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Presentation of Specification to TSG T

Presentation to: TSG T Meeting #6

Document for presentation: 3G TR 21.904 UE Capability Requirements Version 1.1.0

Presented for: Information

Abstract of document:

The document defines a baseline set of capability requirements that enable all UEs to "register" with all applicable 3GPP networks (depending on the availability of a appropriate subscription). It describes all the functions that a UE has to perform in order to "exist" within a 3GPP network. Those functions are used to derive requirements for all aspects of UE baseline capability. The document also identifies different UE Service Capabilities and the functions that a UE must perform in order to access a service. The actual capabilities that a UE must possess to meet these requirements are identified in the report and in some instances listed in the Annexes.

Changes since last presentation to WG T Meeting # 5

The term "Mandatory" has been changed to "Essential" throughout the document. "Terminal" has been changed to "UE" throughout. Separate annexes have been created for all standardised services and the information therein updated according to liaison statements received from other working groups. Text has been added in section 7.1 on support of the default speech service and on Bearer services. Text has been added on support of Multimedia services in section 7.2.1.

Outstanding Issues:

Additional input is expected from other working groups to complete the annexes on service implementation capabilities. Additional input is encouraged from individual companies to annexes and to the body of the report.

Contentious Issues:

The contents of the UE Radio Capabilities report 25.926 will have a significant impact on the contents of TR 21.904.

Work Area / Item:		UE Capability Requirements			
Affects:	UE/MS: Yes	CN: No	UTRAN: No	Compatibility Issues: Yes:	No:
Expected Completion Date:		15 March '00			
Services impacted:		None			
Specifications affected:		3G TR 21.904, Completion of TS34.123-2 Mobile Station Conformance Specification, Part 2 ICS (Implementation Conformance Statement) may be affected.			
Tasks within work which are not complete:			More comprehensive requirements for Terminal Service Implementation Capability should be added. It includes those areas of - FAX - MeXE, AT command, MMS etc. - Security		
Consequences if not included in Release 1999:			Completion of TS34.123-2 Mobile Station Conformance Specification, Part 2 ICS (Implementation Conformance Statement) could be delayed.		
Accepted by TSG#		for late inclusion in Release 1999:			

3rd Generation Partnership Project (3GPP); Technical Specification Group (TSG) Terminals; UE Capability Requirements



Reference

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Foreword

This Technical Report has been produced by the 3rd Generation Partnership Project, Technical Specification Group UEs.

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

Version m.x.y

where:

m indicates [major version number]

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

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

Introduction

The 3GPP System consists of UEs and Network Infrastructure. The System is designed to support a wide variety of services and UE types. Due to this diversity of applications there are many options within the 3GPP specifications. The present document identifies the implementation requirements for the sub-set of options (referred to as **baseline capabilities**) that are required in 3GPP UEs to allow world-wide roaming of UEs within all 3GPP networks. The present document also identifies the implementation requirements for specific UE Service Capabilities, in order to help ensure end to end interworking for UEs claiming to support compatible services.

1 Scope

The present document defines a baseline set of capability requirements that enable all UEs to "register" with all applicable 3GPP networks (depending on the availability of a appropriate subscription). It describes all the functions that a UE has to perform in order to "exist" within a 3GPP network. These functions are used to derive requirements for all aspects of UE baseline capability. The present document also identifies different UE Service Capabilities and the functions that a UE must perform in order to access a service. The actual capabilities that a UE must possess to meet these requirements are identified in the report and in some instances listed in the Annexes to the present document, as well as being described in the referenced implementation specifications.

The present document introduces the concept of "**service-less UE**" which can exist in the network but provides no user service. Although this is not a marketable UE type it describes from the standardisation viewpoint a baseline set of capabilities to which specific service-related UE capabilities can then be added.

The present document should not be used as the sole basis for UE design, only as an informative indication of capabilities required to support a given functionality, and as a pointer to the location of text describing said functionality, in the core specifications.

UE capability requirements may include some regulatory requirements (mandatory requirements). However, it is not intended to identify them as such in this report. Some of the requirements identified in this document as essential, may therefore also be "mandatory" according to the definition of that term appearing herein.

2 References

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

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

- [1] 3G TS 25.304: "3GPP; UE Procedures in idle mode".
- [2] 3G TS 25.303: "3GPP; UE Functions and Inter-Layer Procedures in Connected Mode".
- [3] 3G TS 22.101: "3GPP; Service Principles".
- [4] 3G TS 22.100: "3GPP; UMTS Phase 1".
- [5] 3G TS 22.105: "3GPP; Services and Service Capabilities".
- [6] 3G TS 22.121: "3GPP; Virtual Home Environment".
- [7] 3G TS 22.129: "3GPP; Handover between UMTS and GSM or other Radio systems".
- [8] GSM 02.04: "Digital cellular telecommunications system (Phase2+); General on supplementary services".
- [9] GSM 02.81: "Digital cellular telecommunication system (Phase 2+); Line identification supplementary services - Stage 1".
- [10] GSM 02.82: "Digital cellular telecommunication system (Phase 2+); Call Forwarding (CF) supplementary services - Stage 1".
- [11] GSM 02.83: "Digital cellular telecommunication system (Phase 2+); Call Waiting (CW) and Call Hold (HOLD) supplementary services - Stage 1".
- [12] GSM 02.84: "Digital cellular telecommunication system (Phase 2+); MultiParty (MPTY) supplementary services - Stage 1".
- [13] GSM 02.85: "Digital cellular telecommunication system (Phase 2+); Closed User Group (CUG) supplementary services - Stage 1".
- [14] GSM 02.86: "Digital cellular telecommunication system (Phase 2+); Advice of Charge (AoC) supplementary services - Stage 1".
- [15] GSM 02.88: "Digital cellular telecommunication system (Phase 2+); Call Barring (CB) supplementary services - Stage 1".
- [16] GSM 02.91: "Digital cellular telecommunication system (Phase 2+); Explicit Call Transfer (ECT)".
- [17] 3G TS 24.008: "3GPP; Layer 3 specification".
- [18] 3G TR 21.910: "3GPP; Multi-system issues".
- [19] 3G TS 26.071: "3GPP; Mandatory Speech Codec speech processing functions AMR Speech Codec; General Description"
- [20] 3G TS 26.073: "3GPP; ANSI-C code for the Adaptive Multi Rate speech codec"

- [21] 3G TS 26.074: “3GPP; Mandatory Speech Codec speech processing functions; AMR Speech Codec Test Sequences”
- [22] 3G TS 26.071: “3GPP; Mandatory Speech Codec speech processing functions AMR speech codec; Transcoding functions”
- [23] 3G TS 26.0091: “3GPP; Mandatory Speech Codec speech processing functions AMR speech codec; Error concealment of lost frames”
- [24] 3G TS 26.093: “3GPP; Mandatory Speech Codec speech processing functions AMR Speech Codec; Source Controlled Rate operation”
- [25] 3G TS 26.071: “3GPP; Mandatory Speech Codec speech processing functions Voice Activity Detector (VAD)”
- [26] 3G TS 26.110 Codec for Circuit Switched Multimedia Telephony Service :“General Description;”
- [27] 3G TS 26.111 : “Modifications to H.324”
- [28] 3G TS 26.112 : “Call Set Up Requirements”
- [29] 3G TR 26.911 : “Terminal Implementor’s Guide”

3 Definitions, symbols and abbreviations

3.1 Definitions

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

Baseline capabilities: capabilities that are required for a service-less UE to operate within a network. The baseline capabilities for a UE include the capabilities to search for, synchronise with and register (with authentication) to a network. The negotiation of the UE and the network capabilities, as well as the maintenance and termination of the registration are also part of the required baseline capabilities.

Baseline Implementation Capabilities (BIC): set of Implementation capabilities, in each technical domain, required to enable a UE to support the required Baseline capabilities.

Essential UE Requirement (Conditional) ; Requirement which has to be implemented under certain Service conditions. e.g. AMR codec in UE which supports speech service

Essential UE Requirement (Unconditional); Requirement which has to be implemented in any 3G UE in order to exist in and communicate with 3G network. e.g. Chiprate of 3.84Mcps

Implementation capability: a capability that relates to a particular technical domain. Examples: a spreading factor of 128 (in the domain of the physical layer); the A5 algorithm; a 64 bit key length (in the domain of security); a power output of 21 dBm (in the domain of transmitter performance); support of AMR Codec (in the domain of the Codec); support of CHV1 (in the domain of the USIM).

Mandatory UE Requirement ; Regulatory requirement which is applicable to 3G UEs. It is determined by each country/region and beyond the scope of 3GPP specification. e.g. Spurious emission in UK

Optional UE Requirement ; Any other requirements than 3 requirements listed above. It is totally up to individual manufacturer to decide whether it should be implemented or not. e.g. Network Initiated MM connection establishment

Service Implementation Capabilities (SIC): set of Implementation capabilities, in each technical domain, required to enable a UE to support a set of UE Service Capabilities.

service relationship: the association between two or more entities engaged in the provision of services.

service-less UE: a UE that has only the Baseline capabilities.

UE Service Capabilities (USC): capabilities that can be used either singly or in combination to deliver services to the user. The characteristic of UE Service Capabilities is that their logical function can be defined in a way that is independent of the implementation of the UMTS system (although all UE Service Capabilities are of course constrained by the implementation of UMTS). Examples: a data bearer of 144 kbps; a high quality speech teleservice; an IP teleservice; a capability to forward a speech call.

[Editor's note: other definitions to be added as required]

3.2 Abbreviations

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

BIC	Baseline Implementation Capability
SIC	Service Implementation Capability
USC	UE Service Capability

4 Baseline Definition

The requirements for the baseline implementation capabilities can be defined by the functions required of a UE to power on and attempt registration with a network. Note that successful completion of the registration procedure depends on the subscription and UE Service Capabilities of the UE and user, and is therefore outside the scope of the baseline requirements. The basic Essential MS requirements are further explained in section 15 of 22.101 Service Principles [3]. The corresponding baseline implementation capabilities are referenced in Annex A. The registration attempt and maintenance is illustrated in the state diagram of figure 1.

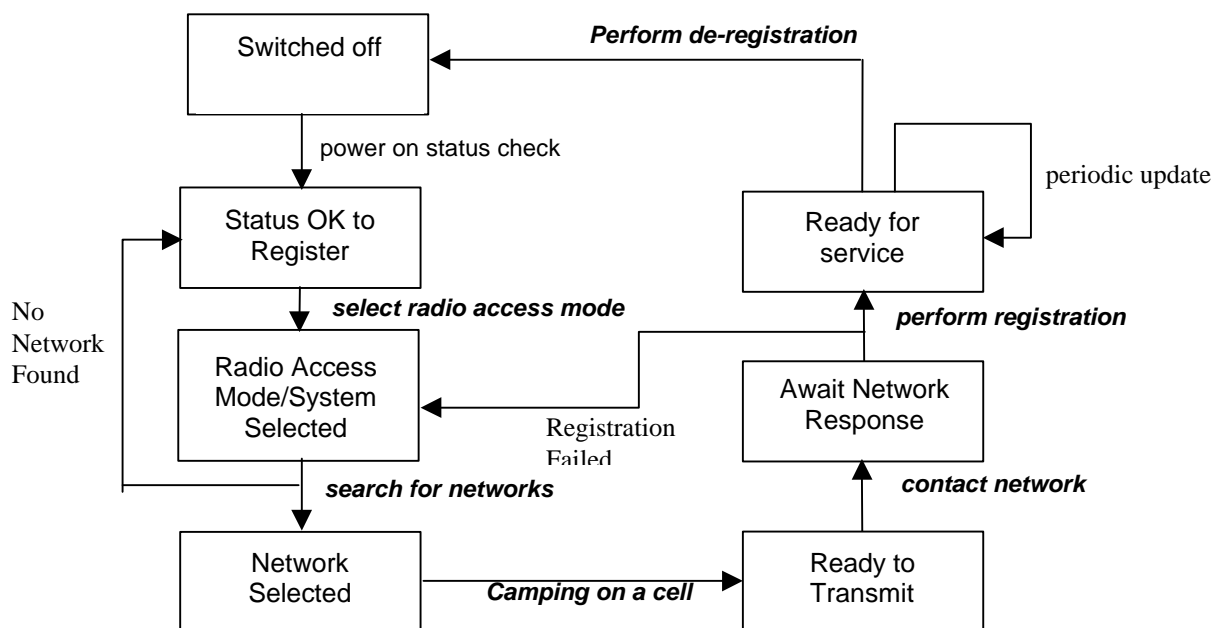


Figure 1: states required for baseline capability

The actions and states given in figure 1 are defined below.

4.1 Switched off

The state "switched off" describes the UE when no 3GPP system functions are operational.

4.2 Power-on status check

The action "power-on status check" describes starting the 3GPP functions within the UE and checking that the UE meets the 3GPP system requirements needed to start the registration procedure (e.g. an appropriate subscription). If no subscription is available, the UE may still select an access node and enter an limited service state in which only emergency calls can be attempted.

4.3 Status OK to register

The state "status OK to register" describes the UE when all checks have been performed and the UE is ready to start 3GPP reception.

4.4 Select radio access mode

The action "select radio access mode" describes the UE's selection of an available radio access mode e.g. UTRA FDD/TDD mode or GSM/GPRS. The decision may be made manually or automatically.

4.5 Radio access mode selected

The state "radio access mode" describes the UE when it has selected a radio access mode to use it its search for networks.

4.6 Search for networks

The action "search for networks" describes the UE's attempt to detect and decode the information for all 3GPP networks in its immediate environment. The UE will initially search for the network to which it was last connected, and then its home network, before undertaking any further search. The result of any subsequent search should produce a list of available networks from which one can be selected on which to attempt registration. If no suitable networks can be found, the UE can revert to its "OK to register" state and select another radio access mode if it has one available.

4.7 Network selected

The state "network selected" describes the UE when a 3GPP network has been selected for a registration attempt. The particular network to be selected may be chosen either manually or automatically.

4.8 Camping on a cell

The action "camping on a cell" describes the UE's selection of one cell in which to attempt registration. This action is further described in 25.304 [1], and enables the UE to receive system information. More detailed descriptions of the procedures for selecting PLMN (including radio access mode selection), and cell selection/re-selection, are also given in 25.304[1].

4.9 Ready to Transmit

The state "ready to transmit" describes the condition in which the UE has regulatory permission to start transmitting at the 3GPP frequencies.

4.10 Contact network

The action "contact network" describes the UE's act of transmitting a first signal to the network to indicate its desire to register.

4.11 Await network response

The state "await network response" describes the condition in which the UE is waiting for the network to respond to its first contact signal.

4.12 Perform registration

The action "perform registration" describes the MM and GMM procedures for authentication, capability negotiation and location/routing area updating. A list of required MM and GMM procedures are given in Annex A section 5. Those procedures are further defined in 24.008 [17]. Note that in order to "perform registration" the UE briefly enters a connected state as defined in 25.303 [2].

4.13 Ready for service

The state "Ready for service" describes the condition in which the UE has successfully completed the registration procedures. If registration is unsuccessful the mobile can revert to the "radio access mode selected" state and try searching for another available network. At this point the UE is ready to initiate or receive data for a specific service. Note that in order to maintain the "ready for service" state, the UE will have to periodically update the location/routing area information, as described in 24.008 [17].

4.14 Perform De-registration

The action "perform de-registration" describes the procedures for de-registering the UE prior to power-off. After de-registration the UE returns to the power-off state.

5 UE Implementation Types

Although the baseline capability requirements define what is needed for service-less UEs there are a few basic service-less UE types can be used to meet these requirements. Examples of these are as follows:

- single-mode FDD
- single-mode TDD
- dual-mode FDD/TDD
- dual-mode FDD/GSM
- dual-mode TDD/GSM
- tri-mode FDD/TDD/GSM

Further information on UE implementation types can be found in 21.910 [18].

6 UE Service Definition

The requirements for the Service Implementation Capabilities can be defined by the functions required of a UE to request and access a service from the network, as well as enter into and maintain a connected state for the purposes of receiving that, or other service(s). Note that it is not always necessary to enter into a connected state in order to receive a

service. In order to simplify the service definition, only two UE states for service access are shown in figure 2. More details of the UE Service Capabilities are given in section 7. UE Functions and Inter-Layer Procedures in Connected Mode are clearly defined in defined in 25.303 [2].

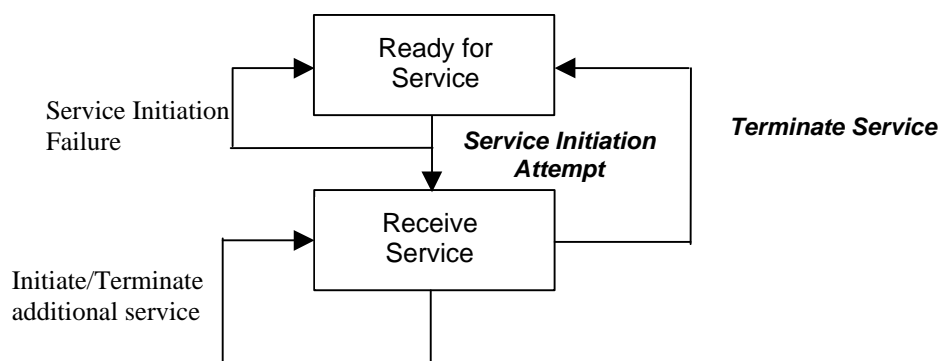


Figure 2: states required for service capability

The actions and states given in figure 2 are defined below.

6.1 Ready for service

The "Ready for service" state is described in section 4.13 above.

6.2 Service initiation attempt

The action "Service initiation attempt" describes the act of attempting to access a service. The action is initiated in the UE, either in response to a page from the network, or as a result of higher layer activity in the UE. If it is not possible to access the required service (e.g. due to failure of the radio link, absence of an appropriate subscription) then the UE will return to the "Ready for service" state.

6.3 Receive service

The state "Receive Service" describes the UE when a service relationship has been established with the network, and the UE is in the process of accessing the requested service. It is also possible that the UE will request/terminate additional services whilst in the "Receive service" state. The many service possibilities/combinations that exist for this state are discussed in section 7 below. The corresponding Service Implementation Capabilities are referenced in Annex B. This state encompasses any handovers that might take place within the network and with other 3G networks & 2G networks, depending on the UE's modes of operation.

6.4 Terminate service

The action "Terminate service" describes the act of ending all current service relationships and re-entering the "ready for service" state. The action can be initiated by either the UE, or the Network. Note that if more than one service is being accessed simultaneously, a service can be terminated without ending the service relationship.

7 UE Service Capabilities

UE Service Capabilities are required in addition to Baseline Capabilities in order that the UE can support a given service. In the 3GPP documentation unless otherwise stated, none of the identified UE Service Capabilities are Essential for the UE and the support of one service in a UE does not imply a requirement to support any other service (unless otherwise stated).

7.1 3GPP Standardised UE Service Capabilities

The 3GPP release '99 requirements for the UE Service Capabilities listed below are listed in TS 22.00 UMTS Phase 1 [4]. UMTS R99 will standardise the technical means by which a UE may implement the following UE Service Capabilities. The UE Service Capabilities can be divided into five main categories as follows:

1. Tele-services (defined in [5])

- Speech
- Emergency Call (essential for all UE supporting the default speech service)
- Short Message Service - Point to Point (SMS-PP)
- Cell Broadcast Service - CBS
- Fax

2. Bearer Services

- Defined by their attributes as described in [5]
 - Information transfer attributes (e.g. Connection mode, Information transfer rate, etc.)
 - Information quality attributes (e.g. Bit Error Ratio, Maximum transfer delay, Delay variation, etc.)

3. Supplementary services

- Defined in GSM R'99¹. Examples:
 - Call Forwarding as defined in [10]
 - Advice of Charge as defined in [14]
 - Explicit Call transfer as defined in [5]

4. Service capabilities (defined in [6])

- Mobile station Execution Environment (MExE)
- Location Services (LCS)
- SIM Application Toolkit (SAT)

5. GSM system features (defined in [5])

- Network Identity and Time Zone (NITZ)
- Support of Localised Service Area (SoLSA)
- Unstructured Supplementary Service Data (USSD)

7.1.1 Support of 3GPP standardised UE Service Capabilities

Editor's note: This sub-section will discuss the support of the standardised USCs with references to corresponding tables in the Annexes, where appropriate.

¹ Note that Supplementary Services are used to complement and personalise the usage of basic telecommunication services (bearer services and teleservices). The capabilities standardised in UMTS shall enable provision of all the supplementary services specified in GSM 02.04 [8] and the 02.8x/02.9xseries [9] –[15].

7.1.1.1 Teleservices

7.1.1.1.1 Default Speech Service

The default speech service that is provided using the Adaptive MultiRate (AMR) codec, is unusual UMTS in that it is a standardised service, rather than a service which can be supported by standardised capabilities, i.e. the implementation of the service itself is specified. The AMR codec for implementation in UMTS UE equipment is defined in [19] to [25]. Support of the AMR in the UE has implications for the UE physical layer and layers 2/3 (Access Stratum). Annex B contains the Service Implementation Capabilities required for UEs supporting the default speech service.

7.1.1.1.2 Short Message Service

7.1.1.1.3 Cell Broadcast Service

7.1.1.1.4 Fax Service

7.1.1.2 Bearer services

Bearer services are described in [5] as providing the capability for information transfer between access points, involving only low layer functions. 3GPP has identified a requirement to support real time and non-real time applications in release '99 of the UMTS specification. An example of a real time application is given as a real time data stream or conversational service, having a guaranteed bit rate, end to end delay and delay variation. A non – real time transfer of information, such as file transfer, should permit differentiation as regards the QoS between different users. In addition 3GPP has agreed the requirement to support Multi-Media applications requiring the ability to support several information flows to/from users, with each information flows having a different traffic types e.g. real/non- real time.

The quality of the information is described in terms of:

- Maximum transfer delay
- Delay variation
- Bit error ratio
- Data rate

Since the maximum transfer delay and transfer delay is mainly a function of the network and not the UE it is not proposed to consider those issues further in this document other than in their impact on the required connection mode. The Bit Error Rate (BER) and Data rate are however, parameters that are dependent on the UEs capabilities, so they will be considered hereafter. The required end user Quality of Service (QoS) is specified in subsection 5.5 of [5] where services are further divided into those that are error tolerant (e.g. conversational speech) and those that are error intolerant (e.g. www browsing). QoS issues are further discussed in [25].

7.1.1.3 Supplementary Service

7.1.1.4 Service Capabilities

7.1.1.5 GSM System Features

7.2 Other UE Service Capabilities

The nature of the UMTS standard is such that it facilitates the implementation of UE Service Capabilities such as Video telephony, Audio and Video Streaming, that are not themselves specified within the UMTS standard. Such UE Service Capabilities are instead realised using standards that have been defined outside of 3GPP, and the defined Bearer Services in section 7.1. The intention is that the UMTS standard shall not limit the implementation of such non-standardised USCs. However, it is important to ensure that non-standardised services can be delivered to UEs with an

appropriate Quality of Service. Example mappings of services to UE Service Capabilities are therefore required, in order to try to identify the USC requirements to support the more commonly envisaged services. Further details of QoS requirements for envisaged services can be found in [5].

7.2.1 Multimedia Services

For release '99, 3G-324M (modified from ITU H.324) has been agreed as the default standard for UEs supporting circuit switched Multimedia capabilities. Details of the Service Implementation Capabilities in the codec domain for the support of that standard are contained in [25] to [27] inclusive. A terminal implementor's guide has also been produced in [28]. The core capabilities identified in the above documents are listed below.

- Support of H.223 with Annex A and B multiplex, and H.245 version 3 or later versions for system control protocol is essential. Support of H.223 with Annex C and D is optional.
- Support of the AMR audio codec is essential for 3G-324M terminals offering audio communication. Support for G.723.1 is optional, but recommended.
- Support of the H.263 video codec is essential for 3G-324M terminals offering video communication. Support of H.263 with Annexes and for MPEG-4 simple profile, is optional. 3G-324M terminals can also support H.261.
- Support of bit rates of at least 32 kbit/s at the mux to wireless network interface, is essential.

7.2.2 Mapping of envisaged services to UE Service Capabilities

7.2.2

Annex A: Baseline Implementation Capabilities

A.1 Baseline implementation capabilities to facilitate conformance testing

UE baseline implementation capabilities:

- The special conformance testing functions and the logical test interface as specified in TS 34.109. This issue is currently under investigation.
- Up-link reference measurement channel 12.2 kbps (FDD), TS 25.101 clause A.2.1.
- Down-link reference measurement channel 12.2 kbps (FDD), TS 25.101 clause A.2.2.

Up-/Down-link reference measurement channels for static channel Rx sensitivity measurements in TDD mode is [TBD] TS 25.102.

A.2 RF Baseline Implementation Capabilities

Table 2: RF baseline implementation capabilities for FDD mode

Capability FDD	Doc.	Para	UE	General Comments
Chiprate 3.84 Mcps	25.101A	5.1	E	
Frequency bands – 1920-1980, 2110-2170 MHz – Other spectrum	25.101A	5.2	E O	As Declared
TX-RX Freq. Sep: - 190 MHz – Variable	25.101A	5.3	E O	referred [1] As Declared
Carrier raster:	25.101A	5.4	E	
UE maximum output power	25.101A	6.2.1	E	At least one power class
Output RF spectrum Emissions	25.101A	6.6	E	

Table 3: RF baseline implementation capabilities for TDD mode

Capability TDD	Doc	Para	UE	General Comments
Chiprate 3.84 Mcps	25.102A	5.1	E	
Frequency bands – 1900-1920 MHz – 2010-2025 MHz – Other spectrum	25.102A	5.2	E E O	referred [1] Declared 1900-1920 MHz Declared 2010-2025 MHz As Declared
Carrier raster:	25.102A	5.4	E	
UE maximum output power	25.102A	6.2.1	E	At least one power class
Output RF spectrum emissions	25.102A	6.6	E	

A.3 Physical Layer baseline implementation capabilities

Table 4: FDD mode Physical Layer Baseline implementation capabilities

Baseline Implementation Capability ²	Specification	Section(s) ³	Comments
Physical Layer UE procedures and measurements:			
Support for network and access node selection	25.214	4.1, 4.2	
Cell selection and reselection	25.215	5.1.1	There are no reference CPICH RSCH measurement
Support for network contact and registration	25.214		There are no reference
Power control	25.214 25.215	5.1.1	PC for PRACH There are no reference
Channel Coding	25.212	4.1, 4.2	The exact requirements for channel coding to support baseline capability, are still to be decided
Spreading and Scrambling Code Generation	25.213	4.1, 4.2 4.3	Limit of FDD spreading factor required to support baseline capability, is still to be decided.
Code de-spreading and de-scrambling	25.213	5.1 5.2	
Modulation	25.213	4.4	
De-modulation	25.213	5.3	DL modulation specifications
Support for downlink Transmit Diversity	25.211	5.3.1	Only Open Loop mode Tx diversity required to support baseline capability
Transport channels necessary for the above:			
Broadcast channel (BCH)	25.211 25.212	4.2.1 4.2.15	Mapping format must be determined (for registration) Description of SFN
Paging channel (PCH)	25.211	4.2.3	PCH is required to transport notification of a change in system information carried on BCCH.
Random access channel (RACH)	25.211	4.2.4	
Forward access channel (FACH)	25.211	4.2.2	
TFCI description	25.212	4.3.3-5	RACH needs TFCI If SCCPCH has TFCI (i.e. PCH and FACH multiplexed into one SCCPCH)
Physical channels necessary for above:			
Timing relation and RACH access procedure	25.211 25.214	7.1, 7.2, 7.3 6.1	RACH random access procedure. There are still remain T.B.D items.
Common Pilot Channel (CPICH)	25.211	5.3.3.1	
Primary Common Control Physical Channel (Primary CCPCH)	25.211	5.3.3. 2	L1 format must be determined (for registration)
Secondary Common Control Physical Channel (Secondary CCPCH)	25.211	5.3.3.3	

² All the baseline implementation capabilities for the FDD mode physical layer should be considered as essential for the terminal.

³ The list of references to the 25.2 series should not be considered exhaustive. References will need to be refined and updated as the standard is further elaborated.

Page Indication Channel (PICH)	25.211	5.3.3.7	(Option ?: depend on PCH usage)
Physical Random Access Channel (PRACH)	25.211	5.2.21	
Synchronisation Channel (SCH)	25.211	5.3.3.4	
Acquisition Indication Channel (AICH)	25.211	5.3.3.6	

Table 5: TDD mode Physical Layer Baseline Implementation Capabilities

Baseline Implementation Capability ⁴	Specification	Section(s) ⁵	Comments
Physical Layer UE procedures and measurements:			
Support for network and access node selection	25.224	6.5, 6.6	
Cell selection and reselection	25.225	6.1.1, 6.1.3, 6.1.5, 6.1.9, 7.1.1.1	
Support for network contact and registration	25.224	6.4	
Power control	25.224	6.3.3.1	
Channel Coding	25.222	6.1, 6.2	The exact requirements for channel coding to support baseline capability, are still to be decided
Spreading and Scrambling Code Generation	25.223	6, 7	
Code de-spreading and de-scrambling	25.223	6, 7	
Modulation	25.223	5	
Support for downlink Transmit Diversity	25.221	6.8	
Transport channels necessary for the above:			
Synchronisation channel (SCH)	25.221	4.1.2	SCH exists for TDD mode only
Broadcast channel (BCH)	25.221	4.1.2, 6	
Paging channel (PCH)	25.221	4.1.2, 6	PCH is required to transport notification of a change in system information carried on BCCH.
Random access channel (RACH)	25.221	4.1.2, 6	
Forward access channel (FACH)	25.221	4.1.2, 6	
Physical channels necessary for above:			
Common Control Physical Channel (CCPCH)	25.221	5.3.1, 6	
Physical Random Access Channel (PRACH)	25.221	5.3.2, 6	
Physical Synchronisation Channel (PSCH)	25.221	5.4, 6	

⁴ All the baseline implementation capabilities for the TDD mode physical layer should be considered as essential for the terminal.

⁵ The list of references to the 25.2 series should not be considered exhaustive. References will need to be refined and updated as the standard is further elaborated.

A.4 Layer 2/3 baseline implementation capabilities (access stratum)

Table 6: Baseline implementation capabilities for Layer 2/3 (access stratum)

Baseline Implementation Capability ⁶	Specification	Section(s) ⁷	Comments
UE procedures:			
The procedures below require support of the RLC protocol described in 25.322, with the exception of RLC header compression. RLC toolbox features (section 9.7) required as part of the baseline capabilities have yet to be identified.			
Support for PLMN selection Support for location registration	25.304	5.2, 5.2, 5.3, 10.4, 10.5, 10.6, 10.7	
Cell selection and reselection	25.304	5.2	
System information reception	25.304 25.331	6.1 10.1.6	System information message is required. RLC Mode TM. Uses logical channel BCCH and transport channel BCH and FACH. "BCCH modification info" in the Paging type 1 message is required. RLC Mode TM Uses logical channel PCCH and transport channel PCH.
Paging	25.331	10.1.3.1 10.1.3.2	Paging type 2 message is required. RLC Mode AM. Uses logical channel DCCH. Paging type 1 message is required. RLC Mode TM. Uses logical channel PCCH and transport channel PCH.
Idle mode measurements	25.304	7	
RRC connection establishment	25.303 25.331	6.1.1 10.1.4.6, 10.1.4.7, 10.1.4.8, 10.1.4.9	RRC connection request message is required. RLC mode TM. Uses logical channel CCCH and transport channel RACH. RRC connection set up message is required. RLC mode UM. Uses logical channel CCCH and transport channel RACH. RRC connection setup complete message is required. RLC mode AM. Uses logical channel DCCH and transport channel RACH. RRC connection reject message is required. RLC mode UM. Uses logical channel CCCH and transport channel RACH.
RRC connection re-establishment	25.331	10.1.4.1, 10.1.4.2, 10.1.4.3	RRC connection re-establish message is required. RLC mode UM. Uses logical channel DCCH and transport channel FACH. RRC connection re-establishment complete message is required. RLC mode AM. Uses logical channel DCCH and transport channel. RRC connection re-establishment request message is required. RLC mode TM. Uses logical channel CCCH and transport channel RACH.
Support for higher layer messages on signaling connection	25.303	7.1.3	

⁶ All the baseline implementation capabilities for L2/3 should be considered as essential for the terminal.

⁷ The list of references to the 25.3 series should not be considered exhaustive. References will need to be refined and updated as the standard is further elaborated.

RRC Status	25.331	10.1.4.10	RRC status message required. RLC mode UM. Uses logical channel DCCH and transport channel FACH. RRC status ack message required. RLC mode UM. Uses logical channel DCCH and transport channel RACH.
RRC connection release	25.303 25.331	6.1.3 10.1.4.4, 10.1.4.5	RRC connection release message required. RLC mode UM. Uses logical channel DCCH and transport channel FACH. RRC connection release complete message required. RLC mode AM/UM. Uses logical channel DCCH and transport channel RACH.
Direct transfer	25.331	10.1.7.4	Direct transfer message required. RLC mode AM. Uses logical channel DCCH and transport channels RACH/FACH.
Cell update	25.303 25.331	6.4.2 10.1.1.4, 10.1.1.5, 10.1.1.13	Cell update message is required. RLC mode TM. Uses logical channel CCCH and transport channel RACH. Cell update confirm message is required. RLC mode UM. Uses logical channel DCCH and transport channel FACH. RNTI reallocation complete message is required. RLC mode AM. Uses logical channel DCCH and transport channel RACH.
URA update	25.331	10.1.1.11 10.1.1.12	URA update message is required. RLC mode TM. Uses logical channel CCCH and transport channel RACH. URA update confirm message is required. RLC mode UM. Uses logical channel CCCH/DCCH and transport channel FACH.
Logical channels necessary for the above procedures:			
Synchronisation control channel (SCCH)	25.301	5.3	SCCH exists for TDD mode only
Broadcast control channel (BCCH)	25.301	5.3	
Paging control channel (PCCH)	25.301	5.3	PCCH is needed for notification of the change in system information on BCCH. It may also be needed by the CN MM protocol for reasons other than UE terminated services.
Common control channel (CCCH)	25.301 25.321	5.3 9.2.1.2	MAC-PDU for mapping CCCH to RACH/FACH
Dedicated control channel (DCCH)	25.301 25.321	5.3 9.2.1.1	MAC-PDU for mapping DCCH to RACH/FACH
Transport channels necessary for the above procedures			
Synchronisation channel (SCH)	25.301	5.2	SCH exists for TDD mode only
Broadcast channel (BCH)	25.301	5.2	
Paging channel (PCH)	25.301	5.2	
Random access channel (RACH)	25.301 25.321	5.2 11.2	RACH transmission procedure
Forward access channel (FACH)	25.301	5.2	

A.5 Layer 3 baseline implementation capabilities (non-access stratum)

Table 7: UE Baseline Implementation Capabilities for NAS

E: Essential Unconditional, C: Essential Conditional, O: Optional,

Baseline Implementation Capabilities			Ref. Doc	Section(s)	Kind of UEs			Comments
					CS-only	PS-only	CS+ PS	
UMTS CS mobility management (Optional)	MM common procedures	TMSI reallocation procedure	24.008	4.3.1	E	-	E	
		Authentication procedure	Ditto	4.3.2	E	-	E	
		Identification procedure	Ditto	4.3.3	E	-	E	
		IMSI detach procedure	Ditto	4.3.4	E	-	E	
		Abort procedure	Ditto	4.3.5	E	-	E	
		MM information procedure	Ditto	4.3.6	O	-	O	
	MM specific procedure	Location updating procedure	Ditto	4.4.1	E	-	E	
		Periodic updating procedure	Ditto	4.4.2	E	-	E	
		IMSI attach procedure	Ditto	4.4.3	E	-	E	
		Generic Location Updating procedure	Ditto	4.4.4	E	-	E	
	MM connection management procedure	MM connection establishment	Ditto	4.5.1.1	E	-	E	
		MM connection establishment for emergency call	Ditto	4.5.1.5	C	-	C	Essential If speech calls supported.
		MM re-establishment	Ditto	4.5.1.6	C	-	C	Essential If CC supported.
		Paging response procedure	Ditto	Not yet defined	E	-	E	
		Network initiated MM connection establishment	Ditto	4.5.1.3	O	-	O	
MM connection release		Ditto	4.5.3	E	-	E		
UMTS PS mobility management (Optional)	GMM common procedures	P-TMSI reallocation procedure	ditto	4.7.6	-	E	E	
		Authentication and ciphering procedure	ditto	4.7.7	-	E	E	
		Identification procedure	ditto	4.7.8	-	E	E	
		Paging procedure	ditto	4.7.9	-	E	E	
		GMM status procedure	ditto	4.7.10	-	E	E	
		GMM support for anonymous access	Ditto	4.7.11	-	O	O	
		GMM Information procedure	Ditto	4.7.12	-	O	O	
	GMM specific procedure	GPRS attach procedure	Ditto	4.7.3.1	-	E	E	
		Combined GPRS attach procedure	Ditto	4.7.3.2	-	-	C	Essential If class-A or B.
		MS initiated GPRS detach procedure	Ditto	4.7.4.1	-	E	E	
		MS initiated Combined GPRS detach procedure	Ditto	4.7.4.1.3	-	-	C	Essential If class-A or B.
		Network initiated GPRS detach procedure	Ditto	4.7.4.2	-	E	E	
		Normal and periodic routing area updating Procedure	Ditto	4.7.5.1	-	E	E	
Combined routing area updating Procedure	Ditto	4.7.5.2	-	-	C	Essential If class-A or B.		

A.6 Security baseline implementation capabilities

Table 8: UE Baseline Implementation Capabilities in the security domain

Security feature		Essential/optional capabilities	Section In TS 33.102 draft V3.2.0 ⁸
User Identity Confidentiality		-----	5.1.1
	Identification by temporary identities and confidential transport of other USIM information.	<Essential Unconditional>	6.1
	Identification by a permanent identity <i>Note: This functionality is implemented in the USIM and is transparent to the UE.</i>	Use of IMUI and other USIM information in cleartext	<Essential Unconditional>
		Transport of an encrypted IMUI and other USIM information.	<Essential Unconditional> <i>Note: The use of the enhanced mechanism is HE-specific.</i>
Entity Authentication		-----	5.1.2
	Authentication and key agreement	The authentication and key agreement protocol	<Essential Unconditional>
		Authentication and key agreement algorithms. <i>Note: Algorithms are implemented on the USIM.</i>	<option> <i>Note: The algorithms are HE-specific.</i>
Confidentiality		-----	5.1.3
	Data confidentiality	<Essential Unconditional>	6.6
	Cipher indicator	<Essential Unconditional>	5.5
Hooks for network wide encryption		<Essential Unconditional>	8.2
Data integrity		-----	5.1.4
	Data integrity of signalling elements	<Essential Unconditional>	6.4
Mobile Equipment Identification <i>Note: Security features for UE identification have currently not been defined.</i>		<Essential Unconditional>	5.1.5
		<i>Note: Includes capability of having IMEI and capability of reporting it to the network.</i>	
User-to-USIM Authentication		<Essential Unconditional>	5.3.1
USIM-UE Link		<Optional>	5.3.2
Secure messaging between the USIM and the network		<Optional> <i>Note: Security features are HE and application specific</i>	5.4.1
Interoperation between 3GPP and GSM systems		<Essential Conditional> UEs that support GSM SIM or a GSM SIM application on the UICC shall include functions that allow conversion of security parameters from GSM to UMTS.	6.3.7.2

⁸ That is V3.1.0 with agreed CRs

A.7 USIM baseline implementation capabilities

Table 9. Baseline Implementation Capabilities in the USIM domain.

Baseline Implementation Capability	Specification	Clause(s)	Essential/Optional Comments
Physical Characteristics			
Support for the card sizes; "ID-1 UICC" and/or "Plug-in UICC"	31.101	4	<Essential Unconditional>
Provisions of Contacts	31.101	4.4	<Essential Unconditional> Support for provision of contacts identified in 4.4
Electrical specifications of the UICC – Terminal interface			
Support for electrical specifications; 3V and 1.8V	31.101	5	<Essential Unconditional>
Initial communication establishment procedures			
Initial communication establishment procedures	31.101	6	<Essential Unconditional>
Protocols			
Transmission protocols T=0 and T=1	31.101	7	T=0 and T=1 are essential for the Terminal. T=0 is essential for the UICC but T=1 is optional.
Application independent procedures	31.101	14	<Essential Unconditional>
Application protocol			
Procedures from USIM initialisation to network registration	31.102	5	<Essential Unconditional> Capabilities to access the related files with network registration (ex. Files which contain IMSI, RACH access control parameters, forbidden PLMNs and location area information)
Security features			
Authentication and Key agreement procedure	31.102	6.1	<Essential Unconditional>

Annex B: Speech Service Implementation Capabilities

This annex identifies Service Implementation Capabilities that are required to support the default speech service.

B.1 Physical layer implementation capabilities to support the default speech service

Table 10. FDD mode Physical Layer Service implementation capabilities for support of AMR speech service

Service Implementation Capability	Specification	Section(s) ⁹	Comments
Physical Layer UE procedures and measurements:			
Handover	25.215 25.212	6.1.1, 6.1.4, 6.1.5, 6.1.9, 7.1.1.2, 7.1.2, 7.1.3 4.4	Support of soft handover is essential for all terminals. Support of Inter-Frequency handover is essential for all terminals. Support of intra-frequency hard handover is FFS. Terminals shall support measurements commensurate with their mode/system capabilities, to facilitate inter-frequency, inter-mode & inter-system handover.
Power control	25.214 25.215	5.1.2, 5.2.3 6.1.1, 6.1.3, 6.1.6, 6.1.7	Support of closed loop power control is Essential for all terminals.
Error detection	25.212	4.2.1	Support of 0, 8, 12 and 16 bits CRC per transport block is essential for all terminals.
Channel Coding	25.212	4.2.3.,	Support of no coding and convolutional coding with rates $\frac{1}{2}$ and $\frac{1}{3}$ is essential for all terminals.
Multiplexing	25.212	4.2.4 – 4.2.14	<p>In single service case, with only AMR and dedicated signalling channel, it is Essential for all terminals to support at minimum 4 transport channels in uplink, of which 1-3 is reserved for AMR and 1 for dedicated signalling.</p> <p>In single service case, with only AMR and dedicated signalling channel, it is Essential for all terminals to support at minimum 5 transport channels in downlink, of which 1-3 is reserved for AMR, 1 for mode commands and 1 for dedicated signalling.</p> <p>< Note: This is a working assumption, since it is still FFS whether there could be more than 4 or 5 transport channels in uplink and downlink, respectively, in the transport format combination set, so that different coding can be applied to the bit classes in different modes.></p> <p><Note: This assumes that fast mode control is required to be signalled in the downlink direction only.></p> <p><Note: It is still FFS how the transport channel carrying mode command bits is transmitted in downlink in Layer 1. ></p> <p>Support of TTI=20 ms for each transport channel is Essential for all terminals.</p>

⁹ The list of references to the 25.2 series should not be considered exhaustive. References will need to be refined and updated as the standard is further elaborated.

Transport format detection	25.212	4.2.15	<p>In downlink, the support of transport format detection with TFCI is essential for all terminals both with fixed and flexible TrCH positions.</p> <p>In downlink, when SF=128 and fixed TrCH positions is used in the single service case, with only AMR and dedicated signalling channel, the support of blind transport format detection is essential for all terminals.</p> <p>In the single service case, with only AMR and dedicated signalling channel, it is essential for all terminals to support at minimum $2 \cdot (8+1+1) = 20$ transport format combinations during the connection in uplink and downlink, of which 8 is reserved for AMR modes, 1 for SID frame, 1 for DTX and the multiplication of 2 is due to dedicated signalling channel having two possible rates (e.g. on/off).</p> <p><Note: For downlink, it is still an open issue, whether the transport channel carrying mode command bits can have two modes, i.e. on/off. If that will be the case, then all terminals would have to support 40 transport format combinations in downlink.></p>
Modulation	25.213	4.4.3	
Spreading and Scrambling Code Generation	25.213	4.3	For the single service case, with only AMR and dedicated signalling channel, it is essential for all terminals to support SF=128 and SF=256 in downlink, and SF=256...64 in uplink. In multiple service case the required spreading factor depends on the data rates of the services to be supported simultaneously.
Code de-spreading and de-scrambling	25.213	5.2	
Support for downlink Transmit Diversity	25.211 25.214	5.3.2 8	Support of open loop and closed loop transmit diversity is Essential for all terminals.
Support for Site Selection Diversity Transmission	25.214	5.3.2.4	Support of SSDT is Essential for all terminals.
Transport channels required:			
Dedicated channel (DCH)	25.211	4.1.1, 6	
Physical channels required:			
Dedicated Physical Data Channel (DPDCH)	25.211	5.2.1, 5.3.2, 6	
Dedicated Physical Control Channel (DPCCH)	25.211	5.2.1, 5.3.2, 6	

Table 11. TDD mode Physical Layer Service implementation capabilities for support of the AMR speech service

Service Implementation Capability	Specification	Section(s) ¹⁰	Comments
Physical Layer UE procedures and measurements:			
Handover	25.225	5	Support of Intra and Inter Frequency hard handover is essential for all terminals. Terminals shall support measurements commensurate with their mode/system capabilities, to facilitate inter-frequency, inter-mode & inter-system handover.
Dynamic Channel Allocation	25.225	5	Terminals shall support measurement of SIR in different timeslots.
Power control	25.224 25.225	4.3 5	Support of closed loop control for DL power. Support of open loop control for UL power.
Error detection	25.222	6.2.1	Support of 0, 8, 12 and 16 bits CRC per transport block is essential for all terminals
Channel Coding	25.222	6.2.3	Support of no coding and convolutional coding with rates ½ and 1/3 is essential for all terminals.
Multiplexing	25.222	6.2.4 – 6.2.13	<p>In single service case, with only AMR and dedicated signalling channel, it is essential for all terminals to support at minimum 4 transport channels in uplink, of which 1-3 is reserved for AMR and 1 for dedicated signalling.</p> <p>In single service case, with only AMR and dedicated signalling channel, it is essential for all terminals to support at minimum 5 transport channels in downlink, of which 1-3 is reserved for AMR, 1 for mode commands and 1 for dedicated signalling.</p> <p>< Note: This is a working assumption, since it is still FFS whether there could be more than 4 or 5 transport channels in uplink and downlink, respectively, in the transport format combination set, so that different coding can be applied to the bit classes in different modes.></p> <p><Note: This assumes that fast mode control is required to be signalled in the downlink direction only.></p> <p><Note: It is still FFS how the transport channel carrying mode command bits is transmitted in downlink in Layer 1. ></p>
Transport format detection	25.222	6.2.13	<p>The support of transport format detection with a TFCI length of 0, 4, 8, 16 and 32 bits is essential for all terminals.</p> <p>Support of 1024 transport format combinations is essential for all terminals</p>
Spreading and Scrambling Code Generation	25.223	6	Terminals shall support spreading factors 8 and 16 for uplink transmission. Simultaneous transmission of up to two codes shall be supported.

¹⁰ The list of references to the 25.2 series should not be considered exhaustive. References will need to be refined and updated as the standard is further elaborated.

Code de-spreading and de-scrambling	25.223	6	Terminals shall support simultaneous reception of up to 2 codes using spreading factor 16 for speech.
Support for Downlink Transmit diversity	25.221 25.224	5.2.4 4.8	Support channel estimation on different midambles
Timing Advance	25.224	4.4	Support of TA adjustment according to higher layer signalling
Discontinuous transmission	25.224	4.7	Each mobile must be capable to switch of transmission in those physical channels which are not needed to transmit the instantaneous TFC.
Transport channels necessary for the above:			
DCH	25.221	4.1.1, 6	
Physical channels necessary for above:			
Dedicated Physical CHannel (DPCH)	25.221	5.2, 6	

B.2 Layer 2/3 Implementation Capabilities to support the default speech service.To be provided.

B.3 Layer 3 (non-access stratum) implementation capabilities to support the default speech service

Table 12: UE Speech Service Implementation Capability for NAS E: Essential Unconditional, C: Essential Conditional, O: Optional

		Service Implementation Capabilities	Ref. Doc	Section(s)	Tele-service for Terminals Speech (w/ E. call)	Comments
Layer 3 specification	UMTS Call Control (Optional)	Mobile originating call Establishment	24.008	5.2.1	C	Essential for speech service
		Mobile terminating call Establishment	Ditto	5.2.2	C	Essential for speech service
		Call clearing	Ditto	5.4.2	C	Essential for speech service
				5.4.3	C	Essential for speech service
				5.4.4	C	Essential for speech service
		In-band tones and announcements	Ditto	5.5.1	C	Essential for speech service
		Status procedure	Ditto	5.5.3	C	Essential for speech service
		DTMF protocol control procedure	Ditto	5.5.7	C	Essential for speech service

Annex C: SMS Service Implementation Capabilities

Annex D: CBS Service Implementation Capabilities

Annex E: FAX Service Implementation Capabilities

Annex F: Bearer Services Service Implementation Capabilities

F.1 Service implementation capabilities to facilitate conformance testing of Bearer Services capabilities

NOTE: Support of the following reference measurement channels is essential depending on the Bearer Services supported by a given terminal.

Terminal service implementation capabilities:

- Down-link reference measurement channel 64 kbps (FDD), TS 25.101 clause A.2.3.
- Down-link reference measurement channel 144 kbps (FDD), TS 25.101 clause A.2.4.
- Down-link reference measurement channel 384 kbps (FDD), TS 25.101 clause A.2.5.
- Packet switched data measurement channel (FDD), TS 25.101 clause A.3.

Down-link (>12.2 kbps) reference measurement channels and Packet-switched measurement channels for TDD is [TBD**Error! Bookmark not defined.**], TS 25.102.

Annex G: Supplementary Services Service Implementation Capabilities

Annex H: Service Capabilities Service Implementation Capabilities

History

Document history		
V 0.0.1	1999-03	First draft (introduction, scope, TOCs) proposed by rapporteur
V 0.0.2	1999-04	Update based on discussions at T2 SWG6#2 (proposed by rapporteur)
V 0.0.3	1999-06	Proposed update from Rapporteur based on discussions on the need for an overall structure for document, agreements of T2 SWG6 #3, discussions in S1 #3 and R2#5.
V 0.0.4	1999-09	Revised baseline definition in section 4, as a result of information received from TSG CN WG1, and comments received during TSG T WG2 #5. Added section 7.1.1 on support of standardised UE service capabilities. Added section 7.2.1 on mapping of envisaged services to UE Service Capabilities. Added section A1 on baseline implementation capabilities for conformance testing purposes. Revised section A4 on L2/3 (access stratum) baseline implementation capabilities to include additional information received from RSG RAN WG2. Added section A5 on baseline implementation capabilities for Layer 3 (non-access stratum), as received from TSG CN WG1. Added section A6 on baseline implementation capabilities for the security domain, as received from TSG SA WG3. Added section B1 on service implementation capabilities for conformance testing purposes. Added section B2 on physical layer service implementation capabilities to support default speech and circuit switched data (up to 64 kbps) services. Editorial changes made where appropriate.
V 0.0.5	1999-10	Minor editorial revisions. Text added to scope to reflect intention that report should not be used as soul basis for UE design. Input on baseline and service implementation capabilities for L3 (non-access stratum) included, as received from TSG CN WG1.
V 1.0.0	1999-10	Presented to TSG-T#5 for information
V 1.0.1	1999-10-07	Modified by TSG-T#5 (Title of A.1, B.1 headings: "to facilitate conformance testing")
V 1.0.2	1999-10	Editorial Changes
V 1.1.0	1999-11	Change "Mandatory" to "Essential". Change "Terminal" to "UE". Create separate annexes for all standardised services. Editorial modifications. Add text on speech in section and on Bearer services in section 7.1.1. Add text on Multimedia support in section 7.2.1
<p>Rapporteur for 3G TR 21.904:</p> <p>Craig Bishop</p> <p>Samsung Electronics Research Institute</p> <p>Tel: +44 1784 428 600 ext 673</p> <p>Fax: +44 1784 428 629</p> <p>Email: ckbishop@aol.com</p> <p>This document is written in Microsoft Word 97.</p>		