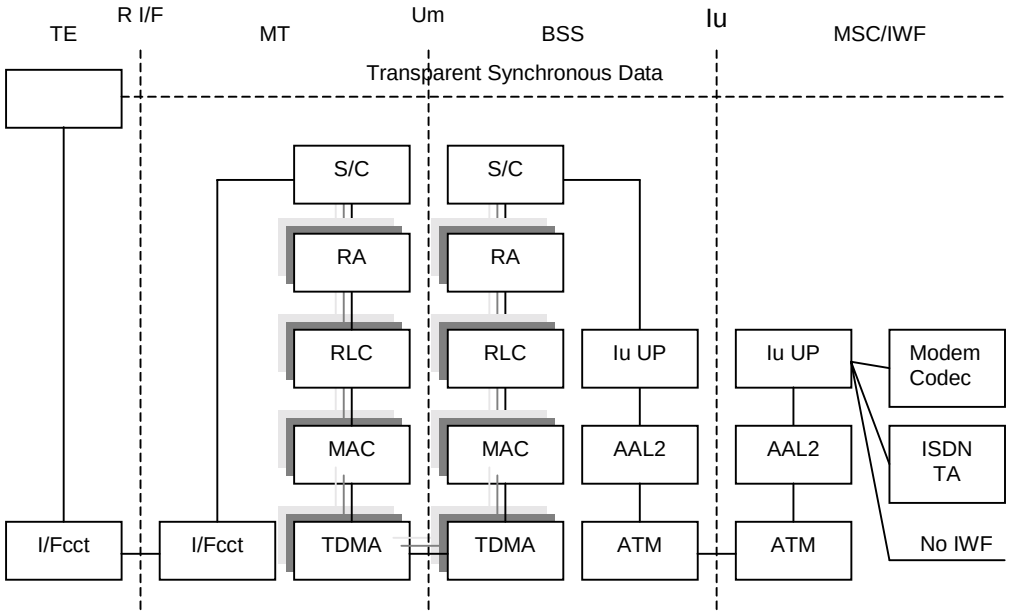


Figure 5: Connection model for Synchronous T CS data

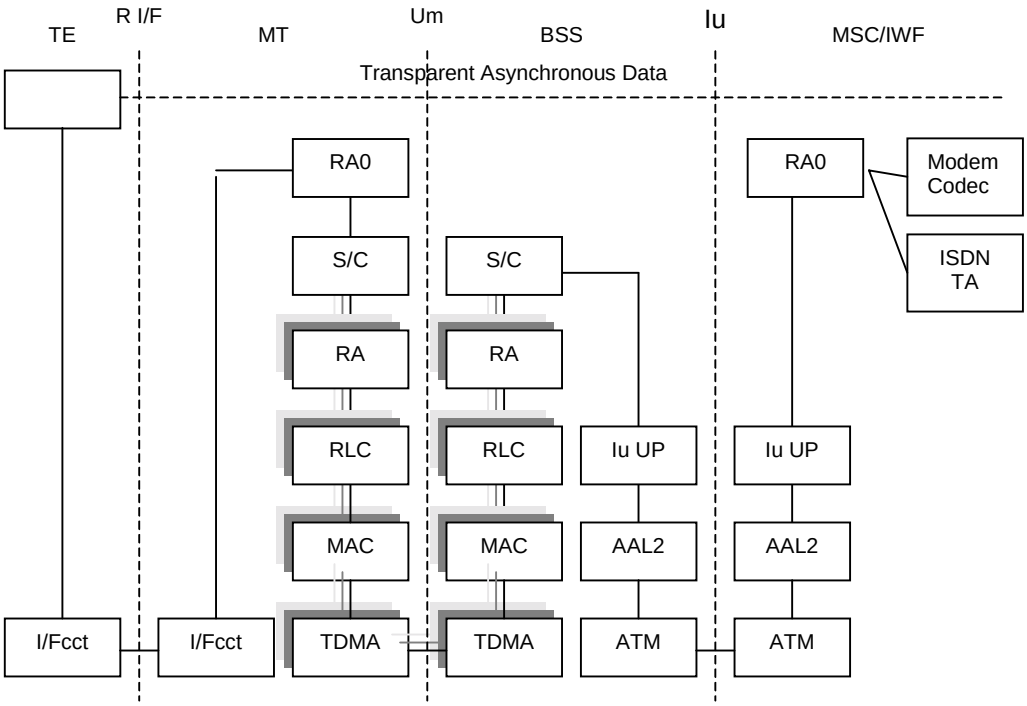


Figure 6: Connection model for Asynchronous T CS data

4.1.2 Non-transparent data

Figure 7 shows the connection model for asynchronous non-transparent CS data.

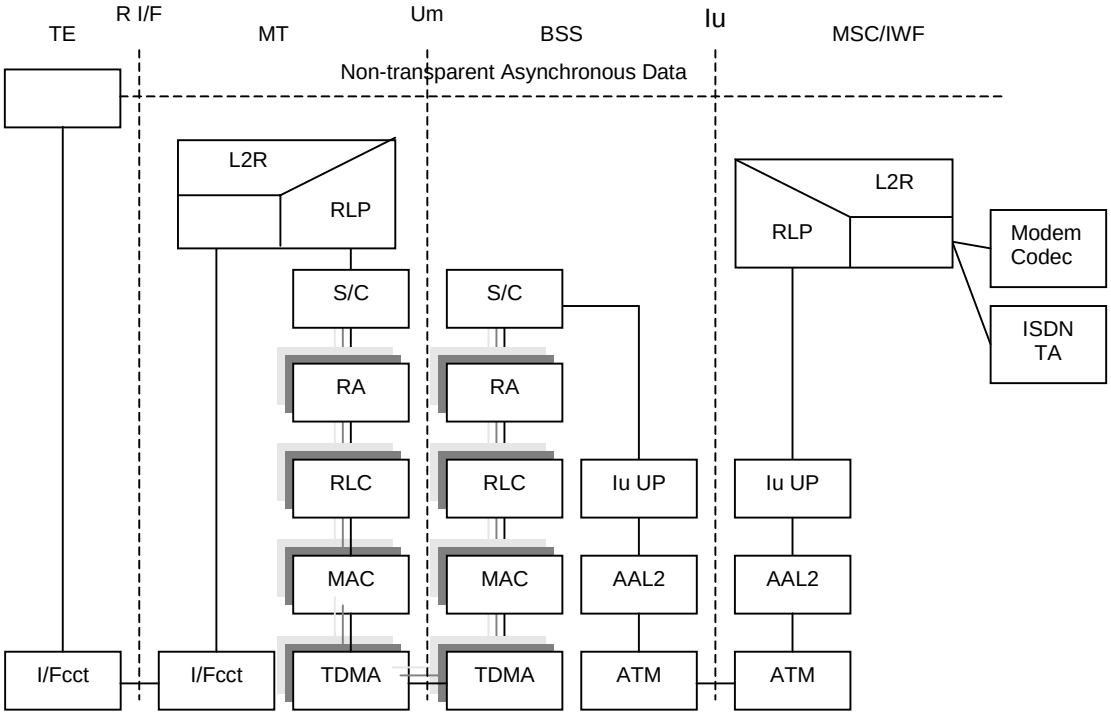


Figure 7: Connection model for Asynchronous NT CS data

5 Bearer Capabilities for ~~UTRAN Iu mode~~UMTS Data Services

The ~~UTRAN Iu mode~~UMTS bearer services are described by the ~~UTRAN Iu mode~~PLMN BC-IE. Five services (or services categories) are currently distinguishable from the ~~UTRAN Iu mode~~PLMN BC-IE in UTRAN Iu mode:

- Speech.
- Transparent Data for support of Multimedia.
- Transparent Data.
- Non-transparent Fax.
- Non-transparent data.

Four services (or services categories) are currently distinguishable from the PLMN BC-IE in GERAN Iu mode:

- Speech.
- Transparent Data for support of Multimedia.
- Transparent Data.
- Non-transparent data.

Speech is currently not in the scope of the present document.

Each ~~UTRAN Iu mode~~UMTS bearer service is supported by a Radio Access Bearers (RAB). The RABs in turn are described by the QoS parameters. There may be one or several RAB candidates for supporting a ~~UTRAN Iu mode~~UMTS bearer service. The possible candidates are described by a mapping of the BC-IE to RAB QoS described in subclause 5.2.

5.1 Bearer Capabilities for ~~UTRAN Iu mode~~UMTS Data Services

5.1.1 Transparent Data

This service is distinguished by the following BC-IE parameters:

- ITC = UDI or 3.1 kHz audio or Other ITC = RDI.
- CE = transparent.

For this service the FNUR at the setup is restricted to:

- 64 kbit/s, in case ITC = UDI.
- 56 kbit/s in case ITC = UDI or Other ITC = RDI.
- 28,8 kbit/s, in case ITC = 3,1 kHz audio.

NOTE: ITU-T V.90 [16] is not supported in transparent mode, because asymmetric user rates are not supported in transparent mode.

5.1.2 Non-Transparent Fax

This service is only applicable for UTRAN Iu mode. It is distinguished by the following BC-IE parameters:

- ITC = Fax Group 3 (ITU-T T.30 [17]).
- CE = non-transparent.

WAIUR shall not be more than 28.8 kbit/s. The possible AIURs are limited to 14,4 kbit/s and 28,8 kbit/s.

5.1.3 NT Data

This service is distinguished by the following BC-IE parameters:

- ITC = UDI or 3.1 kHz audio or Other ITC = RDI.
- CE = non-transparent.

The possible AIURs in UTRAN Iu mode are limited to 14,4 kbit/s, 28,8 kbit/s and 57,6 kbit/s. For GERAN Iu mode the following AIURs are possible: 9,6 kbit/s, 14,4 kbit/s, 19,2 kbit/s, 28,8 kbit/s, 38,4 kbit/s, 43,2 kbit/s and 57,6 kbit/s.

5.1.4 Transparent Data for Support of Multimedia

This service is distinguished by the following BC-IE parameters:

- ITC = UDI or 3.1 kHz audio or Other ITC = RDI.
- CE = transparent.
- Other rate adaptation = H.223 and H.245.

For this service the FNUR at the setup is restricted to:

- 64 kbit/s, in case ITC = UDI.

- 56 kbit/s in case Other ITC = RDI.
- 33,6 kbit/s, in case ITC = 3,1 kHz audio.
- 32 kbit/s, in case ITC = UDI.
- 28,8 kbit/s, in case ITC = 3,1 kHz audio.

NOTE: Transmission rates 31.2 and 28.8 kbit/s negotiated by the modems in a 3.1 kHz multimedia call may be used with a rate adaptation to 33.6 kbit/s between the UE and the IWF (ref. to 3GTS 27.001 and 29.007). The negotiated values shall be provided by the MSC by way of a MODIFY message.

5.2 BC-IE to RAB QoS Mapping

Since ~~UTRAN Iu mode~~UMTS bearer services are described by BC-IEs and RABs by QoS parameters, this section provides implicitly a mapping between the ~~UTRAN Iu mode~~UMTS bearer services and the possible RABs that support them. The QoS mapping is based on 3GPP TS 23.107.

5.2.1 Non-transparent services, including Fax for UTRAN Iu mode

Service identified by the BC IE	Non-transparent data	Comments
Traffic Class	Streaming	Subject to operator tuning
RAB Asymmetry Indicator	Symmetric	
Maximum bit rate (1)	14,4 kbit/s, 28,8 kbit/s, 57.6 kbit/s	Maximum bit rate is set to the highest value ≤ WAIUR (Note 1)
Guaranteed bit rate	14,4 kbit/s, 28,8 kbit/s, 57.6 kbit/s	Operator may choose any of the possible values less or equal to WAIUR. (Note 1)
Delivery Order	Yes	
Maximum SDU size	576 bits	
Transfer Delay	250 ms	Subject to operator tuning
Traffic Handling Priority	-	Not applicable to the streaming traffic class
Source statistics descriptor	Unknown	
SDU Parameters		
Residual bit error ratio	10^{-3}	Subject to operator tuning.
Delivery of erroneous SDUs	No error detection consideration	
SDU format information		
RAB Subflow Combination bit rate	57,6 kbit/s	(Note 2)
RAB Subflow Combination bit rate	28,8 kbit/s	(Note 2)
RAB Subflow Combination bit rate	14,4 kbit/s	
RAB Subflow Combination bit rate	0 kbit/s	indicates DTX, RFCI is not assigned

NOTE 1: If WAIUR is less or equal to 14.4 kbit/s then GBR and MBR shall be set to 14.4 kbit/s.

NOTE 2: Only RAB subflow combination bit rates ≤ maximum bit rate shall be specified.

5.2.2 Transparent Data, including Multimedia

Service identified by the BC IE		Transparent data and BS for support of multimedia service	Comments
Traffic Class		Conversational	Subject to operator tuning
Maximum bit rate		= guaranteed bit rate	
Guaranteed bit rate		FNUR = 64 .. 28.8 kbit/s (Note 2)	GBR for FNUR=56 kbit/s is 64 kbit/s (Note 1)
Delivery Order		Yes	
Maximum SDU size		640 bits for FNUR=32, 56 and 64 kbit/s 576 bits for FNUR=28.8 kbit/s 672 bits for FNUR=33.6 kbit/s	
Transfer Delay		< 200 ms	Subject to operator tuning
Traffic Handling Priority		-	Not applicable for the conversational traffic class
Source statistics descriptor		Unknown	
SDU Parameters			
	SDU error ratio	-	Not applicable
	Residual bit error ratio	10^{-4}	Subject to operator tuning according to 3GPP TS 23.107. Operator may also choose different value for Multimedia and other transparent data services.
	Delivery of erroneous SDUs	-	No error detection in the core network

NOTE 1: In case the FNUR = 56 kbit/s, the GBR is set to 64 kbit/s. Last bit in each data octet is set to 1.

NOTE 2: If the FNUR is changed as a result of a MODIFY procedure during the call, the guaranteed bit rate is not changed.

5.2.3 Non-transparent services for GERAN Iu mode

Service identified by the BC IE	Non-transparent data	Comments
Traffic Class	Streaming	Subject to operator tuning
RAB Asymmetry Indicator	Symmetric	
Maximum bit rate	12 kbit/s, 14,4 kbit/s, 24 kbit/s, 28,8 kbit/s, 36 kbit/s, 43,2 kbit/s, 48 kbit/s, 57.6 kbit/s	Maximum bit rate is set to the highest value ≤ WAIUR (Note 1, 3, 4, 5 and 6)
Guaranteed bit rate	12 kbit/s, 14,4 kbit/s, 24 kbit/s, 28,8 kbit/s, 36 kbit/s, 43,2 kbit/s, 48 kbit/s, 57.6 kbit/s	Operator may choose any of the possible values less or equal to WAIUR. (Note 1)
Delivery Order	Yes	
Maximum SDU size	480 bits if only RAB Subflow Combination bit rates of multiples of 12 kbit/s are possible, 576 bits in all other cases	
Transfer Delay	230 ms if only RAB Subflow Combination bit rates of multiples of 12 kbit/s are possible, 250 ms in all other cases	Subject to operator tuning
Traffic Handling Priority	-	Not applicable to the streaming traffic class
Source statistics descriptor	Unknown	
SDU Parameters		
Residual bit error ratio	10^{-3}	Subject to operator tuning.
Delivery of erroneous SDUs	No error detection consideration	
SDU format information		
Subflow SDU size	576 bit	(Note 7)
RAB Subflow Combination bit rate	57,6 kbit/s	(Note 2)
Subflow SDU size	480 bit	(Note 7)
RAB Subflow Combination bit rate	48 kbit/s	(Note 2 and 3)
Subflow SDU size	576 bit	(Note 7)
RAB Subflow Combination bit rate	43,2 kbit/s	(Note 2)
Subflow SDU size	480 bit	(Note 7)
RAB Subflow Combination bit rate	36 kbit/s	(Note 2 and 4)
Subflow SDU size	576 bit	(Note 7)
RAB Subflow Combination bit rate	28,8 kbit/s	(Note 2)
Subflow SDU size	480 bit	(Note 7)
RAB Subflow Combination bit rate	24 kbit/s	(Note 2 and 5)
Subflow SDU size	576 bit	(Note 7)
RAB Subflow Combination bit rate	14,4 kbit/s	(Note 2)
Subflow SDU size	480 bit	(Note 7)
RAB Subflow Combination bit rate	12 kbit/s	(Note 2 and 6)
RAB Subflow Combination bit rate	0 kbit/s	indicates DTX, RFCI is not assigned

NOTE 1: If WAIUR is less or equal to 14.4 kbit/s then GBR and MBR shall be set to 14.4 kbit/s for TCH/F14.4. If WAIUR is less or equal to 9.6 kbit/s then GBR and MBR shall be set to 12 kbit/s for TCH/F9.6. The maximum values for GBR and MBR shall not exceed the WAIUR unless the higher GBR and MBR can be reached with a smaller number of TCH/F (ref. 3GPP TS 27.001, subclause B.1.12.2). This means, that e.g., a GBR and MBR of 24 kbit/s (2 x TCH/F9.6) can be selected for a WAIUR of 19,2 kbit/s.

NOTE 2: Only RAB subflow combination bit rates ≤ maximum bit rate shall be specified.

NOTE 3: If the WAIUR is 38,4 kbit/s, a GBR and MBR of 48 kbit/s is possible for 4 x TCH/F9.6.

NOTE 4: If the WAIUR is 28,8 kbit/s, a GBR and MBR of 36 kbit/s is possible for 3 x TCH/F9.6.

NOTE 5: If the WAIUR is 19,2 kbit/s, a GBR and MBR of 24 kbit/s is possible for 2 x TCH/F9.6.

NOTE 6: If the WAIUR is 9,6 kbit/s, a GBR and MBR of 12 kbit/s is possible for 1 x TCH/F9.6.

NOTE 7: The Subflow SDU size should only be present when the individual Subflows have different sizes.

6 Iu and Nb User Plane

6.1 NT services

On the Iu interface and on the Nb interfaces between the access network and the IWF, the Iu and Nb user planes are used in support mode, see 3GPP TS 25.415 and 3GPP TS 29.415. Each SDU corresponds to one RLP frame and, consequently, is 576 bits long. In GERAN Iu mode another SDU size of 480 bits is possible. It carries two RLP frames of 240 bits and is used if TCH/F9.6 is used in GERAN. Each SDU is transported in one Iu or Nb UP PDU of Type 1. In UTRAN Iu mode, the ~~The~~ range of RAB Subflow Combination bit rate ~~AIUR~~ values is 14,4, 28,8, 57,6 kbit/s, limited by the maximum bit rate, and varies with the transmission period on the Uu interface, which is ~~10~~ 40 ms, 20 ms or ~~40~~ 10 ms. In GERAN Iu mode these values are valid if TCH/F14.4, TCH/28.8 or TCH/F43.2 is used. In addition GERAN Iu mode has a RAB Subflow Combination bit rate of 43,2 kbit/s with a transmission period of 13 ms. If TCH/F9.6 is used, the range of RAB Subflow Combination bit rate values is 12, 24, 36, 48 kbit/s, limited by the maximum bit rate, and varies with the transmission period on the Um interface, which is 40, 20, 13 or 10 ms. A change in the transmission period is signalled to the IWF through the Iu and Nb UP protocols. The Iu or Nb UP primitive Iu- or Nb-UP-DATA-REQUEST is invoked each time an RLP frame is ready to be sent from the IWF towards the UE. DTX indication is not used.

The following table shows the connection between the RAB subflow combination bit rate and the AIUR.

RAB subflow combination bit rate	AIUR	Used number of traffic channels and channel coding for GERAN Iu mode	Comment
57,6 kbit/s	57,6 kbit/s	4xTCH/F14.4, 2xTCH/F28.2	(Note 1)
43,2 kbit/s	43,2 kbit/s	3xTCH/F14.4, 1xTCH/F43.2	(Note 2)
48 kbit/s	38,4 kbit/s	4xTCH/F9.6	(Note 2)
36 kbit/s	28,8 kbit/s	3xTCH/F9.6	(Note 2)
28,8 kbit/s	28,8 kbit/s	2xTCH/F14.4, 1xTCH/F28.2	(Note 1)
24 kbit/s	19,2 kbit/s	2xTCH/F9.6	(Note 2)
14,4 kbit/s	14,4 kbit/s	1xTCH/F14.4	(Note 1)
12 kbit/s	9,6 kbit/s	1xTCH/F9.6	(Note 2)

Note 1: RAB subflow combination bit rate is used in UTRAN Iu mode and GERAN Iu mode

Note 2: RAB subflow combination bit rate is only used in GERAN Iu mode

If TDM is not used, then between the IWF and the fixed network (ISDN or PSTN), the Nb UP protocol is applied in support mode and the SDU size is 320 bits, transmitted every 5 ms. PDU type 0 is used.

6.2 T services

The Iu UP and Nb UP are used in transparent mode, see 3GPP TS 25.415 and 3GPP TS 29.415. The payload of the Iu and Nb frames will consist of user data bits only for synchronous data, and RA0 synchronous bit streams for asynchronous data.

On the Iu and Nb interfaces, the payload (SDU) size is fixed, determined by the bit rate. Following table shows SDU sizes ~~defined by GSM Association - IMT-2000 Steering Group (Typical Radio Interface Parameter Sets)~~. AAL2 is used. The AAL2 SSCS layer ~~must~~ shall be supported for segmentation and re-assembly.

Bit rate	SDU size (= RLC PDU payload size)
28.8 kbit/s	576 bits
33.6 kbit/s	672 bits
32 kbit/s	640 bits
56/64 kbit/s	640 bits

The primitive Iu-UP or Nb-_UNIT-DATA-REQUEST is invoked at regular intervals in order to have a constant bit rate (every SDU).

If TDM is not used, then between the IWF and the fixed network (ISDN or PSTN), the Nb UP protocol is applied in support mode and the SDU size is 320 bits, transmitted every 5 ms. PDU type 0 is used.

6.2.1 Avoidance of delay at RNC

The TTI-to-CPS Packet packaging delay can be avoided by choosing the length of the CPS packet payload so that the payloads of an integer number of CPS Packets fill one TTI. The contents of the whole TTI can be sent further towards the MSC immediately after the reception without waiting for the next TTI.

6.2.2 Recovery from the loss of ATM cells

The ATM cell loss rate is estimated to be very small (less than 10^{-6} … 10^{-8}), the quality of transmission being comparable to that of a high quality ISDN.

The following happens if a cell is lost (ref. to I.363.2):

- At least one CPS packet is distorted.
- The distorted CPS packet(s) is/are discarded by the receiver.
- If only one CPS packet is discarded, the upper layer can identify the event by the UUI/SSSAR sequence number, and consequently insert a fill sequence of the length of a CPS payload field to the correct place in the bit stream. I.366.1[20] (SSSAR) describes that UUI takes value between 0 and 26 for final data and value 27 for more data, but UUI should take value 26 for final data considering compatibility with other SSCS specifications. When UUI works as sequence number by repetition of 27 and 26, CPS packet payload size is equal to half a SDU size. This CPS packet payload size also satisfies the requirement described in subclause 6.2.1. CPS packet payload size is set by Q.2630.1[21] over Iu interface.
- If more than one CPS packets are discarded, the upper layer can identify the event by monitoring the buffer level at the ATM/TDM interface or by monitoring the reception of CPS packets with a timer. (The modulo 2 sequence number cannot indicate the loss of two consecutive CPS packets). The following figures apply for the 40 octet payload field.
- Worst case: 2 packets lost => 2 * 40 octets * 8 bits/octet : 64kbit/s = 10 ms, i.e. buffer level decreased by 80 octets.
- Consequently, recovery with fill inserted in the correct place is possible, if the ATM cell jitter (i.e. transmission delay variation) is less than 5 ms. With a bigger jitter fill may be inserted in a wrong place in the TDM bit stream.

7 RLC

The RLC shall be used in transparent mode for T and NT services.

8 Initial Synchronisation and resynchronisation

8.1 Modem services (3.1 kHz audio)

8.1.1 Transparent Case

The IWF does not send any SDUs down link until the modem connection has been established and the modems have synchronised. Thereafter the IWF through connects, mapping data from the fixed network side onto SDUs that are sent toward the MS, and mapping data in the received SDUs to the fixed network side.

The MS sends no SDUs until an SDU is received at the transmission SAP. Until the first access stratum SDU is received, CT 106, 107 and 109 remain in the OFF condition. At the reception of the first SDU, CT 106, CT 107 and CT 109 are changed from OFF to ON at the DCE/DTE (TE/TAF) interface. The data in the received SDUs are mapped to CT 104 and data on CT 103 are mapped to SDUs sent toward the RNC.

8.1.2 Non-Transparent Case

At the IWF, the synchronisation of modems on the transit network is performed after ~~establishement~~establishment of the physical connection. The RLP establishment may be initiated by the IWF, but is normally initiated by the MS. If the modems synchronise before the RLP has been established, the IWF stores the information received from the other modem in the L2R buffers.

The UE initiates the RLP after the physical connection has been established. When the RLP link has been established, CT107 at the DCE/DTE interface will be changed from "OFF" to "ON". From this time the information from/to the RLP, including status changes, will be mapped by the L2R entity.

8.2 Digital services

8.2.1 Transparent case

The procedures are the same as for the modem case, but, depending on implementation, the IWF may through connect before the fixed network leg has been synchronised.

8.2.2 Non-Transparent case

The procedures are the same as for the modem case.

8.3 Loss of synchronisation

The PLMN side is not synchronous so loss of synchronisation is not possible. For T services, SDUs may be lost or arrive ~~irregularily~~irregularly, which handling is implementation dependent.

Loss of synchronisation on the fixed network side is handled as in A/Gb mode.

9 Call Control

BC-IE negotiation procedures and mapping to ISDN are specified in 3GPP TS 27.001 and 3GPP TS 29.007. BC-IE parameter values shall be restricted as indicated in subclause 5.1. See also 3GPP TS 27.001, annex B, table B.5a for further details on the validity of parameter values in A/Gb mode and Iu mode.

10 Handover Issues

10.1 Signalling issues

10.1.1 Loss of BC Information during Handover from A/Gb mode to UTRAN Iu mode

In the case of inter-MSC handover from A/Gb mode to UTRAN Iu mode, the serving A/Gb mode MSC/VLR sends a MAP message Prepare Handover carrying the BSSMAP message Handover Request. This message includes the parameter Channel Type, indicating whether radio resources are to be allocated for speech or data (parameter 'Speech or data indicator') and, among other data, the type of data service (transparent/non transparent) and the user rates (both included in the parameter '~~Channel~~Data rate and ~~type~~transparency indicator').

As no other bearer capability related parameters are received, it is not possible to distinguish between any other services than 'speech', 'data transparent' and 'data non-transparent'.

The mapping into QoS radio access parameters would be done as described in Section 5.2 , limited to the services 'speech', 'data, non-transparent' and 'data, transparent'.

10.1.2 Handover from UTRAN Iu mode to A/Gb mode

In case a UTRAN Iu mode call is set up in the CN, the BC IE parameters are mapped into QoS RAB parameters at call setup.

If the CN has to perform a handover towards A/Gb mode, the non-anchor MSC needs to perform an assignment based on GSM traffic channel parameters.

In case of handover from UTRAN Iu mode to A/Gb mode, the anchor MSC maps the BC IE parameters into A/Gb mode traffic channel parameters. This requires that the BC IE is coded according to A/Gb mode protocol requirements, i.e. all those parameters ignored in UTRAN Iu mode should nevertheless be correctly specified by the UE in order to perform a handover to A/Gb mode.

10.1.3 Loss of BC Information during Handover from A/Gb mode to GERAN Iu mode

Subclause 10.1.1 applies also to handover from A/Gb mode to GERAN Iu mode.

Additionally, the serving A/Gb mode MSC/VLR will include the parameter GERAN Classmark in the MAP message Prepare Handover, if this parameter is available. The GERAN Classmark, which indicates the capabilities of the BSS in the target cell (e.g. allowed channel codings and maximum number of traffic channels), shall be taken into account by the target MSC when it performs the mapping into QoS radio access parameters.

10.1.4 Handover from GERAN Iu mode to A/Gb mode

Subclause 10.1.2 applies also to handover from GERAN Iu mode to A/Gb mode.

NOTE: The protocol requirements for the coding of the BC IE according to GERAN Iu mode are the same as for A/Gb mode, i.e. all those parameters needed in order to perform a handover to A/Gb mode are available.

10.1.5 Handover from UTRAN Iu mode to GERAN Iu mode

The serving UTRAN Iu mode MSC/VLR will send a MAP message Prepare Handover carrying the RANAP message Relocation Request. When setting the QoS RAB parameters in the RANAP message Relocation Request, the serving UTRAN Iu mode MSC/VLR shall take into account:

- the GERAN Classmark of the target cell, if this parameter is available;
- the allowed channel codings and the maximum number of traffic channels from the BC IE, if the serving MSC is the anchor MSC; and
- the allowed r i/f rates (included in the parameter Channel Type), if the serving MSC is not the anchor MSC.

This requires that the BC IE is coded according to GERAN Iu mode protocol requirements, i.e. all those parameters ignored in UTRAN Iu mode should nevertheless be correctly specified by the UE in order to perform a handover to GERAN Iu mode. Furthermore, it requires that the anchor MSC maps the BC IE parameters into A/Gb mode traffic channel parameters and includes the parameter Channel Type in the MAP message Prepare Handover also for basic handover to UTRAN Iu mode.

10.1.6 Handover from GERAN Iu mode to UTRAN Iu mode

The serving GERAN Iu mode MSC/VLR will send a MAP message Prepare Handover carrying the RANAP message Relocation Request. When setting the QoS RAB parameters in the RANAP message Relocation Request, the serving GERAN Iu mode MSC/VLR shall take the mode of the target cell into account. (See subclause 5.2. For non-transparent services, some of the RAB Subflow Combination bit rates are supported in GERAN Iu mode, but not in UTRAN Iu mode.)

10.2 User Plane

10.2.1 Handover from ~~UTRAN~~ Iu mode to A/Gb mode

After a handover from ~~UTRAN~~ Iu mode to A/Gb mode the user plane between the anchor MSC and the visited MSC shall comply to the standard A/Gb mode A-interface protocols, i.e:

- A-TRAU or modified V.110 frames as defined in 3GPP TS 44.021 [18] and 3GPP TS 48.020 [19].
- up to four 16kbit/s substreams are multiplexed in one 64kbit/s channel (Split/Combine function and Multiplexing function as defined in 3GPP TS 44.021 [18] and 3GPP TS 48.020 [19]).

10.2.2 Handover from A/Gb mode to UTRAN Iu mode

After a handover from A/Gb mode to UTRAN Iu mode the user plane between the anchor MSC and the visited MSC shall comply to the A-TRAU' protocol except for FNUR = 56 kbit/s (ITC=RDI) and FNUR = 64 kbit/s (ITC=UDI). For both exceptions a plain 64 kbit/s channel is used between the MSCs.

The A-TRAU' protocol is defined as follows:

- A-TRAU' frames are transmitted in regular intervals of 10 ms;
- an A-TRAU' frame consists of two consecutive A-TRAU frames (as defined in 3GPP TS 48.020 [19]) each with a length of 320 bit;
- the A-TRAU' protocol is used on a plain 64 kbit/s channel without substreams;

- the same A-TRAU' format is used for the transparent and non-transparent transmission mode;
- in transparent mode the number of data bits in an A-TRAU' frame depend on the user rate only, each user rate corresponds to a fixed number of data bits (see below);
- in non-transparent mode A-TRAU' frames contain always complete RLP frames, rate adaptation is performed by means of the M2 bit;
- the M1-bit is used to identify 1st and 2nd frame in both transmission modes.

10.2.2.1 Frame layout for the different transparent user rates

The number of data bits in an A-TRAU' frame depend on the user rate only, each user rate corresponds to a fixed number of data bits in an A-TRAU' frame.

Date Rate	Number of data bits per A-TRAU' frame
33,6 kbit/s	336
28,8 kbit/s	288

The data bits are inserted in the A-TRAU' frame starting with D1 of Data field 1 of the first A-TRAU frame. The unused bits are filled with binary '1'.

10.2.2.2 A-TRAU' frame format

One A-TRAU' frame consists of two consecutive A-TRAU frames. The following figure shows the format of one A-TRAU frame.

Octet number	bit number 0	1	2	3	4	5	6	7	
0	0	0	0	0	0	0	0	0	
1	0	0	0	0	0	0	0	0	
2	1	**C1**	**C2**	**C3**	**C4**	**C5**	**M1**	**M2**	
3	**Z1**	D1	D2	D3	D4	D5	D6	D7	
4	D8	D9	D10	D11	D12	D13	D14	D15	36 bit data field 1
5	D16	D17	D18	D19	D20	D21	D22	D23	
6	D24	D25	D26	D27	D28	D29	D30	D31	
7	D32	D33	D34	D35	D36	**Z2**	D1	D2	
8	D3	D4	D5	D6	D7	D8	D9	D10	
9	D11	D12	D13	D14	D15	D16	D17	D18	36 bit data field 2
10	D19	D20	D21	D22	D23	D24	D25	D26	
11	D27	D28	D29	D30	D31	D32	D33	D34	
12	D35	D36	**Z3**	D1	D2	D3	D4	D5	
13	D6	D7	D8	D9	D10	D11	D12	D13	
14	D14	D15	D16	D17	D18	D19	D20	D21	36 bit data field 3
15	D22	D23	D24	D25	D26	D27	D28	D29	
16	D30	D31	D32	D33	D34	D35	D36	**Z4**	
17	D1	D2	D3	D4	D5	D6	D7	D8	
18	D9	D10	D11	D12	D13	D14	D15	D16	36 bit data field 4
19	D17	D18	D19	D20	D21	D22	D23	D24	
20	D25	D26	D27	D28	D29	D30	D31	D32	
21	D33	D34	D35	D36	**Z5**	D1	D2	D3	
22	D4	D5	D6	D7	D8	D9	D10	D11	
23	D12	D13	D14	D15	D16	D17	D18	D19	36 bit data field 5
24	D20	D21	D22	D23	D24	D25	D26	D27	
25	D28	D29	D30	D31	D32	D33	D34	D35	
26	D36	**Z6**	D1	D2	D3	D4	D5	D6	
27	D7	D8	D9	D10	D11	D12	D13	D14	
28	D15	D16	D17	D18	D19	D20	D21	D22	36 bit data field 6
29	D23	D24	D25	D26	D27	D28	D29	D30	
30	D31	D32	D33	D34	D35	D36	**Z7**	D1	
31	D2	D3	D4	D5	D6	D7	D8	D9	
32	D10	D11	D12	D13	D14	D15	D16	D17	
33	D18	D19	D20	D21	D22	D23	D24	D25	36 bit data field 7
34	D26	D27	D28	D29	D30	D31	D32	D33	
35	D34	D35	D36	**Z8**	D1	D2	D3	D4	
36	D5	D6	D7	D8	D9	D10	D11	D12	
37	D13	D14	D15	D16	D17	D18	D19	D20	36 bit data field 8
38	D21	D22	D23	D24	D25	D26	D27	D28	
39	D29	D30	D31	D32	D33	D34	D35	D36	

Figure 5: A-TRAU 320 bit frame

Data Bits (Dxx):

The 288 data bits of an A-TRAU frame are divided in eight fields of 36 bits.

Control bits (C Bits):

C1 to C4:

The Control bits C1 to C4 define the used data rate. C1 to C4 in the first A-TRAU frame indicate the data rate in send direction.

C1 to C4 in the second A-TRAU frame indicate the used data rate in backward direction. This is required for Rate Control that is required in uplink direction. For details on rate control see 3GPP TS 25.415 [13].

C1	C2	C3	C4	Radio Interface User Rate
1	0	1	1	57,6 kbit/s
1	0	1	0	33,6 kbit/s
1	0	0	0	28,8 kbit/s
0	1	1	1	14,4 kbit/s

C5:

C5 is not used, it is set to binary '1'.

Bit M1:

An A-TRAU' frame is made of two consecutive A-TRAU which build the transport container for 576 data bits. Bit M1 is used to determine the order of the A-TRAU frames within an A-TRAU' frame.

The two M1 bits are referred to as the Frame Start Identifier. The FSI value is 01. These values are assigned to the M1 bit as shown below:

	M1 bit
First A-TRAU frame	0
Second A-TRAU frame	1

Bit M2:

The M2 bit is used to indicate 'valid' A-TRAU' frames. The M2 bit in both of the two consecutive A-TRAU frames relating to an A-TRAU' frame shall have the same value.

Transparent mode:

In transparent mode M2 is clamped to binary '0'.

Non-transparent mode:

In non-transparent mode M2 is used for DTX. If DTX is applied, M2 is set to binary '1'. If DTX is not to be applied, M2 bit is set to binary '0'. The DTX handling is used in both directions for rate adaptation purpose. This means that the sending entity will insert 'fill RLP-frames' with DTX set to binary '1' in case no RLP-frame is available.

Fill frames are also sent in order to adapt the RLP transmission frequency to the AIUR. The ratio between RLP frames and 'fill' RLP frames is defined in the following table:

AIUR	Ratio between RLP and 'fill' RLP frames
57.6 kbit/s	Only valid frames
28.8 kbit/s	1 valid frame followed by 1 'fill' frame
14.4 kbit/s	1 valid frame followed by 3 'fill' frames

Z bits:

The bits Zi are used for Framing Pattern Substitution mechanism. This mechanism is defined in 3GPP TS 48.020 [19].

Mapping of A-TRAU' frames to PCM time slots:

~~A-TRAU' frames shall be mapped octet aligned to PCM time slots. I.e. bit number 0 to 7 of each octet of an A-TRAU' frame shall be mapped to bit number 0 to 7 of the PCM time slot.~~

A-TRAU' frames shall be mapped octet aligned to PCM time slots. I.e. bit number 0 to 7 of each octet of an A-TRAU' frame shall be mapped to bit number 0 to 7 of the PCM time slot.

10.2.3 Handover from A/Gb mode to GERAN Iu mode

10.2.3.1 User plane for transparent services

After a handover from a GERAN A/Gb mode MSC to a GERAN Iu mode MSC the user plane between the anchor MSC and the visited MSC shall be identical to the A-TRAU' protocol except for FNUR = 32 kbit/s (ITC = UDI), FNUR = 56 kbit/s (ITC=RDI) and FNUR = 64 kbit/s (ITC = UDI). For these exceptions a plain 64 kbit/s channel is used between the MSCs. The rate adaptation between 64 kbit/s and 32 kbit/s is based on ITU-T I.460.

10.2.3.2. User plane for non-transparent services

For the handover scenario from GERAN A/Gb mode MSC to a GERAN Iu mode MSC, the existing A-TRAU' frame format will be extended to support the new defined RAB subflow data rates of the GERAN Iu mode.

For the RAB subflows with 12 kbit/s, 24 kbit/s, 36 kbit/s and 48 kbit/s the RLP frame length of 240 bit is used. For the transfer of this RLP frame length to A-TRAU' protocol is modified. The A-TRAU'' protocol is introduced. An A-TRAU'' frame has the same layout as the A-TRAU' frame and contains two A-TRAU frames.

One RLP frame with the length of 240 bit is contained in one A-TRAU frame. The A-TRAU'' protocol is only used for the non-transparent services.

In following, the format of the A-TRAU frame for the RLP frame length of 240 is shown.

Octet number	Bit number 0	1	2	3	4	5	6	7	
0	0	0	0	0	0	0	0	0	
1	0	0	0	0	0	0	0	0	
2	1	**C1**	**C2**	**C3**	**C4**	**C5**	**M1**	**M2**	
3	**Z1**	D1	D2	D3	D4	D5	D6	D7	
4	D8	D9	D10	D11	D12	D13	D14	D15	36 bit data field 1
5	D16	D17	D18	D19	D20	D21	D22	D23	
6	D24	D25	D26	D27	D28	D29	D30	D31	
7	D32	D33	D34	D35	D36	**Z2**	D1	D2	
8	D3	D4	D5	D6	D7	D8	D9	D10	
9	D11	D12	D13	D14	D15	D16	D17	D18	36 bit data field 2
10	D19	D20	D21	D22	D23	D24	D25	D26	
11	D27	D28	D29	D30	D31	D32	D33	D34	
12	D35	D36	**Z3**	D1	D2	D3	D4	D5	
13	D6	D7	D8	D9	D10	D11	D12	D13	
14	D14	D15	D16	D17	D18	D19	D20	D21	36 bit data field 3
15	D22	D23	D24	D25	D26	D27	D28	D29	
16	D30	D31	D32	D33	D34	D35	D36	**Z4**	
17	D1	D2	D3	D4	D5	D6	D7	D8	
18	D9	D10	D11	D12	D13	D14	D15	D16	36 bit data field 4
19	D17	D18	D19	D20	D21	D22	D23	D24	
20	D25	D26	D27	D28	D29	D30	D31	D32	
21	D33	D34	D35	D36	**Z5**	D1	D2	D3	
22	D4	D5	D6	D7	D8	D9	D10	D11	
23	D12	D13	D14	D15	D16	D17	D18	D19	36 bit data field 5
24	D20	D21	D22	D23	D24	D25	D26	D27	
25	D28	D29	D30	D31	D32	D33	D34	D35	
26	D36	**Z6**	D1	D2	D3	D4	D5	D6	
27	D7	D8	D9	D10	D11	D12	D13	D14	
28	D15	D16	D17	D18	D19	D20	D21	D22	36 bit data field 6
29	D23	D24	D25	D26	D27	D28	D29	D30	
30	D31	D32	D33	D34	D35	D36	**Z7**	D1	
31	D2	D3	D4	D5	D6	D7	D8	D9	
32	D10	D11	D12	D13	D14	D15	D16	D17	
33	D18	D19	D20	D21	D22	D23	D24	D25	36 bit data field 7
34	D26	D27	D28	D29	D30	D31	D32	D33	
35	D34	D35	D36	**Z8**	D1	D2	D3	D4	
36	D5	D6	D7	D8	D9	D10	D11	D12	
37	D13	D14	D15	D16	D17	D18	D19	D20	36 bit data field 8
38	D21	D22	D23	D24	D25	D26	D27	D28	
39	D29	D30	D31	D32	D33	D34	D35	D36	

Data Bits (Dxx):

The 288 data bits of an A-TRAU frame are divided in eight fields of 36 bits.

Only 240 data bits will be used. The data bits D25 … D 26 of the data field 7 and the data bits D1 … D36 of the data field 8 are set to ‘1’ in of transfer of 240 bit long RLP frames.

Control bits (C Bits):

C1 to C4:

The Control bits C1 to C4 define the used data rate. C1 to C4 in the first A-TRAU frame indicate the data rate in send direction.

C1 to C4 in the second A-TRAU frame indicate the used data rate in backward direction. This is required for Rate Control in uplink direction.

C1	C2	C3	C4	Radio Interface User Rate
1	0	1	1	57,6 bit/s
1	0	0	0	28,8 kbit/s
0	1	1	1	14,4 kbit/s
0	1	1	0	38,4 kbti/s
0	1	0	1	19,2 kbit/s
0	1	0	0	9,6 kbit/s

C5:

The C5 bit indicates that the A-TRAU'' protocol is used and one A-TRAU frame contains one RLP frame with the length of 240 bit. In this case C5 is set binary '0'.

Bit M1:

For A-TRAU'' the M1 bit in each A-TRAU frame is always set to 1.

Bit M2:

A-TRAU'' protocol is only used in non-transparent mode.

The M2 is used for DTX. If DTX is applied, M2 is set to binary '1'. If DTX is not to be applied, M2 bit is set to binary '0'. The DTX handling is used in both directions for rate adaptation purpose. This means that the sending entity will insert 'fill RLP-frames' with DTX set to binary '1' in case no RLP-frame is available.

Fill frames are also sent in order to adapt the RLP transmission frequency to the AIUR. The ratio between RLP frames and 'fill' RLP frames is defined in the following table for the A-TRAU'' protocol:

AIUR	Ratio between RLP and 'fill' RLP frames
38,4 kbit/s	Each A-TRAU frame is valid
28,8 kbit/s	An A-TRAU'' frame with two valid frames is followed by an A-TRAU'' frame containing one valid frame and one fill frame.
19,2 kbit/s	Each A-TRAU'' frame contains one valid frame and one fill frame.
9,6 kbit/s	An A-TRAU'' frame with one valid frame and one fill frame is follows by an A-TRAU'' frame containing two fill frames

Z bits:

The bits Zi are used for Framing Pattern Substitution mechanism. This mechanism is defined in 3GPP TS 48.020.

Mapping of A-TRAU' frames to PCM time slots:

A-TRAU'' frames shall be mapped octet aligned to PCM time slots. I.e. bit number 0 to 7 of each octet of an A-TRAU' frame shall be mapped to bit number 0 to 7 of the PCM time slot.

10.2.~~3~~4 Handover within ~~3G~~ Iu mode PLMNs

After a handover from an Iu mode ~~3G~~ MSC to a~~nother~~ ~~3G~~ UTRAN Iu mode MSC the user plane between the anchor MSC or MGW and the visited MSC or MGW shall comply to

- the Iu UP protocol if both MSC are connected via an ATM interface.
- the A-TRAU' protocol if both MSC are connected via a TDM interface except for the transparent cases FNUR = 32 kbit/s (ITC = UDI), FNUR = 56 kbit/s (ITC=RDI) and FNUR = 64 kbit/s (ITC=UDI). For these exceptions a plain 64 kbit/s channel is used between the MSCs. The rate adaptation between 64kbit/s and 32kbit/s is based on ITU-T I.460.
- the Nb UP protocol if both MGWs are connected via an ATM interface or IP interface. The NbUP shall be configured in support mode, the data is transported in a 64 kbit/s bit stream, formatted in SDUs of 40 octets and transmitted every 5 ms, in accordance with Annex P of ITU-T I.366.2 [81]. PDU type 0 is used, i.e., payload CRC is applied. This is needed for the framing to be handled the same for all transports but the Frame Quality Classification control shall be ignored (3GUP property Delivery Of Erroneous SDUs = yes) and therefore interim nodes shall only pass on the CRC. The data is encoded between MSC-B/MGW-B (non-Anchor) and MSC-A/MGW-A (Anchor) as for the TDM case (A-TRAU' protocol or plain 64kbits/s).

After a handover from an Iu mode MSC to a GERAN Iu mode MSC the user plane between the anchor MSC or MGW and the visited MSC or MGW shall comply to

- the Iu UP protocol if both MSC are connected via an ATM interface.
- the A-TRAU' and A-TRAU" protocol if both MSC are connected via a TDM interface except for the transparent cases FNUR = 32 kbit/s (ITC = UDI), FNUR = 56 kbit/s (ITC=RDI) and FNUR = 64 kbit/s (ITC=UDI). For these exceptions a plain 64 kbit/s channel is used between the MSCs. The rate adaptation between 64kbit/s and 32kbit/s is based on ITU-T I.460.
- the Nb UP protocol if both MGWs are connected via an ATM interface or IP interface. The NbUP shall be configured in support mode, the data is transported in a 64 kbit/s bit stream, formatted in SDUs of 40 octets and transmitted every 5 ms, in accordance with Annex P of ITU-T I.366.2 [81]. PDU type 0 is used, i.e., payload CRC is applied. This is needed for the framing to be handled the same for all transports but the Frame Quality Classification control shall be ignored (3GUP property Delivery Of Erroneous SDUs = yes) and therefore interim nodes shall only pass on the CRC. The data is encoded between MSC-B/MGW-B (non-Anchor) and MSC-A/MGW-A (Anchor) as for the TDM case (A-TRAU' protocol or plain 64kbits/s).

10.2.~~4~~5 Handover for 56kbit/s

The FNUR = 56 kbit/s in transparent mode can be supported in A/Gb mode by two configurations:

1. without IWF with the following channel codings
   - 2*TCH/F32.0
   - 5*TCH/F9.6
2. with IWF with the following channel coding
   - 4*TCH/F14.4

The FNUR = 56 kbit/s in transparent mode is supported in UTRAN Iu mode by a configuration without IWF only. Therefore handover for 56kbit/s in transparent mode between UTRAN Iu mode and A/Gb mode can be supported only for configurations without IWF.

3GPP TSG-CN WG3 Meeting #25
Miami, USA, 23rd - 27th September 2002.

Tdoc ⌘N3-020802

CR-Form-v7

CHANGE REQUEST

⌘ **24.022** **CR** **007** ⌘ **rev** **1** ⌘ Current version: **5.0.0** ⌘

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

Proposed change affects: UICC apps⌘ [ ] ME [X] Radio Access Network [ ] Core Network [X]

Title:	⌘	CS Data Services (including HSCSD and EDGE) for GERAN Iu mode
Source:	⌘	TSG_CN WG3
Work item code:	⌘	CS Data
Date:	⌘	19/09/2002
Category:	⌘	**B**
Release:	⌘	Rel-5

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

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
Rel-4	*(Release 4)*
Rel-5	*(Release 5)*
Rel-6	*(Release 6)*

Reason for change:	⌘	The provision of CS data services in GERAN Iu mode requires changes in 44.022 as proposed in this CR
Summary of change:	⌘	See attached pages
Consequences if not approved:	⌘	Feature is incomplete.

Clauses affected:	⌘	2, 2.1, 3, 4.1, 5.5, 5.5.7, 5.6.2			
		Y	**N**		
Other specs affected:	⌘	**X**		Other core specifications	23.910, 44.021, 48.020, 29.007, 27.001, 43.010
			X	Test specifications	
			X	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.

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] Void.

[2] 3GPP TS 44.021: " Rate adaption on the Mobile Station - Base Station System (MS - BSS) interface".

[3] 3GPP TS 48.004: " Base Station System - Mobile-services Switching Centre(BSS - MSC) interface Layer 1 specification".

[4] 3GPP TS 48.020: " Rate adaption on the Base Station System - Mobile-services Switching Centre (BSS - MSC) interface".

[5] 3GPP TS 25.410: "UTRAN I_u Interface: General Aspects and Principles".

[6] 3GPP TS 25.411: "UTRAN I_u Interface Layer 1".

[7] 3GPP TS 25.414: "UTRAN I_u Interface Data Transport and Transport Signalling".

[8] 3GPP TS 25.415: "Iu Interface CN-UTRAN User Plane Protocols".

[9] 3GPP TS 27.001: "General on Terminal Adaptation Functions (TAF) for Mobile Stations".

[10] 3GPP TS 27.002: "Terminal Adaptation Functions (TAF) for services using asynchronous bearer capabilities".

[11] 3GPP TS 27.003: "Terminal Adaptation Functions (TAF) for services using synchronous bearer capabilities".

[12] Void.

[13] 3GPP TS 29.007: "General requirements on interworking between the Public Land Mobile Network (PLMN) and the Integrated Services Digital Network (ISDN) or Public Switched Telephone Network (PSTN)".

[14] ITU-T Recommendation Q.920: "ISDN user-network interface data link layer - General aspects".

[15] ITU-T Recommendation Q.921: "ISDN user-network interface - data link".

[16] ITU-T Recommendation Q.921bis: "Abstract test suites for LAPD conformance tests".

[17] ITU-T Recommendation Q.922: "ISDN data link layer specification for frame mode bearer services".

[18] ITU-T Recommendation V.42bis: "Data Compression for Data Circuit Terminating Equipment (DCE) using Error Correction Procedures".

[19] ITU-T Recommendation X.25: "Interface between Data Terminal Equipment (DTE) and Data Circuit Terminating Equipment (DCE) for terminals operating in Packet Mode and connected to Public Data Networks by dedicated Circuit".

[20] ISO/IEC Recommendation 4335: "Information technology - Telecommunications and information exchange between systems - High level data link control (HDLC) procedures - Elements of procedures".

[21] ISO Recommendation 3309: "Information technology - Telecommunications and information exchange between systems - High level data link control (HDLC) procedures - Frame structure".

[22] ISO Recommendation 7498: "Information processing systems - Open Systems Interconnection - Basic Reference Model".

[23] ISO Recommendation 8885: "Information technology - Telecommunication and information exchange between systems - High-level data link control (HDLC) procedures - General purpose XID frame information field content and format".

[24] ISO Recommendation 8886: "Information technology - Telecommunication and information exchange between systems - Data link service definitions for Open Systems interconnection".

[25] ISO Recommendation 8509: "Information processing systems - Open Systems Interconnection - Service conventions".

[26] ISO/IEC Recommendation 7809: "Information technology - Telecommunication and information exchange between systems - High-level data link control (HDLC) procedures - Classes of procedures".

[27] ISO Recommendation 7776: "Information processing systems - High-level data link control procedures - Description of the X.25 LAPB-compatible DTE data link procedures".

[28] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[29] 3GPP TS 43.051: “GSM/EDGE Radio Access Network (GERAN) overall description, stage 2”

2.1 Definitions and abbreviations

In addition to the following, abbreviations used in the present document are listed in 3GPP TR 21.905 [28].

ABM	Asynchronous Balanced Mode
ADM	Asynchronous Disconnected Mode
ATM	Asynchronous Transfer Mode.
C/R	Command/Response bit
DISC	Disconnect frame
DM	Disconnected Mode frame
DTX	Discontinuous Transmission
FCS	Frame Check Sequence
L2R	Layer 2 Relay function
N(R)	Receive sequence number
N(S)	Send sequence number
NULL	Null information frame
P/F	Poll/Final bit
RLP	Radio Link Protocol
REJ	Reject frame
REMAP	Remap frame
RNR	Receive Nor ready frame
RR	Receive Ready frame
SABM	Set Asynchronous Balanced Mode frame
SREJ	Selected reject frame
STM:	Synchronous Transfer Mode.
TEST	Test frame
UA	Unnumbered Acknowledge frame
UI	Unnumbered Information frame
XID	Exchange Identification frame

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

A/Gb mode: A system or a subsystem operates in A/Gb mode if an A or Gb interface is used between the radio access network and the core network.

backwards compatibility: RLP defines several backwards-compatible versions. That means that a newer version can interwork with an older one without changing the older one. This is realized by a fall back mechanism during XID exchange.

command: instruction represented in the RLP header, causing the receiving RLP entity to execute a specific function.

frame check sequence: field of redundant information based on a cyclic code, used for error detection.

I + S frame: RLP frame that is used for user information transfer, carrying supervisory information piggyback.

improper frame: RLP frame having an FCS error or having a header the contents of which is inconsistent with this Specification.

Iu mode: A system or a subsystem operates in Iu mode if an Iu-CS or Iu-PS interface is used between the radio access network and the core network. It operates in UTRAN Iu mode if UTRAN is used as radio access network. It operates in GERAN Iu mode if GERAN is used as radio access network.

non-transparent: in PLMN data transmission, a configuration where at layer 2, protocol information of the fixed network is mapped on RLP elements, and vice versa.

piggybacking: means by which one and the same frame can carry both user information and RLP related supervisory information.

response: reply represented in the RLP-header, by which the sending RLP entity reports back about its status.

RLP frame: sequence of contiguous bits, representing an RLP procedural element.

RLP header: that part of an RLP frame that encodes either a command or a response, located at the beginning of the RLP frame.

S frame: RLP frame that contains supervisory information in the absence of user information.

transparent: in PLMN data transmission, a configuration where at layer 2 (and also at the layers above) no protocol conversion takes place.

U frame: RLP frame that contains unnumbered protocol control information.

3 Introduction

Three versions of RLP are defined:

- RLP version 0: single-link basic version;
- RLP version 1: single-link extended version (e.g. extended by data compression);
- RLP version 2: multi-link version.

RLP uses one physical link (single-link) or from 1 up to 4 (multi-link) substreams on one or more physical links. However, the RLP multi-link version is designed to be able to support up to 8 physical links. If, in the call set-up signalling, either end indicates that it cannot support multi-link operation, neither end shall require usage of RLP-versions higher than 1. If the BC negotiation during call set-up results in a possibility for multi-link operation during the call, both ends shall require and accept RLP version 2 only.

If the BC-IE sent by the UE in the SETUP or CALL CONFIRM message indicates negotiation during call set-up results in "maximum number of traffic channels" = "1 TCH" and WAIUR ≤ 14.4 kbit/s and the BC-IE sent by the UE in the CALL CONFIRM message (MT case) or by the MSC in the CALL PROCEEDING message (MO case) indicates UIMI = "not required/not allowed" or "up to 1 TCH/F allowed/may be requested/allowed", this is shall be interpreted as if at least one end does not support multi-link operation, and neither end shall require RLP version higher than 1.

RLP makes use of an underlying FEC (Forward Error Correction) mechanism. For RLP to perform adequately it is assumed that the basic radio channel together with FEC provides for a block error rate of less than 10 %, where a block consists of 240 or 576 bits (Further study on the BLER for 576-bit blocks is needed). Furthermore, it is assumed that in case of multi-link RLP the difference of the delay between all physical links is less than timer T4.

~~In A/Gb mode, RLP frames are sent in strict alignment with the radio transmission. (For details, see 3GPP TS 44.021).~~ In A/Gb mode and in GERAN Iu mode, RLP frames are of a fixed size of 240 (TCH/F4.8 and TCH/F9.6 channel codings) or 576 bits (TCH/F14.4, TCH/F28.8 and TCH/F43.2 channel codings). ~~Whenever a frame is to be sent, the RLP entity has to provide the necessary protocol information to be contained in it.~~ In UTRAN Iu mode, the RLP frame size does not depend on the channel coding, only 576 bit frames are used.

RLP entities running only in an UTRAN Iu mode environment need only to support the 576 bit frame length. The REMAP function is not necessary. RLP entities running in both of the systems have to support the REMAP function. In a handover from UTRAN Iu mode to A/Gb mode or GERAN Iu mode the frame either stays 576 bits long or changes from 576 bits to 240 bits incurring a REMAP. In a handover from A/Gb mode or GERAN Iu mode to UTRAN Iu mode the frame either stays 576 bits long or changes from 240 bits to 576 bits incurring a REMAP.

In A/Gb mode, RLP frames are sent in strict alignment with the radio transmission. (For details, see 3GPP TS 44.021). Whenever a frame is to be sent, the RLP entity has to provide the necessary protocol information to be contained in it.

Provision is made for discontinuous transmission (DTX).

RLP spans from the User Equipment (UE) to the interworking function (IWF), located at the nearest Mobile Switching Centre (MSC), or beyond. Depending on the exact location of the IWF, handover of the UE may result in link-reset or even total loss of the connection.

The UE shall initiate the RLP link. In addition the MSC/IWF may initiate the RLP link.

In the terminology of HDLC, RLP is used in a balanced configuration, employing asynchronous operation, i.e. either station has the right to set-up, reset, or disconnect a link at any time. Procedural means are provided for to deal with contentious situations, should they ever occur.

RLP is full-duplex in the sense that it allows for information to be transferred in both directions simultaneously.

4 Frame structure

4.1 Basic frame structure

In A/Gb mode and GERAN Iu mode, an RLP-frame has a fixed length of either 240 bits, used when the channel coding is TCH/F4.8 or TCH/F9.6, or 576 bits, used when the channel coding is TCH/F14.4, TCH/F28.8 or TCH/F43.2. In UTRAN Iu mode, the RLP-frame has a fixed length of 576 bits.

A frame consists of a header, an information field, and an FCS (frame check sequence) field. The size of the components depends on the radio channel type, RLP version and on the RLP frame. As a benefit of using strict alignment with underlying radio transmission there is no need for frame delimiters (like flags etc.) in RLP. In consequence, there is no "bit-stuffing" necessary in order to achieve code transparency.

a) 240 bit frame size

	Header	Information	FCS
version 0 and 1, version 2 (U frames only)	16 bit	200 bit	24 bit
version 2 (S and I+S frames only)	24 bit	192 bit	24 bit

b) 576 bit frame size

	Header	Information	FCS
version 0, 1, and version 2 (U frames only)	16 bit	536 bit	24 bit
version 2 (S and I+S frames only)	24 bit	528 bit	24 bit

Figure 1: Frame structure

Next section modified

5.5 List of system parameters

The system parameters are as follows.

Table 2: RLP parameter values

Name	Range of values	Default value	Recommended value
Version N°	0 – 2	0	2
k UE ⇒ IWF (for N° = 0/1)	0 – 61	61	61
k UE ⇒ IWF (for N° = 2)	0 - k_{max} (note 3)	480	240 (note 2)
k IWF ⇒ UE (for N° = 0/1)	0 – 61	61	61
k IWF ⇒ UE (for N° = 2)	0 - k_{max} (note 3)	480	240 (note 2)
T1 (note 1)	> 420 ms (version2) > 380 ms > 440 ms > 600 ms	520 ms (fullrate on 14,5, 29,0 or 43,5 kbit/s) 480 ms (fullrate on 12 kbit/s) 540 ms (fullrate on 6 kbit/s) 780 ms (halfrate)	520 ms (fullrate on 14,5, 29,0 or 43,5 kbit/s) 480 ms (fullrate on 12 kbit/s) 540 ms (fullrate on 6 kbit/s) 780 ms (halfrate)
T2 (note 1)		< 80 ms (fullrate on 14,5, 29,0 or 43,5 kbit/s) < 80 ms (fulrate on 12 kbit/s) < 80 ms (fullrate on 6 kbit/s) < 80 ms (halfrate)	< 80 ms (fullrate on 14,5, 29,0 or 43,5 kbit/s) < 80 ms (fullrate on 12 kbit/s) < 80 ms (fullrate on 6 kbit/s) < 80 ms (halfrate)
N2	> 0	6	6
P_T	0	0	0
P_0	0 – 3	0	3
P_1	512 – 65535	512	2048
P_2	6 – 250	6	20
T4 (note 1)	> 25 ms	30 ms 50 ms (fullrate on 14.5, 29.0 or 43.5 kbit/s)	30 ms 50 ms (fullrate on 14.5, 29.0 or 43.5 kbit/s)
Optional feature, Up signalling	0 – 1	0	1

NOTE 1: The timer values shall fulfil the formula:
- T1 > T2 + T4 + (2 * transmission delay) for multi-link operation;
- T1 > T2 + (2 * transmission delay) for single link operation.

For A/Gb mode and GERAN Iu mode the values apply according to indicated channel types, for UTRAN Iu mode the values apply according to "fullrate on 14.5" Timer T4 is ignored in UTRAN Iu mode and in single-link operation.

NOTE 2: This value is recommended in the case of 4 physical links.

NOTE 3: The maximum window size shall fulfil the formula:
- kmax < 496 - n * (1 + T4 / 20 ms), where n denotes the number of channels.

Any value k within the given range may be chosen.
However, to avoid transmission delay the value k should be:
- k > n * (2 * transmission delay) / 20 ms.

Next section modified

5.5.7 Optional features

The format of the optional features parameters is an octet where each bit position represents an optional feature that can be negotiated. The optional features are:

Bit position	Optional feature name
1	Up signalling
2	(Not yet assigned)
3	(Not yet assigned)
4	(Not yet assigned)
5	(Not yet assigned)
6	(Not yet assigned)
7	(Not yet assigned)
8	(Not yet assigned)

The 'Optional Features' parameter is negotiated bitwise in the downward sense, meaning that the value of bit *i* in the XID response shall be less or equal to the value of bit *i* in the XID command.

Up signalling: If the negotiated value of the 'Up signalling' feature is 1, then the UP bit in the S and I+S frame header is used for indicating an upgrading proposal to the UE, otherwise the UP bit is ignored (don't care). This optional feature is only applicable for A/Gb mode and GERAN Iu mode.

5.6 Support for discontinuous transmission (DTX)

In both ADM and ABM, whenever the RLP entity has no numbered or unnumbered supervisory commands/responses and no information transfer frames pending transmission, the RLP entity shall indicate to the lower layer that the DTX function may be invoked.

5.6.1 In case of A/Gb mode

Protocol of lower layer conforms to 3GPP TS 48.004, 3GPP TS 48.020 and 3GPP TS 24.021. A/Gb mode specification assumes STM for lower layer protocol. Even if there is no data to be sent, some transmission is needed on STM. RLP acts as follows in case of DTX.

In case DTX is invoked, in ADM a NULL-frame will be sent, and in ABM a RR or RNR S-frame will be sent.

5.6.2 In case of Iu mode

Protocol of lower layer conforms to 3GPP TS 25.410, 3GPP TS 25.411, 3GPP TS 25.414, ~~and~~ 3GPP TS 25.415 and 3GPP TS 43.051. Iu mode specification assumes ATM for lower layer protocol. When there is no data to be sent, no transmission is available on ATM. In consideration of transmission efficiency, no transmission is suitable. RLP acts as follows in case of DTX.

In case DTX is invoked, in ADM and ABM no frame will be sent.

3GPP TSG-CN WG3 Meeting #25
Miami, USA, 23rd - 27th September 2002.

Tdoc ⌘N3-020803

CR-Form-v7

CHANGE REQUEST

⌘ **29.007** **CR** **056** ⌘ **rev** **1** ⌘ Current version: **5.3.0** ⌘

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

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	CS Data Services (including HSCSD and EDGE) for GERAN Iu mode
Source:	⌘	TSG_CN WG3
Work item code:	⌘	CS Data
Date:	⌘	19.09.2002
Category:	⌘	**B**
Release:	⌘	Rel-5

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

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
Rel-4	*(Release 4)*
Rel-5	*(Release 5)*
Rel-6	*(Release 6)*

Reason for change:	⌘	The provision of CS data services in GERAN Iu mode requires changes in 29.007 as proposed in this CR.
Summary of change:	⌘	See attached pages
Consequences if not approved:	⌘	Incomplete specifications.

Clauses affected:	⌘					
		Y	**N**			
Other specs affected:	⌘	**X**		Other core specifications	⌘	23.910 , 44.021, 48.020, 44.022, 27.001, 43.010
			X	Test specifications		
			X	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/specs/CR.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://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

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

1 Scope

The present document identifies the Mobile-services Switching Centre/Interworking Functions (MSC/IWFs) and requirements to support interworking between:

a) PLMN and PSTN;

b) PLMN and ISDN;

for circuit switched services in the PLMN. It is not possible to treat ISDN and PSTN as one type of network, even when both ISDN and PSTN subscribers are served by the same exchange because of the limitations of the PSTN subscribers access i.e. analogue connection without D-channel signalling.

Within the present document, the requirements for voice and non-voice (data) calls are considered separately.

From R99 onwards the following services are no longer required by a PLMN:

- the dual Bearer Services "alternate speech/data" (BS 61) and "speech followed by data" (BS 81);
- the dedicated services for PAD (BS 4x) and Packet access (BS 5x);
- the single asynchronous and synchronous Bearer Services (BS 21..26, BS 31..34).

From Rel-4 onwards the following services are no longer required by a PLMN:

- the synchronous Bearer Service non-transparent (BS 30 NT).
- the Basic Packet access
- Non-transparent facsimile (TS 61/62 NT) for the A/Gb mode and GERAN Iu mode.

If a PLMN still provides these services it shall fulfil the specification of former releases.

The present document is valid for a PLMN in A/Gb mode) as well as (in Iu mode). If text applies only for one of these systems it is explicitly mentioned by using the terms "A/Gb mode" and "Iu mode". If text applies to both of the systems, but a distinction between the ISDN/PSTN and the PLMN is necessary, the term "PLMN" is used. Please note, that the Gb interface does not play any role in the scope of this document although the term "A/Gb mode" is used.

Next section modified

3 Definitions and abbreviations

Use is made of the following terms within the present document. These terms refer to information requirements necessary to support interworking functions, some of these terms will be identifiable with their use in other 3GPP specifications.

bearer capability information: specific information defining the lower layer characteristics required within the network.

low layer compatibility information: information defining the lower layer characteristics of the terminal.

high layer compatibility information: information defining the higher layer characteristics of the terminal.

compatibility information: this term subsumes the entirety of Bearer Capability, Low Layer Compatibility, High Layer Compatibility, Progress Indicator and Address Information conveyed out-of-band prior to call establishment for the support of compatibility checking and terminal/function/service selection at the ISDN-type user-network interface.

protocol identifier: information defining the specific protocols utilized for the support of data transfer by a terminal.

progress indicator: information supplied to indicate to the terminal that network interworking has taken place.

out-of-band parameter exchange: information exchanged via an associated or non-associated signalling link e.g. SS No 7.

PSTN: subscriber to network interface supports only analogue terminals.

ISDN: subscriber to network interface supports digital or analogue terminals, plus a standardized user to network associated signalling system and a standardized internetwork signalling system.

autobauding type 1: this information element value may be contained in the setup or call confirm messages from the UE in association with a non transparent data service. This implies that the MSC/IWF may select any speed and modem type according to what it can negotiate with the remote modem on the PSTN/ISDN. The parameters User Rate and FNUR (Fixed Network User Rate), if present, has no meaning when Modem Type is autobauding type 1.

multi self selecting speed modem: this term applies to V series modems capable of handling one or more lower speeds as a fall back position. When such a modem is requested in the call setup or call confirm message from the UE in association with a non transparent service, the MSC/IWF may select any of the speeds supported according to the negotiation with the remote modem on the PSTN/ISDN. The parameters User Rate and FNUR (Fixed Network User Rate), if present, has no meaning when Modem Type is autobauding type 1.

unrestricted 64 kbit/s network: a digital network which has 64 kbit/s octet-structured Information Transfer Capability (ITC) with no restrictions on the contents of each octet.

restricted 64 kbit/s network: ITU-T I.464 defines "'restricted 64 kbit/s transfer capability" as "64 kbit/s octet-structured capability with the exception that an all-zero octet is not permitted". In the present document, the term "restricted 64 kbit/s network" refers not only to networks with the I.464 restriction but also to those in which the 8th bit of each octet is unusable for data transmission.

directly connected restricted 64 kbit/s network: restricted 64 kbit/s network which is connected directly to the MSC/IWF.

indirectly connected restricted 64 kbit/s network: restricted 64 kbit/s network which is connected to the MSC/IWF via an unrestricted 64 kbit/s network.

EDGE channel: general term referring to channels based on 8PSK modulation; i.e. TCH/F28.8, TCH/F32.0, and TCH/F43.2.

A/Gb mode: A system or a subsystem operates in A/Gb mode if an A or Gb interface is used between the radio access network and the core network.

Iu mode: A system or a subsystem operates in Iu mode if an Iu-CS or Iu-PS interface is used between the radio access network and the core network. It operates in UTRAN Iu mode if UTRAN is used as radio access network. It operates in GERAN Iu mode if GERAN is used as radio access network.

Next section modified

7 Interworking classifications

7.1 Service interworking

Service interworking is required when the Teleservices at the calling and called terminals are different. No service interworking, except for facsimile group 3 (Teleservice 61 or 62 interworking with standard facsimile group 3 service), has been identified as a requirement of the PLMN system for PSTN/ISDN network based services.

7.2 Network interworking

Network interworking is required whenever a PLMN and a non-PLMN together are involved to provide an end to end connection and may be required in instances of PLMN to PLMN connections.

The concept of Bearer Services was developed for the ISDN and has been extended to the PLMN. A bearer service is defined (in 3GPP TS 22.001) as.

A type of telecommunication service that provides the capability for the transmission of signals between user-network interfaces.

Bearer services are described by a number of attributes, where an attribute is defined as a specified characteristic of an object or element whose values distinguish that object or element from others.

For the purpose of the present document, a PSTN is assumed to provide a bearer service which equates to an ISDN 3,1 kHz audio bearer service.

Refer to 3GPP TS 22.002 for complete list of bearer services. Refer to 3GPP TS 24.008 for coding of Bearer Capabilities. Refer to 3GPP TS 27.001 for the allowed combinations of parameter value settings.

Table 3: Bearer Service Interworking

Bearer service category in PLMN	Bearer Service in PLMN	Bearer service in ISDN	Service in PSTN
Circuit mode unstructured with unrestricted digital capability Transparent and Non-transparent	Asynchronous Data general	Cct mode structured 64 kbit/s unrestricted	Not Applicable
Circuit mode unstructured with unrestricted digital capability Transparent	Synchronous Data general		
3,1 kHz Audio Ex PLMN Transparent and Non-transparent	Asynchronous Data general	Cct Mode 3,1 kHz Audio	Cct Mode 3,1 kHz Audio
3,1 kHz Audio Ex PLMN Transparent	Synchronous Data general		

Table 4: Network interworking of Teleservices

Teleservice in PLMN	Lower layer capabilities addressed in the PLMN Bearer Capabilities IE	Bearer service in ISDN	Service in PSTN
Telephony	Unstructured with speech capability	Speech or Cct mode 3,1 kHz audio	Cct Mode 3,1 kHz audio
Emergency calls	Unstructured with speech capability		
Alternate speech/ facsimile group 3	Data Cct duplex synchronous (A/Gb mode) / asynchronous (UTRAN Iu mode) access alternate speech group 3 fax	Cct mode 3,1 kHz audio	Cct mode 3,1 kHz audio
Automatic Facsimile group 3	Data Cct duplex synchronous (A/Gb mode) / asynchronous (UTRAN Iu mode) access group 3 fax	Cct mode 3,1 kHz audio	

This table does not identify any relationship between Teleservices in the PLMN with those in the ISDN/PSTN, it is merely to identify the interworking of the lower network layers of that teleservice with the network layers i.e. bearer service in the ISDN/PSTN.

Next section modified

9.2.1.2 Modem Selection

In general terms the indication of the bearer capability parameter "Information Transfer Capability" will be utilized in the call set-up message to determine when the modem should be selected in the call.

In case of single calls, the modem function shall operate in the calling mode in case of mobile originated calls and in the answering mode in case of mobile terminated calls.

In case of dual data calls (alternate speech/facsimile group 3) the operation mode of the modem (working in calling or answering mode) depend on the initial call setup direction and on the optional parameter "Reverse Call Setup Direction" information element of the MODIFY message. If this information element is omitted the direction is derived from the initial call setup direction, i.e. the mode is the same as in case of single calls.

For the attribute value "3,1 kHz audio Ex PLMN" and "facsimile group 3", the modem will be selected immediately. The line procedure according to V.25 will then be carried out using the appropriate modem functions.

For the Teleservice 61 "Alternate speech/facsimile group 3", (if speech is selected as the first service), the modem is made available but not selected until the subscriber indicates the change of service request (see subclause 9.3).

For "alternate speech/facsimile group 3" calls refer to 3GPP TS 43.045 (A/Gb mode) and 3GPP TS 23.146 (UTRAN Iu mode).

Next section modified

9.2.3 Transparent service support

The protocol stacks for transparent services are specified in 3GPP TR 43.010 ~~(A/Gb mode)~~ and in 3GPP TR 23.910 ~~(Iu mode)~~.

In Iu mode, the transparent services are based in the Iu User Plane protocol specified in 3GPP TS 25.415.

In A/Gb mode the rate adaptation scheme shall be utilized on the RAN to MSC link as identified in 3GPP TS 48.020. The transcoding function will generate the 64 kbit/s rate adapted format utilizing the 8 and 16 kbit/s intermediate data rates. The MSC to MSC/IWF link (e.g. in the case of handover) will utilize the same 64 kbit/s rate adaptation scheme as that indicated in 3GPP TS 48.020.

For the transparent service support the MSC/IWF will select the modem and speed based on the Compatibility information contained in either the call set-up or call confirmed message reference subclause 9.2.1 and 9.2.2. Where the modem type indicated is one of the multi-speed versions, e.g. V.32, then the MSC/IWF will restrict the modem to the speed indicated in the call set-up and call confirmed message, respectively, i.e. will inhibit the modem from changing speed, irrespective of the conditions, error rate, encountered on the PSTN link. This scenario is also applicable for the use of "autobauding" modems, in that only the specifically requested modem type and speed will be selected at the MSC/IWF (however Facsimile Group 3 can use channel mode modify).

Next section modified

9.2.4 Non-transparent service support

The protocol stacks for non-transparent services are specified in 3GPP TR 43.010 ~~(A/Gb mode)~~ and in 3GPP TR 23.910 ~~(Iu mode)~~. Both of the systems use the Radio Link Protocol (RLP) specified in 3GPP TS 24.022.

In Iu mode, the non-transparent services are based in the Iu User Plane protocol specified in 3GPP TS 25.415.

In A/Gb mode the corresponding necessary support concerning the rate adaptation scheme shall be utilized on the RAN-MSC link as identified in 3GPP TS 48.020.

For the non-transparent service support the MSC/IWF will select the modem and speed based on the Compatibility information contained in either the call set-up or call confirmed message, reference subclauses 9.2.1 and 9.2.2. Where the Modem Type indicated is autobauding type 1, the MSC/IWF may select any speed and modem type according to what it can negotiate with the remote modem. In this case User Rate and Fixed Network User Rate, if present, has no meaning.

Next section modified

9.2.4.12 Service level up and down grading

Service level up and down grading is only applicable for A/Gb mode and GERAN Iu mode. If the value of the RLP parameter "UP signalling" is negotiated to 1, the IWF shall send a suggestion to the UE to initiate an upgrading whenever the following condition holds:

The IWF:

1) is receiving user data from the fixed network side at a higher rate than the current AIUR; or

2) in symmetrical calls only, can send user data towards the fixed network side at a higher rate than the current AIUR.

When the above condition does not hold, the IWF sets the value of the UP bit continuously to 0. When the condition above does hold, the IWF indicates the number of traffic channels to upgrade by, by sending that number of 1s between two consecutive 0s in the UP bit sequence. This indication is not repeated since the FCS protects it. For instance, if the current number of traffic channels is two and an upgrading to four traffic channels is suggested, the UP bit sequence shall be ..01100... How the IWF detects the condition and additional details for setting and resetting of the UP bit, e.g., hysteresis levels, may depend on implementation. NOTE: From MSC/IWF's perspective a TCH/F28.8 or TCH/F43.2 EDGE configuration is identical to a multislot 2×TCH/F14.4 or 3×TCH/F14.4 configuration. In this case, rather than suggesting the number of channels to add, the IWF suggests a number of 14.4 substreams to add and therefore a factor of 1/2 or 1/3 shall be applied to the suggested increase when the assigned up link channel is TCH/F28.8 or TCH/F43.2 respectively.

Next section modified

9.3 Interworking Alternate Speech / Facsimile Group 3 Calls

9.3.1 General

The procedure for the alternate speech/facsimile group 3 services is invoked at UE-MSC link during the call set-up phase. This service is invoked by indication of repeated bearer capability information elements in the setup message and/or call confirmed message respectively (preceded by a repeat indicator "circular"), one indicating speech and the other indicating facsimile group 3. The facsimile service requested will be indicated by the information transfer capability "facsimile group 3", as for a normal single call. The bearer capability first indicated i.e. speech or facsimile group 3 determines the first selection required of the network by the subscriber. Depending on the type of service requested and direction of call establishment (M0/MT, see relevant clauses of 3GPP TS 27 series) low layer and high layer capabilities may also be included. The MSC/IWF will perform both compatibility checking and subscription checking on both sets of capabilities as for normal data calls. If either the subscription check or the compatibility check fails then the call will be rejected. The only exception to this is when TS61/TS62 negotiation takes place, see 3GPP TS 27.001.

The applicable rules for provision of supplementary services are laid down in 3GPP TS 22.004.

The "speech" phase of the call, when invoked is handled by the transcoder and will utilize normal telephony teleservice interworking requirements and mobile network capabilities. This includes any requirements for echo cancellers etc. as

indicated in subclause 9.1. The "facsimile group 3" phase of the call, when invoked, shall utilize the appropriate data interworking capability (IWF including modem) and shall use the transparent mobile network capability in A/Gb mode or the non-transparent mobile network capability in UTRAN Iu mode.

The network shall provide, for service and operational reasons, a rapid and reliable changeover of capability upon request from the mobile user. This changeover may involve the disabling, by-passing or introduction of particular network functions (e.g. speech coder, modem etc.) and change of the channel configuration on the radio interface. This changeover is initiated on the receipt of the "MODIFY" message (see 3GPP TS 24.008) from the UE. The network itself will not initiate a changeover.

Next section modified

10.2.3 Transparent service support

The protocol stacks for transparent services are specified in 3GPP TR 43.010 ~~(A/Gb mode)~~ and in 3GPP TR 23.910 ~~(Iu mode)~~.

In Iu mode, the transparent services are based in the Iu User Plane protocol specified in 3GPP TS 25.415.

In A/Gb mode identifies the rate adaptation scheme shall be utilized on the RAN to MSC link as identified in 3GPP TS 48.020. The transcoding function will generate the 64 kbit/s rate adapted format utilizing the 8 and 16 kbit/s intermediate data rates. The MSC - MSC/IWF will utilize the same rate adaptation scheme as that indicated in 3GPP TS 48.020, i.e. adapted to 64 kbit/s.

Next section modified

10.2.4 Non-transparent service support

The protocol stacks for non-transparent services are specified in 3GPP TR 43.010 ~~(A/Gb mode)~~ and in 3GPP TR 23.910 ~~(Iu mode)~~. Both of the systems use the Radio Link Protocol (RLP) specified in 3GPP TS 24.022.

In Iu mode, the non-transparent services are based in the Iu User Plane protocol specified in 3GPP TS 25.415.

In A/Gb mode the corresponding necessary support concerning the rate adaptation scheme shall be utilized on the RAN-MSC link as identified in 3GPP TS 48.020.

For the non-transparent service support the MSC/IWF will select the modem and speed based on the Compatibility information contained in either the call set-up or call confirmed message, reference subclauses 9.2.1 and 9.2.2. Where the Modem Type indicated is autobauding type 1, the MSC/IWF may select any speed and modem type according to what it can negotiate with the remote modem. In this case User Rate and Fixed Network User Rate, if present, has no meaning.

Next section modified

10.3 Interworking Alternate speech facsimile group 3 calls

10.3.1 Alternate speech data bearer interworking

10.3.1.1 General

The procedure for the alternate speech/facsimile group 3 service is invoked at the UE-MSC link during the call set-up phase. This service is invoked by indication of repeated bearer capability information elements in the setup message and/or call confirmed message, respectively (preceded by a repeat indicator "circular"), one indicating speech and the other indicating "facsimile group 3" plus user rate etc., as for normal single calls. The bearer capability first indicated i.e. speech or facsimile determines the first selection required of the network by the subscriber. Depending on the type of service requested and direction of call establishment (M0/MT, see relevant clauses of the 3GPP TS 27 series) low layer and high layer capabilities may also be included. The MSC/IWF will perform both compatibility checking and subscription checking for mobile originated calls and optionally for mobile terminated calls (single numbering scheme) on both sets of capabilities as for normal data calls. If either the subscription check or the compatibility check fails then the call shall be rejected. The only exception to this is when TS61/TS62 negotiation takes place, see 3GPP TS 27.001.

As regards the supplementary services the application rules are laid down in 3GPP TS 22.004.

The speech phase of the call, when invoked, is handled by the transcoder and will utilize the normal telephony teleservice interworking requirements and mobile network capabilities. The Facsimile group 3 phase of the call, when invoked, shall utilize the appropriate data interworking capability (e.g. IWF) and shall use the transparent mobile network capability in A/Gb mode or the non-transparent mobile network capability in UTRAN Iu mode.

The network shall provide, for service and operational reasons, a rapid and reliable changeover of capability upon request from the mobile user. This changeover may involve the disabling, by-passing or introduction of particular network functions (e.g. speech coder, modem etc.) and change of the channel configuration on the radio interface. This changeover is initiated on the receipt of the "MODIFY" message (see 3GPP TS 24.008) from the UE. The network itself will not initiate a changeover.

Next section modified

11 Interworking between A/Gb mode MSC and Iu mode MSC

11.1 Handover from Iu mode MSC to A/Gb mode MSC

After a handover from an Iu mode MSC to an A/Gb mode MSC the user plane between the anchor MSC and the visited MSC shall comply to the standard A-interface protocols, i.e:

- A-TRAU or modified V.110 frames as defined in 3GPP TS 44.021 [27] and 3GPP TS 48.020 [28];
- up to four 16kbit/s substreams are multiplexed in one 64kbit/s channel (Split/Combine function and Multiplexing function as defined in 3GPP TS 44.021 [27] and 3GPP TS 48.020 [28]).

11.2 Handover from A/Gb mode MSC to UTRAN Iu mode MSC

After a handover from an A/Gb mode MSC to an UTRAN Iu mode MSC the user plane between the anchor MSC and the visited MSC shall comply to the A-TRAU' protocol except for FNUR = 56 kbit/s (ITC=RDI) and FNUR = 64 kbit/s (ITC=UDI). For both exceptions a plain 64 kbit/s channel is used between the MSCs.

The A-TRAU' protocol is defined as follows:

- A-TRAU' frames are transmitted in regular intervals of 10ms;

- an A-TRAU' frame consists of two consecutive A-TRAU frames (as defined in 3GPP TS 48.020 [28]) each with a length of 320 bit;
- the A-TRAU' protocol is used on a plain 64 kbit/s channel without substreams;
- the same A-TRAU' format is used for the transparent and non-transparent transmission mode;
- in transparent mode the number of data bits in an A-TRAU' frame depend on the user rate only, each user rate corresponds to a fixed number of data bits (see below);
- in non-transparent mode A-TRAU' frames contain always complete RLP frames, rate adaptation is performed by means of the M2 bit;
- the M1-bit is used to identify 1st and 2nd frame in both transmission modes.

11.2.1 Frame layout for the different transparent user rates

The number of data bits in an A-TRAU' frame depend on the user rate only, each user rate corresponds to a fixed number of data bits in an A-TRAU' frame.

Table 10: A-TRAU' frame layout for transparent user rate

Date Rate	Number of data bits per A-TRAU' frame
33.6 kbit/s	336
28.8 kbit/s	288

The data bits are inserted in the A-TRAU' frame starting with D1 of Data field 1 of the first A-TRAU frame. The unused bits are filled with binary '1'.

11.2.2 A-TRAU' frame format

One A-TRAU' frame consists of two consecutive A-TRAU frames. Figure 15 shows the format of one A-TRAU frame.

Octet number	bit number 0	1	2	3	4	5	6	7	
0	0	0	0	0	0	0	0	0	
1	0	0	0	0	0	0	0	0	
2	1	**C1**	**C2**	**C3**	**C4**	**C5**	**M1**	**M2**	
3	**Z1**	D1	D2	D3	D4	D5	D6	D7	
4	D8	D9	D10	D11	D12	D13	D14	D15	36 bit data field 1
5	D16	D17	D18	D19	D20	D21	D22	D23	
6	D24	D25	D26	D27	D28	D29	D30	D31	
7	D32	D33	D34	D35	D36	**Z2**	D1	D2	
8	D3	D4	D5	D6	D7	D8	D9	D10	
9	D11	D12	D13	D14	D15	D16	D17	D18	36 bit data field 2
10	D19	D20	D21	D22	D23	D24	D25	D26	
11	D27	D28	D29	D30	D31	D32	D33	D34	
12	D35	D36	**Z3**	D1	D2	D3	D4	D5	
13	D6	D7	D8	D9	D10	D11	D12	D13	
14	D14	D15	D16	D17	D18	D19	D20	D21	36 bit data field 3
15	D22	D23	D24	D25	D26	D27	D28	D29	
16	D30	D31	D32	D33	D34	D35	D36	**Z4**	
17	D1	D2	D3	D4	D5	D6	D7	D8	
18	D9	D10	D11	D12	D13	D14	D15	D16	36 bit data field 4
19	D17	D18	D19	D20	D21	D22	D23	D24	
20	D25	D26	D27	D28	D29	D30	D31	D32	
21	D33	D34	D35	D36	**Z5**	D1	D2	D3	
22	D4	D5	D6	D7	D8	D9	D10	D11	
23	D12	D13	D14	D15	D16	D17	D18	D19	36 bit data field 5
24	D20	D21	D22	D23	D24	D25	D26	D27	
25	D28	D29	D30	D31	D32	D33	D34	D35	
26	D36	**Z6**	D1	D2	D3	D4	D5	D6	
27	D7	D8	D9	D10	D11	D12	D13	D14	
28	D15	D16	D17	D18	D19	D20	D21	D22	36 bit data field 6
29	D23	D24	D25	D26	D27	D28	D29	D30	
30	D31	D32	D33	D34	D35	D36	**Z7**	D1	
31	D2	D3	D4	D5	D6	D7	D8	D9	
32	D10	D11	D12	D13	D14	D15	D16	D17	
33	D18	D19	D20	D21	D22	D23	D24	D25	36 bit data field 7
34	D26	D27	D28	D29	D30	D31	D32	D33	
35	D34	D35	D36	**Z8**	D1	D2	D3	D4	
36	D5	D6	D7	D8	D9	D10	D11	D12	
37	D13	D14	D15	D16	D17	D18	D19	D20	36 bit data field 8
38	D21	D22	D23	D24	D25	D26	D27	D28	
39	D29	D30	D31	D32	D33	D34	D35	D36	

Figure 15: A-TRAU 320 bit frame

Data Bits (Dxx):

The 288 data bits of an A-TRAU frame are divided in eight fields of 36 bits.

Control bits (C Bits):

C1 to C4:

The Control bits C1 to C4 define the used data rate. C1 to C4 in the first A-TRAU frame indicate the data rate in send direction.

C1 to C4 in the second A-TRAU frame indicate the used data rate in backward direction. This is required for Rate Control that is required in uplink direction. For details on Rate Control see 3GPP TS 25.415 [42].

Table 11: A-TRAU' control bits

C1	C2	C3	C4	Radio Interface User Rate
1	0	1	1	57,6 kbit/s
1	0	1	0	33,6 kbit/s
1	0	0	0	28,8 kbit/s
0	1	1	1	14,4 kbit/s

C5:

C5 is not used, it is set to binary '1'.

Bit M1:

An A-TRAU' frame is made of two consecutive A-TRAU which build the transport container for 576 data bits. Bit M1 is used to determine the order of the A-TRAU frames within an A-TRAU' frame.

The two M1 bits are referred to as the Frame Start Identifier. The FSI value is 01. These values are assigned to the M1 bit as shown below:

Table 12: Frame Start Identifier

	M1 bit
First A-TRAU frame	0
Second A-TRAU frame	1

Bit M2:

The M2 bit is used to indicate 'valid' A-TRAU' frames. The M2 bit in both of the two consecutive A-TRAU frames relating to an A-TRAU' frame shall have the same value.

Transparent mode:

In transparent mode M2 is clamped to binary '0'.

Non-transparent mode:

In non-transparent mode M2 is used for DTX. If DTX is applied, M2 is set to binary '1'. If DTX is not to be applied, M2 bit is set to binary '0'. The DTX handling is used in both directions for rate adaptation purpose. This means that the sending entity will insert 'fill RLP-frames' with DTX set to binary '1' in case no RLP-frame is available.

Fill frames are also sent in order to adapt the RLP transmission frequency to the AIUR. The ratio between RLP frames and ‘fill’ RLP frames is defined in the following table:

Table 13: RLP transmission frequency

AIUR	Ratio between RLP and ‘fill’ RLP frames
57.6 kbit/s	Only valid frames
28.8 kbit/s	1 valid frame followed by 1 ‘fill’ frame
14.4 kbit/s	1 valid frame followed by 3 ‘fill’ frames

Z bits:

The bits Zi are used for Framing Pattern Substitution mechanism. This mechanism is defined in 3GPP TS 48.020 [28].

Mapping of A-TRAU’ frames to PCM time slots:

~~A-TRAU’ frames shall be mapped octet aligned to PCM time slots. I.e. bit number 0 to 7 of each octet of an A-TRAU’ frame shall be mapped to bit number 0 to 7 of the PCM time slot.~~A-TRAU’ frames shall be mapped octet aligned to

PCM time slots. I.e. bit number 0 to 7 of each octet of an A-TRAU' frame shall be mapped to bit number 0 to 7 of the PCM time slot.

11.3 Handover from A/Gb mode MSC to GERAN Iu mode MSC

11.3.1 User plane for transparent services

After a handover from a GERAN A/Gb mode MSC to a GERAN Iu mode MSC the user plane between the anchor MSC and the visited MSC shall be identical to the A-TRAU' protocol except for FNUR = 32 kbit/s (ITC = UDI), FNUR = 56 kbit/s (ITC=RDI) and FNUR = 64 kbit/s (ITC = UDI). For these exceptions a plain 64 kbit/s channel is used between the MSCs. The rate adaptation between 64 kbit/s and 32 kbit/s is based on ITU-T I.460.

11.3.2. User plane for non-transparent services

For the handover scenario from GERAN A/Gb mode MSC to a GERAN Iu mode MSC, the existing A-TRAU' frame format will be extended to support the new defined RAB subflow data rates of the GERAN Iu mode.

For the RAB subflows with 12 kbit/s, 24 kbit/s, 36 kbit/s and 48 kbit/s the RLP frame length of 240 bit is used. For the transfer of this RLP frame length to A-TRAU' protocol is modified. The A-TRAU'' protocol is introduced. An A-TRAU'' frame has the same layout as the A-TRAU' frame and contains two A-TRAU frames.

One RLP frame with the length of 240 bit is contained in one A-TRAU frame. The A-TRAU'' protocol is only used for the non-transparent services.

In figure 15a, the format of the A-TRAU frame for the RLP frame length of 240 is shown.

Octet number	Bit number 0	1	2	3	4	5	6	7	
0	0	0	0	0	0	0	0	0	
1	0	0	0	0	0	0	0	0	
2	1	**C1**	**C2**	**C3**	**C4**	**C5**	**M1**	**M2**	
3	**Z1**	D1	D2	D3	D4	D5	D6	D7	
4	D8	D9	D10	D11	D12	D13	D14	D15	36 bit data field 1
5	D16	D17	D18	D19	D20	D21	D22	D23	
6	D24	D25	D26	D27	D28	D29	D30	D31	
7	D32	D33	D34	D35	D36	**Z2**	D1	D2	
8	D3	D4	D5	D6	D7	D8	D9	D10	
9	D11	D12	D13	D14	D15	D16	D17	D18	36 bit data field 2
10	D19	D20	D21	D22	D23	D24	D25	D26	
11	D27	D28	D29	D30	D31	D32	D33	D34	
12	D35	D36	**Z3**	D1	D2	D3	D4	D5	
13	D6	D7	D8	D9	D10	D11	D12	D13	
14	D14	D15	D16	D17	D18	D19	D20	D21	36 bit data field 3
15	D22	D23	D24	D25	D26	D27	D28	D29	
16	D30	D31	D32	D33	D34	D35	D36	**Z4**	
17	D1	D2	D3	D4	D5	D6	D7	D8	
18	D9	D10	D11	D12	D13	D14	D15	D16	36 bit data field 4
19	D17	D18	D19	D20	D21	D22	D23	D24	
20	D25	D26	D27	D28	D29	D30	D31	D32	
21	D33	D34	D35	D36	**Z5**	D1	D2	D3	
22	D4	D5	D6	D7	D8	D9	D10	D11	
23	D12	D13	D14	D15	D16	D17	D18	D19	36 bit data field 5
24	D20	D21	D22	D23	D24	D25	D26	D27	
25	D28	D29	D30	D31	D32	D33	D34	D35	
26	D36	**Z6**	D1	D2	D3	D4	D5	D6	
27	D7	D8	D9	D10	D11	D12	D13	D14	
28	D15	D16	D17	D18	D19	D20	D21	D22	36 bit data field 6
29	D23	D24	D25	D26	D27	D28	D29	D30	
30	D31	D32	D33	D34	D35	D36	**Z7**	D1	
31	D2	D3	D4	D5	D6	D7	D8	D9	
32	D10	D11	D12	D13	D14	D15	D16	D17	
33	D18	D19	D20	D21	D22	D23	D24	D25	36 bit data field 7
34	D26	D27	D28	D29	D30	D31	D32	D33	
35	D34	D35	D36	**Z8**	D1	D2	D3	D4	
36	D5	D6	D7	D8	D9	D10	D11	D12	
37	D13	D14	D15	D16	D17	D18	D19	D20	36 bit data field 8
38	D21	D22	D23	D24	D25	D26	D27	D28	
39	D29	D30	D31	D32	D33	D34	D35	D36	

Figure 15a: Use of A-TRAU frame for RLP frame size of 240 bits

Data Bits (Dxx):

The 288 data bits of an A-TRAU frame are divided in eight fields of 36 bits.

Only 240 data bits will be used. The data bits D25 … D 26 of the data field 7 and the data bits D1 … D36 of the data field 8 are set to '1' in of transfer of 240 bit long RLP frames.

Control bits (C Bits):

C1 to C4:

The Control bits C1 to C4 define the used data rate. C1 to C4 in the first A-TRAU frame indicate the data rate in send direction.

C1 to C4 in the second A-TRAU frame indicate the used data rate in backward direction. This is required for Rate Control in uplink direction.

Table 14: A-TRAU control bits for A-TRAU"

C1	C2	C3	C4	Radio Interface User Rate
1	0	1	1	57,6 bit/s
1	0	0	0	28,8 kbit/s
0	1	1	1	14,4 kbit/s
0	1	1	0	38,4 kbti/s
0	1	0	1	19,2 kbit/s
0	1	0	0	9,6 kbit/s

C5:

The C5 bit indicates that the A-TRAU'' protocol is used and one A-TRAU frame contains one RLP frame with the length of 240 bit. In this case C5 is set binary '0'.

Bit M1:

For A-TRAU'' the M1 bit in each A-TRAU frame is always set to 1.

Bit M2:

A-TRAU'' protocol is only used in non-transparent mode.

The M2 is used for DTX. If DTX is applied, M2 is set to binary '1'. If DTX is not to be applied, M2 bit is set to binary '0'. The DTX handling is used in both directions for rate adaptation purpose. This means that the sending entity will insert 'fill RLP-frames' with DTX set to binary '1' in case no RLP-frame is available.

Fill frames are also sent in order to adapt the RLP transmission frequency to the AIUR. The ratio between RLP frames and 'fill' RLP frames is defined in the following table for the A-TRAU'' protocol:

Table 15: RLP transmission frequency

AIUR	Ratio between RLP and 'fill' RLP frames
38,4 kbit/s	Each A-TRAU frame is valid
28,8 kbit/s	An A-TRAU'' frame with two valid frames is followed by an A-TRAU'' frame containing one valid frame and one fill frame.
19,2 kbit/s	Each A-TRAU'' frame contains one valid frame and one fill frame.
9,6 kbit/s	An A-TRAU'' frame with one valid frame and one fill frame is follows by an A-TRAU'' frame containing two fill frames

Z bits:

The bits Zi are used for Framing Pattern Substitution mechanism. This mechanism is defined in 3GPP TS 48.020.

Mapping of A-TRAU' frames to PCM time slots:

A-TRAU'' frames shall be mapped octet aligned to PCM time slots. I.e. bit number 0 to 7 of each octet of an A-TRAU' frame shall be mapped to bit number 0 to 7 of the PCM time slot.

11.34 Handover within Iu mode PLMNs

After a handover from an Iu mode MSC to ~~another~~ a UTRAN Iu mode MSC the user plane between the anchor MSC or MGW and the visited MSC or MGW shall comply to:

- the Iu UP protocol if both MSC are connected via an ATM interface;
- the A-TRAU' protocol if both MSCs are connected via a TDM interface except for the transparent case FNUR = 32 kbit/s (ITC = UDI or RDI), FNUR = 56 kbit/s (ITC=RDI) and FNUR = 64 kbit/s (ITC=UDI). For these exceptions a plain 64 kbit/s channel is used between the MSCs. The rate adaptation between 64 kbit/s and 32 kbit/s is based on ITU-T I.460 [2].
- the Nb UP protocol if both MGWs are connected via an ATM interface or IP interface. The NbUP shall be configured in support mode, the data is transported in a 64 kbit/s bit stream, formatted in SDUs of 40 octets and transmitted every 5 ms, in accordance with Annex P of ITU-T I.366.2 [81]. PDU type 0 is used, i.e., payload CRC is applied. This is needed for the framing to be handled the same for all transports but the Frame Quality Classification control shall be ignored (3GUP property Delivery Of Erroneous SDUs = yes) and therefore interim nodes shall only pass on the CRC. The data is encoded between MSC-B/MGW-B (non-Anchor) and MSC-A/MGW-A (Anchor) as for the TDM case (A-TRAU' protocol or plain 64kbits/s).

After a handover from an Iu mode MSC to a GERAN Iu mode MSC the user plane between the anchor MSC or MGW and the visited MSC or MGW shall comply to

- the Iu UP protocol if both MSC are connected via an ATM interface.
- the A-TRAU' and A-TRAU" protocol if both MSC are connected via a TDM interface except for the transparent cases FNUR = 32 kbit/s (ITC = UDI), FNUR = 56 kbit/s (ITC=RDI) and FNUR = 64 kbit/s (ITC=UDI). For these exceptions a plain 64 kbit/s channel is used between the MSCs. The rate adaptation between 64kbit/s and 32kbit/s is based on ITU-T I.460.
- the Nb UP protocol if both MGWs are connected via an ATM interface or IP interface. The NbUP shall be configured in support mode, the data is transported in a 64 kbit/s bit stream, formatted in SDUs of 40 octets and transmitted every 5 ms, in accordance with Annex P of ITU-T I.366.2 [81]. PDU type 0 is used, i.e., payload CRC is applied. This is needed for the framing to be handled the same for all transports but the Frame Quality Classification control shall be ignored (3GUP property Delivery Of Erroneous SDUs = yes) and therefore interim nodes shall only pass on the CRC. The data is encoded between MSC-B/MGW-B (non-Anchor) and MSC-A/MGW-A (Anchor) as for the TDM case (A-TRAU' protocol or plain 64kbits/s).

11.45 Handover for 56kbit/s

The FNUR = 56 kbit/s in transparent mode can be supported in A/Gb mode by two configurations:

1. without IWF with the following channel codings
   - 2*TCH/F32.0
   - 5*TCH/F9.6
2. with IWF with the following channel coding
   - 4*TCH/F14.4

The FNUR = 56 kbit/s in transparent mode is supported in Iu mode by a configuration without IWF only. Therefore handover for 56kbit/s in transparent mode between Iu mode MSC and A/Gb mode can be supported only for configurations without IWF.

Note: Handover between configurations with and without IWF are also not supported within A/Gb mode.

11.~~5~~6 Transport within the Core Network

The Nb UP protocol is used to transport user data in the Core Network, see 3GPP TS 29.415 [80]. Figure 17 below shows different cases to consider:

1. Transport on the access side of the IWF
2. Transport beyond the IWF, i.e., between the IWF and the fixed network

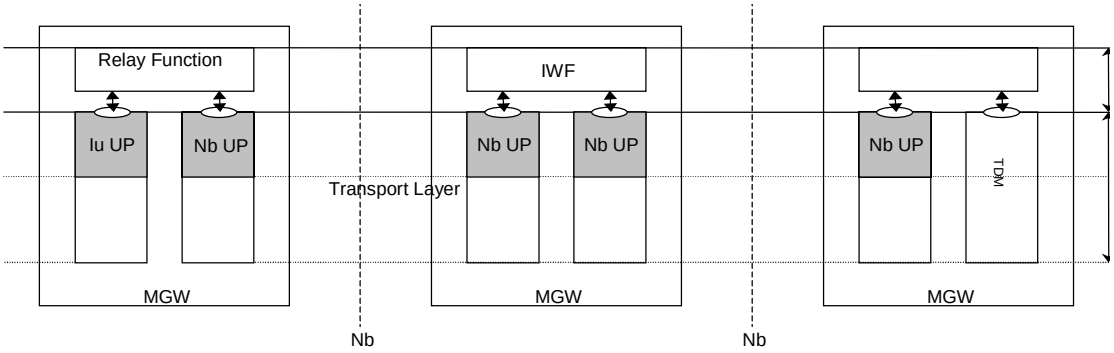

Figure 16: Transport of data within the Core Network

11.~~5~~6.1 Transport on the access side of the IWF

This section is applicable in cases where the IWF is not interfacing an Iu UP layer protocol entity, with the exception of Inter-MSC Relocation – see 11.~~5~~6.3.

11.~~5~~6.1.1 Non-transparent case

The Nb UP is used in support mode. The same SDU sizes and transmission intervals that are used on the Iu interface are used over the Nb interface, see 3GPP TR 23.910 [53] and 3GPP TS 27.001 [43]. A Relay Function (see 3GPP TS 29.232 [82]) is used to relay the user data and control information (such as rate control) in MGWs between the MGW where the IWF is residing and the Iu interface.

11.~~5~~6.1.2 Transparent case

The Nb UP is used in transparent mode. The same SDU sizes and transmission intervals that are used on the Iu interface are used over the Nb interface, see 3GPP TR 23.910 [53] and 3GPP TS 27.001 [43]. The PDUs are passed unmodified through all MGWs between the MGW where the IWF is residing and the Iu interface.

11.~~5~~6.2 Transport beyond the IWF

11.~~5~~6.2.1 UDI and RDI

The data is transported in a 64 kbit/s bit stream, formatted in SDUs of 40 octets and transmitted every 5 ms, in accordance with Annex P of ITU-T I.366.2 [81]. PDU type 0 is used, i.e., payload CRC is applied.

At the border between the CN and the fixed (ISDN) network, conversion between Nb UP and TDM shall be applied. In case of RDI interworking, the 56 kbit/s RDI bit stream is transmitted within the CN as 64 kbit/s bit stream where the last bit of each octet is ignored. For this reason the octet alignment shall be preserved in the SDUs transported in the CN.

11.56.2.2 Modem

The modem signals are PCM encoded and transported on a 64 kbit/s bit stream. The transmission is otherwise identical to the UDI/RDI case, see Section 11.56.2.1

11.56.3 Transport between Anchor MGW and Non-Anchor MGW

The Nb UP is used in support mode; all interim Server nodes are assumed not to be aware of the relocation case – i.e. receive BICC IAM with same information as for connections beyond the IWF (clause 11.56.2). Figure 17 indicates the relevant connections, where MSC-A/MGW-A are the Anchor nodes and MSC-B/MGW-B are the Non-Anchor nodes.

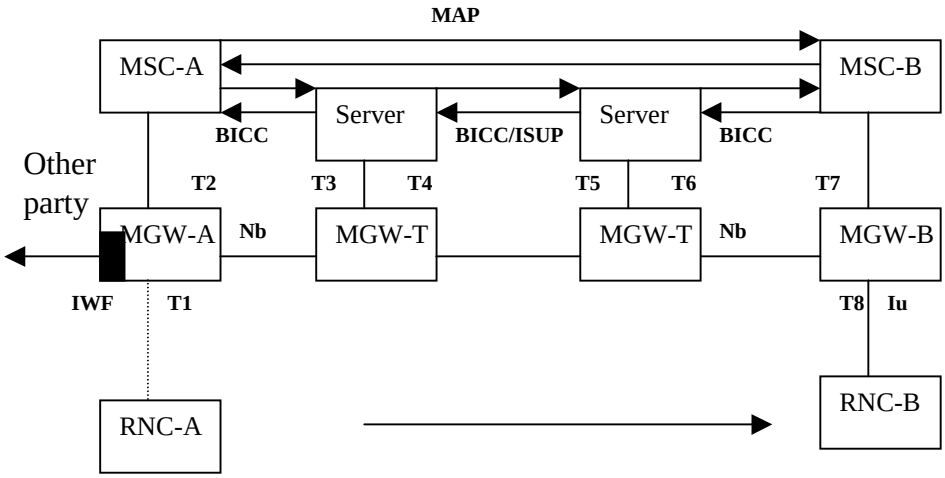

Figure 17: Bearer Independent connections for Inter-MSC SRNS Relocation

The IuUP shall be initialised on each Nb leg in a forward direction (regardless if Forward Bearer or Backward Bearer procedures are used), i.e. in the direction of the IAM. For further details see TS 23.205 [83].

11.~~5~~6.3.1 Non-Transparent CSD

Table 14: Non-Transparent CSD MGW Termination Properties For Inter-MSC SRNS Relocation

Termination Packages/Parameters	MSC-A		MSC-B		Intermediate Nodes
	T1	T2	T7	T8	T3, T4, T5, T6
TMR	-	UDI	UDI	-	UDI
threegcsd:plmnbc	PLMN_BC	PLMN_BC	-	-	-
threegup:interface	RAN	CN	CN	RAN	CN
threegup:initdir	IN	OUT	IN	OUT	IN
threegup:mode	support	support	support	support	support
threegcsde:bitrate	-	-	-	BITRATE	-

11.~~5~~6.3.2 Transparent CSD

Table 15: Transparent CSD MGW Termination Properties For Inter-MSC SRNS Relocation

Termination Packages/Parameters	MSC-A		MSC-B		Intermediate Nodes
	T1	T2	T7	T8	T3, T4, T5, T6
TMR	-	UDI	UDI	-	UDI
threegcsd:plmnbc	-	-	-	-	-
threegup:interface	RAN	CN	CN	RAN	CN
threegup:mode	transparent	support	support	transparent	support
threegup:initdir	-	OUT	IN	-	IN
threegcsden:bitrate	-	-	-	BITRATE (note1 1)	-
Note 1: This is optional for the case when rate is 64kb/s then no rate adaptation is required					

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3GPP TSG-CN WG3 Meeting #25
Miami, USA, 23rd - 27th September 2002.

Tdoc ⌘N3-020804

CR-Form-v7

CHANGE REQUEST

⌘ **27.001** **CR** **081** ⌘ **rev** **1** ⌘ Current version: **5.3.0** ⌘

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

Proposed change affects: UICC apps⌘ [ ] ME [X] Radio Access Network [ ] Core Network [X]

Title:	⌘	CS Data Services (including HSCSD and EDGE) for GERAN Iu mode
Source:	⌘	TSG_CN WG3
Work item code:	⌘	CS Data
Date:	⌘	19.09.2002
Category:	⌘	**B**
Release:	⌘	Rel-5

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

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
Rel-4	*(Release 4)*
Rel-5	*(Release 5)*
Rel-6	*(Release 6)*

Reason for change:	⌘	The provision of CS data services in GERAN Iu mode requires changes in 27.001 as proposed in this CR.
Summary of change:	⌘	See attached pages
Consequences if not approved:	⌘	Feauture incomplete

Clauses affected:	⌘	1, 6.4, 6.5, 8.1.2, 8.2, 8.3.3, annex A, annex B.1

		Y	N			
Other specs affected:	⌘	X		Other core specifications	⌘	44.021, 48.020, 44.022, 29.007, 23.910, 43.010
			X	Test specifications		
			X	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/specs/CR.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://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

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

1 Scope

The present document is based on the principles of terminal adaptor functions presented in the ITU-T I-series of recommendations (I.460 to I.463).

The PLMN supports a wide range of voice and non-voice services in the same network. In order to enable non-voice traffic in the PLMN there is a need to connect various kinds of terminal equipment to the Mobile Termination (MT). The target of the present document is to outline the functions needed for the terminal adaptation.

The bearer services are described in 3GPP TS 22.002 and the general network configuration is described in 3GPP TS 23.002. The ~~A/Gb mode~~ PLMN access reference configuration is defined in 3GPP TS ~~44~~24.002. The various connection types used in the A/Gb mode or GERAN Iu mode PLMN are presented in 3GPP TS 43.010. Terminology used in the present document is presented in 3GPP TR 21.905 and 3GPP TS 29.990. For support of data services between a PLMN and other networks see 3GPP TS 29.007.

The present document is valid for a 2nd generation PLMN (A/Gb mode) as well as for a 3rd generation PLMN (~~UTRAN~~ Iu mode). If text applies only for one of these systems it is explicitly mentioned by using the terms "A/Gb mode" and "UTRAN Iu mode". If text applies to both of the systems, but a distinction between the ISDN/PSTN and the PLMN is necessary, the term "PLMN" is used.

NOTE: From R99 onwards the following services are no longer required by a PLMN:

- the dual Bearer Services "alternate speech/data" and "speech followed by data";
- the dedicated services for PAD and Packet access;
- BS 21 ... 26 and BS 31 ... 34.

From REL-4 onwards the following service is no longer required by a PLMN:

- the synchronous Bearer Service non-transparent (BS 30 NT).
- Non-transparent facsimile (TS 61/62 NT) for the A/Gb mode and GERAN Iu mode.

The support of these services is still optional. The specification of these services is not within the scope of the present document. For that, the reader is referred to former releases.

NOTE: Please note that the Gb interface does not play any role in the scope of the present document although the term “A/Gb mode” is used. ~~GERAN Iu mode is for further study.~~

Next section modified

6.4 User initiated service level up and down grading (applies to A/Gb and GERAN Iu mode only)

When the value of the negotiated UIMI parameter is greater than 0, the MS may at any time during the call, control, to some extent, the number of traffic channels to be used. This is done by signalling a higher or lower value for the wanted air interface user rate (WAIUR) and maximum number of traffic channels (mTCH). The network may assign an AIUR matching the WAIUR using up to mTCH traffic channels, provided that the resources are available (3GPP TS 22.034, 23.034 and 24.008).

If the value of the RLP optional feature 'Up signalling' is negotiated to 1, the MS may receive a suggestion from the network to initiate an upgrading. This occurs when the following condition holds:

The IWF:

1) is receiving user data from the fixed network side at a higher rate than the current AIUR; or

2) in symmetrical calls only, can send user data towards the fixed network side at a higher rate than the current AIUR.

The MS can detect the condition stated in 1) and 2) above by examining the value of the UP bit in the received RLP S and I+S frames. When the condition does not hold, the value of the UP bit is continuously 0. If the condition does hold, the number of 1s between two consecutive 0s indicates the number of traffic channels to upgrade by. There is no need to repeat this indication since the FCS protects it. For instance, if the UP bit sequence is ...01100... and the current number of assigned traffic channels is 2, then an upgrading 4 traffic channels is suggested.

NOTE: From MSC/IWF's perspective a TCH/F28.8 or TCH/F43.2 EDGE configuration is identical to a multislot 2×TCH/F14.4 or 3×TCH/F14.4 configuration. Therefore, a factor of 1/2 or 1/3 has to be applied to the suggested increase when the assigned up link channel is TCH/F28.8 or TCH/F43.2 respectively.

The MS may use the information signalled in the UP bit to find out when a service level upgrading may increase the data throughput. In order to initiate a service level upgrading, the value of UIMI shall be greater than the number of currently assigned channels.

In order to determine when to downgrade, the MS may compare the rate of received and sent information in the RLP frames to the AIUR. If the rate of received and sent information is less than the current AIUR the MS may initiate a downgrading.

User initiated service level up and down grading mechanism may also be used to modify the asymmetry preference, see subclause 6.5. This is achieved by sending a new value of the asymmetry preference in the BC-IE.

6.5 Asymmetry preference indication (applies to A/Gb and GERAN Iu mode only)

The MS's classmark may restrict the possible number of channels or modulation that may be assigned by the network in one of the directions. This may result in an asymmetric transmission, i.e., different numbers of channels or modulations are assigned in each direction.

Asymmetric transmission may also result from a preference indication. At call set up, the MS may send an asymmetry preference indication in the BC-IE (see 3GPP TS 24.008). There are three options:

1) no preference;

2) up link biased asymmetry preferred;

3) down link biased asymmetry preferred.

If down or up link asymmetry preference is indicated, the network shall not assign EDGE channels on the unbiased link. If the network assigns EDGE channels on the biased link, it shall assign TCH/F14.4 on the unbiased link. The WAIUR shall then apply to the biased link.

Next section modified

8.1.2 Non-transparent services

With respect to the TAF, for non-transparent bearer capability support, the synchronization procedure in A/Gb and GERAN Iu mode is as follows:

- firstly, receiving frames on all allocated traffic channels for the call;
- secondly, initiating the RLP link establishment by sending a RLP-SABM across the radio interface.

In UTRAN Iu mode, the TAF shall initiate the RLP after the physical connection has been established.

8.1.2.1 V.-series interface

During the synchronization process described above, i.e. while the synchronization pattern is being sent by the MT, CT106, 107 and 109 remain in the OFF condition.

When the RLP link has been established, CT107 shall be changed from "OFF" to "ON". From this time the information from/to the RLP, including status changes, shall be mapped by the L2R entity applicable to the particular bearer capability (3GPP TS 27.002 "L2R functionality").

8.1.2.2 X.-series interface

Void.

8.1.2.3 S interface (I.420) (does not apply to UTRAN Iu mode)

Void.

8.1.3 Action on loss of synchronization

8.1.3.1 Loss at the TAF-radio interface

In A/Gb and GERAN Iu mode, if the TAF detects a loss of synchronisation on one or more channels, it initiates the re-synchronisation process. The TAF searches for the data frame structure in those channels in which the synchronisation has been lost according to the initial procedures described in subclauses 8.1.1 and 8.1.2. The information received from the channels shall continue to be processed as if the synchronisation had not been lost, i.e. corrupted data is forwarded towards RLP entity or TE during the re-synchronisation process. No action shall be taken on the frames being transmitted towards the MSC, other than to continue sending them normally.

In UTRAN Iu mode, no action shall be taken.

8.1.3.2 Loss at the TAF-terminal interface

Void.

8.2 Filtering of Channel Control Information (A/Gb or GERAN Iu mode transparent mode only)

8.2.1 General

The DTEs used at the MS side of the PLMN conforms to ITU-T's DTE/DCE interface specifications, which assume basically an error-free environment, i.e.:

- limited distance, point-to-point local interconnection of the interface circuits for data and status;
- steady state signalling.

The envisaged use of these DTEs in the PLMN environment leads to the exposure of these "interconnections" to the PLMN radio channel. To assure proper operation even under these conditions appropriate measures have to be taken. In the non transparent case the RLP satisfies the requirement for both data and status lines.

In the transparent case the:

- data line aspects have to be dealt with end-to-end by the users; while
- status line aspects are of concern to the network, and are dealt with in the following.

8.2.2 Filtering process to be applied

Filtering of channel control information is relevant only at the MS side and in the transparent mode of operation. By applying filtering measures the condition of a DTE/DCE control interchange circuit, for which the DTE constitutes the information sink, is preserved until another condition is signalled for an "integration time" period by the channel control information (status bits) of the rate adaptation scheme.

The filtering mechanism is understood to reside between the rate adaptation function (information source) and the DTE (information sink). It receives the unfiltered condition of the respective control interchange circuit set according to the actual sequential appearance of the individual associated status bits and forwards the filtered condition to the DTE.

The filtering process starts when the traffic channel synchronization ends with the expiry of timer T.

8.2.2.1 V.-series interface

CT 106

In the transparent mode the remote inband control of this circuit is needed to support a modem retrain procedure.

OFF-ON transition at the MS authorizes the DTE to send data; if wrongly set, loss of data may occur.

ON-OFF transition at the MS causes the DTE to cease transmitting data; set wrongly may impair the performance in connection usage.

CT 109

In the transparent mode the remote inband control of this circuit is needed to:

- trigger the interpretation of received data;
- indicate to the DTE the state of the connection.

OFF-ON transition at the MS authorizes the DTE to rely on the condition of the received data interchange circuit, set wrongly may cause receipt of wrong data, while setting late may cause loss of data.

ON-OFF transition at the MS:

- causes the DTE to cease receiving data;
- may initiate release of the connection during a data phase by the DTE giving an ON-OFF transition on circuit 108/2.

Setting this condition wrongly may cause loss of data and potentially release the connection.

8.2.2.2 X.-series interface

Void.

8.2.2.3 Filtering mechanism

8.2.2.3.1 Traffic channel types TCH/F4.8 and TCH/F9.6

A filtering mechanism shall be provided by an integration process on those SB and X bits carrying status information in the V.110 frame or in the multiframe structure. The integration periods applied are:

V-series	Transition	Integration period	Status stream

CT 106	Off-On	1 s	X
CT 106	On-Off	1 s	X
CT 109	Off-On	200 ms	SB
CT 109	On-Off	5 s	SB

X-series	**Transition**	**Integration period**	**Status stream**
I-circuit	Off-On	40 ms	SB
I-circuit	On-Off	5 s	SB

The integration process shall ensure that the interchange circuits do not change state in response to spurious transitions of the status bits during the integration period.

The integration process shall operate reliably with error characteristics as specified in 3GPP TS 05.05.

8.2.2.3.2 Traffic channel type TCH/F14.4

To change the state of CT 109 (or I-circuit) or CT 106, it is required that at least two consecutive SB-bits or X-bits, respectively, carry the same value.

Next section modified

8.3.3 Indication of Compatibility Requirements to the PLMN

8.3.3.1 Indication in case of Mobile terminating calls

In support of:

- PSTN originated calls; and
- ISDN originated calls using 3,1 kHz audio Bearer Capability (BC); as well as
- ISDN originated calls using unrestricted digital Bearer Capability but not specifying all parameters for deducing a Bearer Service.

Mobile specific requirements to be dealt with in the Bearer Capability information element the call confirmed message has been introduced in the call control protocol (3GPP TS 24.008). This also allows for renegotiation of specific parameters at the beginning of the connection set-up process. The specific parameters are:

a) mobile specific requirements:
   - Connection element (transparent/non transparent);
   - Structure (note 1);
   - Synchronous/Asynchronous (note 8);
   - Rate adaptation/other rate adaptation (note 9);
   - User information layer 2 protocol (note 1);
   - Intermediate rate (note 2), (note 3);
   - Modem Type (note 1), (note 3);
   - User Rate (note 3);
   - Compression ,
   - Fixed network user rate, (note 3) (note 4);

- Other modem type, (note 3) (note 4);
- User initiated modification indication (note 4).

The following parameters are indicated by the MS to the network, only:

- Radio Channel Requirement;
- Acceptable channel codings (note 5);
- Maximum number of traffic channels, (note 5);
- Wanted air interface user rate (note 6) (note 7);
- Asymmetry preference indication (note 7).

NOTE 1: This parameter is correlated with the value of the parameter connection element.

NOTE 2: For non-transparent services this parameter is correlated with the value of the parameter negotiation of intermediate rate requested.

NOTE 3: Modification of these parameters may be proposed by the MS. The Network may accept it or not.

NOTE 4: This parameter shall be included by the MS only in case it was received from the network.

NOTE 5: This parameter shall be included only in case the parameter 'fixed network user rate' is included.

NOTE 6: This parameter shall be included only for non-transparent services and in case the parameter 'fixed network user rate' is included.

NOTE 7: This parameter has to be included if EDGE channel coding(s) are included in Acceptable channel codings. In cases where this parameter would not otherwise be included, the value is set to 'Air interface user rate not applicable' or 'User initiated modification not requested' or "No preference".

NOTE 8: For FTM and PIAFS, this parameter may be negotiated as in table B.4e. How the subscription for BS20 is assured, is an operator matter.

NOTE 9: For FTM, PIAFS or Multimedia, this parameter may be negotiated as in table B.4f.

b) requirements with effects at the partner terminal:

- Number of data bits;
- Number of stop bits;
- Parity.

The MS indicates the radio channel requirement in the call confirmed message. If the MS indicates the support of "dual" (HR and FR channels) the final decision, which radio channel is chosen, is done by the network in an RR message. The radio channel requirement is ignored in UTRAN Iu mode, see Table B.5a in Annex B.

If the network proposes optional support of both transparent and non transparent connection elements, but does not indicate a user information layer 2 protocol, the MS shall set the appropriate value, if choosing non transparent in the call confirmed message and out-band flow control is not requested, see B.1.1.2.

Additionally the values of the parameters structure, modem type and intermediate rate have to be set in conformance with the values of the parameters radio channel requirements, negotiation of intermediate rate requested and connection element.

Subclause B.1.1.2 and table B.1 in the annex B describe the negotiation procedure. Annex B table B.4 describes the selection of the modem type and the dependence on the value of the parameter connection element. Annex B table B.4 describes the selection of the intermediate rate and user rate and their dependence upon the value of the NIRR parameter and the equipment capabilities.

The following MT cases can be deduced from the individual call set-up request conditions:

a) If the set-up does not contain a BC information element, the MS in the call confirmed message shall include any BC information (single or multiple BC-IE). The MS may use the information provided in the BACKUP BC information element (ref. to 3GPP TS 29.007 and 3GPP TS 24.008) to deduce the requested service. Note, that the presence of the BACKUP BC-IE does not change the condition of "no BC-IE received", that means in particular that the MS shall include any BC-IE (as mentioned before) and shall not negotiate parameter values where the MSC has to offer a value in the BC-IE first, as e.g., for the parameter "compression". In case of multiple BC-IEs one BC-IE shall indicate the information transfer capability "speech". A 3,1 kHz multimedia BC-IE together with a speech BC-IE indicates the support of a fallback to speech. A UDI/RDI multimedia BC-IE together with a speech BC-IE indicates the support of service change and fallback (ref. to 3GPP TS 29.007 and 3GPP TS 24.008).

b) If the set-up message contains a single BC-IE, the MS in the call confirm message shall use either a single BC-IE, if it wants to negotiate mobile specific parameter values or, unless otherwise specified in annex B, no BC-IE, if it agrees with the requested ones.

c) If the set-up contains a multiple BC-IE, the MS in the call confirmed message shall use either a multiple BC-IE, if it wants to negotiate mobile specific parameter values or, unless otherwise specified in annex B, no BC-IE, if it agrees with the requested ones.

- In case of a 3,1kHz multimedia setup the MS may either accept the possibility of a fallback to speech by responding with two BC-IEs, or with no BC-IEs, or turn the call to a speech call by sending only a speech BC-IE in the call confirm message or turn the call to a multimedia only call (i.e. no fallback to speech allowed) by sending only a multimedia BC-IE, in the call confirm message.

- In case of a UDI/RDI multimedia setup, the MS may either accept the possibility of service change by responding with two BC-IEs or with no BC-IEs, or turn the call to a speech call by sending only a speech BC-IE in the call confirm message, or turn the call to a multimedia call by sending only a multimedia BC-IE in the call confirm message.

- In case of facsimile, a single BC-IE, containing fax group 3 only, shall be used if a multiple BC-IE requesting speech alternate fax group 3 is received and the MS is not able to support the speech capability. Annex B, table B.7, describes the negotiation rules.

If the BC-IE contains 3,1 kHz ex PLMN, the MS is allowed to negotiate all mobile specific parameter values listed above. If the BC-IE contains facsimile group 3, the MS is not allowed to negotiate any mobile specific parameter value. In any case, if the set-up message requests a "single service", the MS shall not answer in the call confirmed message requesting a "dual service".

However, for dual services with repeat indicator set to "circular (alternate)" or to "service change and fallback" the MS may change the sequence of dual BC-IEs within the call confirmed message (preceded by the same value of the repeat indicator), if it wants to start with a different Bearer Capability than proposed by the network as the initial one.

In addition, the MS may propose to the network to modify User Rate, Modem Type and Intermediate Rate in the CALL CONFIRMED message. The network may accept or release the call.

If the BC-IE received from the network contains the parameters 'fixed network user rate', 'other modem type' and possibly the 'user initiated modification', the MS may either:

a) if in A/Gb mode, discard these parameters; or

b) include the possibly modified values for the 'fixed network user rate' and 'other modem type' in the BC-IE of the call confirmed message. The network might accept or reject the modified values. In this case the MS shall also include the parameters 'maximum number of traffic channels' and 'acceptable channel codings'. Additionally for non-transparent services, the MS shall also include the parameters 'wanted air interface user rate' and the 'user initiated modification indication'.

In case a), the MS shall use the fall-back bearer service indicated by the remaining parameters of the BC-IE on a single slot configuration (reference 3GPP TS 44.021).

In A/Gb or GERAN Iu mode case b), a single slot configuration shall be used by the MS, in case the 'maximum number of traffic channels' is set to "1 TCH" and the 'user initiated modification indication' is set either to "user initiated modification not required" or to "user initiated modification up to 1TCH may be requested"; other wise the MS shall use a multislot configuration (reference 3GPP TS 44.021).

In case the 'acceptable channel codings' is indicated by the MS, the decision which channel coding is used is done by the network and indicated to the mobile station with a RR message. This RR message may also assign an asymmetric channel coding. The 'acceptable channel codings' parameter takes precedence over the 'negotiation of intermediate rate requested' parameter for non-transparent services. Also the intermediate rate and user rate per traffic channel in a multislot configuration are not indicated by the 'intermediate rate' and 'user rate' parameters of the BC-IE, but depend on the chosen channel coding only.

If the MS receives a BC-IE in the SETUP message containing the parameters 'fixed network user rate', 'other modem type', the MS may include these parameters in the BC-IE of the CALL CONFIRMED message (i.e. octets 6d, 6e, 6f, and 6g ref. 3GPP TS 24.008), with parameter values negotiated according to Annex B. If no BC-IE is received in the SETUP message, the MS may include these parameters in the CALL CONFIRMED message. However, in this case, the network may release the call if it does not support these parameters.

If FNUR = 33.6 kbit/s is agreed on in the setup of a 3.1 kHz multimedia call, the modems may handshake to 31.2 or 28.8 kbit/s. In this case the MS receives a MODIFY message from the MSC to indicate the new data rate, and shall respond with a MODIFY COMPLETE message (ref. to 3GPP TS 24.008), if it supports the requested modification. If the MS does not support the requested modification, it shall respond with a MODIFY REJECT message. The MT shall indicate the new data rate to the TE (e.g. using the ITU-T V.80 inband signaling) in order to cause the TE to use stuffing to adapt the 31.2 or 28.8 kbit/s data rate to the 33.6 kbit/s traffic channel between the TE and IWF.

8.3.3.2 Indication in case of Mobile originating calls

In support of mobile originating calls the values of BC-IE parameters are requested in the set-up message from the MS. If the MS indicates the support of both transparent and non transparent connection elements the network shall return its choice in the call proceeding message. The MS is not allowed to indicate support of both transparent and non transparent, if the MS also requests out-band flow control, i.e. it does not indicate a layer 2 protocol.

Additionally the value of the parameter modem type has to be set depending on the value of the parameter connection element as described in annex B, table B.4a.

The set-up message contains a single or multiple BC-IE. In case of multiple BC-IEs one BC-IE shall indicate the information transfer capability "speech".

In case of a 3,1 kHz multimedia call the setup message contains either a multimedia BC-IE indicating a multimedia only call request (i.e. no fallback to speech allowed) or both a 3,1 kHz multimedia BC-IE and a speech BC-IE to indicate the support of a fallback to speech (ref. 3GPP TS 29.007 and 3GPP TS 24.008).

In case of a UDI/RDI multimedia call, the setup message contains either a multimedia BC-IE indicating a multimedia only call request, or both a multimedia BC-IE and a speech BC-IE (in any order) to indicate the support of service change and fallback (ref. 3GPP TS 29.007 and 3GPP TS 24.008). The latter is not applicable to multimedia calls with FNUR=32.0 kbit/s.

If the set-up message requests a "single service", the network shall not answer in the call proceeding message requesting a "dual service". Alternatively the network shall answer with a single BC-IE containing fax group 3 if a multiple BC-IE requesting speech alternate fax group 3 is received but the network does not allow the use of this alternate service. Annex B, table B.7, describes the negotiation rules.

If the MS requests a "dual service" the network is not allowed to change the sequence of the service.

If the setup message requests a multimedia service with fallback, the network may return both BC-IEs in the same order or no BC-IE to accept the request, or a single BC-IE if fallback, service change or one of the requested services are not allowed.

If the set-up message indicates that negotiation of intermediate rate is requested then the network shall behave as described in annex B, table B.4b.

Unless otherwise specified in annex B, if no BC-IE parameter needs negotiation it is up to the network if it sends a CALL PROC message (with or without a BC-IE) towards the MS or not.

For multislot, TCH/F14.4, and EDGE operations and in UTRAN Iu mode the MS shall include an appropriate set of the parameters 'fixed network user rate', 'other modem type', 'maximum number of TCH' and 'acceptable channel codings' in the BC-IE of the SETUP message. If EDGE channel coding(s) are included in ACC in case of transparent calls, the 'Wanted air interface user rate'-parameter shall be set to 'Air interface user rate not applicable' and the 'User initiated modification indication'-parameter to 'User initiated modification not requested'. In a non-transparent multislot

operation, the MS shall also include the parameters 'wanted air interface user rate' and 'user initiated modification indication' in the BC-IE of the SETUP message. In a non-transparent TCH/F14.4 or EDGE operation or in UTRAN Iu mode the MS shall also include the parameter 'wanted air interface user rate'. In non-transparent EDGE operation the MS shall also include the parameter 'asymmetry preference indication'. It shall also set the other parameters of the BC-IE (i.e. 'user rate') to values identifying fall-back values. Depending on the network two situations can be distinguished:

a) The network supports the requested operation:

- in this case the network shall include the parameter 'fixed network user rate', 'other modem type' and possibly 'user initiated modification' in the BC-IE(s) of the CALL PROCEEDING message, irrespective whether or not they contain modified values or just a copy of the received ones;

- the 'acceptable channel codings' indicated by the MS in the SETUP message takes precedence over the 'negotiation of intermediate rate requested' parameter for non-transparent services. The intermediate rate per traffic channel and the user rate per traffic channel is dependent on the chosen channel coding only. The chosen channel coding is indicated to the mobile station by the network with an RR message.

b) The network does not support the requested operation:

- in this case, in A/Gb mode, the BC-IE of the CALL PROCEEDING message does not contain the parameters fixed network user rate' and 'other modem type' or no BC-IE is included in the CALL PROCEEDING message at all. The mobile station shall then discard the parameters 'fixed network user rate', 'other modem type', 'maximum number of TCH', 'acceptable channel codings' 'wanted air interface user rate' and 'user initiated modification indication' sent with the SETUP message and apply the fall-back bearer service.

In case a), a single slot configuration shall be used by the MS, in case the 'maximum number of traffic channels' is set to "1 TCH" and the 'user initiated modification indication' is set either to "user initiated modification not requested" or to "user initiated modification up to 1TCH may be requested".

In case b), The MS shall use the fall-back bearer service indicated by the remaining parameters of the BC-IE on a single slot configuration (reference 3GPP TS 44.021).

If FNUR = 33.6 kbit/s is agreed on in the setup of a 3.1 kHz multimedia call, the modems may handshake to 31.2 or 28.8 kbit/s. In this case the MS receives a MODIFY message from the MSC to indicate the new data rate, and shall respond with a MODIFY COMPLETE message (ref. to 3GPP TS 24.008), if it supports the requested modification. If the MS does not support the requested modification, it shall respond with a MODIFY REJECT message. The MT shall indicate the new data rate to the TE (e.g. using the ITU-T V.80 inband signaling) in order to cause the TE to use stuffing to adapt the 31.2 or 28.8 kbit/s data rate to the 33.6 kbit/s traffic channel between the TE and IWF.

8.3.3.3 Differences in validity of BC parameter values in A/Gb mode, GERAN Iu mode and UTRAN Iu mode

The validity of a BC parameter value, either in the SETUP or CALL CONFIRM message, may differ from A/Gb mode to GERAN Iu mode and to UTRAN Iu mode. Certain parameters are irrelevant in UTRAN or GERAN Iu mode and any value given is valid and ignored. These parameters may be available in the BC IE. For those parameters that are relevant in UTRAN Iu mode, GERAN Iu mode and A/Gb mode, certain values may be invalid in one of the systems. Invalid parameter values may cause rejection of the BC and subsequent release of the call.

Parameters that are ignored in UTRAN or GERAN Iu mode may be set to default values, or to specific values in view of an eventual handover to A/Gb mode. Parameter values that are invalid in one system may result in unsuccessful handover from the other system.

Table B.5a in Annex B lists parameters that are ignored in UTRAN or GERAN Iu mode and parameter values which validity is different in A/Gb mode, GERAN Iu mode and UTRAN Iu mode.

Next section modified

Annex A (informative): List of Bearer Capability Elements

This annex lists the PLMN Bearer Capability Elements which need to be provided to support Terminal adaptation function to Interworking control procedures. Some parameters are ignored in GERAN or UTRAN Iu mode although present in the BC-IE. The validity of parameter values may also differ from A/Gb mode to GERAN Iu mode and to UTRAN Iu mode. The ignored parameters and the difference of parameter value validity in A/Gb mode, GERAN Iu mode and UTRAN Iu mode are listed in table B.5a in annex B.

Next section modified

B.1 Bearer Capability Information Element

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Table B.5a: Differences in parameter value validity in A/Gb mode and UTRAN Iu mode

Parameter / *value*	A/Gb mode	GERAN Iu mode	UTRAN Iu mode
Radio Channel Requirements / *any*	valid	valid	ignored
User rate / *any*	valid	ignored	ignored
Intermediate Rate / *any*	valid	valid	ignored
NIC on transmission / *any*	valid	ignored	ignored
NIC on reception / *any*	valid	ignored	ignored
Negotiation of IR requested / *any*	valid	ignored	ignored
Acceptable Channel Codings / *any*	valid	valid	ignored (Note 1)
Maximum number of traffic channels / *any*	valid	valid	ignored (Note 1)
User initiated modification indication / *any*	valid	valid	ignored
Asymmetry preference indication/ *any*	valid	valid	ignored
Modem type /			
V.21, V.22, V.22bis, V.26ter	valid	invalid	invalid
V.32	valid	valid	invalid for CE=T
Fixed Network User Rate /			
32 kbit/s	Invalid for CE = NT	Invalid for CE = NT	valid
33.6 kbit/s	invalid	invalid	valid
9.6, 14.4, 19.2, 38.4, 48.0	valid	invalid for CE=T	invalid for CE=T
28.8	valid	invalid for CE=T in the case of ITC=UDI	invalid for CE=T in the case of ITC=UDI
Other Rate adaptation /			
PIAFS	invalid	invalid	valid

NOTE: Although a parameter value is marked as "valid", the validity may be restricted by rules given elsewhere in the present document.

NOTE 1: This parameter is relevant in UTRAN Iu mode for NT calls for deciding which RLP version to negotiate in order to avoid renegotiation of RLP version in case of handover, see 3GPP TS 24.022 [9]. It is otherwise irrelevant for specifying the UTRAN Iu mode radio access bearer.

Next section modified

B.1.13.2 Non-transparent services for UTRAN Iu mode

Depending on the WAIUR signalled by the MS, the network is allowed to assign any radio resources with a radio access bearer parameter indicating a Quality of Service specifying

QoS Parameter	Value	Comments
Traffic Class	Streaming	Subject to operator tuning
RAB Asymmetry Indicator	Symmetric	
Maximum bit rate	14.4, 28.8, 57.6 kbit/s	Maximum bit rate is set to the highest value ≤ WAIUR (Note 1)
Guaranteed bit rate	14.4, 28.8, 57.6 kbit/s	Operator may choose any of the possible values less or equal to WAIUR. (Note 1).
Delivery Order	Yes	
Maximum SDU size	576 bits	
Transfer Delay	250 ms	Subject to operator tuning
Traffic Handling Priority	-	Not applicable to the streaming traffic class
Source statistics descriptor	Unknown	
SDU Parameters		
Residual bit error ratio	10^{-3}	Subject to operator tuning.
Delivery of erroneous SDUs	No error detection consideration	
SDU format information		
RAB Subflow Combination bit rate	57.6 kbit/s	(Note 2)
RAB Subflow Combination bit rate	28.8 kbit/s	(Note 2)
RAB Subflow Combination bit rate	14.4 kbit/s	
RAB Subflow Combination bit rate	0 kbit/s	indicates DTX, RFCI is not assigned

NOTE 1: If WAIUR is less or equal to 14.4 kbit/s then GBR and MBR shall be set to 14.4 kbit/s.

NOTE 2: Only RAB subflow combination bit rates ≤ maximum bit rate shall be specified.

The final decision about the radio interface configuration is taken by the RNC during the Assignment procedure.

B.1.13.3 Non-transparent services for GERAN Iu mode

Depending on the WAIUR signalled by the MS, the network is allowed to assign any radio resources with a radio access bearer parameter indicating a Quality of Service specifying

QoS Parameter	Value	Comments
Traffic Class	Streaming	Subject to operator tuning
RAB Asymmetry Indicator	Symmetric	
Maximum bit rate	12 kbit/s, 14,4 kbit/s, 24 kbit/s, 28,8 kbit/s, 36 kbit/s, 43,2 kbit/s, 48 kbit/s, 57.6 kbit/s	Maximum bit rate is set to the highest value ≤ WAIUR (Note 1, 3, 4, 5 and 6)
Guaranteed bit rate	12 kbit/s, 14,4 kbit/s, 24 kbit/s, 28,8 kbit/s, 36 kbit/s, 43,2 kbit/s, 48 kbit/s, 57.6 kbit/s	Operator may choose any of the possible values less or equal to WAIUR. (Note 1)
Delivery Order	Yes	
Maximum SDU size	480 bits if only RAB Subflow Combination bit rates of multiples of 12 kbit/s are possible, 576 bits in all other cases	
Transfer Delay	230 ms if only RAB Subflow Combination bit rates of multiples of 12 kbit/s are possible, 250 ms in all other cases	Subject to operator tuning
Traffic Handling Priority	-	Not applicable to the streaming traffic class
Source statistics descriptor	Unknown	
SDU Parameters		
Residual bit error ratio	10^{-3}	Subject to operator tuning.
Delivery of erroneous SDUs	No error detection consideration	
SDU format information		
Subflow SDU size	576 bit	(Note 7)
RAB Subflow Combination bit rate	57,6 kbit/s	(Note 2)
Subflow SDU size	480 bit	(Note 7)
RAB Subflow Combination bit rate	48 kbit/s	(Note 2 and 3)
Subflow SDU size	576 bit	(Note 7)
RAB Subflow Combination bit rate	43,2 kbit/s	(Note 2)
Subflow SDU size	480 bit	(Note 7)
RAB Subflow Combination bit rate	36 kbit/s	(Note 2 and 4)
Subflow SDU size	576 bit	(Note 7)
RAB Subflow Combination bit rate	28,8 kbit/s	(Note 2)
Subflow SDU size	480 bit	(Note 7)
RAB Subflow Combination bit rate	24 kbit/s	(Note 2 and 5)
Subflow SDU size	576 bit	(Note 7)
RAB Subflow Combination bit rate	14,4 kbit/s	(Note 2)
Subflow SDU size	480 bit	(Note 7)
RAB Subflow Combination bit rate	12 kbit/s	(Note 2 and 6)
RAB Subflow Combination bit rate	0 kbit/s	indicates DTX, RFCI is not assigned

NOTE 1: If WAIUR is less or equal to 14.4 kbit/s then GBR and MBR shall be set to 14.4 kbit/s for TCH/F14.4. If WAIUR is less or equal to 9.6 kbit/s then GBR and MBR shall be set to 12 kbit/s for TCH/F9.6. The maximum values for GBR and MBR shall not exceed the WAIUR unless the higher GBR and MBR can be reached with a smaller number of TCH/F (ref. subclause B.1.12.2). This means, that e.g., a GBR and MBR of 24 kbit/s (2 x TCH/F9.6) can be selected for a WAIUR of 19,2 kbit/s.

NOTE 2: Only RAB subflow combination bit rates ≤ maximum bit rate shall be specified.

NOTE 3: If the WAIUR is 38,4 kbit/s, a GBR and MBR of 48 kbit/s is possible for 4 x TCH/F9.6.

NOTE 4: If the WAIUR is 28,8 kbit/s, a GBR and MBR of 36 kbit/s is possible for 3 x TCH/F9.6.

NOTE 5: If the WAIUR is 19,2 kbit/s, a GBR and MBR of 24 kbit/s is possible for 2 x TCH/F9.6.

NOTE 6: If the WAIUR is 9,6 kbit/s, a GBR and MBR of 12 kbit/s is possible for 1 x TCH/F9.6.

NOTE 7: The Subflow SDU size should only be present when the individual Subflows have different sizes.

The final decision about the radio interface configuration is taken by the BSS during the Assignment procedure.

3GPP TSG-CN WG3 Meeting #25
Miami, USA, 23rd - 27th September 2002.

Tdoc ⌘N3-020805

CR-Form-v7

CHANGE REQUEST

⌘ **44.021** **CR** **004** ⌘ **rev** **1** ⌘ Current version: **5.1.0** ⌘

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Proposed change affects: UICC apps⌘ [ ] ME [X] Radio Access Network [X] Core Network [ ]

Title:	⌘	CS Data Services (including HSCSD and EDGE) for GERAN Iu mode
Source:	⌘	TSG_CN WG3
Work item code:	⌘	CS Data
Date:	⌘	19/09/2002
Category:	⌘	**B**
Release:	⌘	Rel-5

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

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
Rel-4	*(Release 4)*
Rel-5	*(Release 5)*
Rel-6	*(Release 6)*

Reason for change:	⌘	The provision of CS data services in GERAN Iu mode requires changes in 44.021 as proposed in this CR.
Summary of change:	⌘	See attached pages
Consequences if not approved:	⌘	Feature is incomplete.

Clauses affected:	⌘	8, 8.1, 8.2			
		Y	**N**		
Other specs affected:	⌘	**X**		Other core specifications	⌘ 23.910, 48.020, 44.022, 29.007, 27.001, 43.010
			X	Test specifications	
			X	O&M Specifications	
Other comments:	⌘				

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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://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

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

8 The Relay Functions RA1/RA1', RA1'/RA1", RA1'/RAA' and RA1'/RAA"

The relay functions realise conversion on the infrastructure side in both transparent and non-transparent cases as specified in 3GPP TS 43.010.

The RA1/RA1' function shall be used for channel codings TCH/F4.8 and TCH/F9.6 if the AIUR is less than 48 kbit/s. It converts between the intermediate rate and the input rate to the channel coder.

The RA1'/RA1" function shall be used for channel codings TCH/F4.8 and TCH/F9.6 if the AIUR is equal to 48, 56 or 64 kbit/s. It converts between the 64 kbit/s data stream and the input rate to the channel coder.

The RA1/RA1' and RA1'/RA1" functions only apply in A/Gb mode. In GERAN Iu mode the rate adaptation function RA1' applies instead of that as specified in clause 10.

The RA1'/RAA' function shall be used for channel codings TCH/F14.4, TCH/F28.8 and TCH/F43.2 if the AIUR is less than 64 kbit/s in A/Gb mode and if the AIUR is less that 56 kbit/s in GERAN Iu mode. It converts between the E-TRAU frame specified in 3GPP TS 48.060 and the input rate to the channel coder or the EDGE multiplexing function.

The RA1'/RAA" function shall be used for channel codings TCH/F14.4 if the AIUR is equal to 64 kbit/s in A/Gb mode and if the AIUR is equal to 56 or 64 kbit/s in GERAN Iu mode. It converts between the 64 kbit/s data stream and the input rate to the channel coder.

A relay adaptation function is not needed for the channel coding TCH/F32.

8.1 Single slot rates

There are seven data rates (known as Radio Interface data rates) used for data transfer to the channel coder. These are 43,5 kbit/s (NT only), 32 kbit/s (T only), 29 kbit/s, 14,5 kbit/s, 12 kbit/s, 6 kbit/s and 3.6 kbit/s. In cases where EDGE channel codings TCH/F43.2 or TCH/F28.8 are used, the RA1'/RAA' function adapts the data stream to 14,5 kbit/s substreams as if multiple 14,5 kbit/s radio interface channels were used.

The 32 kbit/s user rate is identical to the 32 kbit/s intermediate rate. In this case the 32 kbit/s intermediate rate is directly mapped to the 32 kbit/s radio interface data rate.

The 8, 16 and 64 kbit/s intermediate rates and the 32 kbit/s intermediate rate with other than 32 kbit/s user rates are adapted to the radio interface data rates as follows:

AIUR	Intermediate rate	Radio interface rate
≤ 600 bit/s	8 kbit/s	3,6 kbit/s
1,2 kbit/s	8 kbit/s	3,6 kbit/s
2,4 kbit/s	8 kbit/s	3,6 kbit/s
4,8 kbit/s	8 kbit/s	6 kbit/s
9,6 kbit/s	16 kbit/s	12 kbit/s
14,4 kbit/s	32 kbit/s	14,5 kbit/s
28,8 kbit/s	64 kbit/s	29 kbit/s (Note 2)
43,2 kbit/s	(Note 1)	43,5 kbit/s(Note 2)
Note 1: AIUR only used in non-transparent configurations. There is no direct relationship between AIUR and Intermediate rate. Note 2: The RA1'/RAA' function adapts the data stream to 14,5 kbit/s substreams as if multiple 14,5 kbit/s radio interface channels were used.		

8.1.1 Radio interface rate of 14,5 kbit/s

The RA1'/RAA' function converts between the E-TRAU frame and the 290 bit blocks from the channel coder. The E-TRAU frames are defined in TS 48.060. The 290 bit blocks carry 288 data bits and the control bits M1 and M2 as specified in section 10.3.1 and 10.3.2.

8.1.2 Radio Interface rate of 12 kbit/s

In this case one modified ITU-T V.110 60 bit frame is received/sent from/to the radio interface every 5ms (see 3GPP TS 45.003). The RA1/RA1' function adds/subtracts the 17 bit synchronization pattern and the E1,E2 and E3 bits to/from each ITU-T V.110 80 bit frame as follows:

The modified ITU-T V.110 60 bits frame received/sent from/to the radio interface at 12 Kbit/s (Figure 5),

D1	D2	D3	D4	D5	D6	S1
D7	D8	D9	D10	D11	D12	X
D13	D14	D15	D16	D17	D18	S3
D19	D20	D21	D22	D23	D24	S4
E4	E5	E6	E7	D25	D26	D27
D28	D29	D30	S6	D31	D32	D33
D34	D35	D36	X	D37	D38	D39
D40	D41	D42	S8	D43	D44	D45
D46	D47	D48	S9			

is converted into the following a ITU-T V.110 80 bits frame at 16 Kbit/s (Figure 3):

0	0	0	0	0	0	0	0
1	D1	D2	D3	D4	D5	D6	S1
1	D7	D8	D9	D10	D11	D12	X
1	D13	D14	D15	D16	D17	D18	S3
1	D19	D20	D21	D22	D23	D24	S4
1	E1	E2	E3	E4	E5	E6	E7
1	D25	D26	D27	D28	D29	D30	S6
1	D31	D32	D33	D34	D35	D36	X
1	D37	D38	D39	D40	D41	D42	S8
1	D43	D44	D45	D46	D47	D48	S9

In the case of the non transparent services, bits S1, X, S3, S4, E4, E5, E6, E7, S6, X (second occurrence), S8, and S9 carry bits D'1, D'2, D'3, D'4, D'5, D'6, D'7, D'8, D'9, D'10, D'11, and D'12, respectively.

For a modified ITU-T V.110 60 bit frames received from the radio interface, the received D, S and X bits or D and D' bits are set to the same value as the transmitted bits. Bits E1, E2, E3 are set according to the user data rate as shown in figure 4 for the transparent services, or the RLP multiframe and DTX indication as per 3GPP TS 48.020 in the non transparent case.

For modified ITU-T V.110 60 bit frames transmitted over the radio interface, the received D, S, and X bits or D and D' are set to the same value as the transmitted bits. Bits E1, E2, E3 are discarded.

8.1.3 Radio Interface rate of 6 kbit/s

In this case one modified ITU-T V.110 60 bit frame is received/sent from/to the radio interface every 10 ms (see 3GPP TS 45.003). The RA1/RA1' function adds/subtracts the 17 bit synchronization pattern and the E1, E2 and E3 bits to/from each ITU-T V.110 80 bit frame as follows:

The modified ITU-T V.110 60 bits frame received/sent from/to the radio interface at 6 Kbit/s (Figure 6),

D1	D2	D3	D4	D5	D6	S1
D7	D8	D9	D10	D11	D12	X
D13	D14	D15	D16	D17	D18	S3
D19	D20	D21	D22	D23	D24	S4
E4	E5	E6	E7	D25	D26	D27
D28	D29	D30	S6	D31	D32	D33
D34	D35	D36	X	D37	D38	D39
D40	D41	D42	S8	D43	D44	D45
D46	D47	D48	S9			

is converted into the following a ITU-T V.110 80 bits frame at 8 Kbit/s (Figure 3):

0	0	0	0	0	0	0	0
1	D1	D2	D3	D4	D5	D6	S1
1	D7	D8	D9	D10	D11	D12	X
1	D13	D14	D15	D16	D17	D18	S3
1	D19	D20	D21	D22	D23	D24	S4
1	E1	E2	E3	E4	E5	E6	E7
1	D25	D26	D27	D28	D29	D30	S6
1	D31	D32	D33	D34	D35	D36	X
1	D37	D38	D39	D40	D41	D42	S8
1	D43	D44	D45	D46	D47	D48	S9

In the case of the non transparent services, bits S1, X, S3, S4, E4, E5, E6, E7, S6, X (second occurrence), S8, and S9 carry bits D'1, D'2, D'3, D'4, D'5, D'6, D'7, D'8, D'9, D'10, D'11, and D'12, respectively.

For a modified ITU-T V.110 60 bit frames received from the radio interface, the received D, S and X bits or D and D' bits are set to the same value as the transmitted bits. Bits E1, E2, E3 are set according to the user data rate as shown in figure 4 for the transparent services, or the RLP multiframe and DTX indication as per 3GPP TS 48.020 in the non transparent case.

For modified ITU-T V.110 60 bit frames transmitted over the radio interface, the received D, S, and X bits or D and D' bits are set to the same value as the transmitted bits. Bits E1, E2, E3 are discarded.

This process is identical to that used for the 12 kbit/s case except that the frame repetition rates are halved.

8.1.4 Radio Interface rate of 3,6 kbit/s (transparent services only)

In this case one modified ITU-T V.110 36 bit frame is received/sent from/to the radio interface every 10ms (see 3GPP TS 45.003 [5]). The RA1/RA1' function adds/subtracts the 17 bit synchronization pattern and the E1, E2 and E3 bits to/from each ITU-T V.110 80 bit frame as follows:

For the AIUR of 2,4 kbit/s the modified ITU-T V.110 36 bits frame received/sent from/to the radio interface at 3.6 kbit/s (Figure 7a),

D1	D2	D3	S1	D4	D5	D6	X
D7	D8	D9	S3	D10	D11	D12	S4
E4	E5	E6	E7	D13	D14	D15	S6
D16	D17	D18	X	D19	D20	D21	S8
D22	D23	D24	S9				

is converted into the following a ITU-T V.110 80 bits frame at 8 Kbit/s (Figure 7b):

0	0	0	0	0	0	0	0
1	D1	D1	D2	D2	D3	D3	S1
1	D4	D4	D5	D5	D6	D6	X
1	D7	D7	D8	D8	D9	D9	S3
1	D10	D10	D11	D11	D12	D12	S4
1	E1	E2	E3	E4	E5	E6	E7
1	D13	D13	D14	D14	D15	D15	S6
1	D16	D16	D17	D17	D18	D18	X
1	D19	D19	D20	D20	D21	D21	S8
1	D22	D22	D23	D23	D24	D24	S9

Figure 8 and 9 show the bit mappings for the AIUR of 1200 and 600 bit/s.

For modified ITU-T V.110 36 bit frames transmitted to the radio interface, E1, E2, E3 are discarded. For modified ITU-T V.110 36 bit frames received from the radio interface, E1, E2, E3 are set as shown in figure 4.

NOTE: The action to be taken in the case where two bits which should have the same value (e.g. bits noted D1) are received with different values is for further study.

8.1.5 Synchronisation

~~Void.~~In GERAN Iu mode, the BSS shall perform the synchronisation towards the MS according to the procedures defined for the A/Gb mode in 3GPP TS 29.007 with the modification that the the indication of "physical connection established" is given on sending the message RAB ASSIGNMENT COMPLETE.

8.1.6 Idle frames

~~Void.~~Whenever no data is received from the radio interface (e.g. frame stealing applies, layer 2 fill frames are received, etc.) idle frames shall be created. These are V.110 frames with frame alignment pattern according to ITU-T V.110 [11] and all data, status and E-bits set to binary "1".

8.2 Multislot rates

In multislot operation the transmission is performed using parallel substreams between the Split/Combine-functions.

8.2.1 AIURs up to 38,4 kbit/s using TCH/F9.6 and TCH/F4.8 channel codings

AIUR	Intermediate rate	Radio interface rate
9,6 kbit/s	16 kbit/s	2×6 kbit/s
14,4 kbit/s	32 kbit/s	2×12 or 3×6 kbit/s
19,2 kbit/s	32 kbit/s	2×12 or 4×6 kbit/s
28,8 kbit/s	64 kbit/s	3×12 kbit/s
38,4 kbit/s	64 kbit/s	4×12 kbit/s

In these cases, the data stream is mapped from 80-bit intermediate rate frames into modified frames of 60 bits for radio-interface transmission as specified in subclause 8.1 for 12 kbit/s and 6 kbit/s except for the following cases:

For AIURs 14,4 and 28,8 kbit/s using channel codings TCH/F4.8 and TCH/F9.6, respectively, four consecutive V.110 80-bit frames (Figure 12) are mapped onto three consecutive modified 60-bit V.110 (Figure 5 or 6) frames at the MS. The 4×36 data bits in the 80-bit frames are mapped onto the 3×48 data bits in the 60-bit frames. However, bits E4-E7 in the 80-bit frames are mapped onto the E4-E7 bits in the 60-bit frames when their value indicate either positive or negative compensation (NIC; See subclause 5.1.1). The E4-E7 bits that indicate 'No compensation' in the 80-bit frames need not be mapped onto the 60-bit frames. The S- and X-bits in every fourth 80 -bit frame are not mapped onto the 60-bit frames. When radio interface rate of 2×12 kbit/s is used for carrying AIUR 14,4 kbit/s, padding is used in the 60-bit frames of the higher substream number (Subclause 11.6).

For substream numbering information, please refer to subclause 10 of the present document.

8.2.2 AIURs up to 64 kbit/s using TCH/F14.4 channel coding

AIUR	Intermediate rate	Radio interface rate
28,8 kbit/s	64 kbit/s	2×14,5
38,4 kbit/s	64 kbit/s	3×14,5
48 kbit/s	64 kbit/s	3×14,5
56 kbit/s	64 kbit/s	4×14,5
64 kbit/s	64 kbit/s	5×14,5

For AIURs < 64 kbit/s in A/Gb mode and for AIURs < 56 kbit/s in GERAN Iu mode, the RA1'/RAA' function extracts the eight 36 data bit blocks in the E-TRAU frames and sends them through the substreams in data blocks containing eight 36-bit frames as described in subclause 10.3.

For AIUR of 64 kbit/s in A/Gb mode and for AIURs of 56 and 64 kbit/s, the RA1'/RAA" function sends the data bits in the 64 kbit/s data stream through the substreams in data blocks containing eight 36-bit frames as described in subclause 10.3. In GERAN Iu mode the data are provided in 640 bits size SDUs. For 56 kbit/s, the last bit of each octet is set to "1".

An M1/M2-bit pair is sent over the radio-interface along with each data block every 20 ms. These bits carry the multiframe, substream number, V.24 status, and NIC information as described in subclauses 10.3.1 and 10.3.2.

3GPP TSG-CN WG3 Meeting #25
Miami, USA, 23rd - 27th September 2002.

Tdoc ⌘N3-020950

CR-Form-v7

CHANGE REQUEST

⌘ **48.020** **CR** **003** ⌘ **rev** **4** ⌘ Current version: **5.1.0** ⌘

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

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☒ Core Network ☒

Title:	⌘	CS Data Services (including HSCSD and EDGE) for GERAN Iu mode
Source:	⌘	TSG_CN WG3
Work item code:	⌘	CS Data
Date:	⌘	06/11/2002
Category:	⌘	**B**
Release:	⌘	Rel-5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
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Use one of the following releases:

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R98	*(Release 1998)*
R99	*(Release 1999)*
Rel-4	*(Release 4)*
Rel-5	*(Release 5)*
Rel-6	*(Release 6)*

Reason for change:	⌘	The provision of CS data services in GERAN Iu mode requires changes in 48.020 as proposed in this CR.
Summary of change:	⌘	See attached pages
Consequences if not approved:	⌘	Incomplete specifications.

Clauses affected:	⌘	1, 2, 3, 5, 5a, 6, 7, 9, 12a, 13, 14, 15, 15a, 16, 16a				
		Y	**N**			
Other specs affected:	⌘	**X**		Other core specifications	⌘	23.910, 44.021, 44.022, 29.007, 27.001, 43.010
			X	Test specifications		
			X	O&M Specifications		
Other comments:	⌘					

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1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

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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.

1 Scope

The present document defines rate adaptation functions to be used in PLMN Base Station Systems (BSS) transcoders and IWF

- for adapting radio interface data rates to the 64 kbit/s used at the A-interface in A/Gb mode and

- for adapting radio interface data rates to the Iu interface in GERAN Iu mode in accordance with 3GPP TS 43.010.

The number of Base Station System - Mobile-services Switching Centre (BSS - MSC) traffic channels supporting data rate adaptation may be limited. In this case some channels may not support data rate adaptation. Those that do, shall conform to this specification.

NOTE: This specification should be considered together with 3GPP TS 44.021 to give a complete description of PLMN rate adaptation.

2 References, abbreviations and definitions

2.1 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. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document in the same Release as the present document.

[1] 3GPP TR 21.905: " Vocabulary for 3GPP specifications ".

[2] 3GPP TS 22.034: “High Speed Circuit Switched Data (HSCSD) - Stage1"

[3] 3GPP TS 43.010: "GSM Public Land Mobile Network (PLMN) connection types".

[4] 3GPP TS 23.034: “High Speed Circuit Switched Data (HSCSD) - Stage2".

[5] 3GPP TS 44.021: "Rate adaption on the Mobile Station - Base Station System (MS - BSS) interface".

[6] 3GPP TS 24.022: "Radio Link Protocol (RLP) for Circuit Switched Bearer and Teleservices".

[7] 3GPP TS 45.003: "Channel coding".

[8] 3GPP TS 27.001: "General on Terminal Adaptation Functions (TAF) for Mobile Stations (MS)".

[9] 3GPP TS 48.008: "Mobile Switching Centre - Base Station System (MSC - BSS) interface; Layer 3 specification".

[10] 3GPP TS 29.007: "General requirements on interworking between the Public Land Mobile Network (PLMN) and the Integrated Services Digital Network (ISDN) or Public Switched Telephone Network (PSTN)".

[11] ITU-T Recommendation V.110: "Support of data terminal equipment’s (DTEs) with V-Series interfaces by an integrated services digital network".

[12] ITU-T Recommendation I.460:-Multiplexing, rate adaption and support of existing interfaces.

[13] 3GPP TS 48.060: "In-band control of remote transcoders and rate adaptors for full rate traffic channels"

[14] 3GPP TS 25.415: "UTRAN Iu Interface user plane protocols".

2.2 Abbreviations

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

FPS	Frame Pattern Substitution
FSI	Frame Start Identifier
ZSP	Zero Sequence Position

2.3 Definitions

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

Substream: Stream of data with explicit or implicit numbering between splitter and combine functions.

Channel: A physical full rate channel on the radio interface (TCH/F) independent of the contents.

A interface circuit: The 8 bits that constitute one 64 kbps circuit on the A interface.

A interface subcircuit: One specific bit position or one specific pair of bit positions within the A interface circuit.

EDGE channel: A general term referring to channels based on 8PSK modulation; i.e. TCH/F28.8, TCH/F32.0, and TCH/F43.2.

3 General approach

3GPP TS 43.010 (clause 6) defines the PLMN connection types necessary to support the ~~GSM PLMN~~ data and telematic services in a PLMN operating in A/Gb mode or GERAN Iu mode.

Within the BSS , transcoder and IWF, there are several data rate adaptation functions which are combined as shown in 3GPP TS 43.010 as part of a connection type.

These functions are RA0, RA1, RA1/RA1' , RA1'' , RA1/RA1", RA1'/RAA", RA1', RAA", RA1'/RAA', RAA' , RAE and RA2. The RA2 function is equivalent to that described in ITU-T Recommendation V.110. In addition, splitting/combining, padding and inband numbering functions as defined in 3GPP TS 44.021 and multiplexing as defined herein are used in cases where more than one channel is allowed.

The RA1/RA1', RA1'/RA1", RA1'/RAA" and RA1'/RAA' are relay functions used as indicated in 3GPP TS 43.010.

The BSS uses the information contained in the ASSIGNMENT REQUEST message on the A-interface (see 3GPP TS 48.008) to set the "E bits" and to map the "D bits" as shown below, as well as to choose the correct channel coding.

4 The RA0 Function

The RA0 function is specified in 3GPP TS 44.021.

5 The RA1 Function

This function shall be used to adapt between the synchronous user rates, or the output of the RA0 function or Split/Combine function and the intermediate rate of 8, 16, 32 or 64 kbit/s.

For multislot operations RA1 applies per substream. RA1 applies only if TCH/F4.8 or TCH/F9.6 is used for user rates up to 38,4 kbit/s. The RA1 function is only applicable for A/Gb mode.

Synchronous user rate	Intermediate rate
≤ 2,4 kbit/s	8 kbit/s
4,8 kbit/s	8 kbit/s
9,6 kbit/s	16 kbit/s
14,4 kbit/s	32 kbit/s
19,2 kbit/s	32 kbit/s
28,8 kbit/s	64 kbit/s
38,4 kbit/s	64 kbit/s

An ITU-T V.110 80 bits frame is constructed using the user data bits received (from the RA0 in the asynchronous case).

Adaptation of 600 bit/s to 8Kbit/s is performed by 8 times consecutive duplication of each user data bit. (Figure 11)

Adaptation of 1200 bit/s to 8 Kbit/s is performed by 4 times consecutive duplication of each user data bit. (Figure 10)

Adaptation of 2400 bit/s to 8kbit/s is performed by 2 times consecutive duplication of each user data bit. (Figure 9)

Adaptation of 4800 bit/s to 8 Kbit/s is performed by transmitting the bit stream with no duplication. (Figure 7)

Adaptation of 9600 bit/s to 16 Kbit/s is performed by transmitting the bit stream with no duplication (the emitting period is halved with respect to the 4800 bit/s case). (Figure 7)

Adaptation of 14400 bit/s to 32 Kbit/s is performed as for 3600 bit/s to 8 kbit/s (the emitting period is divided by four with respect to the 3600 bit/s case).(Adaptation of 3600 bit/s to 8 kbit/s is performed by transmitting the bit stream with no duplication.) (Figure 8)

Adaptation of 19200 bit/s to 32 Kbit/s is performed as for 4800 bit/s to 8 kbit/s (the emitting period is divided by four with respect to the 4800 bit/s case). (Figure 7)

Adaptation of 28800 bit/s to 64 Kbit/s is performed as for 3600 bit/s to 8 kbit/s (the emitting period is divided by eight with respect to the 3600 bit/s case). (Figure 8)

Adaptation of 38400 bit/s to 64 Kbit/s is performed as for 4800 bit/s 8 kbit/s (the emitting period is divided by eight with respect to the 4800 bit/s case). (Figure 7)

The ITU-T V.110 80 bit frames shown in Figures 7 and 8 are used. The meaning of the bits is specified in 44.021.

5a The RA1' Function

The RA1' function is used to adapt between the synchronous data rates and the radio interface rates, i.e. it maps the data provided in the Iu UP SDUs into modified V.110 60 bit frame structure. It is specified in 3GPP TS 44.021.

In the BSS, the RA1' function is only applicable in GERAN Iu mode if TCH/F9.6 channel coding is used.

6 The RA1'' Function

The RA1" function shall be used for converting between synchronous user rates of 48 and 56 kbit/s and the 'intermediate' rate of 64 kbit/s in A/Gb mode.

Note, RA1" is a 3GPP-specific term which is used for the one-step adaptation of 48 and 56 kbit/s rates into 64 kbit/s as specified in ITU-T V.110. For the purposes of 3GPP specifications the term 'intermediate rate' is used for the resulting 64 kbit/s rate although this is not done in ITU-T V.110.

6.1 Rate adaptation of 48 kbit/s user rates with DTE/DCE status to 64 kbit/s

An ITU-T V.110 32 bits frame is constructed using the user data bits received.

The ITU-T V.110 32 bit frame shown in Figure 12 is used. The D bits are used for conveying the user data and the S and X bits are used for conveying channel control information according 3GPP TS 27.001.The order of transmission of the 32 bit frame is from left to right and top to bottom.

6.2 Rate adaptation of 56 kbit/s user rate to 64 kbit/s

An ITU-T V.110 64 bits frame is constructed using the user data bits received.

The ITU-T V.110 64 bit frame shown in figure 13 is used. The D bits are used for conveying the user data.

The order of transmission of the 64 bit frame is from left to right and top to bottom.

7 Split/Combine and Padding Functions

The Split/Combine-function in the IWF shall be used in cases when up to and including 4 substreams are used in A/Gb mode.

The Split/Combine-function in the BSS shall be used only when more than four substreams are used in A/Gb mode.

The Split/Combine-function is always used in the BSS if the BSS uses more than 1 substream in GERAN Iu mode

Next section modified

9 The Functions RA1/RA1' and RA1’/RA1”

These functions only apply for A/Gb mode.

For AIURs less than or equal to 38,4 kbit/s, the RA1/RA1’ function in the BSS shall be applied on each of the n substreams and there are no significant differences between the single slot case and the multislot case. For AIURs less than or equal to 38,4 kbit/s RA1/RA1’ is as specified in 3GPP TS 44.021 for the single slot case.

For AIURs of 48 kbit/s, 56 kbit/s and 64 kbit/s, RA1/RA1’’ shall be applied as specified in 3GPP TS 44.021.

The table 1 gives a relation between the AIUR, channel coding and number of substreams. As an example from table 1: The wanted AIUR is 28,8 kbit/s, the number of substreams needed to support this rate is 3. Each individual substream shall be rate adapted as in the single slot case.

Table 1: Relationship between AIUR, channel coding and number of channels

	Multislot intermediaterate 8 kbps		Multislot intermediate rate of 16 kbps	
AIUR	Transparent	Non-transparent	Transparent	Non-transparent
≤2,4 kbit/s	1	N/A	N/A	N/A
4,8 kbit/s	1	1	N/A	N/A
9,6 kbit/s	2	2	1	1
14,4 kbit/s	3	3	2	N/A
19,2 kbit/s	4	4	2	2
28,8 kbit/s	N/A	N/A	3	3
38,4 kbit/s	N/A	N/A	4	4
48 kbit/s	N/A	N/A	5	N/A
56 kbit/s	N/A	N/A	5	N/A
64 kbit/s	N/A	N/A	6	N/A

Next section modified

12a ~~THE~~The RAE Function

On the BSS side of the Iu interface, the RAE function shall convert in GERAN Iu mode between the E-TRAU format (3GPP TS 48.060) and a synchronous stream, i.e. the data in the payload of the Iu UP SDUs. It is the subsequent execution of the rate adaptation functions RAA' and RAA".

It is used in the case of TCH/F14.4 and user rates less than 56 kbit/s.

The RAE function maps the data from the payload of the Iu UP SDUs directly into E-TRAU frames. It is not necessary to create the A-TRAU format that is the exchange format between RAA' and RAA".

It shall perform the FPS (Frame Pattern Substitution) as specified in subclause 11.2.

In transparent operations, The RAE function shall handle the M1 and M2 bits as specified for the RA1' function in 3GPP TS 44.021.

In non-transparent operations, the payload of the Iu UP SDU has a size of 576 bit and contains one RLP frame. This shall be mapped to two E-TRAU frames each of them consisting of

- 288 data bits making up half of an RLP frame,

- the bits M1 and M2 that shall be used as specified in subclause 15.2 and

- the control bits that shall be used as specified in 3GPP TS 48.060.

13 The RA2 Function

The RA2 function shall be applied only for single slot operations in A/Gb mode. For multislot operations the A-interface Multiplexing Function applies (see clause 14).

This procedure is based on the RA2 function as specified in ITU-T V.110. It shall be used to rate adapt to/from the intermediate rates of 8, 16 or 32 kbit/s from/to the 64 kbit/s rate used at the A-interface.

Intermediate rate	Rate at the A-interface
8 kbit/s	64 kbit/s
16 kbit/s	64 kbit/s
32 kbit/s	64 kbit/s
64 kbit/s	64 kbit/s

For the intermediate and user data rate of 64 kbit/s, the RA2 transmits the bit stream over the A-interface as it is.

It considers the 64 kbit/s stream over the A interface to consist of octets, bits 1 through 8, with bit 1 being transmitted first.

The procedure requires that:

i) The 8 kbit/s stream occupies bit position 1;

ii) The 16 kbit/s bitstream occupies bit positions (1,2);

iii) The 32 kbit/s bitstream occupies bit positions (1,2,3,4) ;

iv) The order of transmission of the bits of the subrate stream is identical before and after rate adaptation.

v) All unused bits in the 64 kbit/s stream are set to binary "1".

14 The A-interface Multiplexing Function

The multiplexing function shall be applied only for AIUR up to and including 57.6 kbit/s for multislot operations in A/Gb mode.

The multiplexing function is based on the ITU-T I.460. The multiplexing function is used to combine n (n=2 to 4) substreams of multislot intermediate rate of 8 kbit/s or n substreams of multislot intermediate rate of 16 kbit/s on one 64 kbit/s stream by using subcircuits in each octet to each substream such that:

i) An 8 kbit/s substream is allowed to occupy subcircuits with positions 1,3,5 or 7 of each octet of the 64 kbit/s stream; a 16 kbit/s stream occupies bit positions (1,2) or (3,4) or (5,6) or (7,8).

ii) The order of the bits at each substream is identical before and after multiplexing.

iii) All unused bit positions shall be set to binary “1".

iv) For transparent multislot configurations the lowest allowed subcircuits are always used.

v) For non-transparent multislot configurations, the lowest allowed subcircuits shall be used at call set up and after change of channel configuration except at downgrading. At downgrading any of the used subcircuits may be released in uplink direction. Always, the released subcircuit(s) in downlink direction shall be the same as the released subcircuit(s) in uplink direction. At a possible subsequent upgrading, the lowest available bit positions shall be used for the added substreams.

NOTE: The rules given here are almost identical to those of I.460, Section ‘Fixed format multiplexing’, except for the rule i) is stricter in that 8 kbit/s substreams cannot occupy any positions, iv) and v) are added.

15 Support of non-transparent bearer services in A/Gb mode

15.1 TCH/F9.6 and TCH/F4.8 kbit/s channel codings

In the case of non-transparent services the RA1/RA1' function shall perform the same mapping as that described for transparent services, using 12 and 6 kbit/s radio interface data rates, with the following modification.

The E2 and E3 bits in the modified ITU-T V.110 80 bit frames shown in Figure 3 (derived from the standard ITU-T V.110 frame shown in Figure 2) are used to indicate each consecutive sequence of ITU-T V.110 80 bit frames corresponding to the four modified ITU-T V.110 60 bit frames (Figure 4) received/transmitted in one radio interface frame. This allows 240 bit Radio Link Protocol frames to/from the MSC to be aligned with the 4x60 bit frames encoded by the radio subsystem channel coder as a single unit (see 3GPP TS 45.003). The 8 bits consisting of the E2 and E3 bits in one of the above sequences is referred to as the Frame Start Identifier. The FSI value is 00 01 10 11. This value is assigned to the E2 and E3 bits as shown in Table7.

Table 7

	E2	**E3**
First Modified ITU-T V.110 80 bit frame	0	0
Second	0	1
Third	1	0
Fourth	1	1

As each RLP frame is transported between the BSS and MSC in four modified ITU-T V.110 80 bit frames, it is necessary following a transmission break and at start up, to determine which modified ITU-T V.110 80 bit frame of the stream is the first for a particular RLP frame. This is needed so that correct alignment with the radio subsystem can be achieved.

Modified V.110 80 bit frames can slip in time during re-routing, and whilst sync exists within the modified ITU-T V.110 80 bit frame to determine the modified ITU-T V.110 80 bit frame boundaries, the FSI is required to determine which quarter of an RLP frame each modified ITU-T V.110 80 bit frame contains.

Table 8: Relationship between FNUR, AIUR, substream rate, number of substreams and intermediate rate

FNUR	**AIUR**	**Number of Channels x Substream Rate**	**Channel Coding**	**Multislot Intermediate Rate**
≤2,4 kbit/s	2,4 kbit/s	2-8 times duplication of each bit to reach 2,4 kbit/s	TCH/F4.8	8 kbit/s
4,8 kbit/s	4,8 kbit/s	4,8 kbit/s	TCH/F4.8	8 kbit/s
4,8 kbit/s	9,6 kbit/s	9,6 kbit/s	TCH/F9.6	16 kbit/s
9,6 kbit/s	9,6 kbit/s	2x4,8 kbit/s	2XTCH/F4.8	8 kbit/s
9,6 kbit/s	9,6 kbit/s	9,6 kbit/s	TCH/F9.6	16 kbit/s
14,4 kbit/s	14,4 kbit/s	3X4,8 kbit/s	3XTCH/F4.8	8 kbit/s
14,4 kbit/s	19,2 kbit/s	2X9,6 kbit/s	2XTCH/F9.6	16 kbit/s
19,2 kbit/s	19,2 kbit/s	4X4,8 kbit/s	4XTCH/F4.8	8 kbit/s
19,2 kbit/s	19,2 kbit/s	2X9,6 kbit/s	2XTCH/F9.6	16 kbit/s
28,8 kbit/s	28,8 kbit/s	3X9,6 kbit/s	3XTCH/F9.6	16 kbit/s
38,4	38,4 kbit/s	4X9,6 kbit/s	4XTCH/F9.6	16 kbit/s
NOTE: The table gives the relation between the FNUR, AIUR, Substream Rate, Channel Coding and Intermediate Rate. As an example: the wanted FNUR is 14,4 kbit/s and the selected channel coding is TCH/F9.6. The data stream is split into two substreams of 9,6 kbit/s yielding an AIUR of 19,2 kbit/s.				

15.1.1 Alignment

An alignment window spanning four modified ITU-T V.110 80 bit frames shall be used to search for the pattern of 8 bits described above in order to identify alignment with an RLP frame.

In the event of failure to detect the 8 bit pattern, the alignment window is shifted one complete modified V.110 80 bit frame, discarding the contents of the most historical frame and then checking the new 8 bit pattern.

15.1.2 Support of Discontinuous Transmission (DTX)

The E1 bit in the modified ITU-T V.110 80 bit frame shown in Figure 3 shall be used in the direction MSC-BSS to indicate that DTX may be invoked (see 3GPP TS 24.022). The E1 bit in all of the four consecutive frames relating to the RLP frame to which DTX may be applied shall be set to 1. If DTX is not to be applied, the E1 bit shall be set to 0.

In the direction BSS-MSC the E1 bit shall always be set to 0.

15.1.3 Order of Transmission

The first bit of each quarter of an RLP frame to be transmitted shall correspond to bit D1 of a modified V.110 frame (figures 3 and 4). The remaining 59 bits of each quarter of an RLP frame shall correspond to the D and D' bits , D2 - D'12, in order left to right and top to bottom as shown in figures 3 and 4.

The first quarter of an RLP frame to be transmitted shall contain the E2 and E3 bit code 00 as shown in Table 1. The second quarter contains the code 01, etc.

15.2 TCH/F14.4, TCH/F28.8, and TCH/F43.2 channel codings

In case of non-transparent service, a 576 bit RLP frame shall be mapped over two consecutive A-TRAU frames.

Because of that mapping, it is required, following a transmission break and at start up, to determine which A-TRAU frame of the stream is the first for a particular RLP frame. This is needed so that correct alignment with the radio subsystem can be achieved.

The two consecutive M1 bits are referred to as the Frame Start Identifier. The FSI value is 01. This value is assigned to the M1 bits as shown in Table 9.

Table 9

	M1 bit
First A-TRAU frame	0
Second A-TRAU frame	1

A-TRAU frames can slip in time during re-routing, and whilst A-TRAU frame synchronisation exists, the FSI is required to determine which half of an RLP frame each A-TRAU frame contains.

Table 10: Relationship between AIUR, substream rate, number of substreams and intermediate rate

	AIUR	**Number of substreams x AIUR per substream**	**Channel Coding**	**Multislot intermediate Rate**
	14,4 kbit/s	14,4 kbit/s	TCH/F14.4	16 kbit/s
	28,8 kbit/s	2X14,4 kbit/s	2XTCH/F14.4 1XTCH/F28,8	16 kbit/s
	43,2 kbit/s	3X14,4 kbit/s	3XTCH/F14.4 1XTCH/F43,2	16 kbit/s
	57,6 kbit/s	4X14,4 kbit/s	4XTCH/F14.4	16 kbit/s
	57,6 kbit/s	4X14,4 kbit/s	4XTCH/F14.4 2XTCH/F28,8	16 kbit/s

NOTE: The table gives the relation between AIUR, Substream Rate, Channel Coding and Intermediate Rate. As an example: the AIUR is 28,8 kbit/s and the selected channel coding is 14,5 kbit/s. The data stream is split into two substreams of 14,5 kbit/s yielding an AIUR of 28,8 kbit/s

The same number of substreams is used in each direction, even if the AIURs in each direction differ. Superfluous substreams are filled with idle frames. These are inserted at the BTS or IWF and are discarded at the IWFor BTS respectively. At the IWF, the down link AIUR is determined by the out of band signalling (Assignment Complete, Handover Performed), whereas the up link AIUR is determined inband by examining the possible substream positions on the A interface.

15.2.1 Alignment

An alignment window spanning two 290 bit blocks in case of TCH/F14.4 channel shall be used to search for the pattern of 2 bits '01' described in subclause 15.2, in order to identify alignment with an RLP frame.

In the event of failure to detect the 2 bits pattern the alignment window is shifted one 290 bit block, discarding the contents of the most historical frame and then checking the new 2 bits pattern.

15.2.2 Support of Discontinuous Transmission (DTX)

The M2 bit in the A-TRAU frame shown in Figure 5 shall be used in the direction MSC to BSS to indicate that DTX may be invoked (see 3GPP TS 24.022). The M2 bit in all of the two consecutive A-TRAU frames relating to the RLP frame to which DTX may be applied shall be set to 1. If DTX is not to be applied, the M2 bit shall be set to 0.

In the direction BSS to MSC the M2 bit shall always be set to 0.

15a Support of non-transparent bearer services in Iu mode

In Iu mode the RLP frames are transmitted via the Iu interface by means of the Iu UP protocol in support mode, see 3GPP TS 25.415. Each SDU is transported in one Iu UP PDU type 1.

Each SDU has a size of 576 bits and carries one RLP frame with frame size of 576 bits if TCH/F14.4, TCH/F28.8 or TCH/F43.2 channel coding is used in GERAN. Each SDU has a size of 480 bits and carries two RLP frames with frame size of 240 bits if TCH/F9.6 channel coding is used in GERAN.

If TCH/F14.4, TCH/28.8 or TCH/F43.2 is used, the range of AIUR values is 14,4 kbit/s, 28,8 kbit/s, 43,2 kbit/s, 57,6 kbit/s, limited by the maximum bit rate, and varies with the transmission period on the Um interface, which is 40 ms, 20 ms, 13 ms or 10 ms. If TCH/F9.6 is used, the range of AIUR values is 12, 24, 36, 48 kbit/s, limited by the maximum bit rate, and varies with the transmission on the Um interface, which is 40 ms, 20 ms, 13 ms or 10 ms. A change in the transmission period is signalled to the IWF through the Iu UP protocol. The Iu UP primitive Iu-UP-DATA-REQUEST is invoked each time an RLP frame is ready to be sent from the IWF towards the UE.

DTX indication is not used.

16 Support of transparent bearer services in A/Gb mode

16.1 TCH/F9.6 and TCH/F4.8 channel codings

16.1.1 User rate adaptation on the A interface, AIUR less than or equal to 38,4 kbit/s

The ITU-T V.110 80 bit frame shall be used for transparent data on the A interface. These frames are transmitted on up to four substreams multiplexed into one stream sent over the A interface. The split/combine function is applied on the substreams as specified in clause 5 of the present document. The relation between the AIUR and the number of channels is specified in table11.

The 64 kbit/s consists of octets, bits 1 through 8, with bit 1 transmitted first.

For a 9 600 bit/s radio interface user rate the V.110 frame is carried with a 16 kbits/s stream which occupies bit positions (1,2).

For radio interface user rates of either 4 800 bit/s, 2 400 bit/s, 1 200 bit/s or 300 bit/s the V.110 frame is carried with a 8 kbits/s stream which occupies bit position (1). For user rates < 1 200bit/s asynchronous characters are padded with additional stop elements by the RA0 function (in the MSC/IWF) to fit into 600 bit/s synchronous RA1 rate prior to rate adaptation to 64 kbits/s.

No use of 4 kbit/s stream is foreseen.

In a given V.110 frame on the A interface:

- for 9 600 bit/s there is no repetition of bits D within the 16 kbit/s stream ;
- for 4 800 bit/s there is no repetition of bits D within the 8 kbit/s stream ;
- for 2 400 bit/s each bit D is repeated twice within the 8 kbit/s stream (D1 D1 D2 D2 etc) ;
- for 1 200 bit/s each bit D is repeated four times within the 8 kbit/s stream (D1 D1 D1 D1 D2 D2 D2 D2 etc) ;
- for 600 bit/s each bit D is repeated eight times within the 8kbit/s stream (D1 D1 D1 D1 D1 D1 D1 D1 D2 D2 D2 D2 D2 D2 D2 D2 etc);

16.1.2 User rate Adaptation on the A-interface, AIUR greater than 38,4 kbit/s

For AIUR of 48 kbit/s, 56 kbit/s and 64 kbit/s one stream consisting of ITU-T V.110 32 bit frames or 64 bit frames, as specified in 3GPP TS 44.021 shall be transmitted over the A-interface. Splitting/Combining which occurs in the BSS, is as specified in 3GPP TS 44.021.

Table 11 gives the relation between the User Rate, Substream Rate Channel Coding and the Intermediate Rate.

16.1.3 Relation between AIUR and the number of channels

Table11: Relationship between the AIUR, substream rate, channel coding, intermediate rate and number of channels

AIUR	Number of channels x Substream Rate	Channel Coding	(Multislot) intermediate Rate (Note1)
≤2,4 kbit/s	2-8 times duplication of each bit to reach 4,8 kbit/s	TCH/F4.8	8 kbit/s
4,8 kbit/s	4,8 kbit/s	TCH/F4.8	8 kbit/s
9,6 kbit/s	2X4,8 kbit/s	2XTCH/F4.8	8 kbit/s
9,6 kbit/s	9,6 kbit/s	TCH/F9.6	16 kbit/s
14,4 kbit/s	3X4,8 kbit/s	3XTCH/F4.8	8 kbit/s
14,4 kbit/s	2X9,6 kbit/s w/ padding	2XTCH/F9.6	16 kbit/s
19,2 kbit/s	4X4,8 kbit/s	4XTCH/F4.8	8 kbit/s
19,2 kbit/s	2X9,6 kbit/s	2XTCH/F9.6	16 kbit/s
28,8 kbit/s	3x9,6 kbit/s	3XTCH/F9.6	16 kbit/s
38,4 kbit/s	4X9,6 kbit/s	4XTCH/F9.6	16 kbit/s
48 kbit/s	5X9,6 kbit/s	5XTCH/F9.6	64 kbit/s
56 kbit/s	5X11,2 kbit/s	5XTCH/F9.6	64 kbit/s
64 kbit/s	66x11,2 kbit/s w/padd.	6XTCH/F9.6	64 kbit/s
NOTE: For AIURs ≤ 38,4 kbit/s this column indicates the multislot intermediate rate: for higher AIURs it indicates the intermediate rate.			

16.1.4 Handling of status bits X, SA, SB

In the single slot case, status bit SA shall be coded repeatedly as S1, S3, S6, S8, and SB is coded repeatedly as S4 and S9 in Figure 2. In the multislot case, status bit SA is coded repeatedly as S6, S8 and SB is coded as S9 in figures 2, 5 and 6.

The handling of the status bits shall comply with the synchronisation procedures for transparent services which are as described in 3GPP TS 29.007 (MSC), 3GPP TS 44.021 (BSS), 3GPP TS 27.001 (MS).

16.1.5 Handling of bits E1 to E7

Bits E1 to E3 shall be used according to 44.021.

Bits E4 to E7 may be used for network independent clocking as indicated in 3GPP TS 44.021.

16.2 TCH/F14.4, TCH/F28.8, and TCH/F32.0 channel codings

16.2.1 User rate adaptation on the A interface, AIUR less than or equal to 56 kbit/s

The A-TRAU frame shall be used for transparent user data rates other than 32 kbit/s on the A interface. The A-TRAU frames are transmitted on up to four substreams multiplexed into one stream sent over the A interface. The split/combine function is applied on the substreams as specified in clause 7 of this TS. The relation between the AIUR and the number of channels is specified in table 12.

In a given A-TRAU frame on the A interface:

- for 14 400 bit/s there is no repetition of bits D within the 16 kbit/s stream in a given A-TRAU frame on the A interface.

The ITU-T I.460 rate adaptation is used for the transparent 32 kbit/s user rate on the A interface, i.e. four bits of each octet in the 64 kbit/s time slot are used for transporting the 32 kbit/s user data.

16.2.2 User Rate Adaptation on the A-interface, AIUR greater than 56 kbit/s

For AIUR of 64 kbit/s one stream consisting of ITU-T V.110 32 bit frames or 64 bit frames, as specified in 3GPP TS 44.021 shall be transmitted over the A-interface. Splitting/Combining which occurs in the BSS, shall be as specified in 3GPP TS 44.021.

Table 12 gives the relation between the User Rate, Substream Rate Channel Coding and the Intermediate Rate.

16.2.3 Relation between AIUR and the number of channels

Table 12: Relationship between the AIUR, AIUR per substream, channel coding, intermediate rate and number of substreams

AIUR	Number of substreams x AIUR per substream	Channel Coding	Multislot intermediate Rate (note 1)
14,4 kbit/s	14,4 kbit/s	TCH/F14.4	16 kbit/s
28,8 kbit/s	2X14,4 kbit/s	TCH/F14.4 TCH/F28.8	16 kbit/s
32 kbit/s	1x32 kbit/s	TCH/F32.0	32 kbit/s
38,4 kbit/s	3X14,4 kbit/s w/padding	TCH/F14.4	16 kbit/s
48 kbit/s	4X14,4 kbit/s w/padding	TCH/F14.4	16 kbit/s
56 kbit/s	4X14,4 kbit/s w/padding 1x64.0 kbit/s (Note 2)	TCH/F14.4 TCH/F32.0	16 kbit/s 64 kbit/s
64kbit/s	5X14,4 kbit/s w/padding 1x64.0 kbit/s (Note 2)	TCH/F14.4 TCH/F32.0	64 kbit/s
NOTE 1: For AIURs ≤ 56 kbit/s this column indicates the multislot intermediate rate: for higher AIURs it indicates the intermediate rate. NOTE 2: One substream over two air interface timeslots. No multislot intermediate rate.			

16.2.4 Handling of status bits X and SB

The X and SB bits shall be carried over the A interface in a multiframe structure as described in subclause 10.3 of 3GPP TS 44.021. SA bit is not carried over the A interface.

The handling of the status bits shall comply with the synchronisation procedures for transparent services which are as described in 3GPP TS 29.007 (MSC), 3GPP TS 44.021 (BSS), 3GPP TS 27.001 (MS).

16a Support of transparent bearer services in Iu mode

The Iu UP protocol is used in transparent mode, see 3GPP TS 25.415. The payload of the Iu frames will consist of user data bits only for synchronous data, and RA0 synchronous bit streams for asynchronous data.

On the Iu interface, the payload (SDU) size is fixed, determined by the bit rate. Following table shows SDU sizes defined. AAL2 is used. The AAL2 SSCS layer shall be supported for segmentation and re-assembly.

Table ~~12~~13: Relationship between the bit rate and the SDU size

Bit rate	SDU size (= RLC PDU payload size)
28.8 kbit/s	576 bits
33.6 kbit/s	672 bits
32 kbit/s	640 bits
56/64 kbit/s	640 bits

The primitive Iu-UP-UNIT-DATA-REQUEST is invoked at regular intervals in order to have a constant bit rate (every SDU).