3GPP TSG-T#11
Palm Springs, CA, USA, 14-16 March 2001

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Agenda Item: 5.2.3

Source: T2

Title: "Terminal Interfaces and Capabilities" Change Requests

Document for: Approval

Spec	CR	Rev	Rel	Subject	Cat	Vers-Curr	Vers-New	T2 Tdoc	Workitem
07.07	A086		R97	Corresponding GMM states for +CGREG command	F	6.4.0	6.5.0	T2-010101	TEI
07.07	A087		R97	Definition of "class C in GPRS and circuit switched alternate mode"	F	6.4.0	6.5.0	T2-010107	TEI
07.07	A088		R98	Corresponding GMM states for +CGREG command	A	7.5.0	7.6.0	T2-010114	TEI
07.07	A089		R98	Definition of "class C in GPRS and circuit switched alternate mode"	A	7.5.0	7.6.0	T2-010117	TEI
27.903	001		rel-4	Addition of SyncML	B	3.0.0	4.0.0	T2-010104	TI-SYNC-EVOL
27.103	002		rel-4	Addition of SyncML	B	3.1.0	4.0.0	T2-010300	TI-SYNC-EVOL
27.007	050		R99	Addition of explicit subscribed value to QoS command	F	3.7.0	3.8.0	T2-010108	TEI
27.007	051		R99	Corresponding GMM states for +CGREG command	A	3.7.0	3.8.0	T2-010115	TEI
27.007	052		R99	Definition of "class C in GPRS and circuit switched alternate mode"	A	3.7.0	3.8.0	T2-010118	TEI
27.007	053		rel-4	Clarification of the specification to incorporate UICC/USIM references	A	4.0.0	4.1.0	T2-010095	TI-ATC
27.007	054		rel-4	Update the AT command, +CPBS, that select the phonebooks in the SIM/UICC	F	4.0.0	4.1.0	T2-010097	TI-ATC
27.007	055		rel-4	Correction of GSM references	F	4.0.0	4.1.0	T2-010099	TI-ATC
27.007	056		rel-4	Update the AT commands that access the PLMN preferred list in the SIM/UICC	F	4.0.0	4.1.0	T2-010105	TI-ATC
27.007	057		rel-4	Update of phonebook AT commands, +CBBS,+CPBR, +CPBF and +CPBW, to access the hidden phonebook entries	F	4.0.0	4.1.0	T2-010106	TI-ATC
27.007	058		rel-4	Addition of explicit subscribed value to QoS command	A	4.0.0	4.1.0	T2-010109	TI-ATC
27.007	059		rel-4	Corresponding GMM states for +CGREG command	A	4.0.0	4.1.0	T2-010116	TI-ATC
27.007	060		rel-4	Definition of "class C in GPRS and circuit switched alternate mode"	A	4.0.0	4.1.0	T2-010119	TI-ATC

3GPP TSG-T WG2#12
Beverley Hills, California, USA,
12-16 February 2001

T2-010101

CR-Form-v3

CHANGE REQUEST

⌘ **07.07** **CR** **A086** ⌘ rev **-** ⌘ Current version: **6.4.0** ⌘

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

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

Title:	⌘	Corresponding GMM states for +CGREG command
Source:	⌘	T2
Work item code:	⌘	TEI
Date:	⌘	2001-02-08
Category:	⌘	**F**
Release:	⌘	R97

Use one of the following categories:
- ***F*** *(essential correction)*
- ***A*** *(corresponds to a correction in an earlier release)*
- ***B*** *(Addition of feature),*
- ***C*** *(Functional modification of feature)*
- ***D*** *(Editorial modification)*

Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

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

Reason for change:	⌘	The current definitions for the return values of the +CGREG AT command are ambiguous and a unequivocal mapping to the corresponding GMM status is not possible.
Summary of change:	⌘	It is proposed to add for each return value an additional definition in which GMM state(s) the cause value should given. Furthermore its clarified if the GPRS service is enabled by the user (i.e. the GPRS attach is request by the user).
Consequences if not approved:	⌘	As the current definitions are ambiguous, there is the risk of different MS implementations.

Clauses affected:	⌘	10.1.13		
Other specs affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	
Other comments:	⌘			

10.1.13 GPRS network registration status +CGREG

Table 1: CGREG parameter command syntax

Command	Possible response(s)
+CGREG=[<n>]	
+CGREG?	+CGREG: <n>,<stat>[,<lac>,<ci>] *+CME ERROR: <err>*
+CGREG=?	+CGREG: (list of supported <n>s)

Description

The set command controls the presentation of an unsolicited result code +CGREG: <stat> when <n>=1 and there is a change in the MT's GPRS network registration status, or code +CGREG: <stat>[,<lac>,<ci>] when <n>=2 and there is a change of the network cell.

NOTE. If the GPRS MT also supports circuit mode services, the +CREG command and +CREG: result code apply to the registration status and location information for those services.

The read command returns the status of result code presentation and an integer <stat> which shows whether the network has currently indicated the registration of the MT. Location information elements <lac> and <ci> are returned only when <n>=2 and MT is registered in the network.

Defined values

<n>:

0 disable network registration unsolicited result code

1 enable network registration unsolicited result code +CGREG: <stat>

2 enable network registration and location information unsolicited result code +CGREG: <stat>[,<lac>,<ci>]

<stat>:

0 not registered, ME is not currently searching a ~~new~~ operator to register to
The MS is in GMM state GMM-NULL or GMM-DEREGISTERED-INITIATED.
The GPRS service is disabled, the MS is allowed to attach for GPRS if requested by the user.

1 registered, home network
The MS is in GMM state GMM-REGISTERED or GMM-ROUTING-AREA-UPDATING-INITIATED INITIATED on the home PLMN.

2 not registered, but ME is currently trying to attach or searching an ~~new~~ operator to register to
The MS is in GMM state GMM-DEREGISTERED or GMM-REGISTERED-INITIATED. The GPRS service is enabled, but an allowable PLMN is currently not available. The MS will start a GPRS attach as soon as an allowable PLMN is available.

3 registration denied
The MS is in GMM state GMM-NULL. The GPRS service is disabled, the MS is not allowed to attach for GPRS if requested by the user.

4 unknown

5 registered, roaming
The MS is in GMM state GMM-REGISTERED or GMM-ROUTING-AREA-UPDATING-INITIATED on a visited PLMN.

<lac>: string type; two byte location area code in hexadecimal format (e.g. "00C3" equals 195 in decimal)

<ci>: string type; two byte cell ID in hexadecimal format

Implementation

Optional.

3GPP TSG-T WG2#12
Beverley Hills, California, USA,
12-16 February 2001

T2-010107

CR-Form-v3

CHANGE REQUEST

⌘ **07.07** **CR** **A087** ⌘ rev **-** ⌘ Current version: **6.4.0** ⌘

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

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

Title:	⌘	Definition of "class C in GPRS and circuit switched alternate mode"
Source:	⌘	T2
Work item code:	⌘	TEI
Date:	⌘	2001-02-08
Category:	⌘	**F**
Release:	⌘	R97

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

Use one of the following releases:

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

Reason for change:	⌘	According to 02.60 there are four different GPRS MS Modes of Operation defined. The fifth mode "class C in GPRS and circuit switched alternate mode" given in the definition of the +CGCLASS AT command is not defined in the GPRS core specifications.
Summary of change:	⌘	As the expected MS behaviour for "class C in GPRS and circuit switched alternate mode" is not clear and there is no equivalent definition in the GPRS specifications, it is proposed to delete this class.
Consequences if not approved:	⌘	As there is no GPRS MS Mode which corresponds to the class 'C' mentioned in the command +CGCLASS there is the risk of different implementations by the manufacturer.

Clauses affected:	⌘	10.1.10
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

10.1.10 GPRS mobile station class +CGCLASS

Table 1: CGCLASS parameter command syntax

Command	Possible Response(s)
+CGCLASS= [<class>]	OK ERROR
+CGCLASS?	+CGCLASS: <class>
+CGCLASS=?	+CGCLASS: (list of supported <class>s)

Description

The set command is used to set the MT to operate according to the specified GPRS mobile class. If the requested class is not supported, an ERROR or +CME ERROR response is returned. Extended error responses are enabled by the +CMEE command.

The read command returns the current GPRS mobile class.

The test command is used for requesting information on the supported GPRS mobile classes.

Defined Values

<class>: a string parameter which indicates the GPRS mobile class (in descending order of functionality)

A class A (highest)
B class B
~~C class C in GPRS and circuit switched alternate mode~~
CG class C in GPRS only mode
CC class C in circuit switched only mode (lowest)

Other values are reserved and will result in an ERROR response to the set command.

If the MT is GPRS attached when the set command is issued with a <class> = CC specified, a detach request shall be sent to the network.

Implementation

Optional.

3GPP TSG-T WG2#12
Beverley Hills, California, USA,
12-16 February 2001

T2-010114

CR-Form-v3

CHANGE REQUEST

⌘ **07.07** **CR** **A088** ⌘ rev **-** ⌘ Current version: **7.5.0** ⌘

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

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

Title:	⌘	Corresponding GMM states for +CGREG command
Source:	⌘	T2
Work item code:	⌘	TEI
Date:	⌘	2001-02-14
Category:	⌘	**A**
Release:	⌘	R98

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

Use one of the following releases:

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

Reason for change:	⌘	The current definitions for the return values of the +CGREG AT command are ambiguous and a unequivocal mapping to the corresponding GMM status is not possible.
Summary of change:	⌘	It is proposed to add for each return value an additional definition in which GMM state(s) the cause value should given. Furthermore its clarified if the GPRS service is enabled by the user (i.e. the GPRS attach is request by the user).
Consequences if not approved:	⌘	As the current definitions are ambiguous, there is the risk of different MS implementations.

Clauses affected:	⌘	10.1.14		
Other specs affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	
Other comments:	⌘			

10.1.14 GPRS network registration status +CGREG

Table 1: CGREG parameter command syntax

Command	Possible response(s)
+CGREG=[<n>]	
+CGREG?	+CGREG: <n>,<stat>[,<lac>,<ci>] *+CME ERROR: <err>*
+CGREG=?	+CGREG: (list of supported <n>s)

Description

The set command controls the presentation of an unsolicited result code +CGREG: <stat> when <n>=1 and there is a change in the MT's GPRS network registration status, or code +CGREG: <stat>[,<lac>,<ci>] when <n>=2 and there is a change of the network cell.

NOTE. If the GPRS MT also supports circuit mode services, the +CREG command and +CREG: result code apply to the registration status and location information for those services.

The read command returns the status of result code presentation and an integer <stat> which shows whether the network has currently indicated the registration of the MT. Location information elements <lac> and <ci> are returned only when <n>=2 and MT is registered in the network.

Defined values

<n>:

0 disable network registration unsolicited result code

1 enable network registration unsolicited result code +CGREG: <stat>

2 enable network registration and location information unsolicited result code +CGREG: <stat>[,<lac>,<ci>]

<stat>:

0 not registered, ME is not currently searching an ~~new~~ operator to register to
The MS is in GMM state GMM-NULL or GMM-DEREGISTERED-INITIATED.
The GPRS service is disabled, the MS is allowed to attach for GPRS if requested by the user.

1 registered, home network
The MS is in GMM state GMM-REGISTERED or GMM-ROUTING-AREA-UPDATING-INITIATED INITIATED on the home PLMN.

2 not registered, but ME is currently trying to attach or searching an ~~new~~ operator to register to
The MS is in GMM state GMM-DEREGISTERED or GMM-REGISTERED-INITIATED. The GPRS service is enabled, but an allowable PLMN is currently not available. The MS will start a GPRS attach as soon as an allowable PLMN is available.

3 registration denied
The MS is in GMM state GMM-NULL. The GPRS service is disabled, the MS is not allowed to attach for GPRS if requested by the user.

4 unknown

5 registered, roaming
The MS is in GMM state GMM-REGISTERED or GMM-ROUTING-AREA-UPDATING-INITIATED on a visited PLMN.

<lac>: string type; two byte location area code in hexadecimal format (e.g. "00C3" equals 195 in decimal)

<ci>: string type; two byte cell ID in hexadecimal format

Implementation

Optional.

3GPP TSG-T WG2#12
Beverley Hills, California, USA,
12-16 February 2001

T2-010117

CR-Form-v3

CHANGE REQUEST

⌘ **07.07** **CR** **A089** ⌘ rev **-** ⌘ Current version: **7.5.0** ⌘

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

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

Title:	⌘	Definition of "class C in GPRS and circuit switched alternate mode"
Source:	⌘	T2
Work item code:	⌘	TEI
Date:	⌘	2001-02-14
Category:	⌘	**A**
Release:	⌘	R98

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

Use one of the following releases:

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

Reason for change:	⌘	According to 02.60 there are four different GPRS MS Modes of Operation defined. The fifth mode "class C in GPRS and circuit switched alternate mode" given in the definition of the +CGCLASS AT command is not defined in the GPRS core specifications.
Summary of change:	⌘	As the expected MS behaviour for "class C in GPRS and circuit switched alternate mode" is not clear and there is no equivalent definition in the GPRS specifications, it is proposed to delete this class.
Consequences if not approved:	⌘	As there is no GPRS MS Mode which corresponds to the class 'C' mentioned in the command +CGCLASS there is the risk of different implementations by the manufacturer.

Clauses affected:	⌘	10.1.11
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

10.1.11 GPRS mobile station class +CGCLASS

Table 1: CGCLASS parameter command syntax

Command	Possible Response(s)
+CGCLASS= [<class>]	OK ERROR
+CGCLASS?	+CGCLASS: <class>
+CGCLASS=?	+CGCLASS: (list of supported <class>s)

Description

The set command is used to set the MT to operate according to the specified GPRS mobile class. If the requested class is not supported, an ERROR or +CME ERROR response is returned. Extended error responses are enabled by the +CMEE command.

The read command returns the current GPRS mobile class.

The test command is used for requesting information on the supported GPRS mobile classes.

Defined Values

<class>: a string parameter which indicates the GPRS mobile class (in descending order of functionality)

A class A (highest)
B class B
~~C class C in GPRS and circuit switched alternate mode~~
CG class C in GPRS only mode
CC class C in circuit switched only mode (lowest)

Other values are reserved and will result in an ERROR response to the set command.

If the MT is GPRS attached when the set command is issued with a <class> = CC specified, a detach request shall be sent to the network.

Implementation

Optional.

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Los Angeles, US
12th - 16th February 2001

T2-0100108

CR-Form-v3

CHANGE REQUEST

⌘ **27.007** **CR** **50** ⌘ rev **-** ⌘ Current version: **3.7.0** ⌘

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

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

Title:	⌘	Addition of explicit subscribed value to QoS command
Source:	⌘	T2
Work item code:	⌘	TEI
Date:	⌘	23/01/2001
Category:	⌘	**F**
Release:	⌘	R99

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

Use one of the following releases:

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

Reason for change:	⌘	Since there is currently no explanation of omitted value of <Traffic Class >, <Delivery Order>, <Delivery of Erronous SDUs>, <Transfer Delay>, <Maximum SDU Size>, <Maximum Bitrate (UL / DL)>, <Guaranteed Bitrate (UL / DL)> and <Traffic Handling Priority> fields in the AT+CGEQREQ, AT+CGEQMIN and AT+CGEQNEG commands means subscribed values, subscribed value is added explicity to each of those fields. Also 'no detect' value is missing from <Delivery of Erronous SDUs> field.
Summary of change:	⌘	Assign a complete different value when referring to subscribed value. This value is put last in the range of the current values. Add 'no detect' value to <Delivery of Erronous SDUs> field. In +CGEQNEG command, the example is corrected; "(e.g. AT+CGEQNEG=...,32, ...)" corrected to "(e.g. +CGEQNEG: ...,32, ...)"
Consequences if not approved:	⌘	As terminals manufacturers may interpret the omitted value in different ways, it may cause incompatibility issue.

Clauses affected:	⌘	10.1.6, 10.1.7, 10.1.8
Other specs Affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

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

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

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 TSG meetings.

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

10.1.6 3G Quality of Service Profile (Requested) +CGEQREQ

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Deleted text

****

Description

This command allows the TE to specify a UMTS Quality of Service Profile that is used when the MT sends an Activate PDP Context Request message to the network.

The set command specifies a profile for the context identified by the (local) context identification parameter, <cid>. The specified profile will be stored in the MT and sent to the network only at activation or MS-initiated modification of the related context. Since this is the same parameter that is used in the +CGDCONT and +CGDSCONT commands, the +CGEQREQ command is effectively an extension to these commands. The QoS profile consists of a number of parameters, each of which may be set to a separate value.

A special form of the set command, +CGEQREQ= <cid> causes the requested profile for context number <cid> to become undefined.

The read command returns the current settings for each defined context.

The test command returns values supported as a compound value. If the MT supports several PDP types, the parameter value ranges for each PDP type are returned on a separate line.

Defined values

<cid>: a numeric parameter which specifies a particular PDP context definition (see +CGDCONT and +CGDSCONT commands).

The following parameters are defined in 3GPP TS 23.107 [46] -

<Traffic class>: a numeric parameter that indicates the type of application for which the UMTS bearer service is optimised.
0 - conversational
1 - streaming
2 - interactive
3 - background
4 - subscribed value

Other values are reserved.

<Maximum bitrate UL>: a numeric parameter that indicates the maximum number of kbits/s delivered to UMTS (up-link traffic) at a SAP. As an example a bitrate of 32kbit/s would be specified as '32' (e.g. AT+CGEQREQ=…,32, …).

<Maximum bitrate DL>: a numeric parameter that indicates the maximum number of kbits/s delivered by UMTS (down-link traffic) at a SAP. As an example a bitrate of 32kbit/s would be specified as '32' (e.g. AT+CGEQREQ=…,32, …). If the parameter is set to '0' the subscribed value will be requested.

<Guaranteed bitrate UL>: a numeric parameter that indicates the guaranteed number of kbits/s delivered to UMTS (up-link traffic) at a SAP (provided that there is data to deliver). As an example a bitrate of 32kbit/s would be specified as '32' (e.g. AT+CGEQREQ=…,32, …). If the parameter is set to '0' the subscribed value will be requested.

<Guaranteed bitrate DL>: a numeric parameter that indicates the guaranteed number of kbits/s delivered by UMTS (down-link traffic) at a SAP (provided that there is data to deliver). As an example a bitrate of

32kbit/s would be specified as '32' (e.g. AT+CGEQREQ=…,32, …). If the parameter is set to '0' the subscribed value will be requested.

<Delivery order>: a numeric parameter that indicates whether the UMTS bearer shall provide in-sequence SDU delivery or not.
0 - no
1 - yes
2 - subscribed value.

Other values are reserved.

<Maximum SDU size>: a numeric parameter (1,2,3,…) that indicates the maximum allowed SDU size in octets. If the parameter is set to '0' the subscribed value will be requested.

<SDU error ratio>: a string parameter that indicates the target value for the fraction of SDUs lost or detected as erroneous. SDU error ratio is defined only for conforming traffic. The value is specified as 'mEe'. As an example a target SDU error ratio of $5•10^{-3}$ would be specified as '5E3' (e.g. AT+CGEQREQ=…,"5E3",…). '0E0' means subscribed value.

<Residual bit error ratio>: a string parameter that indicates the target value for the undetected bit error ratio in the delivered SDUs. If no error detection is requested, Residual bit error ratio indicates the bit error ratio in the delivered SDUs. The value is specified as 'mEe'. As an example a target residual bit error ratio of $5•10^{-3}$ would be specified as '5E3' (e.g. AT+CGEQREQ=…,"5E3",…). '0E0' means subscribed value.

<Delivery of erroneous SDUs>: a numeric parameter that indicates whether SDUs detected as erroneous shall be delivered or not.
0 - no
1 - yes
2 - no detect
3 - subscribed value

Other values are reserved.

<Transfer delay>: a numeric parameter (0,1,2,…) that indicates the targeted time between request to transfer an SDU at one SAP to its delivery at the other SAP, in milliseconds. If the parameter is set to '0' the subscribed value will be requested.

<Traffic handling priority>: a numeric parameter (1,2,3,…) that specifies the relative importance for handling of all SDUs belonging to the UMTS bearer compared to the SDUs of other bearers. If the parameter is set to '0' the subscribed value will be requested.

<PDP_type>: (see +CGDCONT and +CGDSCONT commands).

If a value is omitted for a particular class then the value is considered to be unspecified.

Implementation

Optional. If the command is not implemented then all the values are considered to be unspecified.

10.1.7 3G Quality of Service Profile (Minimum acceptable) +CGEQMIN

Table 1: +CGEQMIN parameter command syntax

Command	Possible Response(s)
+CGEQMIN=[<cid> [,<Traffic class> [,<Maximum bitrate UL> [,<Maximum	OK

Command	Possible Response(s)
bitrate DL> [,<Guaranteed bitrate UL> [,<Guaranteed bitrate DL> [,<Delivery order> [,<Maximum SDU size> [,<SDU error ratio> [,<Residual bit error ratio> [,<Delivery of erroneous SDUs> [,<Transfer delay> [,<Traffic handling priority>]]]]]]]]]]]]	ERROR
+CGEQMIN?	+CGEQMIN: <cid>, <Traffic class> ,<Maximum bitrate UL>, <Maximum bitrate DL> ,<Guaranteed bitrate UL> ,<Guaranteed bitrate DL>, <Delivery order> ,<Maximum SDU size> ,<SDU error ratio> ,<Residual bit error ratio> ,<Delivery of erroneous SDUs> ,<Transfer delay> ,<Traffic handling priority> [<CR><LF>+CGEQMIN: <cid>, <Traffic class> ,<Maximum bitrate UL> ,<Maximum bitrate DL> ,<Guaranteed bitrate UL> ,<Guaranteed bitrate DL>, <Delivery order> ,<Maximum SDU size> ,<SDU error ratio> ,<Residual bit error ratio> ,<Delivery of erroneous SDUs> ,<Transfer delay> ,<Traffic handling priority> […]]
+CGEQMIN=?	+CGEQMIN: <PDP_type>, (list of supported <Traffic class>s) ,(list of supported <Maximum bitrate UL>s) ,(list of supported <Maximum bitrate DL>s), (list of supported <Guaranteed bitrate UL>s), (list of supported <Guaranteed bitrate DL>s) ,(list of supported <Delivery order>s) ,(list of supported <Maximum SDU size>s) ,(list of supported <SDU error ratio>s) ,(list of supported <Residual bit error ratio>s) ,(list of supported <Delivery of erroneous SDUs>s) ,(list of supported <Transfer delay>s) ,(list of supported <Traffic handling priority>s) [<CR><LF>+CGEQMIN: <PDP_type>, (list of supported <Traffic class>s) ,(list of supported <Maximum bitrate UL>s), (list of supported <Maximum bitrate DL>s) ,(list of supported <Guaranteed bitrate UL >s), (list of supported <Guaranteed bitrate DL >s) ,(list of supported <Delivery order>s) ,(list of supported <Maximum SDU size>s) ,(list of supported <SDU error ratio>s) ,(list of supported <Residual bit error ratio>s) ,(list of supported <Delivery of erroneous SDUs>s) ,(list of supported <Transfer delay>s) ,(list of supported <Traffic handling priority>s) […]]

Description

This command allows the TE to specify a minimum acceptable profile, which is checked by the MT against the negotiated profile returned in the Activate/Modify PDP Context Accept message.

The set command specifies a profile for the context identified by the (local) context identification parameter, <cid>. The specified profile will be stored in the MT and checked against the negotiated profile only at activation or MS-initiated modification of the related context. Since this is the same parameter that is used in the +CGDCONT and +CGDSCONT commands, the +CGEQMIN command is effectively an extension to these commands. The QoS profile consists of a number of parameters, each of which may be set to a separate value.

A special form of the set command, +CGEQMIN= <cid> causes the minimum acceptable profile for context number <cid> to become undefined. In this case no check is made against the negotiated profile.

The read command returns the current settings for each defined context.

The test command returns values supported as a compound value. If the MT supports several PDP types, the parameter value ranges for each PDP type are returned on a separate line.

Defined values

<cid>: a numeric parameter which specifies a particular PDP context definition (see +CGDCONT and +CGDSCONT commands).

The following parameters are defined in 3GPP TS 23.107 [46] -

<Traffic class>: a numeric parameter that indicates the type of application for which the UMTS bearer service is optimised.
0 - conversational
1 - streaming
2 - interactive
3 - background

Other values are reserved.

<Maximum bitrate UL>: a numeric parameter that indicates the maximum number of kbits/s delivered to UMTS (up-link traffic) at a SAP. As an example a bitrate of 32kbit/s would be specified as '32' (e.g. AT+CGEQMIN=…,32, …).

<Maximum bitrate DL>: a numeric parameter that indicates the maximum number of kbits/s delivered by UMTS (down-link traffic) at a SAP. As an example a bitrate of 32kbit/s would be specified as '32' (e.g. AT+CGEQMIN=…,32, …).

<Guaranteed bitrate UL>: a numeric parameter that indicates the guaranteed number of kbits/s delivered to UMTS (up-link traffic) at a SAP (provided that there is data to deliver). As an example a bitrate of 32kbit/s would be specified as '32' (e.g. AT+CGEQMIN=…,32, …).

<Guaranteed bitrate DL>: a numeric parameter that indicates the guaranteed number of kbits/s delivered by UMTS (down-link traffic) at a SAP (provided that there is data to deliver). As an example a bitrate of 32kbit/s would be specified as '32' (e.g. AT+CGEQMIN=…,32, …).

<Delivery order>: a numeric parameter that indicates whether the UMTS bearer shall provide in-sequence SDU delivery or not.
0 - no
1 - yes
Other values are reserved.

<Maximum SDU size>: a numeric parameter (1,2,3,…) that indicates the maximum allowed SDU size in octets.

<SDU error ratio>: a string parameter that indicates the target value for the fraction of SDUs lost or detected as erroneous. SDU error ratio is defined only for conforming traffic. The value is specified as 'mEe'. As an example a target SDU error ratio of $5 \cdot 10^{-3}$ would be specified as '5E3' (e.g. AT+CGEQMIN=…,"5E3",…).

<Residual bit error ratio>: a string parameter that indicates the target value for the undetected bit error ratio in the delivered SDUs. If no error detection is requested, Residual bit error ratio indicates the bit error ratio

in the delivered SDUs. The value is specified as 'mEe'. As an example a target residual bit error ratio of $5 \cdot 10^{-3}$ would be specified as '5E3' (e.g. AT+CGEQMIN=…,"5E3",…).

`<Delivery of erroneous SDUs>:` a numeric parameter that indicates whether SDUs detected as erroneous shall be delivered or not.
0 - no
1 - yes
2 - no detect

Other values are reserved.

`<Transfer delay>:` a numeric parameter (0,1,2,…) that indicates the targeted time between request to transfer an SDU at one SAP to its delivery at the other SAP, in milliseconds.

`<Traffic handling priority>:` a numeric parameter (1,2,3,…) that specifies the relative importance for handling of all SDUs belonging to the UMTS bearer compared to the SDUs of other bearers.

`<PDP_type>:` (see +CGDCONT and +CGDSCONT commands).

If a value is omitted for a particular class then the value is considered to be unspecified.

Implementation

Optional. If the command is not implemented then no check is made against the negotiated profile.

10.1.8 3G Quality of Service Profile (Negotiated) +CGEQNEG

Table 2: +CGEQNEG action command syntax

Command	Possible Response(s)
+CGEQNEG =[<cid>[,<cid>[,…]]]	+CGEQNEG: <cid>, <Traffic class> ,<Maximum bitrate UL>, <Maximum bitrate DL> ,<Guaranteed bitrate UL>, <Guaranteed bitrate DL> ,<Delivery order> ,<Maximum SDU size> ,<SDU error ratio> ,<Residual bit error ratio> ,<Delivery of erroneous SDUs> ,<Transfer delay> ,<Traffic handling priority> [<CR><LF>+CGEQNEG: <cid>, <Traffic class> ,<Maximum bitrate UL>, <Maximum bitrate DL> ,<Guaranteed bitrate UL>, <Guaranteed bitrate DL> ,<Delivery order> ,<Maximum SDU size> ,<SDU error ratio> ,<Residual bit error ratio> ,<Delivery of erroneous SDUs> ,<Transfer delay> ,<Traffic handling priority> […]]
+CGEQNEG=?	+CGEQNEG: (list of <cid>s associated with active contexts)

Description

This command allows the TE to retrieve the negotiated QoS profiles returned in the Activate PDP Context Accept message.

The execution command returns the negotiated QoS profile for the specified context identifiers, <cid>s. The QoS profile consists of a number of parameters, each of which may have a separate value.

The test command returns a list of <cid>s associated with active contexts.

Defined values

<cid>: a numeric parameter which specifies a particular PDP context definition (see +CGDCONT and +CGDSCONT commands).

The following parameters are defined in 3GPP TS 23.107 [46] -

<Traffic class>: a numeric parameter that indicates the type of application for which the UMTS bearer service is optimised.
0 - conversational
1 - streaming
2 - interactive
3 - background
Other values are reserved.

<Maximum bitrate UL>: a numeric parameter that indicates the maximum number of kbits/s delivered to UMTS (up-link traffic) at a SAP. As an example a bitrate of 32kbit/s would be specified as '32' (e.g. ~~AT~~+CGEQNEG~~=~~:…,32, …).

<Maximum bitrate DL>: a numeric parameter that indicates the maximum number of kbits/s delivered by UMTS (down-link traffic) at a SAP As an example a bitrate of 32kbit/s would be specified as '32' (e.g. ~~AT~~+CGEQNEG~~=~~:…,32, …).

<Guaranteed bitrate UL>: a numeric parameter that indicates the guaranteed number of kbits/s delivered to UMTS (up-link traffic) at a SAP (provided that there is data to deliver). As an example a bitrate of 32kbit/s would be specified as '32' (e.g. ~~AT~~+CGEQNEG~~=~~:…,32, …).

<Guaranteed bitrate DL>: a numeric parameter that indicates the guaranteed number of kbits/s delivered by UMTS (down-link traffic) at a SAP (provided that there is data to deliver). As an example a bitrate of 32kbit/s would be specified as '32' (e.g. ~~AT~~+CGEQNEG~~=~~:…,32, …).

<Delivery order>: a numeric parameter that indicates whether the UMTS bearer shall provide in-sequence SDU delivery or not.
0 - no
1 - yes
Other values are reserved.

<Maximum SDU size>: a numeric parameter that (1,2,3,…) indicates the maximum allowed SDU size in octets.

<SDU error ratio>: a string parameter that indicates the target value for the fraction of SDUs lost or detected as erroneous. SDU error ratio is defined only for conforming traffic. The value is specified as 'mEe'. As an example a target SDU error ratio of $5 \cdot 10^{-3}$ would be specified as '5E3' (e.g. ~~AT~~+CGEQNEG~~=~~:…,"5E3",…).

<Residual bit error ratio>: a string parameter that indicates the target value for the undetected bit error ratio in the delivered SDUs. If no error detection is requested, Residual bit error ratio indicates the bit error ratio in the delivered SDUs. The value is specified as 'mEe'. As an example a target residual bit error ratio of $5 \cdot 10^{-3}$ would be specified as '5E3' (e.g. ~~AT~~+CGEQNEG~~=~~:…,"5E3",…).

<Delivery of erroneous SDUs>: a numeric parameter that indicates whether SDUs detected as erroneous shall be delivered or not.
0 - no
1 - yes
2 - no detect

Other values are reserved.

<Transfer delay>: a numeric parameter (0,1,2,…) that indicates the targeted time between request to transfer an SDU at one SAP to its delivery at the other SAP, in milliseconds.

<Traffic handling priority>: a numeric parameter (1,2,3,…) that specifies the relative importance for handling of all SDUs belonging to the UMTS bearer compared to the SDUs of other bearers.

If a value is omitted for a particular class then the value is considered to be unspecified.

Implementation

Optional.

3GPP TSG-T WG2#12
Beverley Hills, California, USA,
12-16 February 2001

T2-010115

CR-Form-v3

CHANGE REQUEST

⌘ **27.007** **CR** **51** ⌘ rev **-** ⌘ Current version: **3.7.0** ⌘

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

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

Title:	⌘	Corresponding GMM states for +CGREG command
Source:	⌘	T2
Work item code:	⌘	TEI
Date:	⌘	2001-02-14
Category:	⌘	**F**
Release:	⌘	R99

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

Use one of the following releases:

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

Reason for change:	⌘	The current definitions for the return values of the +CGREG AT command are ambiguous and a unequivocal mapping to the corresponding GMM status is not possible.
Summary of change:	⌘	It is proposed to add for each return value an additional definition in which GMM state(s) the cause value should given. Furthermore its clarified if the GPRS service is enabled by the user (i.e. the GPRS attach is request by the user).
Consequences if not approved:	⌘	As the current definitions are ambiguous, there is the risk of different MS implementations.

Clauses affected:	⌘	10.1.19
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

10.1.19 GPRS network registration status +CGREG

Table 1: CGREG parameter command syntax

Command	Possible response(s)
+CGREG=[<n>]	
+CGREG?	+CGREG: <n>,<stat>[,<lac>,<ci>] *+CME ERROR: <err>*
+CGREG=?	+CGREG: (list of supported <n>s)

Description

The set command controls the presentation of an unsolicited result code +CGREG: <stat> when <n>=1 and there is a change in the MT's GPRS network registration status, or code +CGREG: <stat>[,<lac>,<ci>] when <n>=2 and there is a change of the network cell.

NOTE. If the GPRS MT also supports circuit mode services, the +CREG command and +CREG: result code apply to the registration status and location information for those services.

The read command returns the status of result code presentation and an integer <stat> which shows whether the network has currently indicated the registration of the MT. Location information elements <lac> and <ci> are returned only when <n>=2 and MT is registered in the network.

Defined values

<n>:

0 disable network registration unsolicited result code

1 enable network registration unsolicited result code +CGREG: <stat>

2 enable network registration and location information unsolicited result code +CGREG: <stat>[,<lac>,<ci>]

<stat>:

0 not registered, ME is not currently searching an ~~new~~ operator to register to
The MS is in GMM state GMM-NULL or GMM-DEREGISTERED-INITIATED.
The GPRS service is disabled, the MS is allowed to attach for GPRS if requested by the user.

1 registered, home network
The MS is in GMM state GMM-REGISTERED or GMM-ROUTING-AREA-UPDATING-INITIATED INITIATED on the home PLMN.

2 not registered, but ME is currently trying to attach or searching an ~~new~~ operator to register to
The MS is in GMM state GMM-DEREGISTERED or GMM-REGISTERED-INITIATED. The GPRS service is enabled, but an allowable PLMN is currently not available. The MS will start a GPRS attach as soon as an allowable PLMN is available.

3 registration denied
The MS is in GMM state GMM-NULL. The GPRS service is disabled, the MS is not allowed to attach for GPRS if requested by the user.

4 unknown

5 registered, roaming
The MS is in GMM state GMM-REGISTERED or GMM-ROUTING-AREA-UPDATING-INITIATED on a visited PLMN.

<lac>: string type; two byte location area code in hexadecimal format (e.g. "00C3" equals 195 in decimal)

<ci>: string type; two byte cell ID in hexadecimal format

Implementation

Optional.

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CHANGE REQUEST

⌘ **27.007** **CR** **52** ⌘ rev **-** ⌘ Current version: **3.7.0** ⌘

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

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

Title:	⌘	Definition of "class C in GPRS and circuit switched alternate mode"
Source:	⌘	T2
Work item code:	⌘	TEI
Date:	⌘	2001-02-14
Category:	⌘	**A**
Release:	⌘	R99

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

Use one of the following releases:

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

Reason for change:	⌘	According to 02.60 there are four different GPRS MS Modes of Operation defined. The fifth mode "class C in GPRS and circuit switched alternate mode" given in the definition of the +CGCLASS AT command is not defined in the GPRS core specifications.
Summary of change:	⌘	As the expected MS behaviour for "class C in GPRS and circuit switched alternate mode" is not clear and there is no equivalent definition in the GPRS specifications, it is proposed to delete this class.
Consequences if not approved:	⌘	As there is no GPRS MS Mode which corresponds to the class 'C' mentioned in the command +CGCLASS there is the risk of different implementations by the manufacturer.

Clauses affected:	⌘	10.1.17
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

10.1.17 GPRS mobile station class +CGCLASS (GPRS only)

Table 1: CGCLASS parameter command syntax

Command	Possible Response(s)
+CGCLASS= [<class>]	OK ERROR
+CGCLASS?	+CGCLASS: <class>
+CGCLASS=?	+CGCLASS: (list of supported <class>s)

Description

The set command is used to set the MT to operate according to the specified GPRS mobile class. If the requested class is not supported, an ERROR or +CME ERROR response is returned. Extended error responses are enabled by the +CMEE command.

The read command returns the current GPRS mobile class.

The test command is used for requesting information on the supported GPRS mobile classes.

Defined Values

<class>: a string parameter which indicates the GPRS mobile class (in descending order of functionality)

A	class A (highest)
B	class B
~~C~~	~~class C in GPRS and circuit switched alternate mode~~
CG	class C in GPRS only mode
CC	class C in circuit switched only mode (lowest)

Other values are reserved and will result in an ERROR response to the set command.

If the MT is GPRS attached when the set command is issued with a <class> = CC specified, a detach request shall be sent to the network.

Implementation

Optional.

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Beverley Hills, California, USA,
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CR-Form-v3

CHANGE REQUEST

⌘ **27.007** **CR** **53** ⌘ rev **-** ⌘ Current version: **4.0.0** ⌘

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

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

Title:	⌘	Clarification of the specification to incorporate UICC/USIM references
Source:	⌘	T2
Work item code:	⌘	TI-ATC
Date:	⌘	2001-01-18
Category:	⌘	**A**
Release:	⌘	REL-4

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

Use one of the following releases:

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

Reason for change:	⌘	Clarification of the specification to incorporate UICC/USIM references
Summary of change:	⌘	In the command description where it is said "SIM" it has been replaced by "SIM card or active application in the UICC (GSM or USIM)", when refering to the application, and by "SIM/UICC" when refering to the card.
Consequences if not approved:	⌘	Not clearly identify the link between the AT commands and the UICC/USIM

Clauses affected:	⌘	2, 3.2, 5.6, 6.3, 7.1, 7.4, 7.16, 7.21, 7.22, 7.23, 7.24, 7.26, 8, 8.11, 8.25, 8.26, 8.27, 8.30
Other specs affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications ⌘
Other comments:	⌘	

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

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.
2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 TSG meetings.
3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

2 References

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

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

[1] 3GPP TS 22.002: "3rd Generation Partnership Project; Bearer Services (BS) supported by a GSM Public Land Mobile Network (PLMN)".

[2] 3GPP TS 22.003: "3rd Generation Partnership Project; Teleservices supported by a GSM Public Land Mobile Network (PLMN)".

[3] 3GPP TS 22.081: "3rd Generation Partnership Project; Line identification supplementary services - Stage 1".

[4] 3GPP TS 22.082: "3rd Generation Partnership Project; Call Forwarding (CF) supplementary services - Stage 1".

[5] 3GPP TS 22.083: "3rd Generation Partnership Project; Call Waiting (CW) and Call Hold (HOLD) supplementary services - Stage 1".

[6] 3GPP TS 22.088: "3rd Generation Partnership Project; Call Barring (CB) supplementary services - Stage 1".

[7] 3GPP TS 23.003: "3rd Generation Partnership Project; Numbering, addressing and identification".

[8] 3GPP TS 44.008: "Digital cellular telecommunication system (Phase 2+); Mobile radio interface layer 3 specification".

[9] GSM MoU SE.13, GSM MoU Permanent Reference Document SE.13: "GSM Mobile Network Codes and Names".

[10] ITU-T Recommendation E.212: "Identification plan for land mobile stations".

[11] ITU-T Recommendation T.31: "Asynchronous facsimile DCE control, service class 1".

[12] ITU-T Recommendation T.32: "Asynchronous facsimile DCE control, service class 2".

[13] ITU-T Recommendation T.50: "International Reference Alphabet (IRA) (Formerly International Alphabet No. 5 or IA5) - Information technology - 7-bit coded character set for information exchange".

[14] ITU-T Draft new Recommendation V.25ter: "Serial asynchronous automatic dialling and control".

[15] Telecommunications Industry Association TIA IS-99: "Data Services Option Standard for Wideband Spread Spectrum Digital Cellular System".

[16] Telecommunications Industry Association TIA IS-135: "800 MHz Cellular Systems, TDMA Services, Async Data and Fax".

[17] Portable Computer and Communications Association PCCA STD-101 Data Transmission Systems and Equipment: "Serial Asynchronous Automatic Dialling and Control for Character Mode DCE on Wireless Data Services".

[18] 3GPP TS 24.022: "3rd Generation Partnership Project; Radio Link Protocol (RLP) for data and telematic services on the Mobile Station - Base Station System (MS - BSS) interface and the Base Station System - Mobile-services Switching Centre (BSS - MSC) interface".

[19] 3GPP TS 22.030: "3rd Generation Partnership Project; Man Machine Interface (MMI) of the Mobile Station (MS)".

[20] 3GPP TS 45.008: "Digital cellular telecommunication system (Phase 2+); Radio subsystem link control".

[21] 3GPP TS 22.085: "3rd Generation Partnership Project; Closed User Group (CUG) supplementary services - Stage 1".

[22] 3GPP TS 22.084: "3rd Generation Partnership Project; MultiParty (MPTY) supplementary services - Stage 1".

[23] 3GPP TS 22.090: "3rd Generation Partnership Project; Unstructured Supplementary Service Data (USSD) - Stage 1".

[24] 3GPP TS 27.005: "3rd Generation Partnership Project; Use of Data Terminal Equipment - Data Circuit terminating Equipment (DTE - DCE) interface for Short Message Service (SMS) and Cell Broadcast Service (CBS)".

[25] 3GPP TS 23.038: "3rd Generation Partnership Project; Alphabet and language specific information".

[26] 3GPP TS 22.024: "3rd Generation Partnership Project; Description of Charge Advice Information (CAI)".

[27] 3GPP TS 22.086: "3rd Generation Partnership Project; Advice of Charge (AoC) supplementary services - Stage 1".

[28] 3GPP TS 51.011: "Digital cellular telecommunication system (Phase 2+); Specification of the Subscriber Identity Module - Mobile Equipment (SIM-ME) interface".

[29] 3GPP TS 22.034: "3rd Generation Partnership Project; High Speed Circuit Switched Data (HSCSD) - Stage 1".

[30] 3GPP TS 22.091: "3rd Generation Partnership Project; Explicit Call Transfer (ECT) supplementary service - Stage 1".

[31] 3GPP TS 22.072: "3rd Generation Partnership Project; Call Deflection (CD) supplementary service - Stage 1".

[32] ISO/IEC10646: "Universal Multiple-Octet Coded Character Set (UCS)"; UCS2, 16 bit coding.

[33] 3GPP TS 22.022: "3rd Generation Partnership Project; Personalization of GSM Mobile Equipment (ME) Mobile functionality specification".

[34] 3GPP TS 27.060: "3rd Generation Partnership Project; General requirements on Mobile Stations (MS) supporting General Packet Radio Bearer Service (GPRS)".

[35] CCITT Recommendation V.110: "Support of data terminal equipments (DTEs) with V-Series interfaces by an integrated services digital network".

[36] CCITT Recommendation V.120: "Support by an ISDN of data terminal equipment with V-Series type interfaces with provision for statistical multiplexing".

[37] ITU-T Recommendation X.31: "Support of packet mode terminal equipment by an ISDN".

[38] 3GPP TS 45.005: "Digital cellular telecommunication system (Phase 2+); Radio transmission and reception".

[39] 3GPP TS 29.061: "3rd Generation Partnership Project; General Packet Radio Service (GPRS); Interworking between the Public Land Mobile Network (PLMN) supporting GPRS and Packet Data Networks (PDN)".

[40] 3GPP TS 23.081: "3rd Generation Partnership Project; Technical Specification Group Core Network; Line identification supplementary services - Stage 2".

[41] 3GPP TS 27.001: "3rd Generation Partnership Project; Technical Specification Group Core Network; General on Terminal Adaptation Functions (TAF) for Mobile Stations (MS)".

[42] 3GPP TS 29.007: "3rd Generation Partnership Project; Technical Specification Group Core Network; General requirements on interworking between the Public Land Mobile Network (PLMN) and the Integrated Services Digital Network (ISDN) or Public Switched Telephone Network (PSTN)".

[43] Infrared Data Association; Specification of Ir Mobile Communications (IrMC).

[44] IrDA Object Exchange Protocol.

[45] 3GPP TS 27.010: "3rd Generation Partnership Project; Terminal Equipment to User Equipment (TE-UE) multiplexer protocol User Equipment (UE)".

[46] 3GPP TS 23.107: "3rd Generation Partnership Project; Quality of Service, Concept and Architecture".

[47] 3GPP TS 23.060: "3rd Generation Partnership Project; General Packet Radio Service (GPRS) Service description; Stage 2".

[48] 3GPP TS 23.067: "3rd Generation Partnership Project; Enhanced Multi-Level Precedence and Pre-emption service (eMLPP) - Stage 2".

[49] 3GPP TS 43.068: "Digital cellular telecommunication system (Phase 2+); Voice Group Call service (VGCS) - Stage 2".

[50] 3GPP TS 43.069: "Digital cellular telecommunication system (Phase 2+); Voice Broadcast Service (VBS) - Stage 2".

[51] 3GPP TS 24.067: "3rd Generation Partnership Project; Enhanced Multi-Level Precedence and Pre-emption service (eMLPP) - Stage 3".

[52] 3GPP TS 44.068: "Digital cellular telecommunication system (Phase 2+); Voice Group Call service (VGCS) - Stage 3".

[53] GSM 44.069: "Digital cellular telecommunication system (Phase 2+); Voice Broadcast Service (VBS) - Stage 3".

[54] 3GPP TS 22.067: "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; enhanced Multi-Level Precedence and Pre-emption service (eMLPP) - Stage 1".

[55] 3GPP TS 42.068: "Digital cellular telecommunication system (Phase 2+); Voice Group Call service (VGCS) - Stage 1".

[56] 3GPP TS 42.069: "Digital cellular telecommunication system (Phase 2+); Voice Broadcast Service (VBS) - Stage 1".

[57] 3GPP TS 24.008: "3rd Generation Partnership Project; Mobile Radio Interface Layer 3 specification; Core Network Protocols-Stage 3".

[58] 3GPP TS 22.087: "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects;User-to-User Signalling (UUS) - Stage 1"

[59] 3GPP TS 31.102: "3rd Generation Partnership Project; Technical Specification Group Terminals; Characteristics of the USIM Application".

[60] ETSI TS 102 221 "Smart Cards; UICC-Terminal interface; Physical and logical characteristics (Release 1999)".

3.2 Abbreviations

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

AT	ATtention; this two-character abbreviation is always used to start a command line to be sent from TE to TA
ASCI	Advanced Speech Call Items, including VGCS, VBS and eMLPP
BCD	Binary Coded Decimal
eMLPP	Enhanced Multi-Level Precedence and Pre-emption Service
ETSI	European Telecommunications Standards Institute
FTM	Frame Tunnelling Mode (refer 3GPP TS 27.001 [41] and 3GPP TS 29.007[42])
HSCSD	High Speed Circuit Switched Data
IHOSS	Internet Hosted Octet Stream Service
IMEI	International Mobile station Equipment Identity
IRA	International Reference Alphabet (ITU-T T.50 [13])
IrDA	Infrared Data Association
ISO	International Standards Organization
ITU-T	International Telecommunication Union - Telecommunications Standardization Sector
ME	Mobile Equipment, e.g. a GSM phone (equal to MS; Mobile Station)
MoU	Memorandum of Understanding (GSM operator joint)
MT	Mobile Termination
OSP	Octet Stream Protocol
OSP:IHOSS	Octet Stream Protocol for Internet Hosted Octet Stream Service
PCCA	Portable Computer and Communications Association
PTT	Push to Talk
RDI	Restricted Digital Information
RLP	Radio Link Protocol
SIM	Subscriber Identity Module
TA	Terminal Adaptor, e.g. a GSM data card (equal to DCE; Data Circuit terminating Equipment)
TE	Terminal Equipment, e.g. a computer (equal to DTE; Data Terminal Equipment)
TIA	Telecommunications Industry Association
UDI	Unrestricted Digital Information
UICC	Universal Integrated Circuit Card
USIM	Universal Subscriber Identity Module
VBS	Voice Broadcast Service
VGCS	Voice Group Call Service

5.6 Request international mobile subscriber identity +CIMI

Table 1: +CIMI action command syntax

Command	Possible response(s)
+CIMI	<IMSI> *+CME ERROR: <err>*
+CIMI=?	

Description

Execution command causes the TA to return <IMSI>, which is intended to permit the TE to identify the individual SIM card or active application in the UICC (GSM or USIM) which is attached to ME. Refer subclause 9.2 for possible <err> values.

Defined values

<IMSI>: International Mobile Subscriber Identity (string without double quotes)

Implementation

Optional.

6.3 Direct dialling from phonebooks

GSM/UMTS ME and SIM/UICC can contain phonebooks which have a phone number and an alphanumeric field for each phonebook entry location. The use of V.25ter [14] dialling command ensures that direct dialling from ME and SIM/UICC phonebook is possible through ordinary communications software which just gives the phone number field to be filled and then use the D command to originate the call. Available memories may be queried with Select Phonebook Storage test command +CPBS=?, and location range for example with Read Phonebook Entries test command +CPBR=?.

Execute commands

1. D><str>[I][G][;] originate call to phone number which corresponding alphanumeric field is <str> (if possible, all available memories should be searched for the correct entry).

2. D>*mem*<n>[I][G][;] originate call to phone number in memory *mem* entry location <n> (available memories may be queried with Select Phonebook Storage test command +CPBS=?; *mem* could be e.g. ME).

3. D><n>[I][G][;] originate call to phone number in entry location <n> (it is manufacturer specific which memory storage of ME, SIM/UICC and TA is used; command Select Phonebook Memory Storage +CPBS setting is recommended to be used).

Semicolon character shall be added when voice call is originated. CLIR and CUG per call base modifiers may also be present.

Responses

Possible error responses include +CME ERROR: <err> when error is related to ME functionality. Refer subclause 9.2 for possible error values. Otherwise TA responses can have values defined by V.25ter [14] and commands Service Reporting Control +CR and Connected Line Identification Presentation +COLP. Detailed error report of an unsuccessful originated call failed in a GSM/UMTS network error can be obtained with command Extended Error Report +CEER (if implemented).

Defined values

<str>: string type value, which should equal to an alphanumeric field in at least one phonebook entry in the searched memories; used character set should be the one selected with Select TE Character Set +CSCS

<n>: integer type memory location should be in the range of locations available in the memory used

Implementation

Mandatory when direct dialling is implemented. Also phonebook commands implementation is required.

7.1 Subscriber number +CNUM

Table 2: +CNUM action command syntax

Command	Possible response(s)
+CNUM	+CNUM: [<alpha1>],<number1>,<type1>[,<speed>,<service>[,<itc>]] [<CR><LF>+CNUM: [<alpha2>],<number2>,<type2>[,<speed>,<service> [,<itc>]] [...]] *+CME ERROR: <err>*
+CNUM=?	

Description

Action command returns the MSISDNs related to the subscriber (this information can be stored in the SIM/UICC or in the ME. When storing information in the SIM/UICC, if a SIM card is present or if a UICC with an active GSM application is present, the information is stored in the EF_{MSISDN} under $DF_{Telecom}$. If a UICC with an active USIM application is present, the information is stored in the EF_{MSISDN} under ADF_{USIM}). If subscriber has different MSISDN for different services, each MSISDN is returned in a separate line. Refer subclause 9.2 for possible `<err>` values.

Defined values

`<alpha`*x*`>`: optional alphanumeric string associated with `<number`*x*`>`; used character set should be the one selected with command Select TE Character Set `+CSCS`

`<number`*x*`>`: string type phone number of format specified by `<type`*x*`>`

`<type`*x*`>`: type of address octet in integer format (refer GSM 44.008 [8] subclause 10.5.4.7)

`<speed>`: as defined in subclause 6.7

`<service>` (service related to the phone number):

0 asynchronous modem

1 synchronous modem

2 PAD Access (asynchronous)

3 Packet Access (synchronous)

4 voice

5 fax

also all other values below 128 are reserved by the present document

`<itc>` (information transfer capability):

0 3,1 kHz

1 UDI

Implementation

Optional.

7.4 Facility lock +CLCK

Table 3: +CLCK action command syntax

Command	Possible response(s)

`+CLCK=<fac>,<mode>[,<passwd>[,<class>]]`	*`+CME ERROR: <err>`*
	when `<mode>`=2 and command successful:
	`+CLCK: <status>[,<class1>`
	`[<CR><LF>+CLCK: <status>,<class2>`
	`[...]]`

`+CLCK=?`	`+CLCK:` (list of supported `<fac>`s) *`+CME ERROR: <err>`*

Description

Execute command is used to lock, unlock or interrogate a ME or a network facility <fac>. Password is normally needed to do such actions. When querying the status of a network service (<mode>=2) the response line for 'not active' case (<status>=0) should be returned only if service is not active for any <class>. Refer subclause 9.2 for possible <err> values. This command should be abortable when network facilities are set or interrogated.

Call barring facilities are based on GSM/UMTS supplementary services (refer 3GPP TS 22.088 [6]). The interaction of these with other commands based on other GSM/UMTS supplementary services is described in the GSM/UMTS standard.

Test command returns facility values supported by the TA as a compound value.

Defined values

<fac> values reserved by the present document:

"CS" CNTRL (lock CoNTRoL surface (e.g. phone keyboard))

"PS" PH-SIM (lock PHone to SIM/UICC card) (ME asks password when other than current SIM/UICC card inserted; ME may remember certain amount of previously used cards thus not requiring password when they are inserted)

"PF" lock Phone to the very First inserted SIM/UICC card (also referred in the present document as PH-FSIM) (ME asks password when other than the first SIM/UICC card is inserted)

"SC" SIM (lock SIM/UICC card) (SIM/UICC asks password in ME power-up and when this lock command issued)

"AO" BAOC (Barr All Outgoing Calls) (refer 3GPP TS 22.088 [6] clause 1)

"OI" BOIC (Barr Outgoing International Calls) (refer 3GPP TS 22.088 [6] clause 1)

"OX" BOIC-exHC (Barr Outgoing International Calls except to Home Country) (refer 3GPP TS 22.088 [6] clause 1)

"AI" BAIC (Barr All Incoming Calls) (refer 3GPP TS 22.088 [6] clause 2)

"IR" BIC-Roam (Barr Incoming Calls when Roaming outside the home country) (refer 3GPP TS 22.088 [6] clause 2)

"NT" barr incoming calls from numbers Not stored to TA memory

"NM" barr incoming calls from numbers Not stored to ME memory

"NS" barr incoming calls from numbers Not stored to SIM/UICC memory

"NA" barr incoming calls from numbers Not stored in Any memory

"AB" All Barring services (refer 3GPP TS 22.030 [19]) (applicable only for <mode>=0)

"AG" All outGoing barring services (refer 3GPP TS 22.030 [19]) (applicable only for <mode>=0)

"AC" All inComing barring services (refer 3GPP TS 22.030 [19]) (applicable only for <mode>=0)

"FD" SIM card or active application in the UICC (GSM or USIM) fixed dialling memory feature (if PIN2 authentication has not been done during the current session, PIN2 is required as <passwd>)

"PN" Network Personalization (refer 3GPP TS 22.022 [33])

"PU" network sUbset Personalization (refer 3GPP TS 22.022 [33])

"PP" service Provider Personalization (refer 3GPP TS 22.022 [33])

"PC" Corporate Personalization (refer 3GPP TS 22.022 [33])

<mode>:

0 unlock

1 lock

2 query status

<status>:

0 not active

1 active

<passwd>: string type; shall be the same as password specified for the facility from the ME user interface or with command Change Password +CPWD

<class*x*> is a sum of integers each representing a class of information (default 7):

1 voice (telephony)

2 data (refers to all bearer services; with <mode>=2 this may refer only to some bearer service if TA does not support values 16, 32, 64 and 128)

4 fax (facsimile services)

8 short message service

16 data circuit sync

32 data circuit async

64 dedicated packet access

128 dedicated PAD access

Implementation

The call barring supplementary service control is mandatory for ME supporting AT commands only and not supporting the control through dial command D.

7.16 Advice of Charge +CAOC

Table 4: +CAOC parameter command syntax

Command	Possible response(s)
+CAOC[=<mode>]	[+CAOC: <ccm>] *+CME ERROR: <err>*
+CAOC?	+CAOC: <mode>
+CAOC=?	[+CAOC: (list of supported <mode>s]

Description

This refers to Advice of Charge supplementary service (3GPP TS 22.024 [26] and 3GPP TS 22.086 [27]) that enables subscriber to get information about the cost of calls. With <mode>=0, the execute command returns the current call meter value from the ME.

The command also includes the possibility to enable an unsolicited event reporting of the CCM information. The unsolicited result code +CCCM: <ccm> is sent when the CCM value changes, but not more that every 10 seconds. Deactivation of the unsolicited event reporting is made with the same command.

Refer subclause 9.2 for possible <err> values.

NOTE: Advice of Charge values stored in the SIM card or in the active application in the UICC (GSM or USIM) (ACM, ACMmax, PUCT) can be accessed with generic or restricted SIM access command (+CSIM or +CRSM)).Those values can be more readily accessed with commands +CACM, +CAMM and +CPUC.

The Read command indicates whether the unsolicited reporting is activated or not. Read command is available when the unsolicited result code is supported.

It is recommended (although optional) that the test command returns the supported mode values.

Defined values

<mode>:

0 query CCM value

1 deactivate the unsolicited reporting of CCM value

2 activate the unsolicited reporting of CCM value

<ccm>: string type; three bytes of the current call meter value in hexadecimal format (e.g. "00001E" indicates decimal value 30); value is in home units and bytes are similarly coded as ACMmax value in the SIM card or in the active application in the UICC (GSM or USIM)

Implementation

Optional.

7.21 eMLPP Priority Registration and Interrogation +CAEMLPP

Table 5: CAEMLPP parameter command syntax

Command	Possible Response(s)
+CAEMLPP=<priority>	*+CME ERROR: <err>*
+CAEMLPP?	+CAEMLPP: <default_priority>,<max_priority> *+CME ERROR: <err>*
+CAEMLPP=?	

Description

The execute command is used to change the default priority level of the user in the network. The requested priority level is checked against the eMLPP subscription of the user stored on the SIM card or in the active application in the UICC (GSM or USIM) EF_{eMLPP}. If the user doesn't have subscription for the requested priority level an ERROR or +CMEE ERROR result code is returned.

The read command triggers an interrogation of the provision of the maximum priority level which the service subscriber is allowed to use and default priority level activated by the user.

If the service is not provisioned, a result code including the SS-Status (?) parameter is returned.

Defined Values

<priority>: integer type parameter which identifies the default priority level to be activated in the network, values specified in 3GPP TS 22.067 [54]

<default_priority>: integer type parameter which identifies the default priority level which is activated in the network, values specified in 3GPP TS 22.067 [54]

<max_priority>: integer type parameter which identifies the maximum priority level for which the service subscriber has a subscription in the network, values specified in 3GPP TS 22.067 [54]

Implementation

Mandatory for a ME supporting AT commands only and supplemantery service eMLPP is implemented.

7.22 eMLPP subscriptions +CPPS

Table 6: +CPPS action command syntax

Command	Possible response(s)
+CPPS	+CPPS: <priority>[,<priority> [...]] *+CME ERROR: <err>*
+CPPS=?	

Description

~~This command works with SIM Card and when the GSM Application is selected in UICC. Function with USIM is for further study~~. This command returns all eMLPP priority subscriptions of the user stored on the SIM card or in the active application in the UICC (GSM or USIM) EF_{eMLPP}. If no explicit priority level subscription is stored on the SIM card or in the active application in the UICC (GSM or USIM) -EF_{eMLPP} the result code OK is returned.

Defined values

<priority>: integer type, eMLPP subscription to priority level {0,1,..,4} as defined in 3GPP TS 22.067 [45].

Implementation

Mandatory for a ME supporting AT commands only and eMLPP is implemented.

7.23 Fast call setup conditions +CFCS

Table 7: +CFCS action command syntax

Command	Possible response(s)
+CFCS=<priority>,<status>	*+CME ERROR: <err>*
+CFCS?	+CFCS: <priority>[,<priority> [...]] *+CME ERROR: <err>*
+CFCS=?	+CFCS: (list of supported <priority>,<status>)

Description

~~This command works with SIM Card and when the GSM Application is selected in UICC. Function with USIM is for further study.~~ The set command is used to edit the status of the priority level for fast call set-up stored on the SIM card or in the active application in the UICC (GSM or USIM) EF_{eMLPP}. If the user has no subscription to the priority level status he wants to edit, an ERROR or +CME ERROR result code is returned.

The read command returns all enabled priority levels for fast call set-up stored on the SIM card or in the active application in the UICC (GSM or USIM) $EF_{eMLPP.}$ If no priority level is enabled for fast call set-up, the result code OK is returned.

Defined values

<priority>: integer type, eMLPP fast call set-up priority level {0,1,..,4} as defined in 3GPP TS 22.067 [45]

<status>: integer type

0 disable <priority> for fast call set-up

1 enable <priority> for fast call set-up

Implementation

Mandatory for a ME supporting AT commands only and eMLPP is implemented.

7.24 Automatic answer for eMLPP Service +CAAP

Table 8: +CAAP action command syntax

Command	Possible response(s)
+CAAP=<priority>,<status>	*+CME ERROR: <err>*
+CAAP?	+CAAP: <priority>[,<priority>[...]] *+CME ERROR: <err>*
+CAAP=?	+CAAP: (list of supported <priority>,<status>)

Description

~~This command works with SIM Card and when the GSM Application is selected in UICC. Function with USIM is for further study.~~ The set command is used to edit the status of the priority level for automatic answering for eMLPP stored on the SIM card or in the active application in the UICC (GSM or USIM) EF_{AAeM}. If the user has no subscription to the priority level status he wants to edit, an ERROR or +CME ERROR result code is returned.

The read command returns all enabled priority levels for automatic answering for eMLPP stored on the SIM card or in the active application in the UICC (GSM or USIM) $EF_{AAeM.}$ If no priority level is enabled for automatic answering for eMLPP, the result code OK is returned.

Defined values

<priority>: eMLPP automatic answer priority level value {A,B,0,1,..,4} as defined in 3GPP TS 22.067 [45]

<status>: integer type

0 disable eMLPP <priority> for automatic answering

1 enable eMLPP <priority> for automatic answering

Implementation

Mandatory for a ME supporting AT commands only and eMLPP is implemented.

7.26 Informative examples

This subclause includes all the GSM/UMTS supplementary service related commands, additional commands to lock ME and SIM/UICC capabilities, and commands to check the network registration status.

An example where MSISDNs of a ME are queried, calls are forwarded to different numbers when mobile is busy (CFB) or when it does not answer (CFNRy). The status of CFNRy is read:

```
AT+CNUM
+CNUM: ,"+358501234567",145,,4          (voice number)
OK
AT+CCFC=1,1,"931123456"                 (enable CFB)
OK
AT+CCFC=2,1,"921654321"                 (enable CFNRy)
OK
AT+CCFC=1,2                             (query CFNRy)
+CCFC: 1,7,"+35821654321",145,,,20      (forward after 20 seconds)
OK
```

An example of Call Waiting (+CCWA), Call Related Supplementary Services (+CHLD), and Connected Line Identification Presentation (+COLP) usage:

```
AT+CCWA=1,1;+COLP=1          (enable call waiting and COLP result codes)
OK
ATD9311234567;               (originate a voice call)
+COLP: "+358311234567",145
OK
...conversation...
+CCWA: "+358317654321",145   (another call is waiting)
AT+CHLD=2                    (put first call on hold and answer the second one)
OK
...conversation...
AT+CHLD=1                    (release the second (active) call and recover the first (held) call)
OK
ATH                          (release the first call)
OK
```

Call barring supplementary services are combined in one command, Facility Lock (+CLCK), which is also used to restrict ME and SIM/UICC functionality Some of the facilities require a password when enabled or disabled. An additional command, Change Password (+CPWD), is defined for changing the password of different barring and restriction facilities. An example where locking status of outgoing international calls is interrogated and then barred, and the password of the SIM/UICC card lock (Personal Identity Number, PIN) is changed:

```
AT+CLCK="OI",2
+CLCK: 0,7
OK
AT+CLCK="OI",1,"1234"
OK
AT+CPWD="SC","4321","1234"
OK
```

Operator Selection (+COPS) command is used for querying the status of all GSM/UMTS operators detected in the area, and switching between operators.

Following example illustrates a network selection sequence in Finland. Two operators are found, the status of Tele is unknown and Radiolinja is currently selected. Read command shows that automatic selection mode is on and that Radiolinja is selected. Then an attempt is made to access Tele, but it is denied (shown by +CME ERROR).

```
AT+COPS=?
+COPS: (2,"RADIOLINJA","RL","24405"),(0,"TELE","TELE","24491")
OK
AT+COPS?
+COPS: 0,0,"RADIOLINJA"
OK
AT+COPS=1,0,"TELE"
+CME ERROR: 3
```

When a terminal wanders between countries (i.e. networks), an application may follow this e.g. with the following scenario:

```
AT+CREG=1                    (enable +CREG: <stat> unsolicited result code)
OK
AT+CREG?
+CREG: 1,1                   (ME is registered in home PLMN)
OK
AT+COPS=3,2;+COPS?;+COPS=3,0;+COPS?
+COPS: 0,2,"24405"           (get the country...
+COPS: 0,0,"RADIOLINJA"       ...and operator name)
OK
...user wanders to another PLMN...
+CREG: 2                     (deregistered, roaming ongoing)
+CREG: 5                     (registered again, not home PLMN)
AT+COPS=3,2;+COPS?;+COPS=3,0;+COPS?
+COPS: 0,2,"24001"           (get the country...
+COPS: 0,0,"TELIA MOBITEL"    ...and operator name)
OK
...user loses connection, no other PLMNs around...
+CREG: 0
```

An example of eMLPP Supplementary Service usage for a ptp voice call:

```
ATD*752#+436644101453;      (originate a voice call with the priority level 2, see for priority level definitions GSM 02.30)
OK                          (call setup was successful)
```

8 Mobile Equipment control and status commands

This clause includes commands for ME power, keypad, display and indicator handling. Also commands for selecting, reading and writing of phonebooks, and setting real-time clock facilities are specified. Two commands are specified for accessing SIM/UICC database records in a general way.

Figure 1 illustrates the effect of these commands. Command Phone Activity Status +CPAS indicates the current general activity status of the ME. Command Set Phone Functionality +CFUN is used to set the ME to different power consumption states. Command Enter PIN +CPIN is used to enter ME passwords which are needed before any other functionality of the ME can be used (e.g. SIM PIN, PUK). Commands Generic SIM Access +CSIM and Restricted SIM Access +CRSM can be used to access all data in SIM/UICC. Commands Battery Charge +CBC and Signal Quality +CSQ are same as in TIA IS-135 [16] and they are used to query the battery charge of the ME and the current RSSI of the ME. Command Mobile Equipment Control Mode +CMEC is used to select the controlling unit of ME keypad, display and indicators. Controlling commands for the TE are Keypad Emulation +CKPD, Display Control +CDIS and Indicator Control +CIND. If corresponding event reporting is enabled with command Mobile Equipment Event Reporting +CMER, +CKEV is the result code of a keypad event, +CDEV is the result code of a display event, and +CIEV is the result code of an indicator event. Phonebook commands are Select Phonebook Memory Storage +CPBS, Read Phonebook Entries +CPBR, Find Phonebook Entries +CPBF and Write Phonebook Entry +CPBW. Additional command Clock +CCLK can be used to control the real-time clock of the ME if available. Command Alarm +CALA sets possible alarm clock facilities of the ME.

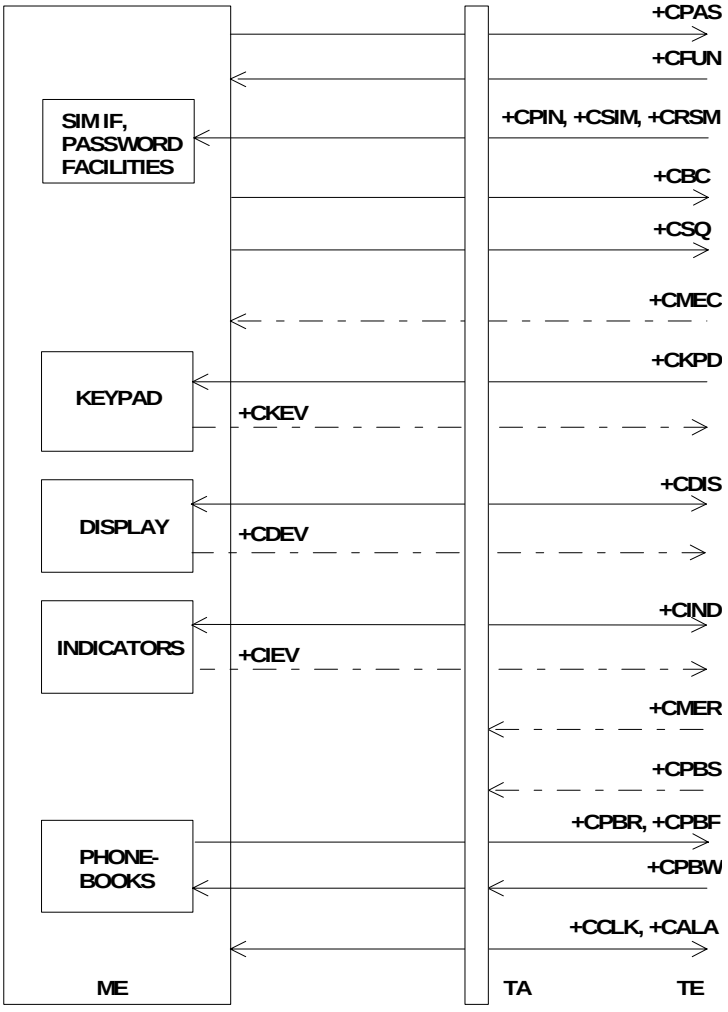

Figure 1: Mobile equipment control and status commands

8.11 Select phonebook memory storage +CPBS

Table 9: +CPBS parameter command syntax

Command	Possible response(s)
+CPBS=<storage>[,<password>]	*+CME ERROR: <err>*
+CPBS?	+CPBS: <storage>[,<used>,<total>] *+CME ERROR: <err>*
+CPBS=?	+CPBS: (list of supported <storage>s)

Description

Set command selects phonebook memory storage <storage>, which is used by other phonebook commands. If setting fails in an ME error, +CME ERROR: <err> is returned. Refer subclause 9.2 for <err> values.

Read command returns currently selected memory, and when supported by manufacturer, number of used locations and total number of locations in the memory.

Test command returns supported storages as compound value.

Defined values

<storage> values reserved by the present document:

"DC" ME dialled calls list (+CPBW may not be applicable for this storage)

"EN" SIM (or ME) emergency number (+CPBW is not be applicable for this storage)

"FD" SIM/USIM fixdialling-phonebook. If a SIM card is present or if a UICC with an active GSM application is present, the information in EF_{FDN} under $DF_{Telecom}$ is selected. If a UICC with an active USIM application is present, the information in EF_{FDN} under ADF_{USIM} is selected

"LD" SIM/UICC last-dialling-phonebook

"MC" ME missed (unanswered received) calls list (+CPBW may not be applicable for this storage)

"ME" ME phonebook

"MT" combined ME and SIM phonebook

"ON" SIM (or ME) own numbers (MSISDNs) list (reading of this storage may be available through +CNUM also) . When storing information in the SIM/UICC, if a SIM card is present or if a UICC with an active GSM application is present, the information in EF_{MSISDN} under $DF_{Telecom}$ is selected. If a UICC with an active USIM application is present, the information in EF_{MSISDN} under ADF_{USIM} is selected

"RC" ME received calls list (+CPBW may not be applicable for this storage)

"SM" SIM phonebook.

"TA" TA phonebook

<password>: string type value representing the PIN2-code required when selecting PIN2-code locked <storage>s above, e.g. "FD".

<used>: integer type value indicating the number of used locations in selected memory

<total>: integer type value indicating the total number of locations in selected memory

Implementation

Mandatory when phonebook read, find or write command, or direct dialling (refer subclause "Direct dialling from phonebooks") is implemented.

8.25 Accumulated call meter +CACM

Table 10: +CACM parameter command syntax

Command	Possible response(s)
+CACM=[<passwd>]	*+CME ERROR: <err>*
+CACM?	+CACM: <acm> *+CME ERROR: <err>*
+CACM=?	

Description

Set command resets the Advice of Charge related accumulated call meter value in SIM card or in the active application in the UICC (GSM or USIM) file EF_{ACM}. ACM contains the total number of home units for both the current and preceding calls. SIM PIN2 is usually required to reset the value. If setting fails in an ME error, +CME ERROR: <err> is returned. Refer subclause 9.2 for <err> values.

Read command returns the current value of ACM.

Defined values

<passwd>: string type; SIM PIN2

<acm>: string type; accumulated call meter value similarly coded as <ccm> under +CAOC

Implementation

Optional.

8.26 Accumulated call meter maximum +CAMM

Table 11: +CAMM parameter command syntax

Command	Possible response(s)
+CAMM=[<acmmax>[,<passwd>]]	*+CME ERROR: <err>*
+CAMM?	+CAMM: <acmmax> *+CME ERROR: <err>*
+CAMM=?	

Description

Set command sets the Advice of Charge related accumulated call meter maximum value in SIM card or in the active application in the UICC (GSM or USIM) file EF_{ACMmax}. ACMmax contains the maximum number of home units allowed to be consumed by the subscriber. When ACM (refer +CACM) reaches ACMmax calls are prohibited (see also 3GPP TS 22.024 [26]). SIM PIN2 is usually required to set the value. If setting fails in an ME error, +CME ERROR: <err> is returned. Refer subclause 9.2 for <err> values.

Read command returns the current value of ACMmax.

Defined values

<acmmax>: string type; accumulated call meter maximum value similarly coded as <ccm> under +CAOC; value zero disables ACMmax feature

<passwd>: string type; SIM PIN2

Implementation

Optional.

8.27 Price per unit and currency table +CPUC

Table 12: +CPUC parameter command syntax

Command	Possible response(s)
+CPUC=<currency>,<ppu>[,<passwd>]	*+CME ERROR: <err>*
+CPUC?	+CPUC: <currency>,<ppu> *+CME ERROR: <err>*
+CPUC=?	

Description

Set command sets the parameters of Advice of Charge related price per unit and currency table in SIM card or in the active application in the UICC (GSM or USIM) file EF_{PUCT}. PUCT information can be used to convert the home units (as used in +CAOC, +CACM and +CAMM) into currency units. SIM PIN2 is usually required to set the parameters. If setting fails in an ME error, +CME ERROR: <err> is returned. Refer subclause 9.2 for <err> values.

Read command returns the current parameters of PUCT.

Defined values

<currency>: string type; three-character currency code (e.g. "GBP", "DEM"); character set as specified by command Select TE Character Set +CSCS

<ppu>: string type; price per unit; dot is used as a decimal separator (e.g. "2.66")

<passwd>: string type; SIM PIN2

Implementation

Optional.

8.30 Set Language +CLAN

Table 13: +CLAN parameter command syntax

Command	Possible response(s)
+CLAN=<code>	*+CME ERROR: <err>*
+CLAN?	+CLAN: <code> *+CME ERROR: <err>*
+CLAN=?	+CLAN:(list of supported <code>s) *+CME ERROR: <err>*

Description

This command sets the language in the ME. The set-command must confirm the selected language with the MMI-module in the ME. If setting fails, a ME error, +CME ERROR: <err> is returned. Refer subclause 9.2 for <err> values.

The <code>-parameter is a two-letter abbreviation of the language. The language codes, as defined in ISO 639, consists of two characters, e.g. "sv", "en" etc.

The complete set of language codes to be used are manufacturer specific and should all be possible to use with the command. Some examples are described under <code>. For a complete list see ISO 639.

The read command gives the current language as output. If the language has been set to "AUTO", the read command returns the current language set from the SIM-card /UICC. Hence, the "AUTO"-code is never returned by the read-command.

Test command returns supported <code>s.

Defined values

<code>: (not all language codes are present in this list)

"AUTO"	Read language from SIMcard/UICC. "Auto" is not returned by the read-command.
"sw"	Swedish
"fi"	Finnish
"da"	Danish
"no"	Norwegian
"de"	German
"fr"	French
"es"	Spanish
"it"	Italian
"en"	English

Implementation

Optional.

3GPP TSG-T WG2#12
Beverley Hills, California, USA,
12-16 February 2001

T2-010097

CR-Form-v3

CHANGE REQUEST

⌘ **27.007** **CR** **54** ⌘ rev **-** ⌘ Current version: **4.0.0** ⌘

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

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

Title:	⌘	Update the AT command, +CPBS, that select the phonebooks in the SIM/UICC
Source:	⌘	T2
Work item code:	⌘	AT commands
Date:	⌘	2001-01-18
Category:	⌘	**F**
Release:	⌘	REL-4

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

Use one of the following releases:

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

Reason for change:	⌘	Update the command +CPBS, that select the memory storage used by other phonebook commands, to be able to select the new phonebooks defined in the UICC/USIM.
Summary of change:	⌘	A new value has been added to the parameter <storage>, in the command +CPBS, in order to be able to select not only the global phonebook in the UICC but also the application specific phonebook.
Consequences if not approved:	⌘	No way to identify, with AT commands, which phonebook to access from the ones specified in the current UICC/USIM have specified in TS 102 221 and TS 31.102

Clauses affected:	⌘	8.11		
Other specs Affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	
Other comments:	⌘			

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

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

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 TSG meetings.

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

8.11 Select phonebook memory storage +CPBS

Table 1: +CPBS parameter command syntax

Command	Possible response(s)
+CPBS=<storage>[,<password>]	*+CME ERROR: <err>*
+CPBS?	+CPBS: <storage>[,<used>,<total>] *+CME ERROR: <err>*
+CPBS=?	+CPBS: (list of supported <storage>s)

Description

Set command selects phonebook memory storage <storage>, which is used by other phonebook commands. If setting fails in an ME error, +CME ERROR: <err> is returned. Refer subclause 9.2 for <err> values.

Read command returns currently selected memory, and when supported by manufacturer, number of used locations and total number of locations in the memory.

Test command returns supported storages as compound value.

Defined values

<storage> values reserved by the present document:

"DC" ME dialled calls list (+CPBW may not be applicable for this storage)

"EN" SIM (or ME) emergency number (+CPBW is not be applicable for this storage)

"FD" SIM fixdialling-phonebook

"LD" SIM last-dialling-phonebook

"MC" ME missed (unanswered received) calls list (+CPBW may not be applicable for this storage)

"ME" ME phonebook

"MT" combined ME and SIM phonebook

"ON" SIM (or ME) own numbers (MSISDNs) list (reading of this storage may be available through +CNUM also)

"RC" ME received calls list (+CPBW may not be applicable for this storage)

"SM" SIM/UICC phonebook. If a SIM card is present or if a UICC with an active GSM application is present, the EF_{ADN} under $DF_{Telecom}$ is selected. If a UICC with an active USIM application is present, the global phonebook, $DF_{PHONEBOOK}$ under $DF_{Telecom}$ is selected

"TA" TA phonebook

"AP" Selected application phonebook. If a UICC with an active USIM application is present, the application phonebook, $DF_{PHONEBOOK}$ under ADF_{USIM} is selected

<password>: string type value representing the PIN2-code required when selecting PIN2-code locked <storage>s above, e.g. "FD".

<used>: integer type value indicating the number of used locations in selected memory

<total>: integer type value indicating the total number of locations in selected memory

Implementation

Mandatory when phonebook read, find or write command, or direct dialling (refer subclause "Direct dialling from phonebooks") is implemented.

3GPP TSG-T WG2#12
Beverley Hills, California, USA,
12-16 February 2001

T2-010099

CR-Form-v3

CHANGE REQUEST

⌘ **27.007** **CR** **55** ⌘ rev **-** ⌘ Current version: **4.0.0** ⌘

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

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

Title:	⌘	Correction of GSM references
Source:	⌘	T2
Work item code:	⌘	TI-ATC
Date:	⌘	2001-02-08
Category:	⌘	**F**
Release:	⌘	REL-4

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

Use one of the following releases:

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

Reason for change:	⌘	The current specification refers to specifications that do not exist
Summary of change:	⌘	44.008 reference removed. The right reference is 24.008 already included
Consequences if not approved:	⌘	Reference to unexisting specifications

Clauses affected:	⌘	2, 6.1, 6.11, 6.27, 7.1, 7.3, 7.6, 7.9, 7.11, 7.12, 7.14, 7.17, 7.18, 7.25, 8.12, 8.13, 8.14, 8.33
Other specs Affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

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

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

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 TSG meetings.

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

2 References

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

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

[1] 3GPP TS 22.002: "3rd Generation Partnership Project; Bearer Services (BS) supported by a GSM Public Land Mobile Network (PLMN)".

[2] 3GPP TS 22.003: "3rd Generation Partnership Project; Teleservices supported by a GSM Public Land Mobile Network (PLMN)".

[3] 3GPP TS 22.081: "3rd Generation Partnership Project; Line identification supplementary services - Stage 1".

[4] 3GPP TS 22.082: "3rd Generation Partnership Project; Call Forwarding (CF) supplementary services - Stage 1".

[5] 3GPP TS 22.083: "3rd Generation Partnership Project; Call Waiting (CW) and Call Hold (HOLD) supplementary services - Stage 1".

[6] 3GPP TS 22.088: "3rd Generation Partnership Project; Call Barring (CB) supplementary services - Stage 1".

[7] 3GPP TS 23.003: "3rd Generation Partnership Project; Numbering, addressing and identification".

[8] 3GPP TS ~~4~~2~~4~~4.008: "3rd Generation Partnership Project; Mobile Radio Interface Layer 3 specification; Core Network Protocols-Stage 3"~~"Digital cellular telecommunication system (Phase 2+); Mobile radio interface layer 3 specification"~~.

[9] GSM MoU SE.13, GSM MoU Permanent Reference Document SE.13: "GSM Mobile Network Codes and Names".

[10] ITU-T Recommendation E.212: "Identification plan for land mobile stations".

[11] ITU-T Recommendation T.31: "Asynchronous facsimile DCE control, service class 1".

[12] ITU-T Recommendation T.32: "Asynchronous facsimile DCE control, service class 2".

[13] ITU-T Recommendation T.50: "International Reference Alphabet (IRA) (Formerly International Alphabet No. 5 or IA5) - Information technology - 7-bit coded character set for information exchange".

[14] ITU-T Draft new Recommendation V.25ter: "Serial asynchronous automatic dialling and control".

[15] Telecommunications Industry Association TIA IS-99: "Data Services Option Standard for Wideband Spread Spectrum Digital Cellular System".

[16] Telecommunications Industry Association TIA IS-135: "800 MHz Cellular Systems, TDMA Services, Async Data and Fax".

[17] Portable Computer and Communications Association PCCA STD-101 Data Transmission Systems and Equipment: "Serial Asynchronous Automatic Dialling and Control for Character Mode DCE on Wireless Data Services".

[18] 3GPP TS 24.022: "3rd Generation Partnership Project; Radio Link Protocol (RLP) for data and telematic services on the Mobile Station - Base Station System (MS - BSS) interface and the Base Station System - Mobile-services Switching Centre (BSS - MSC) interface".

[19] 3GPP TS 22.030: "3rd Generation Partnership Project; Man Machine Interface (MMI) of the Mobile Station (MS)".

[20] 3GPP TS 45.008: "Digital cellular telecommunication system (Phase 2+); Radio subsystem link control".

[21] 3GPP TS 22.085: "3rd Generation Partnership Project; Closed User Group (CUG) supplementary services - Stage 1".

[22] 3GPP TS 22.084: "3rd Generation Partnership Project; MultiParty (MPTY) supplementary services - Stage 1".

[23] 3GPP TS 22.090: "3rd Generation Partnership Project; Unstructured Supplementary Service Data (USSD) - Stage 1".

[24] 3GPP TS 27.005: "3rd Generation Partnership Project; Use of Data Terminal Equipment - Data Circuit terminating Equipment (DTE - DCE) interface for Short Message Service (SMS) and Cell Broadcast Service (CBS)".

[25] 3GPP TS 23.038: "3rd Generation Partnership Project; Alphabet and language specific information".

[26] 3GPP TS 22.024: "3rd Generation Partnership Project; Description of Charge Advice Information (CAI)".

[27] 3GPP TS 22.086: "3rd Generation Partnership Project; Advice of Charge (AoC) supplementary services - Stage 1".

[28] 3GPP TS 51.011: "Digital cellular telecommunication system (Phase 2+); Specification of the Subscriber Identity Module - Mobile Equipment (SIM-ME) interface".

[29] 3GPP TS 22.034: "3rd Generation Partnership Project; High Speed Circuit Switched Data (HSCSD) - Stage 1".

[30] 3GPP TS 22.091: "3rd Generation Partnership Project; Explicit Call Transfer (ECT) supplementary service - Stage 1".

[31] 3GPP TS 22.072: "3rd Generation Partnership Project; Call Deflection (CD) supplementary service - Stage 1".

[32] ISO/IEC10646: "Universal Multiple-Octet Coded Character Set (UCS)"; UCS2, 16 bit coding.

[33] 3GPP TS 22.022: "3rd Generation Partnership Project; Personalization of GSM Mobile Equipment (ME) Mobile functionality specification".

[34] 3GPP TS 27.060: "3rd Generation Partnership Project; General requirements on Mobile Stations (MS) supporting General Packet Radio Bearer Service (GPRS)".

[35] CCITT Recommendation V.110: "Support of data terminal equipments (DTEs) with V-Series interfaces by an integrated services digital network".

[36] CCITT Recommendation V.120: "Support by an ISDN of data terminal equipment with V-Series type interfaces with provision for statistical multiplexing".

[37] ITU-T Recommendation X.31: "Support of packet mode terminal equipment by an ISDN".

[38] 3GPP TS 45.005: "Digital cellular telecommunication system (Phase 2+); Radio transmission and reception".

[39] 3GPP TS 29.061: "3rd Generation Partnership Project; General Packet Radio Service (GPRS); Interworking between the Public Land Mobile Network (PLMN) supporting GPRS and Packet Data Networks (PDN)".

[40] 3GPP TS 23.081: "3rd Generation Partnership Project; Technical Specification Group Core Network; Line identification supplementary services - Stage 2".

[41] 3GPP TS 27.001: "3rd Generation Partnership Project; Technical Specification Group Core Network; General on Terminal Adaptation Functions (TAF) for Mobile Stations (MS)".

[42] 3GPP TS 29.007: "3rd Generation Partnership Project; Technical Specification Group Core Network; General requirements on interworking between the Public Land Mobile Network (PLMN) and the Integrated Services Digital Network (ISDN) or Public Switched Telephone Network (PSTN)".

[43] Infrared Data Association; Specification of Ir Mobile Communications (IrMC).

[44] IrDA Object Exchange Protocol.

[45] 3GPP TS 27.010: "3rd Generation Partnership Project; Terminal Equipment to User Equipment (TE-UE) multiplexer protocol User Equipment (UE)".

[46] 3GPP TS 23.107: "3rd Generation Partnership Project; Quality of Service, Concept and Architecture".

[47] 3GPP TS 23.060: "3rd Generation Partnership Project; General Packet Radio Service (GPRS) Service description; Stage 2".

[48] 3GPP TS 23.067: "3rd Generation Partnership Project; Enhanced Multi-Level Precedence and Pre-emption service (eMLPP) - Stage 2".

[49] 3GPP TS 43.068: "Digital cellular telecommunication system (Phase 2+); Voice Group Call service (VGCS) - Stage 2".

[50] 3GPP TS 43.069: "Digital cellular telecommunication system (Phase 2+); Voice Broadcast Service (VBS) - Stage 2".

[51] 3GPP TS 24.067: "3rd Generation Partnership Project; Enhanced Multi-Level Precedence and Pre-emption service (eMLPP) - Stage 3".

[52] 3GPP TS 44.068: "Digital cellular telecommunication system (Phase 2+); Voice Group Call service (VGCS) - Stage 3".

[53] GSM 44.069: "Digital cellular telecommunication system (Phase 2+); Voice Broadcast Service (VBS) - Stage 3".

[54] 3GPP TS 22.067: "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; enhanced Multi-Level Precedence and Pre-emption service (eMLPP) - Stage 1".

[55] 3GPP TS 42.068: "Digital cellular telecommunication system (Phase 2+); Voice Group Call service (VGCS) - Stage 1".

[56] 3GPP TS 42.069: "Digital cellular telecommunication system (Phase 2+); Voice Broadcast Service (VBS) - Stage 1".

~~[57] 3GPP TS 24.008: "3rd Generation Partnership Project; Mobile Radio Interface Layer 3 specification; Core Network Protocols Stage 3".~~

[5~~8~~7] 3GPP TS 22.087: "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects;User-to-User Signalling (UUS) - Stage 1"

6 Call control commands and methods

This clause describes the control of GSM/UMTS calls. Normal data and fax call control is done as in ITU-T Recommendations V.25ter [14], T.31 [11] and T.32 [12]. For voice call originating, refer subclause "ITU-T V.25ter dial command D".

6.1 Select type of address +CSTA

Table 1: +CSTA parameter command syntax

Command	Possible response(s)
+CSTA=[<type>]	
+CSTA?	+CSTA: <type>
+CSTA=?	+CSTA: (list of supported <type>s)

Description

Set command selects the type of number for further dialling commands (D) according to GSM/UMTS specifications. Test command returns values supported by the TA as a compound value.

Defined values

<type>: type of address octet in integer format (refer ~~GSM 4~~TS 24.008 [8] subclause 10.5.4.7); default 145 when dialling string includes international access code character "+", otherwise 129

Implementation

Mandatory when other than default value allowed.

6.11 Cellular result codes +CRC

Table 2: +CRC parameter command syntax

Command	Possible response(s)
+CRC=[<mode>]	
+CRC?	+CRC: <mode>
+CRC=?	+CRC: (list of supported <mode>s)

Description

Set command controls whether or not the extended format of incoming call indication or GPRS network request for PDP context activation or notification for VBS/VGCS calls is used. When enabled, an incoming call is indicated to the TE with unsolicited result code +CRING: <type> instead of the normal RING.

Test command returns values supported by the TA as a compound value.

NOTE: Similar command may be found in TIA IS-99 [15] and TIA IS-135 [16].

Defined values

<mode>:

0 disables extended format

1 enables extended format

<type>:

ASYNC [,<priority>[,<subaddr>,<satype>]] asynchronous transparent

`SYNC [,<priority>[,<subaddr>,<satype>]]` synchronous transparent

`REL ASYNC [,<priority>[,<subaddr>,<satype>]]` asynchronous non-transparent

`REL SYNC [,<priority>[,<subaddr>,<satype>]]` synchronous non-transparent

`FAX [,<priority>[,<subaddr>,<satype>]]` facsimile (TS 62)

`VOICE [,<priority>[,<subaddr>,<satype>]]` normal voice (TS 11)

`VOICE/`*`XXX`* `[,<priority>[,<subaddr>,<satype>]]` voice followed by data (BS 81) (*XXX* is `ASYNC`, `SYNC`, `REL ASYNC` or `REL SYNC`)

`ALT VOICE/`*`XXX`* `[,<priority>[,<subaddr>,<satype>]]` alternating voice/data, voice first (BS 61)

`ALT `*`XXX`*`/VOICE [,<priority>[,<subaddr>,<satype>]]` alternating voice/data, data first (BS 61)

`ALT VOICE/FAX [,<priority>[,<subaddr>,<satype>]]` alternating voice/fax, voice first (TS 61)

`ALT FAX/VOICE [,<priority>[,<subaddr>,<satype>]]` alternating voice/fax, fax first (TS 61)

`GPRS <PDP_type>, <PDP_addr>[, [<L2P>][,<APN>]]` GPRS network request for PDP context activation

`VGC <GCA>, <GId>, <ackflag> [,<priority>]` voice group call (TS 91)

`VBC <GCA>, <GId>, <ackflag> [,<priority>]` voice broadcast call (TS 92)

The optional <priority> indicates the eMLPP priority level of the incoming call by paging, notification or setup message. The priority level values are as defined in eMLPP specification 3GPP TS 22.067 [54].

`<subaddr>`: string type subaddress of format specified by `<satype>`

`<satype>`: type of subaddress octet in integer format (refer 3GPP TS 24.008 [~~578~~] subclause 10.5.4.8)

`<PDP_type>` ,`<PDP_addr>` and `<APN>` are as defined in the Define PDP Context (+CGDCONT) command. The optional <L2P> proposes a layer 2 protocol to use between the MT and the TE. It is defined in the Enter GPRS Data Mode (+CGDATA) command. If the MT is unable to announce to the TE the network's request (for example it is in V.25ter online data state) the MT shall reject the request. No corresponding unsolicited result code shall be issued when the MT returns to a command state.

<GCA> is a part of the group call reference as specified in 3GPP TS 23.003 [7] and indicates group call area.

<GId> is a part of the group call reference as specified in 3GPP TS 23.003 [7] and indicates group call identification.The <ackflag>=1 proposes that a predefined confirmation procedure is to be used after the call is ended. For <ackflag>=0 no confirmation procedure is required.

Implementation

Mandatory when data or fax circuit mode calls implemented or for a ME supporting AT commands only and eMLPP or VGCS or VBS is implemented.

6.12 HSCSD device parameters +CHSD

Table 3: +CHSD action command syntax

Command	Possible response(s)
`+CHSD`	`+CHSD: <mclass>,<maxRx>,<maxTx>,<sum>,<codings>` `+CME ERROR: <err>`
`+CHSD=?`	

Description

Execution command returns information about HSCSD features (refer 3GPP TS 22.034 [29]) supported by the ME/TA. Refer subclause 9.2 for possible <err> values.

Defined values

<mclass>: integer type; multislot class

<maxRx>: integer type; maximum number of receive timeslots that ME can use

<maxTx>: integer type; maximum number of transmit timeslots that ME can use

<sum>: integer type; total number of receive and transmit timeslots that ME can use at the same time (per TDMA frame). The following applies in a HSCSD call: 1 ≤ (receive slots) + (transmit slots) ≤ <sum>

<codings> is a sum of integers each representing a supported channel coding (e.g. value 5 indicates that 4,8k and 9,6k channel codings are supported):

1 4,8k full rate data traffic channel

4 9,6k full rate data traffic channel

8 14,4k full rate data traffic channel

16 28,8k full rate data traffic channel (only possible when 14.4k is supported)

32 32,0k full rate data traffic channel (only possible in a two-timeslot configuration)

64 43,2k full rate data traffic channel (only possible when 14.4k is supported)

Implementation

Mandatory when HSCSD implemented.

6.27 Informative examples

The alternating mode call handling (voice and fax, or voice and data) and the data call setup commands are defined such that the dialling command of V.25ter [14] (D) still always originates a call. The purpose is to support all current TE applications using the dialling command as default. Fax calls are controlled following the rules of ITU-T T.31 [11] and T.32 [12] standards.

An example where a voice call is originated:

```
ATD+1 812 555673I; (type of address defaults to 145, CLI presentation is restricted for this call)
OK                 (call setup was successful)
```

An example where a voice call is attempted from a phonebook:

```
ATD>"Doe Joe"G; (enable CUG control for this call)
+CME ERROR: 22  (entry "Doe Joe" is not found)
```

Also supplementary services may be controlled using dial command according to 3GPP TS 22.030 [19]. An example of call forwarding on no reply for telephony with the adjustment of the no reply condition timer on 25 seconds:

```
ATD**61*+1812555673*11*25#
OK              (modification was successful)
```

Two new commands are created for controlling the alternating mode calls. First one, Call Mode (+CMOD), selects between single and alternating mode. Because this is a crucial command, it is defined that the value is set back to zero (single mode) after every successfully originated alternating mode call. Also on power-up and factory or user resets, the value is set to zero. The second new command, Hangup Call (+CHUP), is not a replacement of V.25ter [14] command H, but a command which reliably disconnects the call in GSM/UMTS network. This is defined because the H command is used to switch from fax or data mode to voice mode.

The setting of GSM/UMTS bearer service (data circuit duplex asynchronous and synchronous, PAD access circuit asynchronous, or data packet duplex synchronous), is done with Select Bearer Service Type (+CBST). It chooses one of

the four mentioned bearer services, the data rate of the service (or actually the modulation when modem IWFs are used), and enables or disables RLP. Command Radio Link Protocol (+CRLP) is used to set the RLP parameters in the radio path.

Service Reporting Control command (+CR) is defined similarly as the reporting of modulation, V.18, error control, and data compression which are V.25ter [14] features used to show information about the type of the established connection before the CONNECT intermediate result code. +CR command has one subparameter which specifies whether the intermediate result code +CR: <serv> is returned or not. The result code should be returned before any V.25ter [14] reporting result codes. An example of setting up an asynchronous 9600 bit/s modem connection with service reporting:

```
AT+CBST=7,0,1     (asynchronous modem 9600 bit/s and RLP)
OK
AT+CR=1           (enable reporting)
OK
ATD1234567890
+CR: REL ASYNC
CONNECT 9600
```

As GSM/UMTS network offers more information about the reason of the failure in call originating and answering than normal PSTN, it is useful to add an extra command to return this information to the TE. This information should not be returned always after unsuccessful call originating or answering, because many TE applications look for just the regular NO CARRIER, BUSY, NO ANSWER and CONNECT messages. Action command Extended Error Report (+CEER) does not have any subparameters, and it returns the cause of the latest call setup failure. This information may be the textual presentation of the GSM/UMTS network failure code (refer ~~GSM specification 4~~TS 24.008 [8] Annex H), or some other information defined by the TA manufacturer.

7 Network service related commands

This clause describes GSM/UMTS network related commands, which are not covered in call control clause of the present document. Commands include GSM/UMTS supplementary service handling, MSISDN query, ME and network facility locking, and network registration information query.

7.1 Subscriber number +CNUM

Table 4: +CNUM action command syntax

Command	Possible response(s)
+CNUM	+CNUM: [<alpha1>],<number1>,<type1>[,<speed>,<service>[,<itc>]] [<CR><LF>+CNUM: [<alpha2>],<number2>,<type2>[,<speed>,<service> [,<itc>]] [...]] *+CME ERROR: <err>*
+CNUM=?	

Description

Action command returns the MSISDNs related to the subscriber (this information can be stored in the SIM or in the ME). If subscriber has different MSISDN for different services, each MSISDN is returned in a separate line. Refer subclause 9.2 for possible <err> values.

Defined values

<alpha*x*>: optional alphanumeric string associated with <number*x*>; used character set should be the one selected with command Select TE Character Set +CSCS

<number*x*>: string type phone number of format specified by <type*x*>

<type*x*>: type of address octet in integer format (refer ~~GSM 4~~TS 24.008 [8] subclause 10.5.4.7)

<speed>: as defined in subclause 6.7

<service> (service related to the phone number):

0 asynchronous modem

1 synchronous modem

2 PAD Access (asynchronous)

3 Packet Access (synchronous)

4 voice

5 fax

also all other values below 128 are reserved by the present document

<itc> (information transfer capability):

0 3,1 kHz

1 UDI

Implementation

Optional.

7.3 Operator selection +COPS

Table 5: +COPS parameter command syntax

Command	Possible response(s)
+COPS=[<mode>[,<format>[,<oper>]]]	*+CME ERROR: <err>*
+COPS?	+COPS: <mode>[,<format>,<oper>] *+CME ERROR: <err>*
+COPS=?	+COPS: [list of supported (<stat>, long alphanumeric <oper>, short alphanumeric <oper>, numeric <oper>)s] [,,(list of supported <mode>s),(list of supported <format>s)] *+CME ERROR: <err>*

Description

Set command forces an attempt to select and register the GSM/UMTS network operator. <mode> is used to select whether the selection is done automatically by the ME or is forced by this command to operator <oper> (it shall be given in format <format>). If the selected operator is not available, no other operator shall be selected (except <mode>=4). The selected operator name format shall apply to further read commands (+COPS?) also. <mode>=2 forces an attempt to deregister from the network. The selected mode affects to all further network registration (e.g. after <mode>=2, ME shall be unregistered until <mode>=0 or 1 is selected). Refer subclause 9.2 for possible <err> values. This command should be abortable when registration/deregistration attempt is made.

Read command returns the current mode and the currently selected operator. If no operator is selected, <format> and <oper> are omitted.

Test command returns a list of quadruplets, each representing an operator present in the network. Quadruplet consists of an integer indicating the availability of the operator <stat>, long and short alphanumeric format of the name of the operator, and numeric format representation of the operator. Any of the formats may be unavailable and should then be an empty field. The list of operators shall be in order: home network, networks referenced in SIM, and other networks.

It is recommended (although optional) that after the operator list TA returns lists of supported <mode>s and <format>s. These lists shall be delimited from the operator list by two commas.

Defined values

<mode>:

0 automatic (<oper> field is ignored)

1 manual (<oper> field shall be present)

2 deregister from network

3 set only <format> (for read command +COPS?), do not attempt registration/deregistration (<oper> field is ignored); this value is not applicable in read command response

4 manual/automatic (<oper> field shall be present); if manual selection fails, automatic mode (<mode>=0) is entered

<format>:

0 long format alphanumeric <oper>

1 short format alphanumeric <oper>

2 numeric <oper>

<oper>: string type; <format> indicates if the format is alphanumeric or numeric; long alphanumeric format can be upto 16 characters long and short format up to 8 characters (refer GSM MoU SE.13 [9]); numeric format is the GSM Location Area Identification number (refer ~~GSM 4~~TS 24.008 [8] subclause 10.5.1.3) which consists of a three BCD digit country code coded as in ITU-T E.212 Annex A [10], plus a two BCD digit network code, which is administration specific; returned <oper> shall not be in BCD format, but in IRA characters converted from BCD; hence the number has structure: (country code digit 3)(country code digit 2)(country code digit 1)(network code digit 2)(network code digit 1)

<stat>:

0 unknown

1 available

2 current

3 forbidden

Implementation

Optional.

7.6 Calling line identification presentation +CLIP

Table 6: +CLIP parameter command syntax

Command	Possible response(s)
+CLIP=[<n>]	
+CLIP?	+CLIP: <n>,<m>
+CLIP=?	+CLIP: (list of supported <n>s)

Description

This command refers to the GSM/UMTS supplementary service CLIP (Calling Line Identification Presentation) that enables a called subscriber to get the calling line identity (CLI) of the calling party when receiving a mobile terminated call. Set command enables or disables the presentation of the CLI at the TE. It has no effect on the execution of the supplementary service CLIP in the network.

When the presentation of the CLI at the TE is enabled (and calling subscriber allows), +CLIP: <number>,<type>[,<subaddr>,<satype>[,[<alpha>][,<CLI validity>]]] response is returned

after every RING (or +CRING: <type>; refer subclause "Cellular result codes +CRC") result code sent from TA to TE. It is manufacturer specific if this response is used when normal voice call is answered.

Read command gives the status of <n>, and also triggers an interrogation of the provision status of the CLIP service according 3GPP TS 22.081 [3] (given in <m>).Test command returns values supported by the TA as a compound value.

Defined values

<n> (parameter sets/shows the result code presentation status in the TA):

0 disable

1 enable

<m> (parameter shows the subscriber CLIP service status in the network):

0 CLIP not provisioned

1 CLIP provisioned

2 unknown (e.g. no network, etc.)

<number>: string type phone number of format specified by <type>

<type>: type of address octet in integer format (refer ~~GSM 4~~TS 24.008 [8] subclause 10.5.4.7)

<subaddr>: string type subaddress of format specified by <satype>

<satype>: type of subaddress octet in integer format (refer ~~GSM 4~~TS 24.008 [8] subclause 10.5.4.8)

<alpha>: optional string type alphanumeric representation of <number> corresponding to the entry found in phonebook; used character set should be the one selected with command Select TE Character Set +CSCS

<CLI validity>:

0 CLI valid

1 CLI has been withheld by the originator.

2 CLI is not available due to interworking problems or limitations of originating network.

When CLI is not available (<CLI validity>=2), <number> shall be an empty string ("") and <type> value will not be significant. Nevertheless, TA may return the recommended value **128** for <type> ((TON/NPI unknown in accordance with ~~GSM 4~~TS 24.008 [8] subclause 10.5.4.7).

When CLI has been withheld by the originator, (<CLI validity>=1) and the CLIP is provisioned with the "override category" option (refer 3GPP TS 22.081[3] and 3GPP TS 23.081[40]), <number> and <type> is provided. Otherwise, TA shall return the same setting for <number> and <type> as if the CLI was not available.

Implementation

Optional.

7.9 Called line identification presentation +CDIP

Table 7: +CDIP parameter command syntax

Command	Possible response(s)
+CDIP=[<n>]	
+CDIP?	+CDIP: <n>,<m>
+CDIP=?	+CDIP: (list of supported <n>s)

Description

This command related to a network service that provides "multiple called numbers (called line identifications) service" to an MT. This command enables a called subscriber to get the called line identification of the called party when receiving a mobile terminated call. Set command enables or disables the presentation of the called line identifications at the TE.

When the presentation of the called line identification at the TE is enabled, `+CDIP:<number>,<type>[,<subaddr>,<satype>]` response is returned after every `RING` (or `+CRING: <type>`; refer subclause "Cellular result codes +CRC") result code sent from TA to TE. It is manufacturer specific if this response is used when normal voice call is answered.

Read command gives the status of `<n>`, and also triggers an interrogation of the provision status of the "multiple called numbers" service. Test command returns values supported by the TA as a compound value.

Defined values

`<n>` (parameter sets/shows the result code presentation status in the TA):

0 disable

1 enable

`<m>` (parameter shows the subscriber "multiple called numbers" service status in the network):

0 "multiple called numbers service" is not provisioned

1 "multiple called numbers service" is provisioned

2 unknown (e.g. no network, etc.)

`<number>`: string type phone number of format specified by `<type>`

`<type>`: type of address octet in integer format (refer ~~GSM 4~~TS 24.008 [8] subclause 10.5.4.7)

`<subaddr>`: string type subaddress of format specified by `<satype>`

`<satype>`: type of subaddress octet in integer format (refer ~~GSM 4~~TS 24.008 [8] subclause 10.5.4.8)

Implementation

Optional.

7.11 Call forwarding number and conditions +CCFC

Table 8: +CCFC action command syntax

Command	Possible response(s)

`+CCFC=<reason>,<mode>[,<number>[,<type>[,<class>[,<subaddr>[,<satype>[,<time>]]]]]]`	`+CME ERROR: <err>`
	when `<mode>`=2 and command successful:
	`+CCFC: <status>,<class1>[,<number>,<type>[,<subaddr>,<satype>[,<time>]]][`
	`<CR><LF>+CCFC: <status>,<class2>[,<number>,<type>[,<subaddr>,<satype>[,<time>]]][...]]`

`+CCFC=?`	`+CCFC:` (list of supported `<reason>`s)

Description

This command allows control of the call forwarding supplementary service according to 3GPP TS 22.082 [4]. Registration, erasure, activation, deactivation, and status query are supported. When querying the status of a network service (`<mode>`=2) the response line for 'not active' case (`<status>`=0) should be returned only if service is not active for any `<class>`.

Test command returns reason values supported by the TA as a compound value.

Defined values

<reason>:

0 unconditional

1 mobile busy

2 no reply

3 not reachable

4 all call forwarding (refer 3GPP TS 22.030 [19])

5 all conditional call forwarding (refer 3GPP TS 22.030 [19])

<mode>:

0 disable

1 enable

2 query status

3 registration

4 erasure

<number>: string type phone number of forwarding address in format specified by <type>

<type>: type of address octet in integer format (refer ~~GSM 4~~TS 24.008 [8] subclause 10.5.4.7); default 145 when dialling string includes international access code character "+", otherwise 129

<subaddr>: string type subaddress of format specified by <satype>

<satype>: type of subaddress octet in integer format (refer ~~GSM 4~~TS 24.008 [8] subclause 10.5.4.8); default 128

<class*x*> is a sum of integers each representing a class of information (default 7):

1 voice (telephony)

2 data (refers to all bearer services; with <mode>=2 this may refer only to some bearer service if TA does not support values 16, 32, 64 and 128)

4 fax (facsimile services)

8 short message service

16 data circuit sync

32 data circuit async

64 dedicated packet access

128 dedicated PAD access

<time>:

1...30 when "no reply" is enabled or queried, this gives the time in seconds to wait before call is forwarded, default value 20

<status>:

0 not active

1 active

Implementation

Mandatory for ME supporting AT commands only and not supporting the control through dial command D.

7.12 Call waiting +CCWA

Table 9: +CCWA parameter command syntax

Command	Possible response(s)
+CCWA=[<n>[,<mode>[,<class>]]]	*+CME ERROR: <err>* **when <mode>=2 and command successful** +CCWA: <status>,<class1> [<CR><LF>+CCWA: <status>,<class2> [...]]
+CCWA?	+CCWA: <n>
+CCWA=?	+CCWA: (list of supported <n>s)

Description

This command allows control of the Call Waiting supplementary service according to 3GPP TS 22.083 [5]. Activation, deactivation and status query are supported. When querying the status of a network service (<mode>=2) the response line for 'not active' case (<status>=0) should be returned only if service is not active for any <class>. Parameter <n> is used to disable/enable the presentation of an unsolicited result code +CCWA: <number>,<type>,<class>,[<alpha>][,<CLI validity>[,<subaddr>,<satype>[,<priority>]]] to the TE when call waiting service is enabled. Command should be abortable when network is interrogated.

The interaction of this command with other commands based on other GSM/UMTS supplementary services is described in the GSM/UMTS standards.

Test command returns values supported by the TA as a compound value.

Defined values

<n> (sets/shows the result code presentation status in the TA):

0 disable

1 enable

<mode> (when <mode> parameter is not given, network is not interrogated):

0 disable

1 enable

2 query status

<class*x*> is a sum of integers each representing a class of information (default 7):

1 voice (telephony)

2 data (refers to all bearer services; with <mode>=2 this may refer only to some bearer service if TA does not support values 16, 32, 64 and 128)

4 fax (facsimile services)

8 short message service

16 data circuit sync

32 data circuit async

64 dedicated packet access

128 dedicated PAD access

<status>:

0 not active

1 active

<number>: string type phone number of calling address in format specified by <type>

<type>: type of address octet in integer format (refer ~~GSM 4~~TS 24.008 [8] subclause 10.5.4.7)

<alpha>: optional string type alphanumeric representation of <number> corresponding to the entry found in phonebook; used character set should be the one selected with command Select TE Character Set +CSCS

<CLI validity>:

0 CLI valid

1 CLI has been withheld by the originator.

2 CLI is not available due to interworking problems or limitations of originating network.

When CLI is not available (<CLI validity>=2), <number> shall be an empty string ("") and <type> value will not be significant. Nevertheless, TA may return the recommended value **128** for <type> ((TON/NPI unknown in accordance with ~~GSM 4~~TS 24.008 [8] subclause 10.5.4.7).

When CLI has been withheld by the originator, (<CLI validity>=1) and the CLIP is provisioned with the "override category" option (refer 3GPP TS 22.081[3] and 3GPP TS 23.081[40]), <number> and <type> is provided. Otherwise, TA shall return the same setting for <number> and <type> as if the CLI was not available.

<subaddr>: string type subaddress of format specified by <satype>

<satype>: type of subaddress octet in integer format (refer ~~GSM 4~~TS 24.008 [8] subclause 10.5.4.8)

<priority>: optional digit type parameter indicating that the eMLPP priority level of the incoming call. The priority level values are as defined in eMLPP specification 3GPP TS 22.067 [54].

Implementation

Optional.

7.14 Call deflection +CTFR

Table 10: +CTFR action command syntax

Command	Possible response(s)
+CTFR=<number>[,<type>[,<subaddr>[,<satype>]]]	*+CME ERROR: <err>*
+CTFR=?	

Description

This refers to a service that causes an incoming alerting call to be forwarded to a specified number. Action command does this. Refer subclause 9.2 for possible <err> values.

This is based on the GSM/UMTS supplementary service CD (Call Deflection; refer 3GPP TS 22.072 [30]). The interaction of this command with other commands based on other GSM/UMTS supplementary services is described in the GSM/UMTS standards.

NOTE: Call Deflection is only applicable to teleservice 11.

Defined values

<number>: string type phone number of format specified by <type>

<type>: type of address octet in integer format (refer ~~GSM 4~~TS 24.008 [8] subclause 10.5.4.7); default 145 when dialling string includes international access code character "+", otherwise 129

<subaddr>: string type subaddress of format specified by <satype>

<satype>: type of subaddress octet in integer format (refer ~~GSM 4~~TS 24.008 [8] subclause 10.5.4.8); default 128

Implementation

Optional.

7.17 Supplementary service notifications +CSSN

Table 11: +CSSN parameter command syntax

Command	Possible response(s)
+CSSN=[<n>[,<m>]]	
+CSSN?	+CSSN: <n>,<m>
+CSSN=?	+CSSN: (list of supported <n>s),(list of supported <m>s)

Description

This command refers to supplementary service related network initiated notifications. The set command enables/disables the presentation of notification result codes from TA to TE.

When <n>=1 and a supplementary service notification is received after a mobile originated call setup, intermediate result code +CSSI: <code1>[,<index>] is sent to TE before any other MO call setup result codes presented in the present document or in V.25ter [14]. When several different <code1>s are received from the network, each of them shall have its own +CSSI result code.

When <m>=1 and a supplementary service notification is received during a mobile terminated call setup or during a call, or when a forward check supplementary service notification is received, unsolicited result code +CSSU: <code2>[,<index>[,<number>,<type>[,<subaddr>,<satype>]]] is sent to TE. In case of MT call setup, result code is sent after every +CLIP result code (refer command "Calling line identification presentation +CLIP") and when several different <code2>s are received from the network, each of them shall have its own +CSSU result code.

Test command returns values supported by the TA as a compound value.

Defined values

<n> (parameter sets/shows the +CSSI result code presentation status in the TA):

0 disable

1 enable

<m> (parameter sets/shows the +CSSU result code presentation status in the TA):

0 disable

1 enable

<code1> (it is manufacturer specific, which of these codes are supported):

0 unconditional call forwarding is active

1 some of the conditional call forwardings are active

2 call has been forwarded

3 call is waiting

4 this is a CUG call (also <index> present)

5 outgoing calls are barred

6 incoming calls are barred

7 CLIR suppression rejected

8 call has been deflected

<index>: refer "Closed user group +CCUG"

<code2> (it is manufacturer specific, which of these codes are supported):

0 this is a forwarded call (MT call setup)

1 this is a CUG call (also <index> present) (MT call setup)

2 call has been put on hold (during a voice call)

3 call has been retrieved (during a voice call)

4 multiparty call entered (during a voice call)

5 call on hold has been released (this is not a SS notification) (during a voice call)

6 forward check SS message received (can be received whenever)

7 call is being connected (alerting) with the remote party in alerting state in explicit call transfer operation (during a voice call)

8 call has been connected with the other remote party in explicit call transfer operation (also number and subaddress parameters may be present) (during a voice call or MT call setup)

9 this is a deflected call (MT call setup)

10 sdditional incoming call forwarded

<number>: string type phone number of format specified by <type>

<type>: type of address octet in integer format (refer ~~GSM 4~~TS 24.008 [8] subclause 10.5.4.7)

<subaddr>: string type subaddress of format specified by <satype>

<satype>: type of subaddress octet in integer format (refer ~~GSM 4~~TS 24.008 [8] subclause 10.5.4.8)

Implementation

Optional.

7.18 List current calls +CLCC

Table 12:+CLCC action command syntax

Command	Possible response(s)
+CLCC	[+CLCC: <id1>,<dir>,<stat>,<mode>,<mpty>[, <number>,<type>[,<alpha>[,<priority>]]] [<CR><LF>+CLCC: <id2>,<dir>,<stat>,<mode>,<mpty>[, <number>,<type>[,<alpha>[,<priority>]]] [...]]] *+CME ERROR: <err>*
+CLCC=?	

Description

Returns list of current calls of ME. If command succeeds but no calls are available, no information response is sent to TE. Refer subclause 9.2 for possible <err> values.

Defined values

<idx>: integer type; call identification number as described in 3GPP TS 22.030 [19] subclause 4.5.5.1; this number can be used in +CHLD command operations

<dir>:

0 mobile originated (MO) call

1 mobile terminated (MT) call

<stat> (state of the call):

0 active

1 held

2 dialing (MO call)

3 alerting (MO call)

4 incoming (MT call)

5 waiting (MT call)

<mode> (bearer/teleservice):

0 voice

1 data

2 fax

3 voice followed by data, voice mode

4 alternating voice/data, voice mode

5 alternating voice/fax, voice mode

6 voice followed by data, data mode

7 alternating voice/data, data mode

8 alternating voice/fax, fax mode

9 unknown

<mpty>:

0 call is not one of multiparty (conference) call parties

1 call is one of multiparty (conference) call parties

<number>: string type phone number in format specified by <type>

<type>: type of address octet in integer format (refer ~~GSM 4~~TS 24.008 [8] subclause 10.5.4.7)

<alpha>: string type alphanumeric representation of <number> corresponding to the entry found in phonebook; used character set should be the one selected with command Select TE Character Set +CSCS

<priority>: optional digit type parameter indicating the eMLPP priority level of the call, values specified in 3GPP TS 22.067 [54]

Implementation

Optional. Recommended when +CHLD command is implemented.

7.25 User to User Signalling Service 1 +CUUS1

Table 13: +CUUS1 action command syntax

Command	Possible response(s)
+ CUUS1 =[<n>[,<m>[,<message>[,<UUIE>[,<message>[,<UUIE>[,...]]]]]]]	*+CME ERROR: <err>*
+ CUUS1?	+ CUUS1: <n>,<m>[,<message>,<UUIE>[,<message>,<UUIE>[,...]]]
+ CUUS1=?	+ CUUS1: (list of supported <n>s), (list of supported <m>s), (list of supported <message>s), (list of supported <messageI>s),(list of supported <messageU>s)

Description

This command allows control of the User-to-User Signalling Supplementary Service 1 (UUS1) according to 3G 22.087 [5~~7~~8].

Parameters <message> and <UUIE> are used to activate/deactivate the implicit request of the User-to-User Signalling Supplementary Service 1.
When <message> and <UUIE> are both present the string specified in <UUIE> is included as the value part of the User-to-User Information Element (as defined in 3G 24.008) into all subsequent messages of type <message>. If parameter <message> is present but parameter <UUIE> is not present then the User-to-User Information Element shall not be present in subsequent messages of type <message>.

Parameters <n> and <m> are used to enable/disable the presentation of incoming User-to-User Information Elements.
When <n> = 1 and a User-to-User Information is received after a mobile originated call setup or after hanging up a call, intermediate result code +CUUS1I: <messageI>,<UUIE> is sent to the TE.
When <m> = 1 and a User-to-User Information is received during a mobile terminated call setup or during a remote party call hangup, unsolicited result code +CUUS1U: <messageU>,<UUIE> is sent to the TE.

Test command returns values supported by the TA as a compound value.

The interaction of this command with other commands based on other supplementary services is described in the 3G standard.

Defined values
<n> (parameter sets/shows the +CUUS1I result code presentation status in the TA)

0 disable.

1 enable.

<m> (parameter sets/shows the +CUUS1U result code presentation status in the TA)

0 disable.

1 enable.

<message> (type of message containing the outgoing User-to-User Information Element)

0 ANY

1 SETUP

2 ALERT

3 CONNECT

4 DISCONNECT

5 RELEASE

6 RELEASE_COMPLETE

<messageI> (type of message containing the intermediate User-to-User Information Element)

0 ANY

1 ALERT

2 PROGRESS

3 CONNECT (sent after +COLP if enabled)

4 RELEASE

<messageU> (type of message containing the unsollicited User-to-User Information Element)

0 ANY

1 SETUP (returned after +CLIP if presented, otherwise after every RING or +CRING)

2 DISCONNECT

3 RELEASE_COMPLETE

< UUIE>: the User-user Information Element (as defined in 3G 24.008) in hexadecimal character format (for hexadecimal format, refer +CSCS).

NOTE: If the TA does not distinguish the type of message containing the User-to-user Information Element, it can use the value for ANY message.

Implementation

Optional.

7.26 Informative examples

This subclause includes all the GSM/UMTS supplementary service related commands, additional commands to lock ME and SIM capabilities, and commands to check the network registration status.

An example where MSISDNs of a ME are queried, calls are forwarded to different numbers when mobile is busy (CFB) or when it does not answer (CFNRy). The status of CFNRy is read:

```
AT+CNUM
+CNUM: ,"+358501234567",145,,4        (voice number)
OK
AT+CCFC=1,1,"931123456"               (enable CFB)
OK
AT+CCFC=2,1,"921654321"               (enable CFNRy)
OK
AT+CCFC=1,2                           (query CFNRy)
+CCFC: 1,7,"+35821654321",145,,,20    (forward after 20 seconds)
OK
```

An example of Call Waiting (+CCWA), Call Related Supplementary Services (+CHLD), and Connected Line Identification Presentation (+COLP) usage:

```
AT+CCWA=1,1;+COLP=1           (enable call waiting and COLP result codes)
OK
ATD9311234567;                (originate a voice call)
+COLP: "+358311234567",145
OK
...conversation...
+CCWA: "+358317654321",145    (another call is waiting)
AT+CHLD=2                     (put first call on hold and answer the second one)
OK
...conversation...
AT+CHLD=1                     (release the second (active) call and recover the first (held) call)
OK
ATH                           (release the first call)
OK
```

Call barring supplementary services are combined in one command, Facility Lock (+CLCK), which is also used to restrict ME and SIM functionality Some of the facilities require a password when enabled or disabled. An additional command, Change Password (+CPWD), is defined for changing the password of different barring and restriction facilities. An example where locking status of outgoing international calls is interrogated and then barred, and the password of the SIM card lock (Personal Identity Number, PIN) is changed:

```
AT+CLCK="OI",2
+CLCK: 0,7
OK
AT+CLCK="OI",1,"1234"
OK
AT+CPWD="SC","4321","1234"
OK
```

Operator Selection (+COPS) command is used for querying the status of all GSM/UMTS operators detected in the area, and switching between operators.

Following example illustrates a network selection sequence in Finland. Two operators are found, the status of Tele is unknown and Radiolinja is currently selected. Read command shows that automatic selection mode is on and that Radiolinja is selected. Then an attempt is made to access Tele, but it is denied (shown by +CME ERROR).

```
AT+COPS=?
+COPS: (2,"RADIOLINJA","RL","24405"),(0,"TELE","TELE","24491")
OK
AT+COPS?
+COPS: 0,0,"RADIOLINJA"
OK
AT+COPS=1,0,"TELE"
+CME ERROR: 3
```

When a terminal wanders between countries (i.e. networks), an application may follow this e.g. with the following scenario:

```
AT+CREG=1                     (enable +CREG: <stat> unsolicited result code)
OK
AT+CREG?
+CREG: 1,1                    (ME is registered in home PLMN)
OK
AT+COPS=3,2;+COPS?;+COPS=3,0;+COPS?
+COPS: 0,2,"24405"            (get the country...
```

```
+COPS: 0,0,"RADIOLINJA"        ...and operator name)
OK
...user wanders to another PLMN...
+CREG: 2                       (deregistered, roaming ongoing)
+CREG: 5                       (registered again, not home PLMN)
AT+COPS=3,2;+COPS?;+COPS=3,0;+COPS?
+COPS: 0,2,"24001"             (get the country...
+COPS: 0,0,"TELIA MOBITEL"     ...and operator name)
OK
...user loses connection, no other PLMNs around...
+CREG: 0
```

An example of eMLPP Supplementary Service usage for a ptp voice call:

```
ATD*752#+436644101453;         (originate a voice call with the priority level 2, see for priority level definitions GSM 02.30)
OK                             (call setup was successful)
```

8 Mobile Equipment control and status commands

This clause includes commands for ME power, keypad, display and indicator handling. Also commands for selecting, reading and writing of phonebooks, and setting real-time clock facilities are specified. Two commands are specified for accessing SIM database records in a general way.

Figure 1 illustrates the effect of these commands. Command Phone Activity Status +CPAS indicates the current general activity status of the ME. Command Set Phone Functionality +CFUN is used to set the ME to different power consumption states. Command Enter PIN +CPIN is used to enter ME passwords which are needed before any other functionality of the ME can be used (e.g. SIM PIN, PUK). Commands Generic SIM Access +CSIM and Restricted SIM Access +CRSM can be used to access all data in SIM. Commands Battery Charge +CBC and Signal Quality +CSQ are same as in TIA IS-135 [16] and they are used to query the battery charge of the ME and the current RSSI of the ME. Command Mobile Equipment Control Mode +CMEC is used to select the controlling unit of ME keypad, display and indicators. Controlling commands for the TE are Keypad Emulation +CKPD, Display Control +CDIS and Indicator Control +CIND. If corresponding event reporting is enabled with command Mobile Equipment Event Reporting +CMER, +CKEV is the result code of a keypad event, +CDEV is the result code of a display event, and +CIEV is the result code of an indicator event. Phonebook commands are Select Phonebook Memory Storage +CPBS, Read Phonebook Entries +CPBR, Find Phonebook Entries +CPBF and Write Phonebook Entry +CPBW. Additional command Clock +CCLK can be used to control the real-time clock of the ME if available. Command Alarm +CALA sets possible alarm clock facilities of the ME.

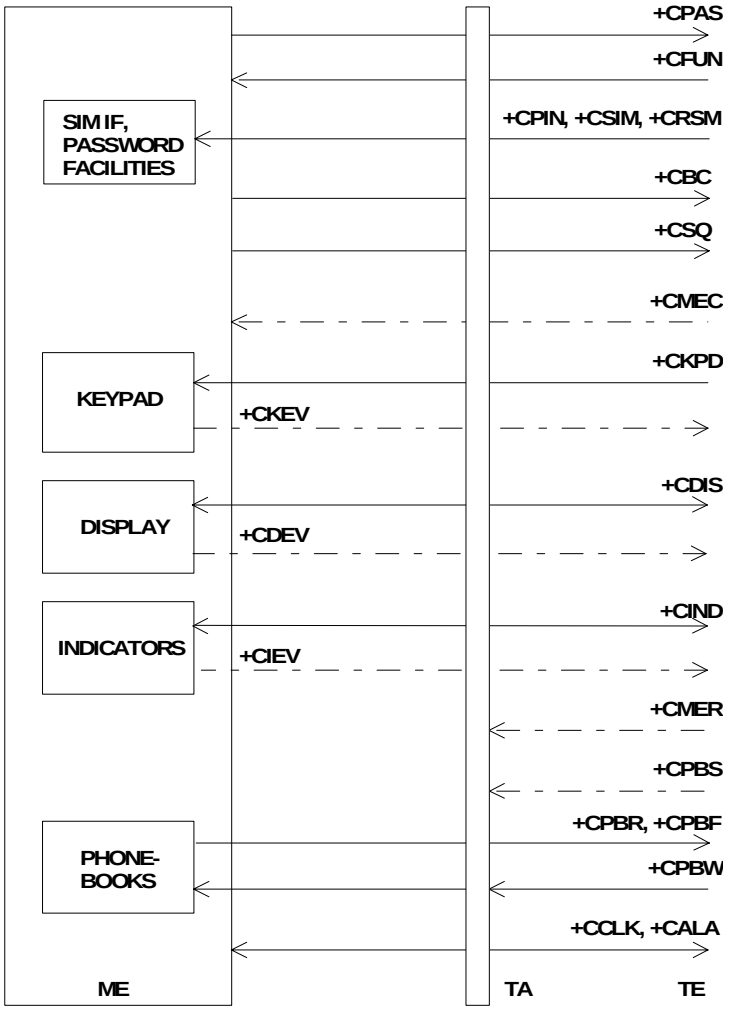

Figure 1: Mobile equipment control and status commands

8.12 Read phonebook entries +CPBR

Table 14: +CPBR action command syntax

Command	Possible response(s)
+CPBR=<index1>[,<index2>]	[+CPBR: <index1>,<number>,<type>,<text>[[...] <CR><LF>+CPBR: <index2>,<number>,<type>,<text>]] *+CME ERROR: <err>*
+CPBR=?	+CPBR: (list of supported <index>s),[<nlength>],[<tlength>] *+CME ERROR: <err>*

Description

Execution command returns phonebook entries in location number range <index1>... <index2> from the current phonebook memory storage selected with +CPBS. If <index2> is left out, only location <index1> is returned. Entry fields returned are location number <index*n*>, phone number stored there <number> (of format <type>) and text <text> associated with the number. If all queried locations are empty (but available), no information text lines may be returnedIf listing fails in an ME error, +CME ERROR: <err> is returned. Refer subclause 9.2 for <err> values.

Test command returns location range supported by the current storage as a compound value and the maximum lengths of <number> and <text> fields. In case of SIM storage, the lengths may not be available. If ME is not currently reachable, +CME ERROR: <err> is returned. Refer subclause 9.2 for <err> values.

Defined values

<index1>, <index2>, <index>: integer type values in the range of location numbers of phonebook memory

<number>: string type phone number of format <type>

<type>: type of address octet in integer format (refer ~~GSM 4~~TS 24.008 [8] subclause 10.5.4.7)

<text>: string type field of maximum length <tlength>; character set as specified by command Select TE Character Set +CSCS

<nlength>: integer type value indicating the maximum length of field <number>

<tlength>: integer type value indicating the maximum length of field <text>

Implementation

Optional.

8.13 Find phonebook entries +CPBF

Table 15: +CPBF action command syntax

Command	Possible response(s)
+CPBF=<findtext>	[+CPBF: <index1>,<number>,<type>,<text>[[...] <CR><LF>+CBPF: <index2>,<number>,<type>,<text>]] *+CME ERROR: <err>*
+CPBF=?	+CPBF: [<nlength>],[<tlength>] *+CME ERROR: <err>*

Description

Execution command returns phonebook entries (from the current phonebook memory storage selected with +CPBS) which alphanumeric field start with string <findtext>. Entry fields returned are location number <index*n*>, phone number stored there <number> (of format <type>) and text <text> associated with the number. If listing fails in an ME error, +CME ERROR: <err> is returned. Refer subclause 9.2 for <err> values.

Test command returns the maximum lengths of <number> and <text> fields. In case of SIM storage, the lengths may not be available. If ME is not currently reachable, +CME ERROR: <err> is returned. Refer subclause 9.2 for <err> values.

Defined values

<index1>, <index2>: integer type values in the range of location numbers of phonebook memory

<number>: string type phone number of format <type>

<type>: type of address octet in integer format (refer ~~GSM 4~~TS 24.008 [8] subclause 10.5.4.7)

<findtext>, <text>: string type field of maximum length <tlength>; character set as specified by command Select TE Character Set +CSCS

<nlength>: integer type value indicating the maximum length of field <number>

<tlength>: integer type value indicating the maximum length of field <text>

Implementation

Optional.

8.14 Write phonebook entry +CPBW

Table 16: +CPBW action command syntax

Command	Possible response(s)
+CPBW=[<index>][,<number>[,<type>[,<text>]]]	*+CME ERROR: <err>*
+CPBW=?	+CPBW: (list of supported <index>s),[<nlength>],(list of supported <type>s),[<tlength>] *+CME ERROR: <err>*

Description

Execution command writes phonebook entry in location number <index> in the current phonebook memory storage selected with +CPBS. Entry fields written are phone number <number> (in the format <type>) and text <text> associated with the number. If those fields are omitted, phonebook entry is deleted. If <index> is left out, but <number> is given, entry is written to the first free location in the phonebook (the implementation of this feature is manufacturer specific). If writing fails in an ME error, +CME ERROR: <err> is returned. Refer subclause 9.2 for <err> values.

Test command returns location range supported by the current storage as a compound value, the maximum length of <number> field, supported number formats of the storage, and the maximum length of <text> field. In case of SIM storage, the lengths may not be available. If ME is not currently reachable, +CME ERROR: <err> is returned. Refer subclause 9.2 for <err> values. If storage does not offer format information, the format list should be empty parenthesis

Defined values

<index>: integer type values in the range of location numbers of phonebook memory

<number>: string type phone number of format <type>

<type>: type of address octet in integer format (refer ~~GSM 4~~TS 24.008 [8] subclause 10.5.4.7) ; default 145 when dialling string includes international access code character "+", otherwise 129

<text>: string type field of maximum length <tlength>; character set as specified by command Select TE Character Set +CSCS

<nlength>: integer type value indicating the maximum length of field <number>

<tlength>: integer type value indicating the maximum length of field <text>

Implementation

Optional.

8.33 Set Voice Mail Number +CSVM

Table 17: +CSVM parameter command syntax

Command	Possible response(s)
+CSVM=<mode>[,<number>[,<type>]]	*+CME ERROR: <err>*
+CSVM?	+CSVM:<mode>,<number>,<type> *+CME ERROR: <err>*
+CSVM=?	+CSVM: (list of supported <mode>s), (list of supported <type>s) *+CME ERROR: <err>*

Description

The number to the voice mail server is set with this command. The parameters <number> and <type> can be left out if the parameter <mode> is set to 0. If setting fails, an ME error, `+CME ERROR: <err>` is returned. Refer subclause 9.2 for `<err>` values.

Read command returns the currently selected voice mail number and the status (i.e. enabled/disabled).

Test command returns supported <mode>s and <type>s.

Defined values

`<mode>`:

0 Disable the voice mail number.

1 Enable the voice mail number.

`<number>`: string type; Character string <0..9,+>

<type>: integer type; Type of address octet. (refer GSM 44.008 subclause 10.5.4.7)

129 ISDN / telephony numbering plan, national / international unknown

145 ISDN / telephony numbering plan, international number

161 ISDN / telephony numbering plan, national number

128 - 255 Other values refer GSM 44.008 section 10.5.4.7

`<type>`: type of address octet in integer format (refer ~~GSM 4~~TS 24.008 [8] subclause 10.5.4.7); default 145 when dialling string includes international access code character "+", otherwise 129

Implementation

Optional.

3GPP TSG-T WG2#12
Beverley Hills, California, USA,
12-16 February 2001

T2-0100105

CR-Form-v3

CHANGE REQUEST

⌘ **27.007** **CR** **56** ⌘ rev **-** ⌘ Current version: **4.0.0** ⌘

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

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

Title:	⌘	Update the AT commands that access the PLMN preferred list in the SIM/UICC
Source:	⌘	T2
Work item code:	⌘	TI-ATC
Date:	⌘	2001-02-13
Category:	⌘	**F**
Release:	⌘	REL-4

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

Use one of the following releases:

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

Reason for change:	⌘	Update the AT commands that access the PLMN selector lists in the SIM/UICC cards with the changes included in USIM and GSM applications.
Summary of change:	⌘	The commands that access the Operator preferred list (+COPS and +CPOL) shall be updated in order to access the 3 existing lists in the USIM and 4 in the SIM, and also to be able to access the Access Technology Identifiers. A new command has been defined, +CPLS, to select the list where the information is going to be written/read by the +COLP command. See the updates included in USIM and SIM in TS 31.102 v3.3.0 chapters 4.2.5, 4.2.53, 4.2.54 and in GSM 11.11 v8.4.0 chapters 10.3.4, 10.3.35, 10.3.36 and 10.3.37.
Consequences if not approved:	⌘	Incomplete access, with AT commands, to the preferred PLMNs lists

Clauses affected:	⌘	7.3, 7.19
Other specs affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications
	⌘	
Other comments:	⌘	

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

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

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be

downloaded from the 3GPP server under ftp://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 TSG meetings.

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

7.3 ~~Operator~~ PLMN selection +COPS

Table 1: +COPS parameter command syntax

Command	Possible response(s)
+COPS=[<mode>[,<format>[,<oper>[,< AcT>]]]	*+CME ERROR: <err>*
+COPS?	+COPS: <mode>[,<format>,<oper>[,< AcT>]] *+CME ERROR: <err>*
+COPS=?	+COPS: [list of supported (<stat>, long alphanumeric <oper>, short alphanumeric <oper>, numeric <oper>[,< AcT>])s] [,,(list of supported <mode>s),(list of supported <format>s)] *+CME ERROR: <err>*

Description

Set command forces an attempt to select and register the GSM/UMTS network operator. <mode> is used to select whether the selection is done automatically by the ME or is forced by this command to operator <oper> (it shall be given in format <format>) to a certain access technology, indicated in <AcT>. If the selected operator is not available, no other operator shall be selected (except <mode>=4). The selected operator name format shall apply to further read commands (+COPS?) also. <mode>=2 forces an attempt to deregister from the network. The selected mode affects to all further network registration (e.g. after <mode>=2, ME shall be unregistered until <mode>=0 or 1 is selected). Refer subclause 9.2 for possible <err> values. This command should be abortable when registration/deregistration attempt is made.

Read command returns the current mode ~~and ,~~ the currently selected operator and the current Access Technology. If no operator is selected, <format>~~,and~~ <oper> and < AcT> are omitted.

Test command returns a set~~list~~ of ~~quadruplets~~ five parameters, each representing an operator present in the network. ~~Quadruplet~~A set consists of an integer indicating the availability of the operator <stat>, long and short alphanumeric format of the name of the operator, ~~and~~ numeric format representation of the operator and access technology. Any of the formats may be unavailable and should then be an empty field. The list of operators shall be in order: home network, networks referenced in SIM or active application in the UICC (GSM or USIM) in the following order: HPLMN selector, User controlled PLMN selector, Operator controlled PLMN selector and PLMN selector (in the SIM or GSM application), and other networks.

It is recommended (although optional) that after the operator list TA returns lists of supported <mode>s and <format>s. These lists shall be delimited from the operator list by two commas.

NOTE: The access technology selected paramters, <AcT>, should only be used in terminals capable to register to more than one access technology.

Defined values

<mode>:

0 automatic (<oper> field is ignored)

1 manual (<oper> field shall be present, and <AcT> optionally)

2 deregister from network

3 set only <format> (for read command +COPS?), do not attempt registration/deregistration (<oper> and < AcT> fields ~~is~~ are ignored); this value is not applicable in read command response

4 manual/automatic (<oper> field shall be present); if manual selection fails, automatic mode (<mode>=0) is entered

<format>:

0 long format alphanumeric <oper>

1 short format alphanumeric <oper>

2 numeric <oper>

<oper>: string type; <format> indicates if the format is alphanumeric or numeric; long alphanumeric format can be upto 16 characters long and short format up to 8 characters (refer GSM MoU SE.13 [9]); numeric format is the GSM Location Area Identification number (refer GSM 44.008 [8] subclause 10.5.1.3) which consists of a three BCD digit country code coded as in ITU-T E.212 Annex A [10], plus a two BCD digit network code, which is administration specific; returned <oper> shall not be in BCD format, but in IRA characters converted from BCD; hence the number has structure: (country code digit 3)(country code digit 2)(country code digit 1)(network code digit 3)(network code digit 2)(network code digit 1)

<stat>:

0 unknown

1 available

2 current

3 forbidden

<AcT> access technology selected:

0 GSM

1 GSM Compact

2 UTRAN

Implementation

Optional.

7.19 Preferred ~~operator~~ PLMN list +CPOL

Table 2:+CPOL parameter command syntax

Command	Possible response(s)
+CPOL=[<index>][,<format>[,<oper>[,<GSM_AcT>,<GSM_Compact_AcT>,<UTRAN_AcT>]]]	*+CME ERROR: <err>*
+CPOL?	+CPOL: <index1>,<format>,<oper1>[,<GSM_AcT1>,<GSM_Compact_AcT1>,<UTRAN_AcT1>] [<CR><LF>+CPOL: <index2>,<format>,<oper2>[,<GSM_AcT2>,<GSM_Compact_AcT2>,<UTRAN_AcT2>] [...]] *+CME ERROR: <err>*
+CPOL=?	+CPOL: (list of supported <index>s),(list of supported <format>s) *+CME ERROR: <err>*

Description

This command is used to edit the ~~SIM preferred list of networks~~ PLMN selector with Access Technology lists in the SIM card or active application in the UICC(GSM or USIM).

Execute command writes an entry in the SIM/USIM list of preferred ~~operators ($EF_{PLMNsel}$)~~ PLMNs, previously selected by the command +CPLS. If no list has been previously selected, the User controlled PLMN selector with Access Technology, $EF_{PLMNwAcT}$, is the one accessed by default. If <index> is given but <oper> is left out, entry is deleted. If <oper> is given but <index> is left out, <oper> is put in the next free location. If only <format> is given, the format of the <oper> in the read command is changed. The Access Technology selection parameters, <GSM_AcT>, <GSM_Compact_AcT> and <UTRAN_AcT>, are required when writing User controlled PLMN selector with Access Technology, EF $EF_{PLMNwAcT}$, Operator controlled PLMN selector with Access Technology $EF_{OPLMNwAcT}$ and HPLMN selector with Access Technology $EF_{HPLMNwAcT}$, see TS 31.102 Refer subclause 9.2 for possible <err> values.

NOTE1: ME may also update ~~this list~~ the User controlled PLMN selector with Access Technology, $EF_{PLMNwAcT}$, automatically when new networks are selected.

NOTE2: The Operator controlled PLMN selector with Access Technology $EF_{OPLMNwAcT}$, can only be written if the write access condition in the SIM/USIM has been previously verified.

Read command returns all used entries from the SIM/USIM list of preferred ~~operators~~ PLMNs, previously selected by the command +CPLS, with the Access Technologies for each PLMN in the list.

Test command returns the whole index range supported by the SIM.

Defined values

<index*n*>: integer type; the order number of operator in the SIM/USIM preferred operator list

<format>:

0 long format alphanumeric <oper>

1 short format alphanumeric <oper>

2 numeric <oper>

<oper*n*>: string type; <format> indicates if the format is alphanumeric or numeric (see +COPS)

<GSM_AcT*n*>: GSM access technology:

0 access technology not selected

1 access technology selected

<GSM_Compact_AcT*n*>: GSM compact access technology:

0 access technology not selected

1 access technology selected

<UTRA_AcT*n*>: UTRA access technology:

0 access technology not selected

1 access technology selected

Implementation

Optional.

7.xx Selection of preferred PLMN list +CPLS

Table 3:+CPLS parameter command syntax

Command	Possible response(s)
+CPLS=<list>	*+CME ERROR: <err>*
+CPLS?	+CPLS: <list> *+CME ERROR: <err>*

+CPLS=?	+CPLS: (list of supported <list>s) *+CME ERROR: <err>*

Description

This command is used to select one PLMN selector with Access Technology list in the SIM card or active application in the UICC(GSM or USIM), that is used by +CPOL command.

Execute command selects a list in the SIM/USIM. Refer subclause 9.2 for possible <err> values.

Read command returns the selected PLMN selector list from the SIM/USIM

Test command returns the whole index range supported lists by the SIM./USIM

Defined values

<list>:

0 User controlled PLMN selector with Access Technology $EF_{PLMNwAcT}$, if not found in the SIM/UICC then PLMN preferred list $EF_{PLMNsel}$ (this file is only available in SIM card or GSM application selected in UICC)

1 Operator controlled PLMN selector with Access Technology $EF_{OPLMNwAcT}$

2 HPLMN selector with Access Technology $EF_{HPLMNwAcT}$

Implementation

Optional.

CR-Form-v3

CHANGE REQUEST

⌘ 27.007 CR 57 ⌘ rev - ⌘ Current version: 4.0.0 ⌘

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

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

Title:	⌘	Update of phonebook AT commands, +CBBS,+CPBR, +CPBF and +CPBW, to access the hidden phonebook entries
Source:	⌘	T2
Work item code:	⌘	TI-ATC
Date:	⌘	2001-02-14
Category:	⌘	F
Release:	⌘	REL-4

Use one of the following categories:
- ***F*** *(essential correction)*
- ***A*** *(corresponds to a correction in an earlier release)*
- ***B*** *(Addition of feature),*
- ***C*** *(Functional modification of feature)*
- ***D*** *(Editorial modification)*

Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

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

Reason for change:	⌘	Update the command +CPBS to include the hidden key to access hidden entries in the selected phonebook Update the commands: +CPBR, +CPBF and +CPBW, to give information about the hidden entries in the phonebooks located in the UICC/USIM or any other phonebook with hidden entries.
Summary of change:	⌘	The <password> defined in +CPBS will be also used as the hidden key to be verified to access hidden phonebook entries, apart from PIN2. A new parameter, <hidden> has been added to the commands +CPBR, +CPBF and +CPBW, in order to indicate if an entry is hidden or not
Consequences if not approved:	⌘	With the current phonebook AT commands there is no way to access to the hidden entries in the USIM/UICC phonebooks or in any other phonebook with hidden entries

Clauses affected:	⌘	8.11, 8.12, 8.13, 8.14, 9.2.1
Other specs Affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

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

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

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be

downloaded from the 3GPP server under ftp://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 TSG meetings.

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

8.11 Select phonebook memory storage +CPBS

Table 1: +CPBS parameter command syntax

Command	Possible response(s)
+CPBS=<storage>[,<password>]	*+CME ERROR: <err>*
+CPBS?	+CPBS: <storage>[,<used>,<total>] *+CME ERROR: <err>*
+CPBS=?	+CPBS: (list of supported <storage>s)

Description

Set command selects phonebook memory storage <storage>, which is used by other phonebook commands. If setting fails in an ME error, +CME ERROR: <err> is returned. Refer subclause 9.2 for <err> values.

Read command returns currently selected memory, and when supported by manufacturer, number of used locations and total number of locations in the memory.

Test command returns supported storages as compound value.

Defined values

<storage> values reserved by the present document:

"DC" ME dialled calls list (+CPBW may not be applicable for this storage)

"EN" SIM/USIM (or ME) emergency number (+CPBW is not be applicable for this storage)

"FD" SIM fixdialling-phonebook

"LD" SIM last-dialling-phonebook

"MC" ME missed (unanswered received) calls list (+CPBW may not be applicable for this storage)

"ME" ME phonebook

"MT" combined ME and SIM/USIM phonebook

"ON" SIM (or ME) own numbers (MSISDNs) list (reading of this storage may be available through +CNUM also)

"RC" ME received calls list (+CPBW may not be applicable for this storage)

"SM" SIM phonebook

"TA" TA phonebook

<password>: string type value representing the PIN2-code required when selecting PIN2-code locked <storage>s above, e.g. "FD" or the hidden key to be verified in order to access to the hidden phonebook entries in the UICC/USIM or any other phonebook with hidden entries.

If the combined phonebook is selected, "MT", the <password> will correspond to the hidden key of the USIM phonebook.

<used>: integer type value indicating the number of used locations in selected memory

<total>: integer type value indicating the total number of locations in selected memory

Implementation

Mandatory when phonebook read, find or write command, or direct dialling (refer subclause "Direct dialling from phonebooks") is implemented.

8.12 Read phonebook entries +CPBR

Table 2: +CPBR action command syntax

Command	Possible response(s)
+CPBR=<index1>[,<index2>]	[+CPBR: <index1>,<number>,<type>,<text>[,<hidden>] [[...] <CR><LF>+CPBR: <index2>,<number>,<type>,<text>[,<hidden>]]] *+CME ERROR: <err>*
+CPBR=?	+CPBR: (list of supported <index>s),[<nlength>],[<tlength>] *+CME ERROR: <err>*

Description

Execution command returns phonebook entries in location number range <index1>... <index2> from the current phonebook memory storage selected with +CPBS. If <index2> is left out, only location <index1> is returned. Entry fields returned are location number <index*n*>, phone number stored there <number> (of format <type>), ~~and~~ text <text> associated with the number and , if the selected phonebook supports hidden entries, <hidden> indicating if the entry is hidden. If all queried locations are empty (but available), no information text lines may be returned. If listing fails in a~~n~~ ME error, +CME ERROR: <err> is returned. Refer subclause 9.2 for <err> values.

Test command returns location range supported by the current storage as a compound value and the maximum lengths of <number> and <text> fields. In case of SIM storage, the lengths may not be available. If ME is not currently reachable, +CME ERROR: <err> is returned. Refer subclause 9.2 for <err> values.

Defined values

<index1>, <index2>, <index>: integer type values in the range of location numbers of phonebook memory

<number>: string type phone number of format <type>

<type>: type of address octet in integer format (refer GSM 44.008 [8] subclause 10.5.4.7)

<text>: string type field of maximum length <tlength>; character set as specified by command Select TE Character Set +CSCS

<nlength>: integer type value indicating the maximum length of field <number>

<tlength>: integer type value indicating the maximum length of field <text>

<hidden>: indicates if the entry is hidden or not

0: phonebook entry not hidden

1: phonebook entry hidden

Implementation

Optional.

8.13 Find phonebook entries +CPBF

Table 3: +CPBF action command syntax

Command	Possible response(s)
+CPBF=<findtext>	[+CPBF: <index1>,<number>,<type>,<text>[,<hidden>][[...] <CR><LF>+CBPF: <index2>,<number>,<type>,<text>[,<hidden>]]] *+CME ERROR: <err>*

+CPBF=?	+CPBF: [<nlength>],[<tlength>] *+CME ERROR: <err>*

Description

Execution command returns phonebook entries (from the current phonebook memory storage selected with +CPBS) which alphanumeric field start with string <findtext>. Entry fields returned are location number <index*n*>, phone number stored there <number> (of format <type>), and text <text> associated with the number and, if the selected phonebook supports hidden entries, <hidden> indicating if the entry is hidden. If listing fails in an ME error, +CME ERROR: <err> is returned. Refer subclause 9.2 for <err> values.

Test command returns the maximum lengths of <number> and <text> fields. In case of SIM storage, the lengths may not be available. If ME is not currently reachable, +CME ERROR: <err> is returned. Refer subclause 9.2 for <err> values.

Defined values

<index1>, <index2>: integer type values in the range of location numbers of phonebook memory

<number>: string type phone number of format <type>

<type>: type of address octet in integer format (refer GSM 44.008 [8] subclause 10.5.4.7)

<findtext>, <text>: string type field of maximum length <tlength>; character set as specified by command Select TE Character Set +CSCS

<nlength>: integer type value indicating the maximum length of field <number>

<tlength>: integer type value indicating the maximum length of field <text>

<hidden>: indicates if the entry is hidden or not

0: phonebook entry not hidden

1: phonebook entry hidden

Implementation

Optional.

8.14 Write phonebook entry +CPBW

Table 4: +CPBW action command syntax

Command	Possible response(s)
+CPBW=[<index>][,<number>[,<type>[,<text>[,<hidden>]]]]	*+CME ERROR: <err>*
+CPBW=?	+CPBW: (list of supported <index>s),[<nlength>],(list of supported <type>s),[<tlength>] *+CME ERROR: <err>*

Description

Execution command writes phonebook entry in location number <index> in the current phonebook memory storage selected with +CPBS. Entry fields written are phone number <number> (in the format <type>), ~~and~~ text <text> associated with the number , and, if the selected phonebook supports hidden entries, <hidden> parameter, which indicates if the entry is hidden or not. If those fields are omitted, phonebook entry is deleted. If <index> is left out, but <number> is given, entry is written to the first free location in the phonebook (the implementation of this feature is manufacturer specific). If writing fails in an ME error, +CME ERROR: <err> is returned. Refer subclause 9.2 for <err> values.

Test command returns location range supported by the current storage as a compound value, the maximum length of <number> field, supported number formats of the storage, and the maximum length of <text> field. In case of SIM storage, the lengths may not be available. If ME is not currently reachable, +CME ERROR: <err> is returned. Refer subclause 9.2 for <err> values. If storage does not offer format information, the format list should be empty parenthesis

Defined values

<index>: integer type values in the range of location numbers of phonebook memory

<number>: string type phone number of format <type>

<type>: type of address octet in integer format (refer GSM 44.008 [8] subclause 10.5.4.7) ; default 145 when dialling string includes international access code character "+", otherwise 129

<text>: string type field of maximum length <tlength>; character set as specified by command Select TE Character Set +CSCS

<nlength>: integer type value indicating the maximum length of field <number>

<tlength>: integer type value indicating the maximum length of field <text>

<hidden>: indicates if the entry is hidden or not

0: phonebook entry not hidden

1: phonebook entry hidden

Implementation

Optional.

9.2.1 General errors

0 phone failure

1 no connection to phone

2 phone-adaptor link reserved

3 operation not allowed

4 operation not supported

5 PH-SIM PIN required

6 PH-FSIM PIN required

7 PH-FSIM PUK required

10 SIM not inserted

11 SIM PIN required

12 SIM PUK required

13 SIM failure

14 SIM busy

15 SIM wrong

16 incorrect password

17 SIM PIN2 required

18 SIM PUK2 required

20 memory full

21 invalid index

22 not found

23 memory failure

24 text string too long

25 invalid characters in text string

26 dial string too long

27 invalid characters in dial string

30 no network service

31 network timeout

32 network not allowed - emergency calls only

40 network personalization PIN required

41 network personalization PUK required

42 network subset personalization PIN required

43 network subset personalization PUK required

44 service provider personalization PIN required

45 service provider personalization PUK required

46 corporate personalization PIN required

47 corporate personalization PUK required

48 hidden key required (Note: this key is required when accessing hidden phonebook entries)

100 unknown

3GPP TSG-T2 #12
Los Angeles, US
12th - 16th February 2001

T2-0100109

CR-Form-v3

CHANGE REQUEST

⌘ **27.007** **CR** **58** ⌘ rev **-** ⌘ Current version: **4.0.0** ⌘

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

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

Title:	⌘	Addition of explicit subscribed value to QoS command
Source:	⌘	T2
Work item code:	⌘	TI - ATC
Date:	⌘	23/01/2001
Category:	⌘	**A**
Release:	⌘	Rel-4

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

Use one of the following releases:

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

Reason for change:	⌘	Since there is currently no explanation of omitted value of <Traffic Class >, <Delivery Order>, <Delivery of Erronous SDUs>, <Transfer Delay>, <Maximum SDU Size>, <Maximum Bitrate (UL / DL)>, <Guaranteed Bitrate (UL / DL)> and <Traffic Handling Priority> fields in the AT+CGEQREQ, AT+CGEQMIN and AT+CGEQNEG commands means subscribed values, subscribed value is added explicity to each of those fields. Also 'no detect' value is missing from <Delivery of Erronous SDUs> field.
Summary of change:	⌘	Assign a complete different value when referring to subscribed value. This value is put last in the range of the current values. Add 'no detect' value to <Delivery of Erronous SDUs> field. In +CGEQNEG command, the example is corrected; "(e.g. AT+CGEQNEG=...,32, ...)" corrected to "(e.g. +CGEQNEG: ...,32, ...)"
Consequences if not approved:	⌘	As terminals manufacturers may interpret the omitted value in different ways, it may cause incompatibility issue.

Clauses affected:	⌘	10.1.6, 10.1.7, 10.1.8
Other specs Affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

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

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

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 TSG meetings.

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

10.1.6 3G Quality of Service Profile (Requested) +CGEQREQ

****

Deleted text

****

Description

This command allows the TE to specify a UMTS Quality of Service Profile that is used when the MT sends an Activate PDP Context Request message to the network.

The set command specifies a profile for the context identified by the (local) context identification parameter, <cid>. The specified profile will be stored in the MT and sent to the network only at activation or MS-initiated modification of the related context. Since this is the same parameter that is used in the +CGDCONT and +CGDSCONT commands, the +CGEQREQ command is effectively an extension to these commands. The QoS profile consists of a number of parameters, each of which may be set to a separate value.

A special form of the set command, +CGEQREQ= <cid> causes the requested profile for context number <cid> to become undefined.

The read command returns the current settings for each defined context.

The test command returns values supported as a compound value. If the MT supports several PDP types, the parameter value ranges for each PDP type are returned on a separate line.

Defined values

<cid>: a numeric parameter which specifies a particular PDP context definition (see +CGDCONT and +CGDSCONT commands).

The following parameters are defined in 3GPP TS 23.107 [46] -

<Traffic class>: a numeric parameter that indicates the type of application for which the UMTS bearer service is optimised.
0 - conversational
1 - streaming
2 - interactive
3 - background
4 - subscribed value

Other values are reserved.

<Maximum bitrate UL>: a numeric parameter that indicates the maximum number of kbits/s delivered to UMTS (up-link traffic) at a SAP. As an example a bitrate of 32kbit/s would be specified as '32' (e.g. AT+CGEQREQ=…,32, …).

<Maximum bitrate DL>: a numeric parameter that indicates the maximum number of kbits/s delivered by UMTS (down-link traffic) at a SAP. As an example a bitrate of 32kbit/s would be specified as '32' (e.g. AT+CGEQREQ=…,32, …). If the parameter is set to '0' the subscribed value will be requested.

<Guaranteed bitrate UL>: a numeric parameter that indicates the guaranteed number of kbits/s delivered to UMTS (up-link traffic) at a SAP (provided that there is data to deliver). As an example a bitrate of 32kbit/s would be specified as '32' (e.g. AT+CGEQREQ=…,32, …). If the parameter is set to '0' the subscribed value will be requested.

<Guaranteed bitrate DL>: a numeric parameter that indicates the guaranteed number of kbits/s delivered by UMTS (down-link traffic) at a SAP (provided that there is data to deliver). As an example a bitrate of

32kbit/s would be specified as '32' (e.g. AT+CGEQREQ=…,32, …). If the parameter is set to '0' the subscribed value will be requested.

<Delivery order>: a numeric parameter that indicates whether the UMTS bearer shall provide in-sequence SDU delivery or not.
0 - no
1 - yes
2 - subscribed value.

Other values are reserved.

<Maximum SDU size>: a numeric parameter (1,2,3,…) that indicates the maximum allowed SDU size in octets. If the parameter is set to '0' the subscribed value will be requested.

<SDU error ratio>: a string parameter that indicates the target value for the fraction of SDUs lost or detected as erroneous. SDU error ratio is defined only for conforming traffic. The value is specified as 'mEe'. As an example a target SDU error ratio of $5•10^{-3}$ would be specified as '5E3' (e.g. AT+CGEQREQ=…,"5E3",…). '0E0' means subscribed value.

<Residual bit error ratio>: a string parameter that indicates the target value for the undetected bit error ratio in the delivered SDUs. If no error detection is requested, Residual bit error ratio indicates the bit error ratio in the delivered SDUs. The value is specified as 'mEe'. As an example a target residual bit error ratio of $5•10^{-3}$ would be specified as '5E3' (e.g. AT+CGEQREQ=…,"5E3",…). '0E0' means subscribed value.

<Delivery of erroneous SDUs>: a numeric parameter that indicates whether SDUs detected as erroneous shall be delivered or not.
0 - no
1 - yes
2 - no detect
3 - subscribed value

Other values are reserved.

<Transfer delay>: a numeric parameter (0,1,2,…) that indicates the targeted time between request to transfer an SDU at one SAP to its delivery at the other SAP, in milliseconds. If the parameter is set to '0' the subscribed value will be requested.

<Traffic handling priority>: a numeric parameter (1,2,3,…) that specifies the relative importance for handling of all SDUs belonging to the UMTS bearer compared to the SDUs of other bearers. If the parameter is set to '0' the subscribed value will be requested.

<PDP_type>: (see +CGDCONT and +CGDSCONT commands).

If a value is omitted for a particular class then the value is considered to be unspecified.

Implementation

Optional. If the command is not implemented then all the values are considered to be unspecified.

10.1.7 3G Quality of Service Profile (Minimum acceptable) +CGEQMIN

Table 1: +CGEQMIN parameter command syntax

Command	Possible Response(s)
+CGEQMIN=[<cid> [,<Traffic class> [,<Maximum bitrate UL> [,<Maximum	OK

Command	Possible Response(s)
bitrate DL> [,<Guaranteed bitrate UL> [,<Guaranteed bitrate DL> [,<Delivery order> [,<Maximum SDU size> [,<SDU error ratio> [,<Residual bit error ratio> [,<Delivery of erroneous SDUs> [,<Transfer delay> [,<Traffic handling priority>]]]]]]]]]]]]	ERROR
+CGEQMIN?	+CGEQMIN: <cid>, <Traffic class> ,<Maximum bitrate UL>, <Maximum bitrate DL> ,<Guaranteed bitrate UL> ,<Guaranteed bitrate DL>, <Delivery order> ,<Maximum SDU size> ,<SDU error ratio> ,<Residual bit error ratio> ,<Delivery of erroneous SDUs> ,<Transfer delay> ,<Traffic handling priority> [<CR><LF>+CGEQMIN: <cid>, <Traffic class> ,<Maximum bitrate UL> ,<Maximum bitrate DL> ,<Guaranteed bitrate UL> ,<Guaranteed bitrate DL>, <Delivery order> ,<Maximum SDU size> ,<SDU error ratio> ,<Residual bit error ratio> ,<Delivery of erroneous SDUs> ,<Transfer delay> ,<Traffic handling priority> […]]
+CGEQMIN=?	+CGEQMIN: <PDP_type>, (list of supported <Traffic class>s) ,(list of supported <Maximum bitrate UL>s) ,(list of supported <Maximum bitrate DL>s), (list of supported <Guaranteed bitrate UL>s), (list of supported <Guaranteed bitrate DL>s) ,(list of supported <Delivery order>s) ,(list of supported <Maximum SDU size>s) ,(list of supported <SDU error ratio>s) ,(list of supported <Residual bit error ratio>s) ,(list of supported <Delivery of erroneous SDUs>s) ,(list of supported <Transfer delay>s) ,(list of supported <Traffic handling priority>s) [<CR><LF>+CGEQMIN: <PDP_type>, (list of supported <Traffic class>s) ,(list of supported <Maximum bitrate UL>s), (list of supported <Maximum bitrate DL>s) ,(list of supported <Guaranteed bitrate UL >s), (list of supported <Guaranteed bitrate DL >s) ,(list of supported <Delivery order>s) ,(list of supported <Maximum SDU size>s) ,(list of supported <SDU error ratio>s) ,(list of supported <Residual bit error ratio>s) ,(list of supported <Delivery of erroneous SDUs>s) ,(list of supported <Transfer delay>s) ,(list of supported <Traffic handling priority>s) […]]

Description

This command allows the TE to specify a minimum acceptable profile, which is checked by the MT against the negotiated profile returned in the Activate/Modify PDP Context Accept message.

The set command specifies a profile for the context identified by the (local) context identification parameter, <cid>. The specified profile will be stored in the MT and checked against the negotiated profile only at activation or MS-initiated modification of the related context. Since this is the same parameter that is used in the +CGDCONT and +CGDSCONT commands, the +CGEQMIN command is effectively an extension to these commands. The QoS profile consists of a number of parameters, each of which may be set to a separate value.

A special form of the set command, +CGEQMIN= <cid> causes the minimum acceptable profile for context number <cid> to become undefined. In this case no check is made against the negotiated profile.

The read command returns the current settings for each defined context.

The test command returns values supported as a compound value. If the MT supports several PDP types, the parameter value ranges for each PDP type are returned on a separate line.

Defined values

<cid>: a numeric parameter which specifies a particular PDP context definition (see +CGDCONT and +CGDSCONT commands).

The following parameters are defined in 3GPP TS 23.107 [46] -

<Traffic class>: a numeric parameter that indicates the type of application for which the UMTS bearer service is optimised.
0 - conversational
1 - streaming
2 - interactive
3 - background

Other values are reserved.

<Maximum bitrate UL>: a numeric parameter that indicates the maximum number of kbits/s delivered to UMTS (up-link traffic) at a SAP. As an example a bitrate of 32kbit/s would be specified as '32' (e.g. AT+CGEQMIN=…,32, …).

<Maximum bitrate DL>: a numeric parameter that indicates the maximum number of kbits/s delivered by UMTS (down-link traffic) at a SAP. As an example a bitrate of 32kbit/s would be specified as '32' (e.g. AT+CGEQMIN=…,32, …).

<Guaranteed bitrate UL>: a numeric parameter that indicates the guaranteed number of kbits/s delivered to UMTS (up-link traffic) at a SAP (provided that there is data to deliver). As an example a bitrate of 32kbit/s would be specified as '32' (e.g. AT+CGEQMIN=…,32, …).

<Guaranteed bitrate DL>: a numeric parameter that indicates the guaranteed number of kbits/s delivered by UMTS (down-link traffic) at a SAP (provided that there is data to deliver). As an example a bitrate of 32kbit/s would be specified as '32' (e.g. AT+CGEQMIN=…,32, …).

<Delivery order>: a numeric parameter that indicates whether the UMTS bearer shall provide in-sequence SDU delivery or not.
0 - no
1 - yes
Other values are reserved.

<Maximum SDU size>: a numeric parameter (1,2,3,…) that indicates the maximum allowed SDU size in octets.

<SDU error ratio>: a string parameter that indicates the target value for the fraction of SDUs lost or detected as erroneous. SDU error ratio is defined only for conforming traffic. The value is specified as 'mEe'. As an example a target SDU error ratio of $5 \cdot 10^{-3}$ would be specified as '5E3' (e.g. AT+CGEQMIN=…,"5E3",…).

<Residual bit error ratio>: a string parameter that indicates the target value for the undetected bit error ratio in the delivered SDUs. If no error detection is requested, Residual bit error ratio indicates the bit error ratio

in the delivered SDUs. The value is specified as 'mEe'. As an example a target residual bit error ratio of $5 \cdot 10^{-3}$ would be specified as '5E3' (e.g. AT+CGEQMIN=…,"5E3",…).

`<Delivery of erroneous SDUs>:` a numeric parameter that indicates whether SDUs detected as erroneous shall be delivered or not.
0 - no
1 - yes
2 - no detect

Other values are reserved.

`<Transfer delay>:` a numeric parameter (0,1,2,…) that indicates the targeted time between request to transfer an SDU at one SAP to its delivery at the other SAP, in milliseconds.

`<Traffic handling priority>:` a numeric parameter (1,2,3,…) that specifies the relative importance for handling of all SDUs belonging to the UMTS bearer compared to the SDUs of other bearers.

`<PDP_type>:` (see +CGDCONT and +CGDSCONT commands).

If a value is omitted for a particular class then the value is considered to be unspecified.

Implementation

Optional. If the command is not implemented then no check is made against the negotiated profile.

10.1.8 3G Quality of Service Profile (Negotiated) +CGEQNEG

Table 2: +CGEQNEG action command syntax

Command	Possible Response(s)
+CGEQNEG =[<cid>[,<cid>[,…]]]	+CGEQNEG: <cid>, <Traffic class> ,<Maximum bitrate UL>, <Maximum bitrate DL> ,<Guaranteed bitrate UL>, <Guaranteed bitrate DL> ,<Delivery order> ,<Maximum SDU size> ,<SDU error ratio> ,<Residual bit error ratio> ,<Delivery of erroneous SDUs> ,<Transfer delay> ,<Traffic handling priority> [<CR><LF>+CGEQNEG: <cid>, <Traffic class> ,<Maximum bitrate UL>, <Maximum bitrate DL> ,<Guaranteed bitrate UL>, <Guaranteed bitrate DL> ,<Delivery order> ,<Maximum SDU size> ,<SDU error ratio> ,<Residual bit error ratio> ,<Delivery of erroneous SDUs> ,<Transfer delay> ,<Traffic handling priority> […]]
+CGEQNEG=?	+CGEQNEG: (list of <cid>s associated with active contexts)

Description

This command allows the TE to retrieve the negotiated QoS profiles returned in the Activate PDP Context Accept message.

The execution command returns the negotiated QoS profile for the specified context identifiers, <cid>s. The QoS profile consists of a number of parameters, each of which may have a separate value.

The test command returns a list of <cid>s associated with active contexts.

Defined values

<cid>: a numeric parameter which specifies a particular PDP context definition (see +CGDCONT and +CGDSCONT commands).

The following parameters are defined in 3GPP TS 23.107 [46] -

<Traffic class>: a numeric parameter that indicates the type of application for which the UMTS bearer service is optimised.
0 - conversational
1 - streaming
2 - interactive
3 - background
Other values are reserved.

<Maximum bitrate UL>: a numeric parameter that indicates the maximum number of kbits/s delivered to UMTS (up-link traffic) at a SAP. As an example a bitrate of 32kbit/s would be specified as '32' (e.g. ~~AT~~+CGEQNEG~~=~~:…,32, …).

<Maximum bitrate DL>: a numeric parameter that indicates the maximum number of kbits/s delivered by UMTS (down-link traffic) at a SAP As an example a bitrate of 32kbit/s would be specified as '32' (e.g. ~~AT~~+CGEQNEG~~=~~:…,32, …).

<Guaranteed bitrate UL>: a numeric parameter that indicates the guaranteed number of kbits/s delivered to UMTS (up-link traffic) at a SAP (provided that there is data to deliver). As an example a bitrate of 32kbit/s would be specified as '32' (e.g. ~~AT~~+CGEQNEG~~=~~:…,32, …).

<Guaranteed bitrate DL>: a numeric parameter that indicates the guaranteed number of kbits/s delivered by UMTS (down-link traffic) at a SAP (provided that there is data to deliver). As an example a bitrate of 32kbit/s would be specified as '32' (e.g. ~~AT~~+CGEQNEG~~=~~:…,32, …).

<Delivery order>: a numeric parameter that indicates whether the UMTS bearer shall provide in-sequence SDU delivery or not.
0 - no
1 - yes
Other values are reserved.

<Maximum SDU size>: a numeric parameter that (1,2,3,…) indicates the maximum allowed SDU size in octets.

<SDU error ratio>: a string parameter that indicates the target value for the fraction of SDUs lost or detected as erroneous. SDU error ratio is defined only for conforming traffic. The value is specified as 'mEe'. As an example a target SDU error ratio of $5 \cdot 10^{-3}$ would be specified as '5E3' (e.g. ~~AT~~+CGEQNEG~~=~~:…,"5E3",…).

<Residual bit error ratio>: a string parameter that indicates the target value for the undetected bit error ratio in the delivered SDUs. If no error detection is requested, Residual bit error ratio indicates the bit error ratio in the delivered SDUs. The value is specified as 'mEe'. As an example a target residual bit error ratio of $5 \cdot 10^{-3}$ would be specified as '5E3' (e.g. ~~AT~~+CGEQNEG~~=~~:…,"5E3",…).

<Delivery of erroneous SDUs>: a numeric parameter that indicates whether SDUs detected as erroneous shall be delivered or not.
0 - no
1 - yes
2 - no detect

Other values are reserved.

<Transfer delay>: a numeric parameter (0,1,2,…) that indicates the targeted time between request to transfer an SDU at one SAP to its delivery at the other SAP, in milliseconds.

<Traffic handling priority>: a numeric parameter (1,2,3,…) that specifies the relative importance for handling of all SDUs belonging to the UMTS bearer compared to the SDUs of other bearers.

If a value is omitted for a particular class then the value is considered to be unspecified.

Implementation

Optional.

3GPP TSG-T WG2#12
Beverley Hills, California, USA,
12-16 February 2001

T2-010116

CR-Form-v3

CHANGE REQUEST

⌘ **27.007** **CR** **59** ⌘ rev **-** ⌘ Current version: **4.0.0** ⌘

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

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

Title:	⌘	Corresponding GMM states for +CGREG command
Source:	⌘	T2
Work item code:	⌘	TI-ATC
Date:	⌘	2001-02-14
Category:	⌘	**A**
Release:	⌘	REL-4

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

Use one of the following releases:

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

Reason for change:	⌘	The current definitions for the return values of the +CGREG AT command are ambiguous and a unequivocal mapping to the corresponding GMM status is not possible.
Summary of change:	⌘	It is proposed to add for each return value an additional definition in which GMM state(s) the cause value should given. Furthermore its clarified if the GPRS service is enabled by the user (i.e. the GPRS attach is request by the user).
Consequences if not approved:	⌘	As the current definitions are ambiguous, there is the risk of different MS implementations.

Clauses affected:	⌘	10.1.19		
Other specs affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	
Other comments:	⌘			

10.1.19 GPRS network registration status +CGREG

Table 1: CGREG parameter command syntax

Command	Possible response(s)
+CGREG=[<n>]	
+CGREG?	+CGREG: <n>,<stat>[,<lac>,<ci>] *+CME ERROR: <err>*
+CGREG=?	+CGREG: (list of supported <n>s)

Description

The set command controls the presentation of an unsolicited result code +CGREG: <stat> when <n>=1 and there is a change in the MT's GPRS network registration status, or code +CGREG: <stat>[,<lac>,<ci>] when <n>=2 and there is a change of the network cell.

NOTE. If the GPRS MT also supports circuit mode services, the +CREG command and +CREG: result code apply to the registration status and location information for those services.

The read command returns the status of result code presentation and an integer <stat> which shows whether the network has currently indicated the registration of the MT. Location information elements <lac> and <ci> are returned only when <n>=2 and MT is registered in the network.

Defined values

<n>:

0 disable network registration unsolicited result code

1 enable network registration unsolicited result code +CGREG: <stat>

2 enable network registration and location information unsolicited result code +CGREG: <stat>[,<lac>,<ci>]

<stat>:

0 not registered, ME is not currently searching an ~~new~~ operator to register to
The MS is in GMM state GMM-NULL or GMM-DEREGISTERED-INITIATED.
The GPRS service is disabled, the MS is allowed to attach for GPRS if requested by the user.

1 registered, home network
The MS is in GMM state GMM-REGISTERED or GMM-ROUTING-AREA-UPDATING-INITIATED INITIATED on the home PLMN.

2 not registered, but ME is currently trying to attach or searching an ~~new~~ operator to register to
The MS is in GMM state GMM-DEREGISTERED or GMM-REGISTERED-INITIATED. The GPRS service is enabled, but an allowable PLMN is currently not available. The MS will start a GPRS attach as soon as an allowable PLMN is available.

3 registration denied
The MS is in GMM state GMM-NULL. The GPRS service is disabled, the MS is not allowed to attach for GPRS if requested by the user.

4 unknown

5 registered, roaming
The MS is in GMM state GMM-REGISTERED or GMM-ROUTING-AREA-UPDATING-INITIATED on a visited PLMN.

<lac>: string type; two byte location area code in hexadecimal format (e.g. "00C3" equals 195 in decimal)

<ci>: string type; two byte cell ID in hexadecimal format

Implementation

Optional.

3GPP TSG-T WG2#12
Beverley Hills, California, USA,
12-16 February 2001

T2-010119

CR-Form-v3

CHANGE REQUEST

⌘ **27.007** **CR** **60** ⌘ rev **-** ⌘ Current version: **4.0.0** ⌘

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

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

Title:	⌘	Definition of "class C in GPRS and circuit switched alternate mode"
Source:	⌘	T2
Work item code:	⌘	TI - ATC
Date:	⌘	2001-02-14
Category:	⌘	**A**
Release:	⌘	Rel-4

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

Use one of the following releases:

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

Reason for change:	⌘	According to 02.60 there are four different GPRS MS Modes of Operation defined. The fifth mode "class C in GPRS and circuit switched alternate mode" given in the definition of the +CGCLASS AT command is not defined in the GPRS core specifications.
Summary of change:	⌘	As the expected MS behaviour for "class C in GPRS and circuit switched alternate mode" is not clear and there is no equivalent definition in the GPRS specifications, it is proposed to delete this class.
Consequences if not approved:	⌘	As there is no GPRS MS Mode which corresponds to the class 'C' mentioned in the command +CGCLASS there is the risk of different implementations by the manufacturer.

Clauses affected:	⌘	10.1.17
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

10.1.17 GPRS mobile station class +CGCLASS (GPRS only)

Table 1: CGCLASS parameter command syntax

Command	Possible Response(s)
+CGCLASS= [<class>]	OK ERROR
+CGCLASS?	+CGCLASS: <class>
+CGCLASS=?	+CGCLASS: (list of supported <class>s)

Description

The set command is used to set the MT to operate according to the specified GPRS mobile class. If the requested class is not supported, an ERROR or +CME ERROR response is returned. Extended error responses are enabled by the +CMEE command.

The read command returns the current GPRS mobile class.

The test command is used for requesting information on the supported GPRS mobile classes.

Defined Values

<class>: a string parameter which indicates the GPRS mobile class (in descending order of functionality)

A	class A (highest)
B	class B
~~C~~	~~class C in GPRS and circuit switched alternate mode~~
CG	class C in GPRS only mode
CC	class C in circuit switched only mode (lowest)

Other values are reserved and will result in an ERROR response to the set command.

If the MT is GPRS attached when the set command is issued with a <class> = CC specified, a detach request shall be sent to the network.

Implementation

Optional.

3GPP TSG-T2 #12
Los Angeles, California, USA
12th - 16th February 2001

T2-010300

CR-Form-v3

⌘ **27.103** **CR** **002** ⌘ ⌘ Current version: **3.1.0** ⌘

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

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

Title:	⌘	Addition of SyncML
Source:	⌘	T2
Work item code:	⌘	TI-SYNC-EVOL
Date:	⌘	16-Feb-2001
Category:	⌘	**B**
Release:	⌘	REL-4

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

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

Reason for change:	⌘	The updated 27.903 reflects a significant change in the data synchronisation technology environment. 27.103 needs to be updated to reflect that change.
Summary of change:	⌘	Add informative references to and definitions for the SyncML standard, remove reference to IrMC in Chapter 5 and add SyncML reference, delete Chapters 6 and 7. Fix various spelling errors.
Consequences if not approved:	⌘	3GPP needs to keep up with a changing technology environment. To ignore significant changes in technologies ensures that 3GPP specifications will be obsolete before they reach products.

Clauses affected:	⌘	Chapters 1, 3.1, 3.2, 4.1, 4.3, added Chapter 4.4, Chapters 5, 6, and 7 to eliminate references to the Release 99 nature of the subject matter, added Chapter 5 to cover Release 4's addition of SyncML.		
Other specs Affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	
Other comments:	⌘			

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

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

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 TSG meetings.

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

3GPP TS 27.103 V3.1.0 (2000-10)

Technical Specification

3rd Generation Partnership Project;
Technical Specification Group Terminals;
Wide area network synchronization standard
(Release 1999)

Keywords
UMTS, terminal, WAN

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Contents

Foreword

This Technical Specification has been produced by the 3GPP.

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

Version x.y.z

where:

- x the first digit:
  - 1 presented to TSG for information;
  - 2 presented to TSG for approval;
  - 3 Indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the specification;

1 Scope

This specification provides a definition of a Wide Area ~~Synchronization~~Synchronisation protocol. The ~~synchronization~~synchronisation protocol is based upon ~~IrMC level 4.~~current synchronisation industry standards.

The present document covers Wide Area Network ~~Synchronization~~Synchronisation between current and future mobile communication end-user devices, desktop applications and server-based information servers. This is a living document and, as such, it will evaluate new technologies (e.g. XML) for inclusion as they become readily available.

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] Bluetooth: Bluetooth SIG, Bluetooth Specifications, version 1.0, July 1999. (http://www.bluetooth.com/)

[2] IrMC, Infrared Data Association, "Specifications for Ir Mobile Communications (IrMC)", version 1.1, 01 March 1999, plus all applicable errata. (http://www.irda.org/)

[3] IrOBEX, Infrared Data Association, "Ir Object Exchange Protocol IrOBEX", version 1.2, April 1999, plus all applicable errata. (http://www.irda.org/)

[4] vCalendar, the Internet Mail Consortium, "vCalendar - The Electronic Calendaring and Scheduling Exchange Format - Version 1.0", 18 September 1996. (http://www.imc.org/pdi/vcal-10.doc)

[5] vCard, the Internet Mail Consortium, "vCard - The Electronic Business Card - Version 2.1", 18 September 1996.(http://www.imc.org/pdi/vcard-21.doc)

[6] WAP, WAP Forum, "WAP Technical Specifications Suite", version 1.1, June 1999. (http://www.wapforum.com/)

[7] XML, W3C, “Extensible Markup Language (XML) 1.0”, v1.0, REC-xml-19980210, Feb 1998

[8] SyncML initiative, SyncML Technical Specifications, version 1.0 (http://www.syncml.org)

[9] 3G TR 27.903, Discussion of Synchronisation Standards

3 Definitions and abbreviations

3.1 Definitions

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

Bluetooth: a technology specification for short range radio links between mobile PCs, mobile phones and other portable devices. (http: //www.bluetooth.com/)

GET: the operation of requesting that the server returns an object~~from~~ to the client as defined in the IrDA IrOBEX specification

GSM: Global System for Mobile communications

HTTP: HyperText Transfer Protocol

IrDA: an industry consortium set up to define a set of short range Ir communications standards. (http: //www.irda.org/)

Level 1: minimum level support defined in the IrDA IrMC set of specifications

Level 2: access level support defined in the IrDA IrMC set of specifications

Level 3: index level support defined in the IrDA IrMC set of specifications

Level 4: sync level support defined in the IrDA IrMC set of specifications

MapItems: describes to the server the mapping of a local UID to a server UID

MIME: Multipurpose Internet Mail Extension

PUT: the operation of sending one object from the client to the server as defined in the IrDA IrOBEX specification

SSL: Secure Socket Layer

Sync Alert: A SyncML command for requesting a synchronisation on a particular datastore.

~~**Synchronization:**~~**Synchronisation**: the process of exchanging information between multiple physical or virtual locations for the purpose of ensuring that each location's copy of that information reflects the same information content

SyncML initiative: an industry initiative set up to define a data synchronisation standard based on XML (http://www.syncml.org/)

vCalendar: a format defined by the IMC for electronic calendaring and scheduling exchange with extensions as defined in the IrDA IrMC set of specifications

vCard: a format defined by the IMC for electronic business card exchange with extensions as defined in the IrDA IrMC set of specifications

WAP: an industry consortium set up to define a set of standards to empower mobile users with wireless devices to easily access and interact with information and services. (http: //www.wapforum.com/)

Wide Area Network: a geographically-large range wireless connection between two or more devices for the purpose of transferring information. Large geographical range is typically defined as one kilometer or more in distance

3.2 Abbreviations

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

Cookie~~:~~	a method of tracking http-based information
IETF	Internet Engineering Task Force
IMC	Internet Mail Consortium
Ir	Infrared
IrDA	Infrared Data Association
IrMC	Ir Mobile Communications
IrOBEX	Ir Object EXchange
OBEX	Object Exchange
PDA	Personal Digital Assistant
PIM	Personal Information Manager
SyncML	Synchronisation Markup Language.
UID	Unique Identification
URL~~:~~	Universal Resource Location
WAP	Wireless Application Protocol
WBXML	Wireless Binary XML
WML~~:~~	Wireless Markup Language
WSP	Wireless Session Protocol
XML~~:~~	eXtensible Markup Language

4 Background

This background material is a synopsis of the material presented in 3G TR 27.903. Note that Release 99 is based on IrMC Sync. This release reflects a change to SyncML.

4.1 IrMC

The IrMC standard was developed as an extension to the IrDA standard for the purpose of providing an open standard for data exchange between mobile devices or between mobile devices and desktops or PDAs. Among other things, IrMC defines four levels of support for information exchange. By definition, each higher level must support all of the preceding levels. The four levels are: Level 1 (Minimum Level), Level 2 (Access Level), Level 3 (Index Level), and Level 4 (Sync Level). Level 4 does not require Level 3. Level 2 and Level 4 are the most relevant for ~~synchronization.~~synchronisation. IrMC has been adopted by IrDA and Bluetooth initiatives ~~and has wide industry support~~.

4.2 Bluetooth

Bluetooth has adopted the IrMC standard as the basis for their ~~synchronization~~synchronisation specification.

4.3 WAP

WAP has not specified a ~~synchronization standard. Attempts to form a work group last year were abandoned.~~synchronisation standard. The WAP Forum is currently evaluating synchronisation technologies and is expected to identify a technology later in 2001.

~~5 IrMC~~

~~There are two approaches regarding syncing of a mobile device. Either the logic of the synchronization has to be controlled by the server or by the mobile device. It has to be decided whether the mobile device should be the client or the server in the synchronization process. As the mobile device has a limited amount of memory and limited processing~~

capacity, it is desired to perform as much of the processing as possible outside of the mobile device. In this case the mobile device becomes the server in the synchronization process, only performing the operations the client tells it to perform. This introduces a problem, as the mobile device is an Internet client, and now has to act like a server. How this is solved is explained in chapter 6.2.

To be able to synchronize a mobile device calendar, a set of rules for how to read and write data from and to the mobile device has to be defined. It must also be decided how to keep track of changes done in the mobile device. An existing, and widely spread, standard for this is IrMC. IrMC provides a model for how to store and access data, such as calendar items, contacts and more. IrMC is usually put in the application layer on top of the OBEX layer in an IR stack. The purpose of this document is to describe how to apply IrMC and OBEX on the Internet, using 3GPP. This requires tunneling of OBEX in 3GPP and reversing the client/server roles.

6 Tunnelling of OBEX

There are two major problems with tunneling OBEX over a wide area network.

The first problem is that no logical connection is kept between the client and the server. In the same way that HTTP is stateless, 3GPP only knows a client at one Request/Response pair at the time. This means that the state awareness of an application has to be implemented by the application.

The second problem is that the client and the server roles are strictly defined. The client always requests the server and never the other way around. To get around this, a protocol has to be defined that emulates the reversion of the roles.

6.1 Introduction of State

The problem with achieving state awareness on the Internet is usually solved by creating a session object on the server that identifies the client by a cookie. Cookies are not yet a standard of 3GPP and also introduce scalability problems on the server side. The option left is to pass a Session Id between the client and the server throughout the session. This solution is widely adopted on the Internet today.

Usually, when state awareness has to be achieved on the Internet, the client is a browser and the Session Id has to be passed back and forth in hidden fields of forms. As the synchronization of a calendar application in a mobile phone is performed by a program and does not involve a browser and no interactivity with the user, a Session Id only has to be passed to the client at initialization of the synchronization process. The client however has to pass the Session Id in every request to be identified by the server.

The Connection Id used in OBEX is a 4 byte number. The Session Id chosen for the synchronization is a 128 bit (16 bytes) number. Preferably this number should be generated as a GUID (Global Unique Identifier) as these numbers are guarantied to be unique.

6.2 Client/Server

In the case of synchronizing a mobile device with a server's data, it is preferable to put the synchronization logic on the server side, as the mobile device has limited resources of memory and processing capacity. The synchronization process should thus be controlled by the server. The connection however should be initiated by the client. As the Internet Request/Response model contradicts this, we have to define a way to get around this.

The approach is to let the client (the mobile device) consecutively query the server for what operation it wants to perform on the client. The client will then perform the action and query the server for a new task. This is repeated until the server has no more tasks to perform.

The client will always call the server with OBEX headers as http POST data. The reason for using POST is that there is a size limit for sending data in the URL, using the GET method. Using the POST method also avoids problems with special characters, using binary POST (binary POST is not supported in WAP1.1, however. Another solution is provided below). Every client request implies permission for the server to request a client task in its response.

6.3 Binary Post

As binary POST is not supported in WAP1.1, the OBEX headers are base64 encoded and sent as plain text.

This could result in sending 33% more than the ammount of data neccesary.. The solution is however only temporary, awaiting WAP binary POST.

6.4 The secure connection

The authentication process only guaranties that the client and the server can rely on each others identity during the connection process. The connection that is established is not secure and could easily be tapped for information. It is therefore desired to encrypt all data that is sent between the client and the server. 3GPP currently does not guarantee strong enough encryption so we will ensure data is secure and untampered.

In the case of a synchronization of a mobile calendar over 3GPP, there are actually two different transports that has to be considered. First it is the transport from the mobile device to the 3GPP gateway. Then there is the transport from the gateway to the web server. The transport from the mobile device to the gateway is sent over GSM, which is fairly well encrypted. The transport from the gateway to the web server is not protected in any way though. To solve this problem we will use a third party product, e.g. "Wireless Jalda", to establish a protected connection from the gateway to the web server. This should be transparent from the mobile device and set up the required SSL connection.

6.5 Connect

The connect sequence sets up the connection from the mobile device to the web server. The session id has to be assigned in the first response from the server, as more request/response pairs are needed to complete the authentication procedure. The Connect procedure is always invoked by the client.

	Data	Description
Request →	<OBEX push>	The mobile device alerts the web server, sending an empty obex push.
Response ←	<obex connect with authenticate challenge, WAN UUID and target >	The web server responds with a 16 byte session id and the obex headers for connect with authenticate challange. The server also sends an obex target header, indicating calendar synchronization.
Request →	<obex unauthorized with authenticate challenge containg user name in realm, WAN UUID and who header >	The mobile device responds to the connect request by sending an unauthorized response with authernticate challenge, forcing the web server to authenticate itself. Username is sent as realm. Who header with assigned connection id.
Response ←	<obex connect with authenticate challenge and authentication response , and connectionid>	The web server verifies the mobile device and authenticates itself.
Request →	<obex success with authenticate response, WAN UUID and connectionid>	The mobile device verifies the web server and sends an obex success.
Response ←	...	The web server now starts acting like the a client to the mobile device, sending PUT and GET operations to the mobile device.

6.6 Disconnect

Disconnection can either be invoked by the client or be invoked by the server as a last response. The client's session is then destroyed in the server. A third case is that the connection is lost for other reasons, e.g. power failure by the client. In this case, the session should be timed out automatically.

6.6.1 Client disconnection

The client normally should not invoke the disconnection. Should the client however need to disconnect, the following sequence should be used:

	Data	Description
Response ←	...	The web server asks the mobile device to perform some operation.
Request	<obex disconnect, WAN	The mobile device send an obex disconnect to the

→	UUID >	web server.
Response ←	-	The web server destroys the session and responds with an empty response.

6.6.2 Server disconnection

When the server is done synchronizing its content, it should disconnect the client. The following sequence should be used:

	Data	Description
Response ←	<obex disconnect> <obex connectionid>	The web server send an obex disconnect to the mobile device and destroys the session.
	-	The mobile device disconnects and sends no more requests to the web server.

6.7 Put

The PUT operation sends a named vCalendar object from the server to the mobile device. The PUT operation can only be invoked by the web server.

	Data	Description
Response ←	<obex put, connectionid>	The web server sends a put request to the mobile device.
Request →	<obex put response, WAN UUID >	The mobile device performs the put operation and responds with the resulting obex data.

6.8 Get

The GET operation retrieves a named vCalendar object from the mobile device. The GET operation can only be invoked by the web server.

	Data	Description
Response ←	<obex get> <obex target>	The web server sends a get request to the mobile device.
Request →	<WAN UUID ><obex get response>	The mobile device performs the get operation and responds with the resulting obex data.

6.9 Timeouts

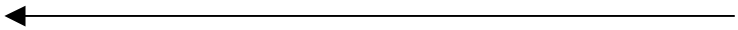
The operation will wait for N seconds before retry. The timeout will be similar to one used on browsers and implementation dependent.

7Use Case

The user choses “remote sync” and is prompted for the URL, for example www.somesite.com, userid and password. The userid will be sent to the server. The userid and the password will be saved in the local storage of the mobile device.

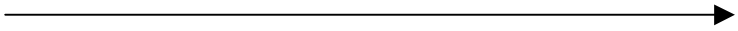
When the WAP server receives this, it will try to establish an OBEX connection with the mobile device, acting as a primary from an OBEX point of view. An OBEX Connect request with a WAN UUID header and an Authentication challenge header will be sent. The WAN UUID header will contain a unique16 byte UUID that will be used to identify this session. The server also sends an obex target header, indicating that a syncronization is in progress.

OBEX Connect With Authenticate
Challenge header + WAN UUID + target



When the phone receives the OBEX connect, it will respond with an OBEX Unauthorized response and an Authenticate Challenge of it's own.The user id is sent in the realm field in the obex authorize header. From now on, the given UUID must be present when a request is sent from the phone to the WAP server. This is the only way that the server can recognize the phone. The UUID will be identified with the WAN UUID header, which means that the phone identifies itself with the given UUID. The client also assigns a connection id that is sent in an obex who header in every request.

OBEX Unauthorized + WAN UUID header
+ Authenticate Challenge header + Who

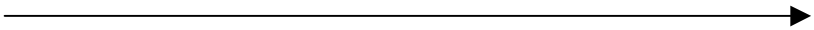


Receiving this, the WAP server resends the same command as last time but this time also adds the Authenticate Response header. The server always sends an obex target header, containg the connection id.

OBEX Connect + Authenticate Challenge header +
Authenticate Response header + connectionid

If the OBEX secondary at this stage verifies the received request digest with the one generated by itself, the client is authenticated and the response will be an OBEX Success with an Authenticate Response header.

OBEX Success + WAN UUID header +
Authenticate Response header



At this stage the OBEX connection is up and the actual synchronization can start. We are now in the middle of a WAP request/response pair and the WAP server response will now contain a OBEX Get command, asking for the mobile's Change Log. The steps following are identical to the ones in a local synchronization from an OBEX and IrMC point of view, the only real difference is the use of the WAN UUID header when sending from the mobile. Worth mentioning is that this form of remoted synchronization is not suited for a slow sync [see reference 2]. The user is supposed to do the first synchronization locally, using for example cable or IR.

4.4 SyncML

SyncML is an XML-based specification for data synchronisation. It accommodates not only traditional local synchronisation but also the special requirements associated with remote synchronisation 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, synchronisation protocol, and transport bindings. The Representation protocol defines XML-based messages for synchronisation, whereas the Synchronisation protocol defines synchronisation in the form of message sequence charts. The Transport binding specification defines a mechanism to carry synchronisation messages over different transport mechanisms.

5 SyncML

5.1 SyncML Overview

SyncML was designed with a number of goals:

- Reduce the number of messages being sent over the air,
- Reduce the message size,
- Provide a robust authentication mechanism,
- Transport independence,
- Datatype independence.

5.1.1 Reduce the number of messages being sent over the air

To achieve a reduction in the number of messages being transmitted, the SyncML device is required to determine which of the objects to be synchronised has changed since the last synchronisation for each server. This way, the SyncML device may tell the server what has changed, and then the server may tell the device what has changed and together they may determine the most appropriate course of action. In the case where there are no changes from the server or client, there could be as few as two messages exchanged. In the case where the server is sending additions to the device, there could be as few as four messages exchanged.

A detailed explanation of the messages being exchanged may be found in the protocol document [8].

5.1.2 Reduce the message size

SyncML messages can be in either XML or WBXML. The XML version is rather large, as the tags are clearly spelled out. The XML version makes for easier debugging, but is much too large for normal use over a wireless network. WBXML has the same structure as XML, but replaces the text strings with binary tags. This produces much smaller messages, at the expense of human readability. SyncML devices are required to support only XML or WBXML, not both. SyncML servers must support both XML and WBXML.

5.1.3 Provide a robust authentication mechanism

SyncML has required authentication on the message level, and optional authentication for the datastores and individual objects. The authentication is either Basic (username:password) or MD5 (username:password:nonce). Stronger authentication and encryption are work items for the year 2001. To keep the authentication free from casual viewing, the data is base64 encrypted.

It is possible to send an initial message to the SyncML server using Basic authentication, and have the server reject the message, asking instead for MD5 authentication. It is also possible authentication for every message being sent to the server and device.

5.1.4 Transport Independence

SyncML has the capability of operating over a several transport mechanisms. Version 1.0 specifies OBEX, WSP and HTTP.

To achieve this independence, SyncML has defined a set of specifications and conformance for each transport. Each transport must be able to carry a SyncML message reliably between SyncML devices. Each transport must be able to send a message to a device, and then be able to wait for a response from that device.

5.1.5 Datatype Independence

SyncML has specified a minimal set of objects for SyncML servers to support, but has not made the same requirements for SyncML clients. These objects are vCard 2.1, and vCalendar 1.0. SyncML only requires that an object be a registered MIME type for it to be synchronised. Both a client and server must support this object for it to be synchronised. The Device Information object indicates which objects are supported for any datastore. The Device Information Object must be exchanged on the first synchronisation between a client and server.

Typically, SyncML servers will support a wide variety of datatypes, while a SyncML client will support only one datatype (in the interest of smaller footprint). If a new datatype is created, it is very easy for this to be supported.

5.2 Change of Client/Server Roles from Release 99

SyncML uses the following description for client/server roles:

> "A client is a device (or application) which initiates a request for a session. The server is a device that passively waits for session requests from client devices. The server can either accept the request or reject it."

IrMC defines the client as:

> "The IrMC Client is the device that initiates communication with an IrMC Server. Typical IrMC Clients are PCs. However, in some cases, PDAs, pagers and phones may also be IrMC clients. IrMC Clients can only communicate with IrMC servers. For instance, an IrMC client may request a particular Phone Book record from an IrMC Server."

IrMC also defines the server as:

> "The IrMC Server listens for requests from IrMC clients. Typical Servers are pagers, phones and PDAs. IrMC Servers can not initiate communication, and can only communicate with IrMC clients."

5.3 Transport Bindings

The transport to be used should be either HTTP or WSP.

Details on the transport bindings may be found on the SyncML website. [8]

5.4 Security

Each SyncML message must exchange authentication credentials on each message level and may exchange additional authentication for each datastore as well. This authentication process will only guarantee that the client and server can rely on each other for the duration of the session. For longer duration security, the basic level of authentication is not adequate, instead MD5 authentication should be used. This will guarantee authentication not only over a session, but between sessions as well.

Encryption is not currently available in SyncML and must be supplied by the transports. Transport from the mobile device to the gateway is well protected. Transport from the gateway to the server should be sent via a secure channel, such as HTTPS.

5.5 Connection

The connect sequence sets up the connection from the mobile device to the synchronisation server. The client must choose a session id that is unique between the client and server and must determine what level of authentication to use (basic or MD5). Once the authentication has been decided, the client is free to start the actual connection process. Note that the connect procedure is always invoked by the client and that the transport binding documents detail the connection process.

Persistent connections should be terminated only after the last expected response from the server has been received.

5.6 Sending and Receiving Information

Both WSP and HTTP transport bindings use the Post method for sending and receiving SyncML messages to the server.

5.7 Intermittent Connectivity

Both the WSP and HTTP transport bindings operate over networks with high latency and have timeouts built in. Both transport bindings operate as follows:

> "In the case of a server timeout, the SyncML client SHOULD establish a new HTTP session with the HTTP server and attempt to resend the current SyncML package, beginning with the first SyncML command for which the SyncML client has not received an acknowledgement. In the event that the SyncML client requested that no responses be sent, the SyncML client SHOULD begin retransmitting with the first SyncML command in the SyncML package.
>
> In the case of a client timeout during a SyncML client-initiated data synchronization, the SyncML server SHOULD clean up the TCP connection and do no further processing of the SyncML request." [8]

5.8 Compatibility with Release 99

Compatibility between this release and Release 99 assumes that, within the network, there is a target server to act upon synchronisation transactions. This target server is the destination or origin for all ME synchronisation translations.

This target server has to be able to differentiate between Release 99 Sync and newer versions of Sync. If the new transport link is OBEX, then there will be different OBEX target headers for Release 99 and newer releases. If the new transport link is not OBEX, then the server will differentiate between Release 99 and newer releases by port number or MIME type. In either case, there is a distinctive method for determining how to service the Sync transaction.

Compatibility also assumes that the existing data store types may be maintained as currently defined in both the client and the server. Newer data store types may not need to maintain backwards compatibility since the older Release 99 clients would not understand the new types.

5.9 Use Case with SyncML

The user wants to synchronise data. If the user has not previously set up the remote synchronisation, the user will have to enter in the URL for the server, the authentication data (user name, password, and possibly a nonce), as well as any datastores to be synchronised. The device will have to maintain this information in the local storage of the device.

The user then chooses with which remote server to synchronise and then starts the synchronisation. The server will receive a message from the client with authorisation information and a Sync Alert for each datastore to be synchronised. The server will send back a message to the client with a status for all of the Sync Alerts as well as the authorisation. Note that the server has the option to tell the client to not send any more authentication at this point. Likewise, the server could tell the client to switch to more robust authentication and have it resend the first message with MD5 authentication.

The client will send a message to the server with all of the changed data since the last synchronisation with that server. The server will respond with a message containing a status on all of the changed data and all of server-changed data since the last synchronisation.

If there is any data from the server, then the client will have to send a message back to the server with status on the server's changed data requests, and possibly some MapItems. MapItems are used to tell the server how to map the local UIDs to the server's UIDs. MapItems are only sent to the server if the server has sent any new objects to the client. If the client has sent a new objectto the server, the server will take care of any UID mapping at that time.

If the client had sent any MapItems to the server, then the server will send a final message to the client with a status on all of the MapItems sent.

The user will then see a prompt telling them the synchronisation is now complete and, possibly, indicate any errors.

Annex A (informative): Change history

Change history							
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Old**	**New**
22/09/00	9	TP-000143	001	1	Introduction of PUSH and TARGET	3.0.0	3.1.0

3GPP TSG-T2 #12
Los Angeles, US
12th - 16th February 2001

T2-010104

CR-Form-v3

CHANGE REQUEST

⌘ **27.903** **CR** **001** ⌘ ⌘ Current version: **3.0.0** ⌘

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

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

Title:	⌘	Addition of SyncML
Source:	⌘	T2
Work item code:	⌘	TI-SYNC-EVOL
Date:	⌘	12-FEB-2001
Category:	⌘	**B**
Release:	⌘	REL-4

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

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

Reason for change:	⌘	Update to reflect a significant change in the data synchronisation technology environment.
Summary of change:	⌘	Add informative references and definitions to/for the SyncML standard.
Consequences if not approved:	⌘	3GPP needs to keep up with a changing technology environment. To ignore significant changes in technologies ensures that 3GPP specifications will be obsolete before they reach products.

Clauses affected:	⌘	Changed sections 2, 3.1, 3.2, 4.1, 4.3, 5.1, 6. Added sections 4.5, 5.4
Other specs affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications ⌘
Other comments:	⌘	

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

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.
2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 TSG meetings.
3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

3G TR 27.903 V 3.0.0 (1999-10)

Technical Report

3rd Generation Partnership Project; Technical Specification Group Terminals; Discussion of Synchronisation Standards (3G TR 27.903 version 3.0.0)

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Contents

Foreword

This Technical Report has been produced by the 3GPP.

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

Version 3.y.z

where:

- x the first digit:
  - 1 presented to TSG for information;
  - 2 presented to TSG for approval;
  - 3 Indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the specification;

1 Scope

The present document provides information on existing synchronisation protocols. It summarises proprietary and standard protocols relevant to current and future mobile communication devices.

The present 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.

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] Bluetooth: Bluetooth SIG, Bluetooth Specifications, version 1.0, July 1999. (http://www.bluetooth.com/)

[2] Generic Binary Object: Infrared Data Association, "IrWW IrDA for Wrist Watches", "Generic Binary Object" Chapter 4, version 0.5, 12 July 1999. (members section of ftp://ftp.irda.org/)

[3] ICNIRP: "Guidelines for limiting exposure to time-varying electric, magnetic, and electromagnetic fields (up to 300 GHz)", International Commission on Non-Ionizing Radiation Protection (ICNIRP), Health Physics, vol. 74, pp 494-522, April 1998.

[4] IrLAP: Infrared Data Association, "Serial Infrared Link Access Protocol (IrLAP)", version 1.1, 16 June 1996, plus all applicable errata. (http://www.irda.org/)

[5] IrLMP, Infrared Data Association, "Link Management Protocol", version 1.1, 23 January 1996, plus all applicable errata. (http://www.irda.org/)

[6] IrMC, Infrared Data Association, "Specifications for Ir Mobile Communications (IrMC)", version 1.1, 01 March 1999, plus all applicable errata. (http://www.irda.org/)

[7] IrOBEX, Infrared Data Association, "Ir Object Exchange Protocol IrOBEX", version 1.2, April 1999, plus all applicable errata. (http://www.irda.org/)

[8] MNCRS, Mobile Network Computing Reference Specification Consortium, Mobile Network Computing Reference Specification, Data Synchronisation Work Group, Application Programmer's Guide to Mobile Network Computer Data Synchronisation, version 1.1, March 1999. (http://www.oadg.or.jp/activity/mncrs/mncrs03-99.html)

[9] MDSP - Mobile Data Synchronisation Protocol.

[10] Tiny TP, Infrared Data Association, "'Tiny TP': A Flow-Control Mechanism for use with LrLMP", version 1.1, 20 October 1996, plus all applicable errata. (http://www.irda.org/)

[11] Various documents produced for "Synchronisation".

[12] vCalendar, the Internet Mail Consortium, "vCalendar - The Electronic Calendaring and Scheduling Exchange Format - Version 1.0", 18 September 1996. (http://www.imc.org/pdi/vcal-10.doc)

[13] vCard, the Internet Mail Consortium, "vCard - The Electronic Business Card - Version 2.1", 18 September 1996.(http://www.imc.org/pdi/vcard-21.doc)

[14] WAP, WAP Forum, "WAP Technical Specifications Suite", version 1.1, June 1999. (http://www.wapforum.com/)

[15] SyncML initiative, SyncML Technical Specifications, version 1.0 (http://www.syncml.org)

3 Definitions and Abbreviations

3.1 Definitions

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

Bluetooth: a technology specification [1] for short range radio links between mobile PCs, mobile phones and other portable devices. (http://www.bluetooth.com/)

bvCalendar: a compressed version of vCalendar as defined in the IrDA Generic Binary Object proposal [2].

bvCard: a compressed version of vCard as defined in the IrDA Generic Binary Object proposal [2].

GET: the operation of requesting that the server returns an object from to the client as defined in the IrDA IrOBEX specification [7].

IrDA: an industry consortium set up to define a set of short range Ir communications standards. (http://www.irda.org/)

Latency: time delay associated with the process of information exchange in a network.

Level 1: minimum level support defined in the IrDA IrMC set of specifications [6].

Level 2: Access Level support defined in the IrDA IrMC set of specifications [6].

Level 3: Index Level support defined in the IrDA IrMC set of specifications [6].

Level 4: Sync Level support defined in the IrDA IrMC set of specifications [6].

Personal Area Network: a short range wireless connection between two or more devices for the purpose of transferring information. Short range is typically defined as fifty meters or less in distance.

PUT: the operation of sending one object from the client to the server as defined in the IrDA IrOBEX specification [7].

Radio Frequency (RF): the frequency range between 300 Hz and 300 GHz (ICNIRP definition [3]).

Synchronisation: the process of exchanging information between multiple physical or virtual locations for the purpose of ensuring that each location's copy of that information reflects the same information content.

SyncML initiative: an industry initiative set up to define a data synchronisation standard based on XML (http://www.syncml.org/)

Ultra: a connectionless information transfer mechanism defined as part of the IrDA IrMC set of specifications [6].

vCalendar: a format defined by the IMC for electronic calendaring and scheduling exchange [12] with extensions as defined in the IrDA IrMC set of specifications [6].

vCard: a format defined by the IMC for electronic business card exchange [13] with extensions as defined in the IrDA IrMC set of specifications [6].

WAP: an industry consortium set up to define a set of standards [14] to empower mobile users with wireless devices to easily access and interact with information and services. (http://www.wapforum.com/)

Wide Area Devices: devices intended for use in 3G systems.

Wide Area Network: a geographically-large range wireless connection between two or more devices for the purpose of transferring information. Large geographical range is typically defined as one kilometer or more in distance.

Wireless Information Devices: wide area and short range devices intended for information transfer.

3.2 Abbreviations

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

DID	Database IDentifier
IAS	Information Access Service
IBM	International Business Machines
ICNIRP	International Commission on Non-Ionizing Radiation Protection
IETF	Internet Engineering Task Force
IMC	Internet Mail Consortium
Ir	Infrared
IrDA	Infrared Data Association
IrLAP	Infrared Link Access Protocol
IrLMP	Infrared Link Management Protocol
IrMC	Ir Mobile Communications
IrOBEX	Ir Object EXchange
LUID	Unique object IDentifier
MDSP	Mobile Data Synchronisation Protocol
MNCRS	Mobile Network Computer Reference Specification
OBEX	Object Exchange
PDA	Personal Digital Assistant
PIM	Personal Information Manager
SyncML	Synchronisation Markup Language
TTP	Tiny TP
WAP	Wireless Application Protocol
WBXML:	Wireless Binary XML
WML:	Wireless Markup Language
XML:	eXtensible Markup Language

4 Summary of Standards Activities

4.1 IrMC

The IrMC standard [6] was developed as an extension to the IrDA standard for the purpose of providing an open standard for data exchange between mobile devices or between mobile devices and desktops or PDAs. Among other things, IrMC defines four levels of support for information exchange. By definition, each higher level must support all of the preceding levels. The four levels are: Level 1 (Minimum Level), Level 2 (Access Level), Level 3 (Index Level), and Level 4 (Sync Level). (Level 4 does not require Level 3) Level 2 and Level 4 are the most relevant for synchronisation. IrMC has been adopted by the IrDA and Bluetooth initiatives ~~and has wide industry support~~.

4.2 Bluetooth

Bluetooth has adopted the IrMC standard [6] as the basis for their synchronisation specification.

4.3 WAP

WAP [14] has not specified a synchronisation standard. ~~Attempts to form a work group last year were abandoned.~~The WAP Forum is currently evaluating synchronisation technologies and is expected to identify a technology later this year.

4.4 Other Standards Activities

4.4.1 MNCRS

The MNCRS [8] (Mobile Network Computer Reference Specification) specifies an application programming interface (API) providing data-synchronisation services focused on Java-enabled devices. MNCRS is promoted by a number of companies but has not been adopted by any formal standards body.

4.4.2 Synchronisation

A group met informally in early 1999 for the purpose of defining a synchronisation specification [11] to be presented to the 3GPP or WAP bodies. The parties involved - Symbian, Puma, Ericsson, Nokia, Motorola, Starfish, and Lotus - disbanded before any agreement was reached.

4.4.3 MDSP

MDSP [9] (Mobile Data Synchronisation Protocol) is a data synchronisation and data exchange protocol for networked devices promoted by IBM. It is designed primarily for use between mobile devices that are sporadically connected to the network and servers that are continuously connected to the network. In particular, MDSP is designed to handle the case where the server and device store the data they are ~~synchronizing~~synchronising in different formats, using different software systems. MDSP can be used to exchange data elements, without attempting to ~~synchronize~~synchronise the containers as used in a one-way synchronisation to a device with no editing capabilities. MDSP has not been adopted by any formal standards body.

4.5 SyncML

SyncML is an XML-based specification for data synchronisation. It accommodates not only traditional local synchronisation but also the special requirements associated with remote synchronisation 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, synchronisation protocol, and transport bindings. The Representation protocol defines XML-based messages for synchronisation, whereas the Synchronisation protocol defines synchronisation in the form of message sequence charts. The Transport binding specification defines a mechanism to carry synchronisation messages over different transport mechanisms.

5 Overview of Synchronisation Standards

5.1 Introduction

3G Wireless Information Devices will enable unprecedented access to information regardless of location. Information will continue to be stored on personal computers or servers, however users will also expect to be able to have access to that same information on handheld or palm-size devices and wireless devices.

To date, there ~~is only one adopted standard that addresses~~are two adopted standards that address synchronisation: IrMC and SyncML. The IrMC standard [6] is also referenced in the Bluetooth specification. ~~3GPP has not yet adopted a standard for synchronisation.~~

The IrMC standard [6] is defined for personal area networks running either low or high bandwidth wireless links and may be used in connection-oriented or connectionless links such as IrDA or Bluetooth. It does not currently support a specifically ~~optimized~~optimised mode for wide area network synchronisation. Wide area network synchronisation presents a unique set of problems for efficient and accurate synchronisation.

The SyncML standard [15] is designed for use between mobile devices that are intermittently connected to the network and services that are continuously available to the network. SyncML may also be used for peer-to-peer data synchronisation. SyncML is designed specifically to be format-agnostic with respect to the data to be synchronised between network services and mobile devices.

5.2 IrMC Overview

The IrMC version 1.1 specification [6] was driven by leading handset manufacturers to provide a standard means for exchanging data between mobile devices and between mobile devices and desktop, handheld PCs, and Printers of various kinds. The focus of the original specification was to extend the IrDA standard to include extensions for transferring Personal Information Manager (PIM) data, files, and isochronous voice between co-operating IrMC devices. The current IrMC specification [6] supports data exchange with Phone Book, Calendar, Messaging and Note applications on mobile devices.

The specification was recently updated (version 1.1 [6]) to better support synchronisation features requested by the Bluetooth initiative, which is also committed to using IrMC version 1.1 [6] and its supporting IrOBEX [7] object exchange layer for satisfying its data exchange needs over short-distance radio links.

The scope of the IrMC specification [6] encompasses more than synchronisation. Components of IrMC deal with Call Control (for mobile handsets), real time audio transmission, and permissions for getting and setting the real time clock on the mobile device. IrMC also defines four (4) distinct levels of support for information exchange, where each higher level is expected to support the preceding levels (with some exceptions, see above). For purposes of synchronisation, Level 2 (Access Level) and Level 4 (Sync Level) are the only information exchange levels required to address our stated requirements.

The IrMC specification [6] and its supporting IrOBEX [7] object exchange layer is layered on top of the pre-existing IrDA stack. Since the IrMC synchronisation component requires either the Connection Oriented Service or the Connectionless Oriented Service, this means that IrMC and IrOBEX, when used in an IrDA application, sit atop of the IrDA layers IrLAP [4], IrLMP [5], and possibly TTP [10] and IAS [5]. Thus, the IrMC specification [6] is a natural extension of the IrDA stack. When used in Bluetooth, IrMC and IrOBEX sit atop the Bluetooth equivalent of these layers. The object is to swap transport and below layers while keeping a common set of applications.

The information exchange levels of IrMC prescribe the text-based data formats that must be exchanged between two mobile devices. Wherever possible, industry-standard data formats are used. Where no pre-existing data format exists, IrMC defines new formats that must be supported by implementers. Required data formats include IMC's vCard [13] and vCalendar [12] plus the similarly defined constructs vMessage [6] and vNote [6]. In addition, custom data formats are prescribed for exchanging data objects (such as change logs, information logs, error logs and device information). IrMC is currently evaluating allowing the use of the IETF versions of these constructs, the binary versions called bvCard [2] and bvCalendar [2], plus a completely generic Generic Binary Object [2].

IrMC effectively addresses the synchronisation needs of PIM applications residing on mobile devices, and operating in a connected or connectionless environment. At the highest level (Level 4), IrMC specifies core functionality such as database identifiers (DID), unique object identifiers (LUID), change logs and change counters or time stamps which are essential to ensure fast and reliable synchronisation. The specification also includes a rich set of features for exchanging PIM data. Included in this is an Information Log that describes the characteristics of each database, a Device Information block that identifies each device with capabilities, an optional Error Log that returns record-level error codes, a mechanism for detecting new items entered while synchronisation is in progress, and a means for detecting device resets.

5.3 IrMC 1.1 Limitations for Wide Area Synchronisation

IrMC was written to address the exchange of PIM data in a personal area network or peer-to-peer environment. However, the current IrMC specification [6] has not yet addressed synchronisation in a wide area wireless network environment such as that which would exist in a 3GPP scenario.

The limitations of IrMC in a 3G environment are as follows:

5.3.1 Level 4 Dependent on Connection-based Transport Protocol

IrMC Level 4 (Sync Level) requires either a Connection Oriented Service, when using IrDA involves components such as IrLAP [4] and IrLMP [5]. By its nature, IrOBEX [7] involves establishing an explicit connection between devices, performing the necessary data exchange, and then disconnecting. A persistent connection between devices is difficult to maintain in some Wide Area Network environments. Latency can slow the transactions to an unacceptable level, or worse, cause synchronisation to be stopped due to timeouts.

5.3.2 Inefficient Data Exchange

Data exchanges between an IrMC client and server tend to be chatty and quite inefficient. In particular, each object sent between devices requires a separate request/response pair using IrOBEX [7] commands. For example, GET operations entail a request and response for each object. PUT Operations can be more efficient in an Ultra [6] environment since no response is expected.

5.4 SyncML

The SyncML initiative [15] is a group of companies who have co-operated to produce an open specification for data synchronisation. SyncML is a data synchronisation specification that contains the following main components:

- An XML-based data representation protocol,
- A synchronisation protocol, and
- Transport bindings for the synchronisation protocol.

The data representation specifies an XML DTD that allows the representation of all the information required to perform synchronisation, including data, metadata and commands. The synchronisation protocol specifies how SyncML messages conforming to the DTD are exchanged in order to allow a SyncML client and server to exchange additions, deletions, updates, and other status information. The synchronisation protocol supports both two-way and one-way synchronisation.

There are also DTDs which define the representation of information about the device such as memory capacity and the representation of various types of meta information such as security credentials.

Although the SyncML specification defines transport bindings that specify how to use a particular transport to exchange messages and responses, the SyncML representation and synchronisation protocols are transport-independent. Each SyncML package is completely self-contained, and could, in principle, be carried by any transport. The initial bindings specified are HTTP, WSP, and OBEX. There is no reason why SyncML could not be implemented using other bindings such as email or message queues. Because SyncML messages are self-contained, multiple transports may be used without either the server or client devices having to be aware of the network topology. Thus, a short-range OBEX connection could be used for local connectivity with the messages being passed via HTTP to an Internet-hosted synchronisation server.

Either the client or the server may initiate a synchronisation session and both one-way and two-way synchronisation are supported. Both linear and star synchronisation topologies may be implemented using SyncML.

To reduce the data size, a binary coding of SyncML based on the WAP Forum's WBXML is defined. Messages may also be passed in clear text if required. In this and other ways SyncML addresses the bandwidth and resource limitations imposed by mobile devices.

SyncML is both datatype and datastore independent. SyncML can carry any datatype that can be represented as a MIME object. To promote interoperability between different implementations of SyncML, the specification includes the representation formats used for common PIM data. A conforming implementation of SyncML must use these data formats.

SyncML is an evolutionary synchronisation protocol – it takes the best from IrMC, MDSP, MAL, and others, and combines them with XML and MIME datatypes to create an efficient data synchronisation protocol.

6 ~~Recommendations~~Conclusions

To address the limitations of IrMC Level 4 synchronisation in a Wide Area Network, one of two actions must occur.

a) Modifications to the IrMC Level 4 to address the above limitations within the Wide Area Network must be made.

b) An extension to IrMC Level 4 for Wide Area Network Synchronisation must be created. Ideally, this extension would operate on top of existing stacks and would use as much existing code base as possible.

SyncML synchronisation does not appear to have such issues and appears to have the necessary Wide Area Network support already incorporated.

History

Document history		
V 3.0.0	October 1999	TSG-T#5