

**Overview of 3GPP Release 4**  
**Summary of all Release 4 Features**  
**v.1.0.0**  
***DRAFT***

## ***Credits***

This document is produced by the ETSI MCC department, namely Adrian Zoicas, Alain Sultan, Andrijana Jurisic, Cesar Gutierrez, Claude Arzelier, David Boswarthick, Friedhelm Rodermund, Jürgen Caldenhoven, Kimmo Kymalainen, Michael Clayton, Paolo Usai, Per Johan Jorgensen and Maurice Pope, and also Hans van der Veen. The ETSI MCC department was headed by Adrian Scrase and then by John Meredith. The work was coordinated by Alain Sultan, who wishes to acknowledge all contributors for the quality of their inputs.

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# 1 Introduction

## 1.1 Scope

This document contains a high-level description of the 3GPP Release 4 Features.

A Feature is defined as new or substantially enhanced functionality which represents added value to the existing system. A feature should normally embody an improved service to the customer and / or increased revenue generation potential to the supplier.

Features are as independent as possible from each other, and relationships between features (if any) are clarified here.

Some features correspond to a grouping of different independent items impacting the same parts of the system (e.g. "Release 4 RAN improvements"). These groupings are performed to artificially limit the total number of features for each Release. For these features, a summary of each item is provided.

For each feature (or independent item), references are given to guide the reader on how to deepen the subject: the Work Item Description (WID) as well as the list of impacted specifications are provided in the beginning of the section describing the feature. Only the list of impacted specifications is provided here. The exact impact on a given specification due to a given feature is described in the Change Request (CR) list, which can be found at the end of the specification, or in the CR database, which provides the full list of CRs for all 3GPP specifications.

The second part of this introduction contains global references, and provides links towards the 3GPP Specifications, the temporary documents (tdocs), the Work Plan, the Work Item Descriptions (WIDs) and the CR database.

The main body of this document is structured according to the 3GPP Release 4 Features: each chapter corresponds to one Release 4 Feature.

## 1.2 References

### 1.2.1 Specifications

Global information on the Specifications (also called "specs") can be found at:

<http://www.3gpp.org/specs/specs.htm>

The latest versions of all 3GPP specifications, containing the most recent corrections and additions, are available at:

<http://www.3gpp.org/ftp/Specs/latest/>

For specific purposes, older versions might be needed. These versions are available at:

<http://www.3gpp.org/ftp/Specs/Archive/>

where the specifications are sorted by series and then by folders containing all the available versions of a given spec (one folder per spec), for all Releases.

## 1.3 Tdocs

The Temporary Documents (tdocs) are mainly the original papers written by the 3GPP Members, and are the inputs for elaborating the specs. They are available (sorted by 3GPP technical groups (Technical Specification Groups (TSGs) and Working Groups (WGs)) at:

<http://www.3gpp.org/ftp/>

starting with 'tsg....'.

### 1.3.1 Work Plan, Work Items and Study Items

Work Item Description (“WID”) (also called WI Sheet) and Study Item (also called "Feasibility Studies") are forms which initial version provides the target to be reached before starting the technical work. Potential subsequent versions narrow the target and foreseen completion date according the actual progress. They are stored in:

[http://www.3gpp.org/ftp/Information/WI\\_sheets/](http://www.3gpp.org/ftp/Information/WI_sheets/)

The 3GPP Work Plan is a living document, updated roughly each month, which contains the full list of Work Items and Study Items, as well as summary information for each WI, as: the WG in charge of it, its starting date and (foreseen or actual) completion date, the actual progress, etc. The Work Plan is available at:

[http://www.3gpp.org/ftp/Information/WORK\\_PLAN/](http://www.3gpp.org/ftp/Information/WORK_PLAN/)

### 1.3.2 Change Request database

A specification is originally drafted and maintained by a rapporteur, who compiles the contents from discussions in the WGs and TSGs. When it is considered to be 80% complete, it is brought under a so-called "change control" process. After this, changes to the specification can only be made using Change Requests that are usually agreed by consensus in the Working Group responsible for the specification, and then formally approved by the relevant Technical Specification Group<sup>1</sup>.

The Change Request database contains all available information on Change Requests, including a Work Item code, a Change Request number that is unique within the specification (different versions are possible, but only one can ever be approved), the status of each Change Request and references to relevant temporary document numbers and meetings. This database is available in:

[http://www.3gpp.org/ftp/Information/Databases/Change\\_Request/](http://www.3gpp.org/ftp/Information/Databases/Change_Request/)

Further information on CR is available at:

<http://www.3gpp.org/specs/CR.htm>

## 2 New Features applicable to UMTS and GSM

### 2.1 Bearer Independent CS architecture (also called “Bearer Independent Core Network”)

**Acronym:** CSSPLIT / BICC  
**UID:** 1322  
**Main responsibility:** CN4

#### References for WI " Enable bearer independent CS architecture "

Document	Title/Contents
NP-000538	Bearer Independent Circuit-Switched Core Network
<b>Impacted Specifications</b>	
TS 29.007	General requirements on Interworking between the PLMN and the ISDN or PSTN
TS 23.002	Network Architecture

<sup>1</sup> For a complete description on the handling of Specs and CRs at 3GPP, see the presentation in: <http://www.3gpp.org/ftp/Information/presentations/>

New Dedicated Specifications	
TS 23.205	Bearer-independent circuit-switched core network – Stage 2
TS 29.205	Application of Q.1900 Series to Bearer Independent CS Core Network Architecture – Stage 3
TS 29.232	Media Gateway Controller (MGC) – Media Gateway (MGW) Interface; Stage 3
TS 29.414	Core Network Nb Data Transport and Signalling Transport
And the re-use of the ITU-T Q.19xx series of recommendations, in particular the Q.1902.x, as defined in TS 29.205	

## 2.1.1 Introduction

The objective of this feature is to dissociate, in the Circuit Switched domain (CS domain), the transport and the control. The aim is to offer a better transport resource efficiency and a convergence with the PS domain transport. Different transport resources, as ATM, IP or STM can be used for the PLMN internal transport.

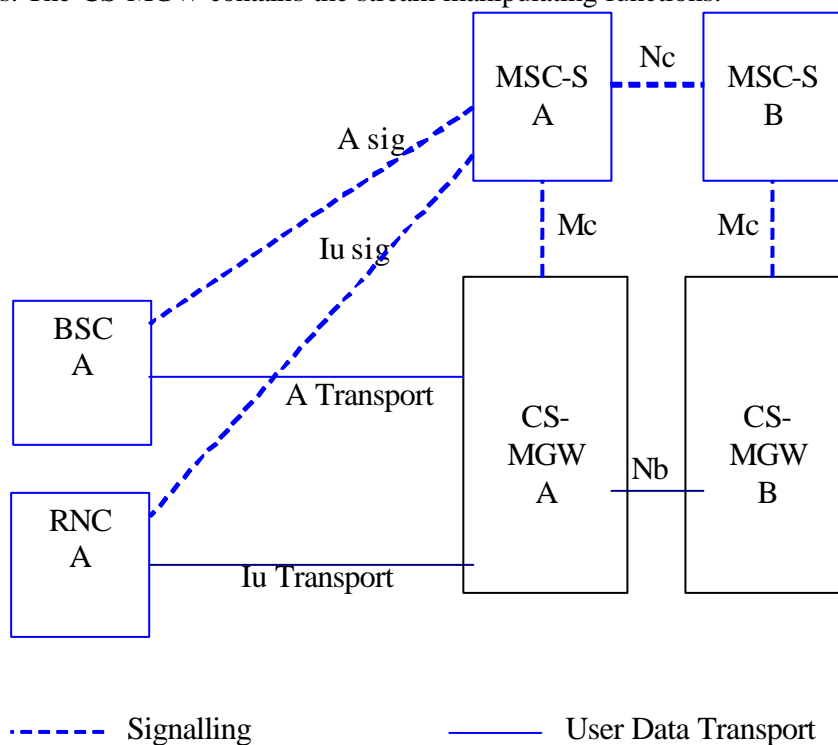
The bearer independent circuit-switched network architecture comprises all the “classical” CS core network functionality for provision of bearer- and teleservices. It includes the functions for the call control, related supplementary services, application services and mobility support.

The protocols used between the terminals and the network are the same as for R99 for the CS domain. This means for example there is no need for IP enabled terminals if IP is the transport resource within the network. Also, the protocols used for access signalling and signalling within the network (e.g. DTAP in TS 24.008 or MAP in TS 29.002) are not affected by the introduction of new signalling transport bearers in the core network.

The users connected to the CS core network shall not be aware whether a monolithic MSC is used, or a combination of a MSC server and media gateway, defined below.

## 2.1.2 Architecture

The basic principle is that the MSC is split into a MSC server, and a (Circuit-Switched) Media Gateway (CS-MGW), the external interfaces remaining the same as much as possible as for a monolithic MSC. The same applies to the GMSC, split into a GMSC server and a CS-MGW. The (G)MSC server provides the call control and mobility management functions, and the CS-MGW provides the bearer control and transmission resource functions. The CS-MGW contains the stream manipulating functions.



**BICC Network Architecture**

### 2.1.2.1 MSC Server and GMSC Server

The MSC Server mainly comprises the call control (CC) and mobility control parts of a MSC.

The MSC Server is responsible for the control of mobile originated and mobile terminated CC CS Domain calls. It terminates the user-network signalling and translates it into the relevant network – network signalling. The MSC Server also contains a VLR to hold the mobile subscriber's service data and CAMEL related data.

The MSC Server controls the parts of the call state that pertain to connection control for media channels in a CS-MGW.

A GMSC Server is to a GMSC as an MSC Server is to an MSC.

### 2.1.2.2 Circuit Switched - Media Gateway (CS-MGW)

The CS-MGW is the PSTN/PLMN transport termination point for a defined network and interfaces UTRAN/BSC with the core network over Iu or the A interface. It interacts with the MSC server and the GMSC server for resource control.

A CS-MGW may also terminate bearer channels from a circuit switched network and media streams from a packet network (e.g., RTP streams in an IP network). As the entity interfacing the access and the core network, the CS-MGW operates the requested media conversion (it contains e.g. the TRAU), the bearer control and the payload processing (e.g. codec, echo canceller, conference bridge). It supports the different Iu options for CS services (AAL2/ATM based as well as RTP/UDP/IP based).

The CS-MGW bearer control and payload processing capabilities also need to support mobile specific functions such as SRNS relocation/handover and anchoring. Current H.248 standard mechanisms are applied to enable this. Further tailoring (i.e. packages) of the H.248 may be required to support additional codecs and framing protocols, etc.

Note that no confusion should be made between the CS-MGW defined here and the IP Multimedia CN Subsystem Media Gateway, the IM-MGW, defined in Release 5.

## 2.1.3 Interfaces and protocols

### 2.1.3.1 Mc Reference Point: (G)MSC server to CS-MGW

The Mc reference point describes the interfaces between the MSC Server and CS-MGW, and between the GMSC Server and CS-MGW. It supports a separation of call control entities from bearer control entities, and a separation of bearer control entities from transport entities.

It uses the H.248/IETF Megaco protocol, jointly developed by ITU-T and IETF, with the parameters and options specified in TS.29232 ("Media Gateway Controller (MGC) – Media Gateway (MGW) Interface; Stage 3)

It has the following properties:

- flexible connection handling which allows support of different call models and different media processing purposes not restricted to H.323 usage.
- open architecture where extensions/Packages definition work on the interface may be carried out.
- dynamic sharing of MGW physical node resources. A physical MGW can be partitioned into logically separate virtual MGWs/domains consisting of a set of statically allocated terminations.
- dynamic sharing of transmission resources between the domains as the MGW controls bearers and manage resources according to the H.248 protocols.

Mobile specific functions such as SRNS relocation/handover and anchoring are also supported.

### 2.1.3.2 Nc Reference Point: MSC Server to (G)MSC Server

Over the Nc reference point, the Network-Network based call control is performed. Examples of this are ISUP or an evolution of ISUP for bearer independent call control (BICC). The protocol used on the Nc interface is specified in TS 29.205: "Application of Q.1900 Series to Bearer Independent circuit-switched core network architecture; Stage 3". In fact, the Nc interface uses ITU's BICC as specified in ITU Rec. Q.1902.x series of recommendations. It supports IP and ATM transports in a bearer-independent manner for the ISDN service set, allowing the physical separation of the call control entities from the bearer control entities, hence the name "Bearer-Independent Call Control".

The interworking between BICC and ISUP shall follow the ITU recommendation Q.1912.1 ("ISUP-BICC Interworking") and Q.19.12.2 ("Interworking between selected signalling systems and BICC").



### 2.1.3.3 Nb Reference Point: CS-MGW to CS-MGW

Over the Nb reference point, the bearer control and transport are performed. Different options are possible for user data transport and bearer control, as defined in TS.29.414 ("Core Network Nb Data Transport and Signalling Transport"). It can be IP bearer control protocol, BICC tunnelling protocol, "AAL type 2 signalling protocol (Q.2630.1-2).

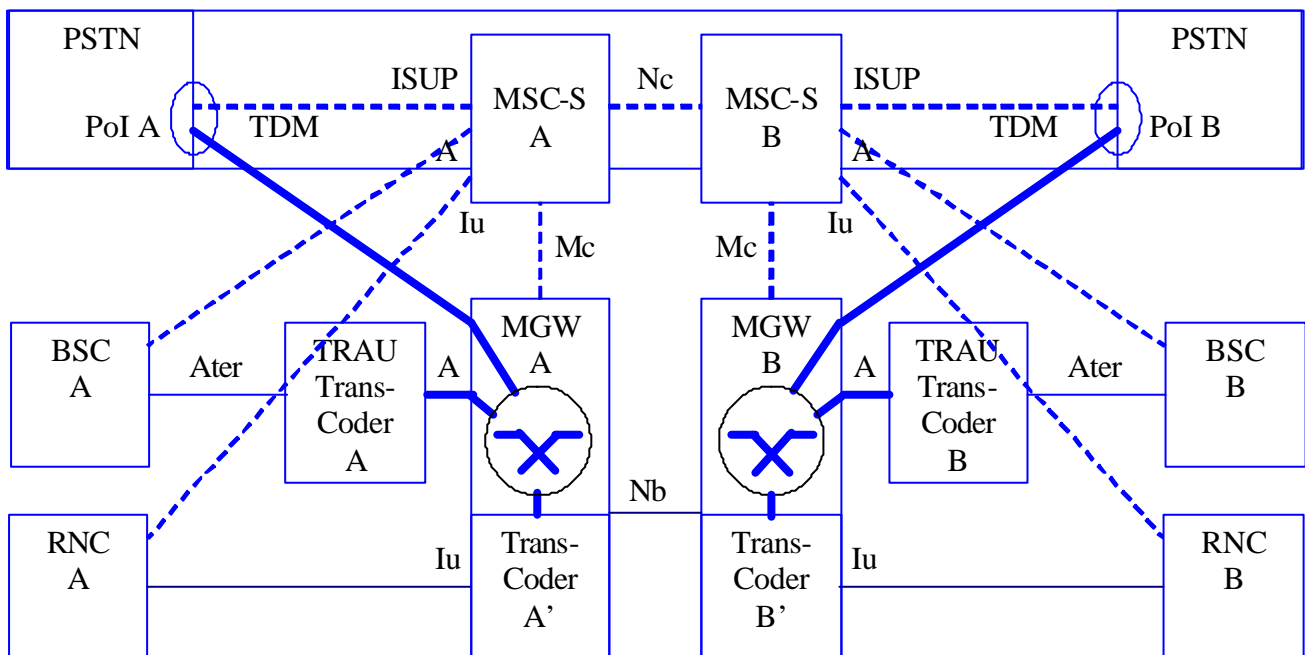
In the case of ATM or IP transport, the passage of compressed speech at variable bit rates is possible through the CS core network.

## 2.2 Features related to Speech encoding and decoding

### 2.2.1 General speech coding concepts

In a normal MS<sup>2</sup>-MS call configuration, the Speech Signal is first encoded in the originating MS, sent over the Air Interface and on Ater, converted to A-law or  $\mu$ -law ITU-T Rec. G.711 in the local transcoder (TRAU), carried over the fixed network, transcoded again in the distant transcoder, sent over the distant Air Interface and finally decoded in the terminating MS. When the Iu interface is used, the transcoder is in the MSC.

The figure below, extracted from TR 23.977, shows the different types of transcoding taking place for end-to-end calls, in case BICC is used. The end-user is a PSTN-user (upper part of the figure), or she/he is a GSM/GERAN user (middle part) or she/he is a UMTS-user (lower part). The figure is limited to the infrastructure side of the end-to-end call, i.e. the radio interface and the User Equipments are not shown.



- - - - - Call Control Signalling      ——— Ater Interface      ——— A and TDM Interface: 64kb/s  
 ——— Iu and Nb Interface  
 PoI: Point of Interconnect

#### Bearer Independent Core Network with A- and Iu-Interfaces from Release 4 onwards

In this configuration, the two speech codecs (coder/decoder pairs) at both ends are in "Tandem Operation". The key inconvenience of a tandem configuration is the speech quality degradation introduced by the double

<sup>2</sup> MS (Mobile Station) and UE (User Equipment) refer to the same logical part of the network, which is the (set of) device(s) the user carries with him to access GSM/UMTS services: the "phone", the UICC card with (U)SIM, and potentially a PC. In the standard, MS is reserved for GSM and UE for UMTS. No distinction was thought to be necessary in this document, so MS and UE are used indistinctively.

transcoding. This degradation is usually more noticeable when the speech codecs are operating at low rates and in noisy conditions.

To avoid this double transcoding, different mechanisms have been defined: the Out-of-Band Transcoder Control (OoBTC), the Tandem Free Operation (TFO, also called in-band TFO), and the Transcoder free operation (TrFO).

## 2.2.2 Relationship between (in-band) TFO, TrFO and OoBTC

Tandem Free Operation (TFO), also called In-band TFO, removes the double speech encoding/decoding done in the TRAU's in MS-to-MS calls by 'tunnelling' the 'compressed' speech (i.e. as used on the radio interface, with same codec type and configuration – but without radio channel related information) through the PCM links of the core network.

No transmission resources are saved in the core network as PCM links are still used, but avoiding the double transcoding mainly improves the perceived speech quality in mobile-to-mobile calls.

With Transcoder Free Operation (TrFO), there is no constraint to use PCM link on the Nb interface, so, in addition of the advantages proposed by TFO, there is also a saving of transmission resources. TrFO can also be used in mobile-to-fix calls: the mobile to fix transcoding is done at the edge of the mobile network, hence resource are saved in the mobile network.

Finally, Out of Band Transcoder Control (OoBTC) is the mechanism to establish the Transcoder Free Operation. It is the capability of a system to negotiate the types of codecs and codec modes on a call per call basis through out-of-band signalling. OoBTC is used before call set-up. If the OoBTC fails to establish the TrFO and transcoders are required, then in-band TFO may be used after call set-up. In-band TFO shall be the fallback mechanism when transcoders cannot be avoided, either at set-up or during the communication phase.

When looking on the figure above, OoBTC/TrFO on the Nc/Nb interface or TFO on the Nb interface provide the means to transport speech in compressed form on the Nb interface. The MSC-Ss know, negotiate and select the speech Codec Types and Configurations on the Iu and on the Nb Interface.

This may lead to Transcoder free operation (TrFO) with compressed speech at the Nb interface.

If the MSC-Ss determine G.711 as the codec used between the MGWs, then the MGWs may afterwards establish TFO at the Nb interface. In this, case the transcoders in the MGWs know and negotiate the speech codec configuration on the Nb interface, and they inform the MSC-Server of this configuration indicating that TFO is possible. If the transcoder is in the BSCs, the BSCs know and select the speech codec type and configuration on the A-ter interface to enable TFO operation on the A interface.

## 2.2.3 Tandem Free Operation (TFO) (also called "In-band TFO")

*Full official name: Tandem Free aspects for 3G and between 2G and 3G system*

**Acronym:** TFO  
**UID:** 1631 (and BB 1632 on Tandem Free AMR)  
**Main responsibility:** S4

### References for WI " Tandem Free aspects for 3G and between 2G and 3G systems "

Document	Title/Contents
None	WID Sheet not produced (WI moved from R99 to Rel-4)
<b>Impacted Specifications</b>	
TS 22.053 TS 23.153 TS 28.062	Tandem Free Operation (TFO); Service Description; Stage 1 Out of Band Transcoder Control; Stage 2 Inband Tandem Free Operation (TFO) of speech codecs; Service description; Stage 3
<b>New Dedicated Specifications</b>	
	None

TFO, which removes the double speech encoding/decoding done in the TRAU in mobile-to-mobile calls by tunnelling the radio-encoded speech on the PCM links, is intended to be used for MS to MS (GSM), MS to UE (GSM/3G) or UE to UE (3G) call configurations.

In addition of improving the perceived speech quality, TFO saves DSP resources, and allows new speech services like wideband speech. Generally, no transmission resources are saved in the core network as PCM links are still used. Possible savings could be done in case the inter-PLMN transmission links carry compressed speech compatible with a 16 kbit/s or 8 kbit/s sub-multiplexing scheme, including packet switched transmission. Also possible reduction in the end-to-end transmission delay is sometimes mentioned as an advantage of TFO.

TFO is also called “in-band TFO” as it uses in-band signalling. This signalling is controlled by the TRAU after call set-up, and is described in TS 28.062. The procedure is that in case two transcoders are in tandem (a pair of transcoders with PCM coding between them) and are able to communicate to each other (i.e. both support TFO), then the inband TFO protocol allows the transcoders to compare coding schemes. If compatible codec types exist, the transcoders are able to overwrite the PCM coding with the pure compressed speech (effectively bypassing the transcoding functions).

Using in-band signalling implies that the link between the TRAU is transparent in the sense that the digital content of what is emitted by a TRAU is not modified. The so-called In Path Equipments must therefore be disabled or configured in such a way that the information (signalling and coded speech) required for Tandem Free is not altered.

Note that if the TFO protocol is not supported by both transcoders or the coding schemes are not compatible then normal "Tandem" operation occurs and PCM encoded speech is passed between them.

In case the TFO connection can not be maintained (e.g. because of activation of supplementary services causing insertion of CCD, DTMF, tones, etc), the protocol ideally provides a fast and seamless fallback to Tandem Operation/

TFO is defined for the different Speech Codec Types used in GSM and GSM evolved 3G systems. This includes the GSM\_FR, GSM\_HR, GSM\_EFR and FR\_AMR, HR\_AMR, UMTS\_AMR, UMTS\_AMR\_2 codec types. However, the procedures used to establish TFO are considered system independent and could be extended to call configurations involving other systems like ISDN phones, speech servers, IP Multimedia or other wireless systems.

For non-AMR Speech Codec Types (i.e. GSM\_FR, GSM\_EFR and GSM\_HR), Tandem Free Operation is fully compatible with the installed equipment base. The feature is fully supported by the Transcoder Units. The additional processing complexity is small compared to the encoding/decoding functions. Other network elements are not affected and possibly not aware of the establishment of Tandem Free Operation.

For the support of AMR Tandem Free Operation in GSM, the BTS and possibly the BSC may be involved in addition to the TRAU.

The resolution of a possible codec mismatch is defined as an optional feature. A codec mismatch occurs when incompatible speech codecs are used at both ends of the call configuration at call set-up. The resolution consists in finding an optimal speech codec on which TFO may be established. For that purpose, other elements in the Radio Access Network (BSS in GSM or RNC in 3G) might be involved. The communication channel between the Transcoder Units and the other network elements used to transfer network parameters to solve a codec mismatch is considered a proprietary interface, and is not further defined in TS 28.062. For GSM AMR, provision exists in the TRAU Frames to carry the network parameters across the Abis/Ater interface (see TS 48.058, 48.060 and 48.061).

Note that RAN and CN have to verify UMTS\_AMR\_2 support in Release 4.

The main difference between OoBTC and TFO is that OoBTC is performed before call setup and TFO immediately after call setup.

## 2.2.4 Transcoder-Free Operation/ Out-of-Band Transcoder Control

<b>Acronym:</b>	OoBTC
<b>UID:</b>	1541

**Main responsibility:** N4

#### References for WI " Transcoder-Free Operation "

Document	Title/Contents
NP-000529	WID for Out of band Transcoder Control
<b>Impacted Specifications</b>	
TS 24.008 <sup>3</sup>	Mobile radio interface Layer 3 specification; Core network protocols; Stage 3
TS 26.108	
<b>New Dedicated Specifications</b>	
TS 23.153	Out of band Transcoder Control; Stage 2

Initially, this WI had been started for R99. However, a significant amount of open issues were not closed on time so the WI was postponed to Rel-4 and all remaining issues identified in R99 were resolved.

Out-of-Band Transcoder is the mechanism to establish the Transcoder Free Operation. Transcoder Free Operation (TrFO) is defined as the configuration of a speech or multimedia call for which no transcoder device is physically present in the communication path between the source codecs and hence no control or conversion or other functions can be associated with it

In case of mobile to fixed network calls, the term "Transcoder free operation" is applicable for the TrFLs carrying compressed speech. The TrFO usually ends at the Gateway to the PSTN where the speech is transcoded e.g. to G.711.

Although the main reason for avoiding transcoding in mobile-to-mobile calls has been speech quality, the transmission of compressed information in the CN and CN-CN interface of the cellular network also offers the possibility of bandwidth savings. Therefore Out-of-Band Transcoder Control is not limited to mobile-to-mobile calls but can be applied for calls to or from an external network as well.

In order to allocate transcoders for a call inside the network, and to select the appropriate codec type inside the UEs, signalling procedures are defined to convey the codec type selected for a call to all the affected nodes (UEs and potential transcoding points inside the network). Also, codec negotiation capabilities have been defined to enable the selection of a codec type supported in all the affected nodes, i.e. to resolve codec mismatch situations. This codec negotiation maximises the chances of operating in compressed mode end-to-end for mobile-to-mobile calls.

To allow transport of information in a compressed way in transmission networks, these networks make use of the transport -independent call control protocol as specified in TS 23.205 that provides means for signalling codec information, negotiation and selection of codecs end-to-end.

## 2.3 Transparent End-to-End PS mobile streaming application

**Acronym:** PSTREAM  
**UID:** 1539  
**Main responsibility:** S4

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<sup>3</sup> Out-of-Band Transcoder Control requires the capability to indicate preferable transcoder types from the MT to the network and vice versa employing Call Control messages as a means of transport. The parameter for BICC protocol need to be adjusted. (Ex. OID)

## References for WI " Transparent End-to-End PS mobile streaming application "

Document	Title/Contents
SP-000345	WI Sheet
<b>Impacted Specifications</b>	
TS 26.233	Transparent end-to-end packet switched streaming service (PSS); General description
TS 26.234	Transparent end-to-end packet switched streaming service (PSS); Protocols and codecs
<b>New Dedicated Specifications</b>	
	None

Streaming refers to the ability of an application to play synchronised media streams like audio and video streams in a continuous way while those streams are being transmitted to the client over a data network.

Applications, which can be built on top of streaming services, can be classified into on-demand and live information delivery applications. Examples of the first category are music and news-on-demand applications. Live delivery of radio and television programs are examples of the second category.

Streaming over fixed-IP networks is already a major application. While the Internet Engineering Task Force (IETF) and the W3C have developed a set of protocols used in fixed-IP streaming services, for 3G systems, the 3G packet-switched streaming service (PSS) fills the gap between 3G MMS, e.g. downloading, and conversational services.

PSS enables mobile streaming applications, where the protocol and terminal complexity is lower than for conversational services, which in contrast to a streaming terminal require media input devices, media encoders and more complex protocols.

This feature offers the transparent 3G packet-switched streaming services (3G PSS) that enables a multitude of streaming applications to be deployed in 3G systems. Thanks to this standardized solution, content providers can reach many more customers without needing many different servers. The mobile users can also access much more content.

For mobile streaming applications, two specific new issues were considered:

- For terminals which have limited possibility of software plug-ins, the coupling between the browser and the streaming client needed to be addressed, as well as a default set of the streaming protocols and codecs.
- Connection time may be very costly, so that bad quality streaming is less tolerable than on the Internet.

The Feature has standardized the components of a mobile streaming service, including streaming protocols, media transport protocols, and multimedia codecs. Note that the wideband codec ITU-T G.722.2 has been made allowable for this release 4 work item, while the "AMR-WB service" is a feature which is part of the 3GPP Release 5.

Harmonization with existing and emerging 3GPP multimedia applications has been considered whenever possible.

The mobile streaming application allows various charging models.

Transport security aspects were covered as well.

TS 26.233 defines the usage scenarios, overall high level end-to-end service concept, and lists terminal related functional components. It also lists any identified service interworking requirements. PSS protocols for control signalling, scene description, media transport and media encapsulations are specified in TS 26.234. Codecs for speech, audio, video, still images, bitmap graphics, and text are specified in TS 26.234 as well. Vector graphics belongs to the extended PSS features and is not specified in 3GPP Release 4.

## 3 UMTS-only new Features

### 3.1 Low Chip Rate TDD option [section not stable]

<b>Acronym:</b>	LCRTDD
<b>UID:</b>	1222

**Main responsibility:** RAN1

Structure of the feature:

UID	Task name	WG	Acronym
1223	Physical layer	R1	LCRTDD-Phys
1224	Layer 2 and layer 3 protocol aspects	R2	LCRTDD-L23
1225	"RF radio transmission/reception, system performance requirements and conformance testing"	R4	LCRTDD-RF
1227	UE radio access capability	R2	LCRTDD-UErac
1228	Iub/Iur protocol aspects	R3	LCRTDD-IubIur
2262	Low chiprate TDD interworking with GERAN		

### References for WI " Low Chip Rate TDD option "

Document	Title/Contents
RAN_Wis	WI Sheet
<b>Impacted Specifications</b>	
25.102	UE Radio Transmission and Reception (TDD)
25.105	BTS Radio Transmission and Reception (TDD)
25.123	Requirements for support of Radio Resource Management (TDD)
25.142	Base station conformance testing(TDD)
25.113	Base station EMC
25.133	Requirements for support of Radio Resource Management (FDD)
25.201	Physical layer – General description
25.221	Physical channels and mapping of transport channels onto physical channels (TDD)
25.222	Multiplexing and channel coding (TDD)
25.223	Spreading and modulation (TDD)
25.224	TDD; physical layer procedures
25.225	Physical layer; measurements
25.302	Services Provided by the physical layer
25.303	UE functions and Inter-layer procedures in connected mode
25.304	UE procedures in idle mode and procedures for cell reselection in connected mode
25.305	User Equipment (UE) positioning in Universal Terrestrial Radio Access Network (UTRAN); Stage 2
25.321	Medium access control (MAC) protocol specification
25.331	Radio resource control (RRC) protocol specification
25.401	UTRAN Overall Description
25.402	Synchronisation in UTRAN Stage 2
25.423	UTRAN Iur Interface RNSAP Signalling
25.425	UTRAN Iur Interface User Plane Protocols for Common Transport Channel data streams
25.427	UTRAN Iub/Iur Interface User Plane Protocols for DCH data streams
25.430	UTRAN Iub Interface: General Aspects and Principles
25.433	UTRAN Iub Interface NBAP Signalling
25.435	UTRAN Iub Interface User Plane Protocols for Common Transport Channel data streams
25.922	Radio Resource Management Strategies
25.944	Channel coding and multiplexing examples
25.306	UE Radio Access capabilities definition
25.843	1,28 Mcps TDD UE Radio Access Capabilities
34.108	Common test environments for User Equipment (UE) conformance testing
34.122	Terminal conformance specification, Radio transmission and reception (TDD)
34.123-1	User Equipment (UE) conformance specification; Part 1: Protocol conformance specification
34.123-2	User Equipment (UE) conformance specification; Part 2: Implementation conformance statement (ICS) specification
34.124	Electromagnetic compatibility (EMC) requirements for Mobile terminals and ancillary equipment
<b>New Dedicated Specifications</b>	
25.834	UTRA TDD low chip rate option; Radio protocol aspects
25.928	Low Chip Rate TDD Physical Layer
25.937	Low chip rate TDD Iub/Iur protocol aspects
25.945	RF requirements for 1.28 Mcps UTRA TDD option

3GPP Release 99 UTRA (Universal Terrestrial Radio Access) included two basic modes of operation: Frequency Division Duplex (FDD) and Time Division Duplex (TDD). One particularity of TDD is that it can be introduced without needs for paired spectrum and is well-suited to asymmetric traffic.

In addition to Release 99 TDD, using a chip rate of 3.84 Mcps, Release 4 introduces an option that uses a

chip rate of 1.28 Mcps, i.e. a third of the “normal TDD”. One consequence of using a lower chip rate is the ability to use narrower frequency bands than for basic TDD or FDD. This mode is therefore known as "Low Chip Rate TDD" (LCRTDD) or "Narrow-band TDD".

The benefit of LCRTDD is that it can be supported on unpaired frequency bands of 1.6MHz, making it possible to accommodate on existing GSM frequency allocations.

LCRTDD is also supported by ITU-R and Operators Harmonisation Group (OHG). The design goal was to enable the full integration of the low chip rate TDD option and its specific properties into the Release 4 specifications of 3GPP. In other words, the integration work of all aspects of LCR TDD described below was designed to maximize the commonality with the high chip rate TDD.

It is expected that some extensions are necessary in the higher layers' specifications. For the physical layer specifications, the specific properties of low chip rate option have to be respected.

The introduction of LCR TDD includes the following areas:

### 3.1.1 Physical layer

The different aspects of LCR TDD physical layer are as follows:

- Physical Channels and Mapping of Transport Channels onto Physical Channels
- Multiplexing and Channel Coding
- Modulation and spreading
- Physical layer procedures
- Physical Layer Measurements

### 3.1.2 Layers 2 and 3

The different aspects of LCR TDD layer 2 and layer 3 protocol aspects are as follows:

- UE procedures in idle mode
- Interlayer procedures in connected mode
- Control plane protocol aspects
- User plane protocol aspects
- mobility aspects

### 3.1.3 UE radio access Capability

It includes the definition of UE radio access capabilities for low chip rate option.

### 3.1.4 UTRAN network lub/lur protocol aspects

### 3.1.5 Low chip rate TDD lub/lur protocol aspects

1228	lub/lur protocol aspects	R3	LCRTDD-lublur	RAN_Wis	"Y. CWTS"	Liu,
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WID in RP-000316  
Affected RAN3 specs:



New specifications						
Spec No.	Title	Prime rsp. WG	2ndary rsp. WG(s)	Presented for endorsement at plenary#	Approved at plenary#	Comments
25.937	TR on Low chip rate TDD Iub/Iur protocol aspects	WG3		RAN #11	RAN #11	
Affected existing specifications						
Spec No.	CR	Subject			Approved at plenary#	Comments
25.401	23	UTRAN Overall Description			RAN#11	
25.402	14	Synchronisation in UTRAN Stage 2			RAN#11	
25.433	358, 359	UTRAN Iub Interface NBAP Signalling			RAN#11	
25.423	309	UTRAN Iur Interface RNSAP Signalling			RAN#11	
25.425	23	UTRAN Iur Interface User Plane Protocols for Common Transport Channel data streams			RAN#11	
25.427	42	UTRAN Iub/Iur Interface User Plane Protocols for DCH data streams			RAN#11	
25.430	14	UTRAN Iub Interface: General Aspects and Principles			RAN#11	
25.435	37	UTRAN Iub Interface User Plane Protocols for Common Transport Channel data streams			RAN#11	

The introduction of the low chip rate option (1.28 Mcps TDD - The low chip rate option of TDD ) resulted in adaptations of Information Elements in radio link related signaling for Iub and Iur interfaces, to support the changed physical channel parameters.

This implies new parameters and information elements in the radio related protocols.

The following enhancements of the radio frame structure have impacted the Iur/Iub protocols:

- Different frame structure than for high chiprate TDD option;
- Different basic midamble sequences, maximum channel impulse response is scalable (W=8, 9, 12, 16, 21, 32, 64), depending on number of users and environment, including the association between midambles and channelisation codes;
- Use of only one burst type for physical channels except special bursts in DwPCH/UpPCH. Because there is only one burst type in low chip rate TDD option, “burst type” defined as a parameter for physical channel is not necessary;
- Support of different timeslot formats due to different number of bits and L1 control signals and midamble length;
- Support of use of 8PSK for special timeslots/all timeslots per cell;
- Beacon function is provided by DwPCH and P-CCPCH.

In NBAP and RNSAP messages, the information elements referring to time slot information, burst types, and common physical channels were updated to cover both TDD chip rate options.

Three physical channels were added to support the low chip rate TDD option. These are:

DwPCH (Downlink Pilot Channel), UpPCH (Uplink Pilot Channel) and FPACH (Fast Physical Access CHannel). Besides, two physical channels, Primary SCH and Secondary SCH, are not needed in low chip rate TDD option

In NBAP and RNSAP messages, the information elements referring to common physical channels had to be updated to cover both TDD chip rate options. For FPACH and DwPCH, new IEs had to be introduced.

### 3.1.6 RF Radio Transmission/ Reception, System Performance Requirements and Conformance Testing

- The different aspects of LCR TDD are as follows:
- UE radio transmission and reception
- BTS radio transmission and reception
- BTS Conformance testing
- BTS Electromagnetic compatibility
- Requirements for support of Radio Resource Management

### 3.1.7 Inter-working with GERAN

Although the handover and the Cell Selection / Reselection to the low chip rate TDD is very similar to the handover and the Cell Selection / Reselection to the UTRA TDD (3.84 Mcps), there are some differences, e.g. modification of the system broadcast and measurement report, which are described and clarified. Basically, most of them were originated from the differences of physical layer between low chip rate TDD and UTRA TDD (3.84 Mcps). This section describes the inter-working with GERAN.

The technical objective of this work item is to complete the GSM functionality handover and Cell Selection / Reselection to UTRA FDD and 3.84 Mcps TDD with the adaptations to the handover and Cell Selection / Reselection to the low chip rate UTRA TDD.

It includes the following work tasks:

- UE measurement report procedures
- System Broadcast
- Intersystem handover procedures

New specifications							
Spec No.	Title	Prime rsp. WG	2ndary rsp. WG(s)	Presented information at plenary#	for at	Approved at plenary#	Comments
Affected existing specifications							
Spec No.	CR	Subject			Approved at plenary#	Comments	
TS44.018		Radio Resource Control Protocoll			TSG-GERAN#2		
TS44.060		Radio Link Control / Medium Access Control Protocol			TSG-GERAN#2		
TS45.002		Multiplexing and multiple access on the radio path			TSG-GERAN#2		
TS45.008		Radio subsystem link control			TSG-GERAN#2		
TS48.008		MSC-BSS interface Layer 3 specification			TSG-GERAN#2		
TS48.058		BSC-BTS interface Layer 3 specification			TSG-GERAN#2		
TS24.008		Mobile radio interface Layer 3 specification; Core network protocols; Stage 3					

## 3.2 UTRA FDD Repeater Specification

**Acronym:** RInImp-REP

**UID:**

**Main responsibility:** RAN WG4

### References for WI " Rel-4 Improvements of Radio Interface "

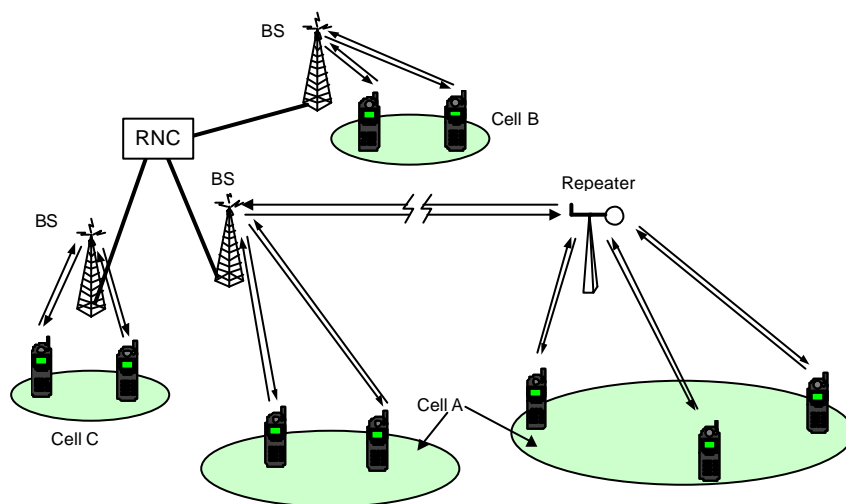
Document	Title/Contents
RAN_Work_Items_History	WI Sheet
R4-00012	Repeater Feasibility Study
<b>Impacted Specifications</b>	
TS 25.113	Base station and repeater electromagnetic compatibility (EMC)
<b>New Dedicated Specifications</b>	
TS 25.106	UTRA repeater radio transmission and reception
TS 25.143	UTRA repeater conformance testing

A repeater is a device that receives, amplifies and transmits the radiated or conducted RF carrier both in the downlink direction (from the base station to the mobile area) and in the uplink direction (from the mobile to the base station)

The repeater converts the signal down to IF (Intermediate Frequency), amplifies and filters it and converts it back to RF. The repeater doesn't process the signal in base band hence it cannot decode any information. For this reason, UTRA TDD repeaters have been considered out of scope. Without the information contained in the signalling the repeater cannot know when to transmit in each direction, uplink or downlink.

Repeaters have been used in 2G networks as a cost effective solution for extending coverage in sparsely populated areas or environments with particular propagation conditions such as buildings, tunnels, subways, stadiums, etc.

The following figure shows a simple schema of the use of a repeater.



**Use of a repeater**

In the frame of this work, two new specifications are produced. TS 25.106 contains a set of Radio requirements for repeaters, and TS 25.143 specifies how this requirements should be tested. The following requirements are specified in Rel-4:

- 1) Maximum output power. Difference between the actual power and the manufacturer's rated power. It has to be noted that 3GPP does not specify Maximum TX powers, this is a matter of national regulation.
- 2) Frequency stability. Frequency deviation of the output signal with respect to the input signal
- 3) Out of band gain. Undesired amplification of signals out of the operation band of the repeater.
- 4) Unwanted emissions. Two set of limits: Out of band emissions, for the frequencies immediately outside the operating band; and Spurious emissions, from 9 KHz to 12,75 GHz. For the latter, particular requirements are specified for the cases of co-existence with various technologies (GSM, UTRA TDD, ...)

- 5) Modulation accuracy. To ensure that the quality of the source signal is not degraded by the additional processing in the repeater. Two requirements, Error Vector Magnitude and Peak Code-Domain error
- 6) Input Intermodulation. The interference generated in the operating band in the repeater as a result of the presence of interfering signals on frequencies other than the operating band shall be less than a certain limit.
- 7) Output Intermodulation. Similar requirement as above, but in this case the interfering signals reach the repeater through the output port.

These requirements are roughly based on FDD Base Station requirements, only 3) and 7) address issues related to the operation of Repeaters. Notably, undesired interference or amplification in adjacent bands which might belong to a different network operator. Additional requirements are added in later Releases, as the particularities of operation of repeaters in a WCDMA network become evident.

The use of repeaters in the radio access is transparent to upper layers. However, there is an impact in the OTDOA method used in Location Services due to an increase in the path delay not originated by an increase in distance.

## 4 GSM-only new Features

### 4.1 700 MHz spectrum support

**Acronym:** 700SS  
**UID:** 2403  
**Main responsibility:** GP

**References for WI " 700 MHz spectrum support "**

Document	Title/Contents
GP-000449	WI Sheet
<b>Impacted Specifications</b>	
TS 51.010	Mobile Station (MS) conformance specification; Part 1: Conformance specification
TS 51.021	Base Station System (BSS) equipment specification; Radio aspects
TS 43.022	Functions related to Mobile Station (MS) in idle mode and group receive mode
TS 43.030	Radio network planning aspects
TS 44.018	Radio Resource Control (RRC) protocol
TS 24.008	Core network protocols; Stage 3
TS 45.001	Physical layer on the radio path; General description
TS 45.005	Radio transmission and reception
TS 45.008	Radio subsystem link control
<b>New Dedicated Specifications</b>	
	None

Contains:

2404	GERAN support for the 700 MHz band	GP-000450
2408	GERAN MS Conformance test for 700 MHz band	GP-000451
2410	GERAN BTS Conformance test for 700 MHz band	GP-000452

This feature provides GERAN system support for 700 MHz frequency band.

The commercial use of the 746-764 MHz and 776-794 MHz bands may be launched by US operators who have shown interest to provide GSM services on those new bands. In order to be one candidate technology to be used as a cellular service for those bands, the GSM specifications have been included the support of 700 MHz spectrum.

The band independent format of GSM specifications allows all GSM services to be deployed in the 700 MHz band. Service, MMI, Charging and Security aspects are as in GSM400/850/900/1800/1900 band. When considering the GSM for the 700 MHz band, potential extension on further frequency bands like 430-450 MHz, 698-746 MHz, 1710-1885 MHz, 2500-2690 MHz was considered, e.g. in the channel numbering.

## 5 Improvements of UMTS and GSM pre-Release 4 features

### 5.1 Multimedia Messaging Service

**Acronym:** MMS  
**UID:** 1818  
**Main responsibility:** T2

**References for WI " Multimedia Messaging Service "**

Document	Title/Contents
TP-000078	WI Sheet
<b>Impacted Specifications</b>	
TS 22.140 TS 23.140	Multimedia Messaging (MMS) stage 1 Multimedia Messaging (MMS) stage 2/3
<b>New Dedicated Specifications</b>	
	None

The Multimedia Messaging Service (MMS) was first introduced in Release 99. It allows users to send and receive messages exploiting a large array of media types e.g. text of almost unlimited length, images, audio and video clips, while also making it possible to support new content types as they become popular. Multiple media elements can be combined into a composite single message. Messages can be sent either to a mobile phone or to an e-mail address.

The main new network element of the Multimedia Message Service Environment (MMSE) is the MMS Relay/Server which is responsible for storage and handling of incoming and outgoing messages and for the transfer of messages between different messaging systems. Beside these tasks, the MMS Relay/Server has many other tasks which are described in TS 23.140. Other involved MMS elements are the MMS User Agent and MMS User databases. The functional descriptions of the involved MMS elements are provided in TS 23.140 and for implementation of the MMS User Agent – MMS Relay/Server interface a reference to the WAP Implementation of MMS is given. Whereas the Release 99 specifications only included the concept with little technical details, the Rel-4 document was enhanced significantly.

The following enhancements were introduced in Rel-4:

- The MMS Service Behaviour Description, the MMS Reference Architecture, the Multimedia Messaging framework, Application protocol framework and service primitives, and the Technical realisation of MMS service features were added.
- To enable interoperability of MMS between terminals and MMS network equipment of different manufacturers, the definition of a minimum set of mandatory media formats for the MMS User Agent was introduced. It included AMR for media type Audio, and Baseline JPEG for media type Image. The optional support of several more codecs is specified.
- The service behaviour description and the technical realization of Delivery-report and Read-reply report were introduced.
- Support for streaming in MMS was added.

- As implementation examples for the MM1 interface between MMS User Agent and MMS Relay/Server, WAP implementation and IP implementation of MMS were added as Annexes.
- Support for prepaid services in MMS was added.
- The reply-charging feature was added. This allows a user to take over the charge for the sending of a reply-MM to their submitted MM from the recipient(s). The originating MMS User Agent may define a reply-charging limitation request (e.g. may specify the latest time of submission of the reply-MMs or a maximum size of reply-MMs).
- Support of address hiding was added.
- The interworking with external servers (in particular IP-based) was further defined. An annex was added giving guidance on MM3 principles.
- The addressing scheme was further elaborated.
- The ability of forwarding MMs without prior download was inserted.
- MM7: MMS Relay/Server – MMS VAS Applications was added to the reference architecture. (Please note that a detailed stage 2 and stage 3 description was added in Rel-5)
- An example of Integration with Unified Messaging System (UMS) was added as an annex.
- Charging enhancements: An annex was added describing information of MMs/abstract messages which may be required for inclusion into Call Data Records (CDRs) for MMS for the purpose of Billing and Traceability.
- The support of SMS over MMS was added. For this the encapsulation of a short message (SMS) in a multimedia message (MMS) was specified.
- Handling of MMS-related information on the USIM was specified.

## 5.2 MExE enhancements Rel-4

**Acronym:** MExE  
**UID:** 1445  
**Main responsibility:** T2

**References for WI " MExE enhancements Rel-4 "**

<b>Document</b>	<b>Title/Contents</b>
TP-030052	WI Sheet
<b>Impacted Specifications</b>	
TS 22.057	Mobile Execution Environment stage 1
TS 23.057	Mobile Execution Environment stage 2
<b>New Dedicated Specifications</b>	
	None

The work item MExE enhancements Rel-4 consists of two Building Blocks (BB):

- MExE Rel-4 Improvements and Investigations: Under this BB, several enhancements were introduced in Rel-4 of which the most significant are mentioned in the MExE description below
- MExE Security Analysis Activity: This BB was suggested to carry out an analysis of the MExE security framework and evaluate if it is sufficient to eliminate the risks posed by downloading content and applications. This analysis was performed by SA WG3 (Security) in co-operation with T2-MExE group.

MExE is a feature introduced in GSM Release 98, enhanced in GSM Release 99 to cover the following additional enhancements: SIM MExE certificate management, security clarifications and QoS aspects. Release 4 introduced further enhancements of which the most significant was the introduction of a new small footprint Java classmark (Classmark 3).

MExE provides a standardised execution environment in an MS, and an ability to negotiate its supported capabilities with a MExE service provider, allowing applications to be developed independently of any MS platform. The MS can then be targeted at a range of implementations for MExE from small devices with low bandwidth, limited displays, low processor speeds, limited memory, MMI etc., to sophisticated with a complete MExE execution environment.

A standardised means of negotiating the MSs' and network's capabilities is supported. This negotiation permits the mutual exchange of capabilities between the MS and the MExE server, and possibly includes the service profile of the user and capabilities of the network.

A network can be a transport bearer for the negotiation, interaction and transferring of applications, applets and content with the MS. It does not have to be the provider of the MExE services with which the MS's execution environment is interacting with. The network may also be the intermediary between two MSs which are engaged in a MExE service with each other, with the network effectively supplying the "pipe" and not playing a MExE role in the connection. Network nodes, nodes external to the network, or even MSs are the entities which can interact with the MS's execution environment.

Central elements of the MExE specification are the classmark concept, content negotiation and the security architecture which are explained below.

MExE categorises devices by giving them different MExE classmarks. The following classmarks are defined in Rel-4 (in Rel-4 MExE classmark 3 was added):

- MExE classmark 1 - based on Wireless Application Protocol (WAP) - requires limited input and output facilities (e.g. as simple as a 3 lines by 15 characters display and a numeric keypad) on the client side, and is designed to provide quick and cheap information access even over narrow and slow data connections.
- MExE classmark 2 - based on Personal-Java - provides and utilises a run-time system requiring more processing, storage, display and network resources, but supports more powerful applications and more flexible MMIs. MExE Classmark 2 also includes support for MExE classmark 1 applications (via the WML browser.)
- MExE classmark 3 – based on J2ME CLDC and MIDP environment – supports Java applications running on resource-constrained devices. Classmark 3 MExE devices are based on the Connected Limited Device Configuration (CLDC) with the Mobile Information Device Profile (MIDP). Java 2 Micro Edition (J2ME) is a version of the Java 2 platform targeted at consumer electronics and embedded devices. CLDC consists of a virtual machine and a set of APIs suitable for providing tailored runtime environments. The J2ME CLDC is targeted at resource constrained connected devices (e.g. memory size, processor speed etc.)

Content negotiation allows for flexible choice of formats available from a server or adaptation of a service to the actual classmark of a specific client device. Bi-directional capability negotiation between the MExE Service Environment and MExE device (including MExE classmark), supports the transfer of capabilities between the client and the server.

In order to manage the MExE and prevent attack from unfriendly sources or transferred applications unintentionally damaging the MExE device a security architecture is specified. The basis of MExE security is:

- a framework of permissions which defines the permissions transferred MExE executables have within the MExE MS;
- the secure storage of these permissions and permission types);
- conditions within the execution environment that ensure that MExE executables can only perform actions for which they have permission.

The MExE permissions framework is as follows (there is no implied hierarchy):

- MExE Security Operator Domain (MExE executables authorised by the HPLMN operator);
- MExE Security Manufacturer Domain (MExE executables authorised by the terminal manufacturer);
- MExE Security Third Party Domain (trusted MExE executables authorised by trusted third parties);
- Support for the three domains is mandatory;

Untrusted MExE executables are not in a specific domain, and have very reduced privileges.

In Rel-4 several enhancements to the security framework have been introduced in particular enhancements related to the new MExE classmark 3 based on J2ME CLDC and MIDP.

Another enhancement in Rel-4 is the optional support of core software download. Core software download enables the UE radio, characteristics and properties to be updated by changing the software in the UE. E.g. a new codec may be loaded into a device, a new air interface, etc. Guidelines are introduced into the specification but the functionality is not specified in detail.

### 5.3 Advanced Speech Call Items enhancements\_REL-4

**Acronym:** ASCII  
**UID:** 2230  
**Main responsibility:** CN1

References for WI " Advanced Speech Call Items enhancements_REL-4 "	
Document	Title/Contents
NP-000730	WI Sheet on ASCII Release 4 enhancements
<b>Impacted Specifications</b>	
TS 43.068 TS 43.069 TS 44.068 TS 44.069 TS 24.008	Voice Group Call Service (VGCS); Stage 2 Voice Broadcast Service (VBS); Stage 2 Group Call Control (GCC) protocol Broadcast Call Control (BCC) protocol Mobile radio interface Layer 3 specification; Core network protocols; Stage 3
<b>New Dedicated Specifications</b>	
	None

High Speed Train Interoperability, were mainly European railways introduced GSM for Railways (GSM-R). Therefore some Release 4 enhancements of ASCII were required for proper operation (and also requested by the TSI, Technical Standards for Interoperability). Enhancements were the possibility to add operator-to-dispatcher information, definition of ASCII related event records, and introduction of VGCS/VBS ciphering. But mainly it was a workitem for maintenance of the ASCII feature.

### 5.4 UMTS QoS Architecture for PS Domain

**Acronym:** QoS  
**UID:** 2546  
**Main responsibility:** S2

References for WI " UMTS QoS Architecture for PS Domain "	
Document	Title/Contents
SP-010342	WI Sheet
<b>Impacted Specifications</b>	
TS 2x.xxx	Example
<b>New Dedicated Specifications</b>	
	None



Contains:

2548	Architecture	S2		
2550	Charging and OAM&P for QoS Management	S5	QoS-SPS-OAM	SP-010461
1681	RAB Quality of Service (re)Negotiation over Iu	R3	QoS-SPS-MAPEND-RABQoS	RAN_Wis
1553	GERAN QoS Aspects - Handovers: maintenance of real-time QoS while moving between cells in the PLMN including inter-SGSN and SRNS relocation or possibly other mechanisms	GP	GERQoS	GP-010431
50010	GERAN MS Conformance test for inter-system and intra-system Packet data real-time Handover	"G4,R3"	GERQoS-Mstest	GP-012287
1685	PS-domain handover for real-time services	R3	QoS-SPS-PSdoRTS	RAN_Wis
2554	RAB QoS Renegotiation at Relocation	R3		

#### 5.4.1 RAB Quality of Service Negotiation over Iu

WID in RP-000499

Affected RAN3 spec: TS25.413

In Release 99, UTRAN can only accept or reject a radio access bearer request from the core network. For services that could accept looser QoS requirements than those requested by the CN in the RAB establishment request there exist no means for UTRAN to propose alternative (looser) QoS. For such services the RAB establishment will fail, or alternatively the CN could re-attempt the RAB reestablishment with looser QoS requirements which would significantly increase the setup time.

In Release 4 the Radio Access Bearer setup is enhanced with a QoS negotiation mechanism. This aligns the procedure with the already existing CN solution used in GPRS and it improves the service setup time.

#### 5.4.2 RAB Quality of Service Renegotiation over Iu

WID in RP-000500

Affected RAN3 spec: TS25.413

New dedicated TR: 25.851 (RAB Quality of service negotiation over Iu)

Release 99 also does not allow the UTRAN to renegotiate RAB/QoS parameters for on-going calls/session. Since the UTRAN is responsible for managing the radio resources, it was seen necessary that the UTRAN is able to initiate RAB renegotiation for efficient use of the radio interface.

In Release 4 the management of Radio Access Bearers for on-going calls/session was enhanced such that QoS parameters can be renegotiated by the UTRAN

The intention is also to allow continuation of service through UTRAN initiated QoS renegotiation

#### 5.4.3 RAB Quality of Service Negotiation over Iu during Relocation

WID in RP-010168

Affected RAN3 spec: TS 25.413

In Release 99 no means exists for the UTRAN to propose an alternative QoS for services that could accept looser QoS requirements than those requested by the CN in the relocation request.

In Release 4 the relocation is enhanced such that QoS parameters can be negotiated by the UTRAN during relocation.

#### 5.4.4 PS-Domain handover for real-time services

WID in RP-000127

Affected RAN3 spec: 25.413

New dedicated TR: 25.936 (PS-Domain handover for real-time services)

In Release 99, Relocation for services from PS domain is only optimised for non-real-time services. The R99 mechanism was originally designed for non-real-time services. The principle is that the N-PDUs are forwarded from the source RNC buffers to the target RNC. Data buffering is not adapted to real-time services, and means that interruption may exceed the requirement for real-time services.

In Release 4 the relocation is optimised by utilising a N-PDU duplication mechanism in the RNC/BSS and the execution of relocation is performed after relocation resource allocation.

## 5.5 Rel-4 Evolutions of the transport in the CN

**Acronym:** CNTRSP  
**UID:** 400004  
**Main responsibility:** CN4

**References for WI " Rel-4 Evolutions of the transport in the CN "**

<b>Document</b>	<b>Title/Contents</b>
NP-000746	#7 Signalling over IP in Core Network
<b>Impacted Specifications</b>	
TS 29.002	Mobile Application Part (MAP) specification
TS 29.078	CAMEL Application Part (CAP) specification
TS 29.018	Gs interface layer 3 specification (BSSAP+)
TS 29.016	Gs interface Layer 2 specification
<b>New Dedicated Specifications</b>	
	None

IP plays a significant role in UMTS according to the actual trend towards IP capable backbone networks. CN is working on specifications to introduce IP based transmission in a Bearer Independent Core Network, therefore the option to transfer #7 signalling (e.g. MAP, CAP, BSSAP+) over IP should be considered.

Within IETF there is currently a group, SIGTRAN, working out Internet Drafts for that. The architecture defined by SIGTRAN (RFC 2719) consist of a modular extensible structure with a common reliable transport protocol SCTP (RFC 2960). SCTP (Stream Control Transmission Protocol) is an application level datagram transfer protocol operating on top of IP. In order to access SCTP an adaptation module has been defined between the SCN (Switched Circuit Network) signalling system being carried and SCTP. The adaptation module allows keeping the signalling protocol unchanged. Functionality To introduce in the relevant Core Network Technical Specifications for Release 4 the option to allow the transfer of #7 signalling (e.g. MAP, CAP, BSSAP+) over IP according to the architecture defined by SIGTRAN (RFC 2719) with the SCTP layer (RFC 2960) and the appropriate adaptation layer. Impacts to the higher layer protocols TC and MAP should be avoided.

## 5.6 Rel-4 Emergency call enhancements

**Acronym:** EMC1  
**UID:** 401652, 1654  
**Main responsibility:** N1

**References for WI " Rel-4 Emergency call enhancements "**

Document	Title/Contents
NP-010136	CS based Emergency Call Enhancements in Rel-4
<b>Impacted Specifications</b>	
TS 24.008	Mobile radio interface Layer 3 specification; Core network protocols; Stage 3
<b>New Dedicated Specifications</b>	
	None

Emergency calls over the CS domain has been integrated into the system as a mandatory feature from the beginning of GSM. This workitem enhances the possibilities to establish an emergency speech call to the serving network. Emergency calls should be routed to the emergency services in accordance with the new national regulations, which should be based upon one or more default numbers stored in the ME and/or USIM. And it should be allowed to establish an emergency call without the need to dial a dedicated number, in order to avoid the mis-connection in a roaming case. That could be by means such as menu, or a linkage to a car air bag control. This functionality is also supported by the UE without a SIM/USIM being present, and no other type than Emergency calls is accepted without a SIM/USIM.

Emergency calls was intended to work in the CS and the PS domain, but the packet emergency calls was not implemented in Rel-4 and became a workitem for Rel-5 where that part was enhanced to include IMS.

## 5.7 Rel-4 Terminal interfaces

The Feature Rel-4 Terminal Interfaces consists of the following three Building Blocks (BB) which are described in the following sections:

- AT commands enhancements
- Wide Area Data Synchronization
- Terminal local model

### 5.7.1 AT-commands enhancements

**Acronym:** TI-ATC  
**UID:** 1827  
**Main responsibility:** T2

**References for WI " AT commands enhancements "**

Document	Title/Contents
<b>Impacted Specifications</b>	
TS 27.007	AT command set for User Equipment (UE)
<b>New Dedicated Specifications</b>	
	None

TS 27.007 specifies a profile of AT commands and recommends that this profile be used for controlling ME functions and GSM network services from a TE through Terminal Adaptor (TA). The command prefix +C is reserved for Digital Cellular in ITU-T Recommendation V.25ter. This TS has also the syntax details used to construct these extended GSM commands. Commands from ITU-T Recommendation V.25ter and existing digital cellular standards (TIA IS-99 and TIA IS-135) are used whenever applicable. Some of the new commands are defined such way that they can be easily applied to ME of networks other than GSM.

This work item is about AT<sup>4</sup> commands for control of 3GPP Mobile Equipments (MEs) via an external Terminal Equipment (TE), fully compatible with GSM AT commands.

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<sup>4</sup> AT: ATtention; this two character abbreviation is always used to start a command line to be sent from TE to TA. TE is the Terminal Equipment, e.g. a computer (equal to DTE; Data Terminal Equipment), TA is Terminal Adaptor, e.g. a GSM data card (equal to DCE; Data Circuit terminating Equipment)

Several new AT commands have been added in Release 4 related to ASCI<sup>5</sup> services:

- Introduction of a new AT command +CUUS1 to manage User-to-User Information element
- Indication of priority and/or sub-address in the unsolicited result code CCWA
- eMLPP SIM Commands
- VBS, VGCS SIM Commands
- Extension of dial command for VBS and VGCS
- Introduction of a new AT command +COTDI to manage Originator-to-dispatcher information element

## 5.7.2 Wide Area Data Synchronisation

**Acronym:** TI-WADS  
**UID:** 1829  
**Main responsibility:** T2

**References for WI " Wide Area Data Synchronisation "**

Document	Title/Contents
<b>Impacted Specifications</b>	
TR 27.903	Discussion of synchronisation standards
TS 27.103	Wide Area Network Synchronisation
<b>New Dedicated Specifications</b>	
	None

In Release 99, the concept of Wide Area Synchronisation for 3GPP has been developed to allow data stored in the ME/USIM to be synchronised with the outside world. In Rel-4, SyncML was introduced as the preferred synchronisation mechanism replacing IrMC level 4.

TR 27.903 provides information on existing synchronisation protocols. It summarises proprietary and standard protocols relevant to current and future mobile communication devices. The document covers only synchronisation between end-user devices, desktop applications, and server-based information services. It does not refer to replication or synchronisation between enterprise databases.

This specification provides a definition of a Wide Area Synchronisation protocols. The synchronization protocol was originally based upon IrMC level 4 in Release 99 which was replaced by SyncML in Rel-4. The document covers Wide Area Network Synchronisation between current and future mobile communication end-user devices, desktop applications and server-based information servers.

SyncML is an XML-based specification for data synchronization. It accommodates not only traditional local synchronization but also the special requirements associated with remote synchronization in wide-area wireless environments with intermittent connectivity. SyncML is based on a client-server model. SyncML specifications consist of three major components: representation protocol, synchronization protocol, and transport bindings. The Representation protocol defines XML-based messages for synchronization, whereas the Synchronization protocol defines synchronization in the form of message sequence charts. The Transport binding specification defines a mechanism to carry synchronization messages over different transport mechanisms.

## 5.7.3 Terminal Local Model

**Acronym:** TLM  
**UID:** 1832

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<sup>5</sup> ASCI: Advanced Speech Call Items, including Voice Group Call Service (VGCS), Voice Broadcast Service (VBS) and Enhanced Multi-Level Precedence and Pre-emption Service (eMLPP)

**Main responsibility:** T2

**References for WI "Terminal Local Model"**

Document	Title/Contents
TP-000080	WI Sheet
<b>Impacted Specifications</b>	
TS 23.227	Application and User interaction in the UE - Principles and specific requirements
<b>New Dedicated Specifications</b>	
	None

The rapid development of a diversity of new applications and application environments for mobile usage creates a complexity of previously unseen proportions that the Mobile Equipment has to handle. Since we are allowing third party software to run in various parts of the UE it was felt that there is the need for a general framework to ensure that the APIs we create for the different UE-based toolkits work in harmony with each other.

The work item introduces a generic model approach for the UE environment; the purpose is *not* to categorise the applications peripherals, but to try to structure the events that are internal and external to, and has to be handled by, the MT Core Functions. This means that the structure or grouping of the events should be made from a *MT centric* perspective. Some applications run on the UE side have counterparts in the network. The present document does not address the functions in the network.

Under this work item the principles were defined for scheduling resources between applications in different application execution environment (e.g. MExE, USAT etc.) and internal and external peripherals (e.g. infra-red, Bluetooth, USIM, radio interface, MMI, memory etc.).

## 5.8 Rel-4 Location Services enhancements

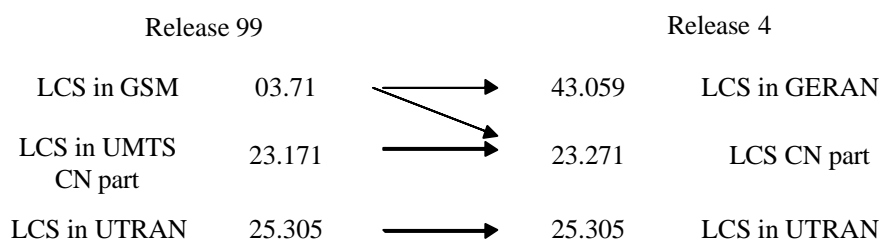
### 5.8.1 General aspects

**Acronym:** LCS1  
**UID:** 401536  
**Main responsibility:** S2

**References for WI " Rel-4 Location Services enhancements "**

Document	Title/Contents
SP-010518	WI Sheet
<b>Impacted Specifications</b>	
TS 25.305	LCS Stage 2 (UTRAN part)
<b>New Dedicated Specifications</b>	
TS 23.271	LCS Stage 2 (CN part)
TS 43.059	LCS Stage 2 (GERAN part)

Between Rel99 LCS and Releases 4 LCS, the main difference concerns documentation. The Stage 2 documents are restructured, as shown in the figure below.



Restructuring of LCS Stage 2 between Release 99 and Release 4

Release 99 and Release 4 are practically identical. The main difference is the support of OTDOA method in LCR TDD (see description of corresponding feature) mode only starting from Release 4. Also in Rel 4, the "Deferred Location Request" is introduced: in response to this request, the location is provided to the LCS client as soon as the target mobile becomes reachable again. Differed answers triggered by other types of events are considered, but will not be standardised before Release 6. Lastly, new OSA (Application Programming Interface for Open Access Service) APIs are defined for the LCS.

## 5.8.2 Iub/Iur interfaces for UE positioning methods supported on the radio interface Release 99

**Acronym:** LCS1-UEpos-IubIur  
**UID:** 1601  
**Main responsibility:** R3

### References for WI " Iub/Iur interfaces for UE positioning methods supported on the radio interface Release 99 "

Document	Title/Contents
RP-000509	WI Sheet on "Iub/Iur interfaces for methods Rel 99"
<b>Impacted Specifications</b>	
TS 25.401	UTRAN Overall Description
TS 25.420	UTRAN Iur Interface: General Aspects and Principles
TS 25.423	UTRAN Iur Interface RNSAP Signalling
TS 25.430	UTRAN Iub Interface: General Aspects and Principles
TS 25.433	UTRAN Iub Interface NBAP Signalling
<b>New Dedicated Specifications</b>	
TR 25.850	UE positioning in UTRAN Iub/Iur protocol aspects

Several methods for UE positioning are supported on the radio interface in Release 99:

- cell coverage based positioning method;
- OTDOA method with network configurable idle periods and
- network assisted GPS method.

Nevertheless, only the cell coverage based positioning method is supported on the Iub and Iur interface of Release 99.

In Release 4 the necessary support for the positioning methods defined for Release 99 were added to the Iub and Iur protocols, hence the discrepancy between the name of this functionality and the Release to which it applies.

## 5.9 Rel-4 UICC/(U)SIM enhancements and interworking

**Acronym:** UICC1  
**UID:** 401560  
**Main responsibility:** T3

### References for WI " Rel-4 UICC/(U)SIM enhancements and interworking "

Document	Title/Contents
TP-040116	WID on "Addition of CPHS features", WID on "Enhancements to 03.48",
<b>Impacted Specifications</b>	
TS 22.101 TS 31.102 TS 51.011	
<b>New Dedicated Specifications</b>	
	None

Addition of CPHS features:

The Common PCN (Personal Communication Network) Handset Specification (CPHS), defines additional terminal and SIM functionality to the standard GSM specifications. The additional functionality enhances the

services offered to the subscriber and includes features to both terminal and SIM. Several handset manufacturers have implemented the features; however, they remain outside the core GSM specifications. Since these features have proved useful, it is proposed to standardise them in 3GPP Rel-4.

- To provide the USIM with CPHS functionality for operator name display: File EF<sub>PNN</sub>(PLMN Network Name) is added to reflect the CPHS file EF<sub>OpName</sub> (PLMN Operator Name)-
- Addition of a Service to indicate support for the EF<sub>OPL</sub> (Operator PLMN List): File EF<sub>OPL</sub> (Operator PLMN List) is added to indicate for which Location Area Identities a required network name is to be displayed-
- To provide the USIM with CPHS functionality, requirements for Storage of mailbox number and Message waiting indicator are added (TS 22.101). A specific example of Service Dialling Numbers is the storage of mailbox dialling numbers on the SIM/USIM for access to mailboxes associated with Voicemail, Fax, Electronic Mail and Other messages.-
- A short message may be used to provide and indication to the user about the status and number of types of messages waiting on systems connected to the PLMN. The ME shall present this indication as an icon on the screen, or other MMI indication, and store the indication status on the SIM/USIM to allow the status to be retained through power off/on, SIM/USIM movement between UEs etc.
- The ME shall be able to accept and acknowledge these message waiting status short messages irrespective of the memory available in the SIM/USIM.

WID on "Report on SIM/USIM interoperation" was approved for Release 4 and TR 31.900 was created, but withdrawn in TP#16 plenary meeting. Only Rel-5 TR 31.900 remains valid.

#### Enhancements to 03.48

GSM 03.48 changed to TS 43.048. The contents of TS 43.048 v4.0.0 was identical to GSM 03.48 v8.4.0 TS 43.048 was withdrawn at TP-12 and was replaced by TS 23.048 "Security Mechanisms for the (U)SIM application toolkit in Rel-4" which contains following enhancements versus Release 99 specification:

- USIM input and output commands for RFM (Remote File Management)
- Clarification on computation of DES (Data Encryption Standard) in CBC (Cipher Block Chaining) mode
- Clarifications on Access Domain Parameter

To meet the requirements in Rel-4, the storage of MMS related information in several elementary files on the SIM is introduced retroactively (affected specifications are TS 51.011 and TS 31.102).

## 5.10 Rel-4 (U)SIM toolkit enhancements

**Acronym:** USAT1  
**UID:** 401800  
**Main responsibility:** T3

**References for WI " Rel-4 (U)SIM toolkit enhancements "**

Document	Title/Contents
not needed	WI Sheet
<b>Impacted Specifications</b>	
TS 31.111 TS 51.014	
<b>New Dedicated Specifications</b>	
	None

USAT LOCAL LINK : "Use of local link (RS232, Bluetooth, USB, Irda) as a bearer for USAT (Universal SIM Application Toolkit)"This work extends the existing bearer independent functionality and allows a (U)SAT application to communicate with local devices using the local connectivity capabilities of the terminal.

For applications dedicated to third party equipment, the knowledge of the bcal environment (attached devices) is useful. So it is also proposed to have a way for the (U)SAT to get the local connection status, independent of the type of link.

Some applications may require a secure link. Security facilities offered by the bearer may be used, and if necessary an upper security layer could be defined. For example, an implementation of security mechanisms specified in GSM 03.48 for bearer independent channels, could be considered (the specification is later replaced by TS 23.048 "Security Mechanisms for the (U)SIM application toolkit in Rel-4").

## 5.11 Rel-4 Security enhancements [section not stable]

**Acronym:** SEC1  
**UID:** 401571  
**Main responsibility:** SA3

### References for WI " Rel-4 Security enhancements "

Document	Title/Contents
SP-000421	WI Sheet containing: S3-000488: UE triggered authentication during connections S3-000490: Enhanced home control of security by HE S3-000599: USIM toolkit security S3-000609: Location services security S3-000610: VHE security S3-000611: Study on network-based denial of services attacks
<b>Impacted Specifications</b>	
TS 33.102 TS 22.022 TS 33.107	Security architecture Personalisation of ME LI architecture
<b>New Dedicated Specifications</b>	
TS 21.133 TS 33.200 TR 33.909	Threats and requirements MAP Application Layer Security An Example Algorithm for the 3GPP Authentication and Key Generation Functions

To be written by Maurice.

Indicative contact: Peter.Howard@vodafone.com

Contains:

1587	Evolution of GSM CS algorithms (e.g. A5/3 development and deployment)	S3	SEC1-CSALGO1	SP-000306	Algorithm development go-ahead at SA3#21. Scheduled for completion in August 2002?. Approved SA#17. DELETE ENTRY FROM REL-4?
1588	Evolution of GSM PS algorithms (e.g. GEA 2 deployment)	S3	SEC1-PSALGO1	SP-000307	A5/3 development will consider new GEA algorithm based on Kasumi.
401583	MAP application layer security	S3	SEC1-MAPAL		"TO DELETE: REPLACED BY NDS-MAP and NDS-IP. TO BE DELETED, but replacement NDS-MAP w as missing. Completed Auto Key Management -> Rel-6"

## 6 Improvements of UMTS-only pre-Release 4 features

### 6.1 Rel-4 Evolutions of the transport in the UTRAN

**Acronym:** ETRAN  
**UID:** 400002  
**Main responsibility:** RAN



## 6.1.1 QoS optimization for AAL type 2 connections over Iub and Iur interfaces

### References for WI " QoS optimization for AAL type 2 connections over Iub and Iur interfaces "

Document	Title/Contents
RP-010146	Final Status Report
RP-000188	WID: QoS optimization for AAL type 2 connections over Iub and Iur interfaces
<b>Impacted Specifications</b>	
TS 25.414	UTRAN Iu interface: data transport & transport signalling
TS 25.415	UTRAN Iu interface: user plane protocols
TS 25.420	UTRAN Iur interface: general aspects and principles
TS 25.424	UTRAN Iur interface: data transport & transport signalling for common transport channel data streams
TS 25.425	UTRAN Iur interface: user plane protocols for common transport channel data streams
TS 25.426	UTRAN Iur and Iub interfaces: data transport & transport signalling for DCH data streams
TS 25.430	UTRAN Iub interface: general aspects and principles
TS 25.434	UTRAN Iub interface: data transport & transport signalling for common transport channel data streams
TR 25.931	UTRAN functions, examples on signalling procedures
<b>New Dedicated Specifications</b>	
TR 25.934	QoS optimization for AAL type 2 connections over Iub and Iur interfaces

In Release 99, traffic like compressed voice (AAL type 2 connection) and data (AAL type 2 connection) is accommodated in common underlying Virtual Circuits for AAL type 2 connections as real time traffic over Iub and Iur interfaces. This is done to ease management of Connection Frame Number (CFN) allocation to downlink data frames or scheduling at the Serving RNC (SRNC). In addition to that, in sections with AAL type 2 switches, ITU Recommendations I.363.2 and Q.2630.1, which are referred to in Release 99, have no capability to prioritise real time traffic like compressed voice or non-real time traffic like data. In general, this requires much higher capacity for underlying Virtual Circuits for AAL type 2 connections to meet the delay requirements for real time traffic like compressed voice, especially in case of a real time traffic data frame (smaller) immediately after a non-real time traffic data frame (much bigger). However, higher capacity for underlying Virtual Circuits for AAL type 2 connections over the Iub interface impacts very much on initial and running costs of the Iub interface which usually consists of a leased line.

In Release-4 "QoS optimization for AAL type 2 connections over Iub and Iur interfaces" (ETRAN-QoSAAAL2) introduces the capability to optimise the bandwidth of underlying Virtual Circuits for AAL type 2 connections over Iub and Iur interfaces in addition to the scheduling capability at SRNC, by introducing a Path type capability as introduced in ITU Recommendation Q.2630.2

## 6.1.2 Transport bearer modification procedure on Iub, Iur, and Iu

**References for WI " Transport bearer modification procedure on lub, lur, and lu "**

Document	Title/Contents
RP-010148	Final Status Report
RP-000446	WID: Transport bearer modification procedure on lub, lur, and lu (originally Migration to Modification procedure
<b>Impacted Specifications</b>	
TS 25.410	UTRAN lu interface: data transport & transport signalling
TS25.413	UTRAN lu interface: user plane protocols
TS 25.414	UTRAN lur interface: general aspects and principles
TS 25.420	UTRAN lur interface: data transport & transport signalling for common transport channel data streams
TS 25.424	UTRAN lur interface: user plane protocols for common transport channel data streams
TS 25.426	UTRAN lur and lub interfaces: data transport & transport signalling for DCH data streams
TS 25.430	UTRAN lub interface: general aspects and principles
TS 25.434	UTRAN lub interface: data transport & transport signalling for common transport channel data streams
TR 25.931	UTRAN functions, examples on signalling procedures
<b>New Dedicated Specifications</b>	
TR 25.954	Transport bearer modification procedure on lub, lur, and lu

In Release 99, a radio access bearer can be modified by establishing a new bearer and releasing the old one. This is not very efficient, but no modification message exists.

In Release 4 a modification procedure is introduced that optimises bandwidth and the required number of signalling messages and is functionally less complex in that a transport channel no longer needs to be moved from one transport bearer to another.

## 6.2 Rel-4 Improvements of Radio Interface [section not stable]

**Acronym:** RInImp  
**UID:** 401216  
**Main responsibility:** RAN1

**References for WI " Rel-4 Improvements of Radio Interface "**

Document	Title/Contents
RAN Wis	WI Sheet
<b>Impacted Specifications</b>	
TS 2x.xxx	Example
<b>New Dedicated Specifications</b>	
	None

Contains:

1509	Handled elsewhere as feature in 2.2.2	R4	RInImp-REP
1994	DSCH power control improvement in soft handover check with Tsukasa	R1	RInImp-DSCHsho
1996	Not Rel 4	R4	RInImp-UMTS18
2467	Not Rel 4	R4	RInImp-UMTS19
1219	FS on High Speed downlink packet access	R2	RInImp-HSDPA
1510	FS on improved common DL channel for Cell-FACH state	R2	RInImp-DLCFACH

## 6.3 Rel-4 RAN improvements

**Acronym:** RANimp  
**UID:** 400009  
**Main responsibility:** RAN

This feature contains two independent items described in the next two sections.

### 6.3.1 Node B synchronisation for TDD [section not stable]

**Acronym:** RANimp-NBsync  
**UID:** 655  
**Main responsibility:** RAN1

#### References for WI " Node B synchronisation for TDD "

Document	Title/Contents
RAN_Work_Items_History	WI Sheet
<b>Impacted Specifications/ TRs</b>	
<b>New Dedicated Specifications</b>	

### 6.3.2 Radio Access Bearer Support Enhancements for Rel-4

655	Node B synchronisation for TDD	R1	RANimp-NBsync
2206	RAB support enhancement for Rel-4 below	R2	RANimp-RABSE

**Acronym:** RANimp-RABSE  
**UID:** 2206  
**Main responsibility:** RAN2

#### References for WI " Radio Access Bearer Support Enhancements for Rel-4"

Document	Title/Contents
RAN_Work_Items_History	WI Sheet
<b>Impacted Specifications/ TRs</b>	
TS 25.331 TS 25.323 TR 25.844 Release 4	Radio Resource Control (RRC); Protocol Specification Packet Data Convergence Protocol (PDCP) Specification Radio Access Bearer Bearer Support Enhancements
<b>New Dedicated Specifications</b>	
-	None

Under the Release 4, the RObust Header Compression functionality (ROHC) was introduced within this Work Item. Its benefit is an important reduction in header overhead, simply because the fields of the headers of IP packets are either constant or changing in a known pattern. Hence it is possible to send only information regarding the nature of the changing fields of those headers.

This leads to a reduction in the total size of header+payload, from 60 octets into 20 octets for some applications (e.g. IP based voice applications) and with IP version4, and from about 80 octets to 20 octets with IP version6. This translates directly into bandwidth efficiency.

The ROHC scheme is claimed to be more suited to cellular environment and changing links than the previous compression schemes.

The Robust Header compression protocol (RFC 3095) is included as a new functionality of the (already existing) Packet Data Convergence Protocol (PDCP), and this for the Release 4.

One of the use of ROHC is real-time IP services (over wireless links).

## 7 Improvements of GSM-only pre-Release 4 features

### 7.1 Gb over IP (GERAN improvements 1)

**Acronym:** GEIMP1  
**UID:** 2310 and 2311  
**Main responsibility:** GP

References for WI " GERAN improvements 1 (Gb over IP) "	
Document	Title/Contents
GP-000433	WI Sheet
GP-000434	Same as above [?]
Impacted Specifications	
TS 48.016	BSS Serving GPRS Support Node (SGSN) interface;
TS 48.018	Network Service Serving GPRS Support Node (SGSN); BSS GPRS Protocol (BSSGP)
New Dedicated Specifications	
	None

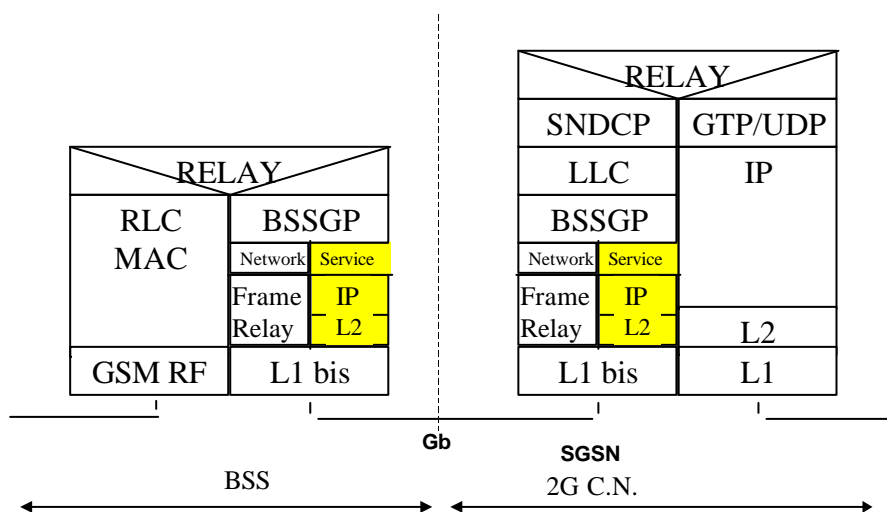
The evolution in data communication services leads to increased support for IP-based end-user services. The fixed infrastructure is in place to support the services via IP-based terrestrial networks; IP architecture and protocols support IP multimedia domain users.

In UMTS, the Core Network is based on different transport networks. One of the alternatives is IP based and also the Iu interface between 3G Core Network and Radio Access Networks is IP based.

This Work Item allows the Gb-interface to be configured to include IP based sub-network as an alternative sub-layer to existing Frame Relay sub-network. The IP sub-network will be the common sub-network between 2 / 3 G Core Networks and GSM/EDGE Radio Access Network (GERAN).

The user of the Network Service will experience one common Network Service independent of the utilised sub-network, see figure below.

### Gb interface - IP position



TS 48.016 specifies the Network Service used on the Base Station System (BSS) to Serving GPRS Support Node (SGSN) interface (Gb interface). The Network Service entity provides network services to the BSS GPRS Protocol (BSSGP) entity specified in TS 48.018. The required procedures between BSS and SGSN are defined in detail in TS 48.018.

## 7.2 Network Assisted Cell Change - NACC (GERAN improvements 2)

**Acronym:** GEIMP2  
**UID:** 2314 and 2316  
**Main responsibility:** GP

**References for WI " GERAN improvements 2 (NACC) "**

Document	Title/Contents
GP-012812	WI Sheet on Intra BSC NACC (Network Assisted Cell Change)
<b>Impacted Specifications</b>	
TS 04.18	Mobile radio interface layer 3 specification; Radio Resource Control Protocol.
TS 04.60	Mobile Station (MS) - Base Station System (BSS) interface; Radio Link Control/ Medium Access Control (RLC/MAC) protocol.
TS 05.08	Radio subsystem link control.
	<i>Non exhaustive</i>
<b>New Dedicated Specifications</b>	
	<i>None</i>

The purpose of this feature is to shorten the service outage time when the mobile station re-selects between GERAN cells (belonging to the same Base Station Controller, BSC). This improves (as it reduces) the interruption time (in GPRS data transfer). It is defined as mandatory for a Release 4 mobile station (supporting the General Packer Radio Service, GPRS).

In the original GPRS specifications, under some scenarios defined by some network settings (known as NC0 or NC1), the cell change was performed without notifying the network. For this, the mobile station had to acquire all the necessary information on the new cell, leading to an interruption in the session.

With this feature, the network assists the mobile station before and during the cell change. For this, the mobile informs the network of its wish to change cell. In turn, the network provides the mobile while on the old cell in a dedicated connection all the "System Information" that is needed for accessing the new cell. This is done in a much quicker way than acquiring information broadcast from the new cell and therefore the interruption to the session is considerably reduced. Note that while doing this the network may order the mobile to reselect to another cell than the one initially identified by the mobile.

This functionality is enhanced in the Release 5 of the specifications to assist in the cell reselection between two cells parented by different BSCs (external NACC).

## 7.3 Delayed TBF (GERAN improvements 4)

**Acronym:** GEIMP4  
**UID:** 2324 and 2325  
**Main responsibility:** GP

**References for WI " GERAN improvements 4 (Delayed TBF) "**

<b>Document</b>	<b>Title/Contents</b>
GP-010363	WI Sheet
<b>Impacted Specifications</b>	
TS 44.060	Mobile Station (MS) - Base Station System (BSS) interface; Radio Link Control/ Medium Access Control (RLC/MAC) protocol.
<b>New Dedicated Specifications</b>	
	None

GPRS RLC/MAC procedures were designed for non real-time data transfer where the data arrives as one large block. However, the true nature of packet traffic is usually different from this assumption. Typically there is a considerable amount of interactive message exchange between client and the server before the actual data transfer may begin and even during the data transfer. For example in the IMAP email protocol (commonly used to access mail server) the client generates a lot of requests to the server and typically the next request is sent only after receiving response for the previous request. This kind of a behaviour, which is common for many applications, leads to a high number of Temporary Block Flow (TBF) establishments and releases. The current procedures for establishment and releases were felt not sufficient; consequently, the resource utilization would be far from optimal, transmission delays unnecessary long and the load on the common control channels increased. This feature solves the problem of frequent TBF establishments and improve (E)GPRS Rel-4 performance by:

1. Enhancing the RLC/MAC behavior in case of typical IP applications (e.g. e-mail, HTTP, FTP);
2. Reducing the number of TBF establishments caused by interactive client-server message exchange; this would in turn reduce the delay in signalling and data transfer;
3. Reducing the load on common control channels.

The following Stage 3 changes were included in 44.060:

- Definition of enhanced countdown procedure
- Definition of enhanced TBF release procedure
- Definition of USF=FREE type polling mechanism on PDCH

## **8 Other aspects**

### **8.1 Rel-4 Charging and OAM&P [section not stable]**

**Acronym:** OAM  
**UID:** 401142  
**Main responsibility:** SA5

### References for WI " Rel-4 Charging and OAM&P "

Document	Title/Contents
SP-000524	SA5 proposed Work-Plan & Work Items for Release 4 (contains the following WIDs)
S5-000569	WID for Feature: UTRAN Operations and Maintenance procedures (UOAM)
S5-000570	WID for Feature: Charging and OAM&P (OAM)
S5-000571	WID for BB: Principles, high level Requirements and Architecture (OAM-AR)
S5-000572	WID for BB: Configuration Management (OAM-CM)
S5-000573	WID for BB: Fault Management (OAM-FM)
S5-000574	WID for BB: Performance Management (OAM-PM)
S5-000575	WID for BB: Charging Management (OAM-CH)
<b>Impacted Specifications</b>	
32.101	Telecommunication management; Principles and high level requirements
32.102	Telecommunication management; Architecture
	On Telecommunication management; Fault Management:
32.111-1	Part 1: 3G fault management requirements
32.111-2	Part 2: Alarm Integration Reference Point (IRP): Information Service (IS)
32.111-3	Part 3: Alarm IRP: Common Object Request Broker Architecture (CORBA) Solution Set (SS)
32.111-4	Part 4: Alarm IRP: Common Management Information Protocol (CMIP) Solution Set (SS)
<b>New Dedicated Specifications</b>	
<b>On Telecommunication management; Charging management</b>	
32.200	Charging principles
32.205	Charging data description for the Circuit Switched (CS) domain
32.215	Charging data description for the Packet Switched (PS) domain
32.235	Charging data description for application services
	On Telecommunication management; Configuration Management (CM);
32.300	Name convention for Managed Objects
32.301	Notification IRP: Requirements
32.302	Notification IRP: Information Service (IS)
32.303	Notification IRP: Common Object Request Broker Architecture (CORBA) Solution Set (SS)
32.304	Notification IRP: Common Management Information Protocol (CMIP) Solution Set (SS)
32.311	Telecommunication management; Generic IRP management; Requirements
32.312	Telecommunication management; Generic IRP management; Information Service (IS)
	On Telecommunication management; Performance Management (PM);
32.401	Concept and requirements
52.402	Performance measurements - GSM
32.403	Performance measurements - UMTS and combined UMTS/GSM
	On Telecommunication management; Configuration Management (CM):
32.600	Concept and high-level requirements
32.601	Basic CM IRP; Requirements
32.602	Basic CM IRP Information Service (SS)
32.603	Basic CM IRP Common Object Request Broker Architecture (CORBA) Solution Set (SS)
32.604	Basic CM IRP Common Management Information Protocol (CMIP) Solution Set (SS)
32.611	Bulk CM IRP Requirements
32.612	Bulk CM IRP Information Service (IS)
32.613	Bulk CM IRP: Common Object Request Broker Architecture (CORBA) Solution Set (SS)
32.614	Bulk CM IRP: Common Management Information Protocol (CMIP) Solution Set (SS)
32.615	Bulk CM IRP: eXtensible Markup Language (XML) file format definition
32.621	Generic network resources IRP; Requirements
32.623	Generic network resources IRP: Common Object Request Broker Architecture (CORBA) Solution Set (SS)
32.624	Generic network resources IRP: Common Management Information Protocol (CMIP) Solution Set (SS)
32.631	Core network resources IRP: Requirements
32.632	Core Network Resources IRP: Network Resource Model (NRM)
32.633	Core network resources IRP: Common Object Request Broker Architecture (CORBA) solution set
32.634	Core network resources IRP: Common Management Information Protocol (CMIP) solution set
32.641	UTRAN network resources IRP; Requirements
32.642	UTRAN network resources IRP: Network Resource Model (NRM)
32.643	UTRAN network resources IRP: Common Object Request Broker Architecture (CORBA) Solution Set (SS)
32.644	UTRAN network resources IRP: Common Management Information Protocol (CMIP) Solution Set (SS)
32.651	GERAN network resources IRP: Requirements
32.652	GERAN network resources IRP: Network Resource Model (NRM)
32.653	GERAN network resources IRP: Common Object Request Broker Architecture (CORBA) Solution Set (SS)
32.654	GERAN network resources IRP: Common Management Information Protocol (CMIP) Solution Set (SS)
32.800	Telecommunication management; Management level procedures and interaction with UTRAN

The objective of these features is to continue progressing the Charging and OAM&P framework to be followed by the 3G Telecom Management standardisation and met by all other subsequent specifications - to

be produced by all 3GPP TSGs (e.g. SA5, RAN O&M, GERAN O&M, etc. - pertinent to 3G Systems' Telecom Management).

<b>32.101 Telecommunication management; Principles and high level requirements</b>
Update and re-organisation of Functional Architecture
Introduction of Subscription Management and QoS Management Anne
<b>32.102 Telecommunication management; Architecture</b>
Add UMTS TMN conformance
Enhancements of the IRP Concept
Update of TM architectural aspects and compliance condition for a UMTS entity
Update and alignment of compliance conditions for UMTS Management Physical architectures
<b>32.2xy Charging management</b>
Addition of 'Inter-PLMN SGSN change' as partial output record trigger for G-CDR
Addition of CAMEL phase 3 extensions in SMS-MO CDR
Addition of inter-network accounting in the GMSC
Addition of CAMEL phase 3 extensions in SMS-MO CDR
Addition of "QoSRequested" parameter into "traffic volume containers"
Addition of SGSN's Mobile Country Code (MCC) and Mobile Network Code (MNC) on G-CDR
Specification of the "Data Record Format" and "Data Record Format Version"
Alignment with 23.060 by adding 'intra-SGSN intersystem change' as record closure criterion for S-CDR
Alignment on MMS charging scenarios with MMS CDR type definitions
Alignment of LCS charging

## 8.2 Rel-4 Open Service Access (OSA) improvements

**Acronym:** OSA1  
**UID:** 401142  
**Main responsibility:** CN5



## References for WI "OSA improvements"

Document	Title/Contents
<b>WIDs</b>	
SP-000216 (S1-000447)	WI on Scope of Open Interface for Service Provision in Release 2000 (SA1)
SP-000302	OSA security (SA3)
<b>Impacted Specifications</b>	
22.121	Service aspects; The Virtual Home Environment; Stage 1
23.127	Virtual Home Environment (VHE) / Open Service Access (OSA); Stage 2
29.198	Open Services Architecture API part 1 (R99 was split in Rel-4 in a multi-part TS, see below)
SA3 spec#	from Maurice
29.998	Open Services Architecture API part 2 (R99 was split in Rel-4 in a multi-part TS, see below)
<b>New Dedicated Specifications</b>	
22.127	Service Requirement for the Open Services Access (OSA); Stage 1
29.198-01	OSA API; Part 1: Overview
29.198-02	OSA API; Part 2: Common data
29.198-03	OSA API; Part 3: Framework
29.198-04	OSA API; Part 4: Call control
29.198-05	OSA API; Part 5: Generic user interaction
29.198-06	OSA API; Part 6: Mobility
29.198-07	OSA API; Part 7: Terminal capabilities
29.198-08	OSA API; Part 8: Data session control
29.198-11	OSA API; Part 11: Account management
29.198-12	OSA API; Part 12: Charging
29.998-01	OSA API Mapping for OSA; Part 1: General Issues on API Mapping
29.998-04-1	OSA API Mapping for OSA; Part 4: Call Control Service Mapping; Subpart 1: API to CAP Mapping
29.998-05-1	OSA API Mapping for OSA; Part 5: User Interaction Service Mapping; Subpart 1: API to CAP Mapping
29.998-05-4	OSA API Mapping for OSA; Part 5: User Interaction Service Mapping; Subpart 4: API to SMS Mapping
29.998-06	OSA API Mapping for OSA; Part 6: User Location and User Status Service Mapping to MAP
29.998-08	OSA API Mapping for OSA; Part 8: Data Session Control Service Mapping to CAP
SA3 spec#	[from Maurice]

Open Service Access (OSA) allows service development by operators and third parties.

OSA enables service application developers to make use of network functionality through open, standardised, secure, extensible and scalable interfaces. Applications see the network functionality offered to them as a set of Service Capability Features (SCFs) in the OSA APIs. These SCFs provide access to the network capabilities on which the application developers can rely when designing their applications. The OSA APIs are independent of where or which network capabilities are implemented in the network, and of vendor-specific solutions and programming languages.

This work (stage 1, 2 and 3 specifications) was done jointly with other fora (3GPP2, ETSI SPAN and Parlay), so that there is a single set of standard OSA APIs for the whole development community.

a) **Objective** of the Rel-4 work item is to enhance the OSA interface for the communication between Applications and Service Capability Features (SCF).

b) **Service Aspects**

The OSA API are independent of the 3GPP Rel-4 toolkits. The SCFs are summarised in the OSA set of specifications.

Rel-4 brings enhancements to the OSA interface based on the evolved network capabilities within the Core Networks. Examples of these are:

- Call Control (IP)  
This takes into account the ongoing development of the IP multimedia scenario and addresses the Call Control capabilities based on SIP and/or H.323.

- E-Commerce  
This takes into account the capabilities provided by the network to use the capabilities provided by the post processing of the charging capabilities (e.g. E-Pay). It also involves the enhancements of the security to be provided by the network and by the application.

## Enhancements to OSA Release 99

- **User Location**  
Further integration of the Location Services within the provisioning of geographical positioning information, taking into account the evolution of the 3G networks associated with this capability.
- **Terminal Capabilities**  
In Release 99, the mechanism to retrieve the terminal capabilities is only applicable to WAP phones. Rel-4 adds a mechanism that is applicable to all types of phones. Security mechanisms for the display of terminal capabilities information have been added.
- **Enhanced User Profile Management**  
The integration of the Personal Service Environment Management (PSEM) within the Network and Framework SCFs.
- **Enhanced Session Control**  
This provides the enhancements of the bearer manipulation and creation of bearers/sessions sessions (in particular negotiation of the QoS).

### c) **Charging Aspects** - the OSA API offer charging options to:

- Supervise user activities for online charging features;
- Allow applications to access the online account;
- Allow applications to add charging information to network based charging records;
- Inform applications on network based charging event.

### d) **Security Aspects**

The OSA API provide security facilities to guarantee secure access to user confidentially information. Sensitive information is prevented from unauthorised access.

### e) **Release 4 adds new/ enhances functionality and splits the R99 Stage 3 TS 29.198 into a multi-part TS. A similar split was applied to the R99 TR 29.998 on OSA API Mapping.**

Additions
a releaseInterface() method to IpAccess
Initial Load Notification report for Framework Integrity Management Load Notification model
missing inheritance in service agreement management interfaces
one additional error indication
P_INVALID_INTERFACE_TYPE exception to IpService.setCallback() and IpService.setCallbackWithSessionID()
support for multi-vendorship
of missing mandatory method (authenticationSucceeded) to sequence flow
of listInterfaces() method
of missing description of RouteErr()
of Support of National Numbering Plans
new method getNotifications to correct the result type of IpDataSessionControlManager.getNotification() to permit retrieval of all created notifications.
and use of new Service Instance ID
missing mobility exceptions
MPCC Originating and Terminating Call Leg STDs for IpCallLeg
sequence diagrams for MPCC services
Service Instance Lifecycle Management

TpOctet
Operation Set as part of General Service Properties
TpMediaType
errors in definition of (credit/debit)(Amoun/Unit)Err
behaviour when a call leg times out
Storing eventCriteria
Missing exceptions for enabling and changing the notifications
Missing TpCallAppInfoSet description
*Err methods to Fault management
Method balance on Fault management interfaces
Methods accepting an interface as a parameter need to be able to raise P_INVALID_INTERFACE_TYPE
OSA Framework - Generate statistics records on behalf of another entity using genFaultStatsRecordReq
<b>Removals</b>
distinction between final- and intermediate-report
Faulty state in MPCCS Call State Transition Diagram and method callFaultDetected in MPCCS in OSA R4
P_CHS_PARAM_RESULT value from the TpChargingParameterID type
P_SERVICE_ACCESS_TYPE
perception that the OSA API only uses CORBA for its transport mechanism
serviceID from queryAppLoadReq()
time based charging property

### 8.3 Miscellaneous UE Conformance Testing Activities

**Acronym:** MISTST1  
**UID:** 1861  
**Main responsibility:** T1

**References for WI " Miscellaneous UE Conformance Testing Activities "**

Document	Title/Contents
not needed	WI Sheet
<b>Impacted Specifications</b>	
TS 2x.xxx	Example
<b>New Dedicated Specifications</b>	
	None

Note: The testing of the Release 4 feature is just started at the time of publication of this document. A description will be added to this document when the work will progress. The structure of the testing documents is described in the document "Description of the Release 99".

### 8.4 Small Technical Enhancements and Improvements for Rel4

**Acronym:** TEI4  
**UID:** 1993  
**Main responsibility:** Generic

**References for WI " small Technical Enhancements and Improvements for Rel4 "**

Document	Title/Contents
SP-00xxxx	WI Sheet
<b>Impacted Specifications</b>	
TS 23.038	<ul style="list-style-type: none"> <li>• Automatic removal of 'read' SMS</li> <li>• Data coding scheme value for the Icelandic language</li> <li>• Message Waiting Indication Status storage on the USIM</li> </ul>
TS 23.040	<ul style="list-style-type: none"> <li>• Addition of numbering plan value for Service Centre Specific Addresses</li> <li>• SMS Address fields enhancements</li> <li>• User prompt indication</li> <li>• Predefined animations for EMS</li> </ul>
<b>New Dedicated Specifications</b>	
	None

This “Feature” was artificially created to be used as an umbrella for all the small technical corrections and improvements not justifying the creation of a dedicated Feature.

## 8.5 Global Text Telephony

**Acronym:** GTT  
**UID:** 1517  
**Main responsibility:** S2

**References for WI " Global Text Telephony "**

Document	Title/Contents
SP-010340	WI Sheet
<b>Impacted Specifications</b>	
TS 2x.xxx	Example
<b>New Dedicated Specifications</b>	
	None

This Release-independent Feature is described in the document “Description of the Release 5”.

## 8.6 “Hollow” features

These features were once defined by 3GPP, but no work was actually done.

### 8.6.1 Operator Determined Barring for Packet Oriented Services

**Acronym:** ODB  
**UID:** 2463  
**Main responsibility:** NP

WI Sheet in NP-010089, but no work was done on this feature.

### 8.6.2 Facsimile

**Acronym:** FAX-RT  
**UID:** 1340  
**Main responsibility:**

WI Sheet in SP-000169, but no work was done on this feature.