Technical Document - Confidential

GSM GENERAL PACKET RADIO SERVICES

MESSAGE SEQUENCE CHARTS

GACI

Document Number:	8441.207.99.001
Version:	0.2
Status:	Draft
Approval Authority:	
Creation Date:	1999-Oct-18
Last changed:	2015-Mar-08 by XGUTTEFE
File Name:	gaci.doc

Important Notice

Texas Instruments Incorporated and/or its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products, software and services at any time and to discontinue any product, software or service without notice. Customers should obtain the latest relevant information during product design and before placing orders and should verify that such information is current and complete.

All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment. TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI products, software and/or services. To minimize the risks associated with customer products and applications, customers should provide adequate design, testing and operating safeguards.

Any access to and/or use of TI software described in this document is subject to Customers entering into formal license agreements and payment of associated license fees. TI software may solely be used and/or copied subject to and strictly in accordance with all the terms of such license agreements.

Customer acknowledges and agrees that TI products and/or software may be based on or implement industry recognized standards and that certain third parties may claim intellectual property rights therein. The supply of products and/or the licensing of software does not convey a license from TI to any third party intellectual property rights and TI expressly disclaims liability for infringement of third party intellectual property rights.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products, software or services are used.

Information published by TI regarding third–party products, software or services does not constitute a license from TI to use such products, software or services or a warranty, endorsement thereof or statement regarding their availability. Use of such information, products, software or services may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Change History

Date	Changed by	Approved by	Version	Status	Notes
1999-Oct-18	DGH		0.1		1
2003-May-14	XGUTTEFE		0.2	Draft	

Notes:

1. Initial version

Table of Contents

List of Figures and Tables

List of References

[ISO 9000:2000] International Organization for Standardization. Quality management systems - Fundamentals and vocabulary. December 2000

1.1 References

[1] GSM 05.02 version 8.0.0 Release 1999
Digital cellular telecommunications system (Phase 2+);
Multiplexing and multiple access on the radio path

[2] GSM 04.60 version 6.3.0 Release 1997
Digital cellular telecommunications system (Phase 2+);
General Packet Radio Service (GPRS);
Mobile Station (MS) - Base Station System (BSS) interface;
Radio Link Control/ Medium Access Control (RLC/MAC) protocol

[3] GSM 04.08 version 6.3.0 Release 1997
Digital cellular telecommunications system (Phase 2+);
Mobile radio interface layer 3 specification

[4] GSM 03.64 version 6.1.0 Release 1997
Digital cellular telecommunications system (Phase 2+);
General Packet Radio Service (GPRS);
Overall description of the GPRS radio interface; Stage 2

[5] GSM 03.60 version 6.3.1 Release 1997
Digital cellular telecommunications system (Phase 2+);
General Packet Radio Service (GPRS);
Service description; Stage 2

[6] GSM 04.07 version 6.3.0 Release 1997
Digital cellular telecommunications system (Phase 2+);
Mobile radio interface signalling layer 3; General aspects

[7] GSM 04.64 version 6.3.0 Release 1997
Digital cellular telecommunications system (Phase 2+);
General Packet Radio Service (GPRS);
Mobile Station - Serving GPRS Support Node (MS-SGSN)
Logical Link Control (LLC) layer specification

[8] GSM 05.08 version 6.4.0 Release 1997
Digital cellular telecommunications system (Phase 2+);
Radio subsystem link control

[9] GSM 05.10 version 6.3.0 Release 1997
Digital cellular telecommunications system (Phase 2+);
Radio subsystem synchronization

[10] GSM 03.20 TS 100 929: July 1998 (GSM 03.20 version 6.0.1)
Security related network functions, ETSI

[11] GSM 03.22 Draft GSM 03.22: August 1998 (GSM 03.22 version 6.1.0)
Functions related to Mobile Station (MS) in idle mode and group receive mode, ETSI

[12] GSM 04.65] GSM 04.65 V6.3.0: Subnetwork Dependant Convergence Protocol
ETSI, March 1999

[13] ITU-T V42bis ITU-T, Recommendation V.42 bis 1990

[14] GSM 09.60 GPRS Tunneling Protocol (GTP) across the Gn and Gp InterfaceAbbreviations

AGCH	Access Grant Channel
AT	Attention sequence "AT" to indicate valid commands of the ACI
BCCH	Broadcast Control Channel
BS	Base Station
BSIC	Base Station Identification Code
C/R	Command/Response
C1	Path Loss Criterion
C2	Reselection Criterion
CBCH	Cell Broadcast Channel
CBQ	Cell Bar Qualify
CC	Call Control
CCCH	Common Control Channel
CCD	Condat Coder Decoder
CKSN	Ciphering Key Sequence Number
CRC	Cyclic Redundancy Check
DCCH	Dedicated Control Channel
DCOMP	Identifier of the user data compression algorithm used for the N-DPU
DISC	Disconnect Frame
DL	Data Link Layer
DM	Disconnected Mode Frame
DTX	Discontinuous Transmission
E	Extension bit
EA	Extension Bit Address Field
EL	Extension Bit Length Field
EMMI	Electrical Man Machine Interface
F	Final Bit
FACCH	Fast Associated Control Channel
FHO	Forced Handover
GACI	AT Command Interpreter
GMM	GPRS Mobility Management
GP	Guard Period
GRR	GPRS RR
GSM	Global System for Mobile Communication
HISR	High level Interrupt Service Routine
HPLMN	Home Public Land Mobile Network
I	Information Frame
IMEI	International Mobile Equipment Identity
IMSI	International Mobile Subscriber Identity
IP	Internet Protocol
ITU	International Telecommunication Union
IWF	Interworking Function
Kc	Ciphering Key
L	Length Indicator
LAI	Location Area Information
LISR	Low level Interrupt Service Routine
LLC	Logical Link Control
LPD	Link Protocol Discriminator
M	More bit used to indicate the last segment of N-DPU
MAC	Medium Access Control
MCC	Mobile Country Code
MM	Mobility Management
MMI	Man Machine Interface
MNC	Mobile Network Code
MS	Mobile Station

N(R)	Receive Number
N(S)	Send Number
NC	Network Control
NCC	National Colour Code
NECI	New Establishment Causes included
N-PDU	Network Protocol Data Unit
NSAPI	Network Layer Service Access Point Identifier
OTD	Observed Time Difference
P	Poll Bit
P/F	Poll/Final Bit
PACCH	Packet Associated Control Channel
PBCCH	Packet BCCH
PCCCH	Packet CCCH
PCOMP	Identifier of the protocol control information compression algorithm used for the N-DPU
PDCH	Packet Data Channel
PDP	Packet Data Protocol e.g. IP or X.25
PDTCH	Packet Data Traffic Channel
PRACH	Packet RACH
PSI	Packet System Information
PCH	Paging Channel
PCO	Point of Control and Observation
PDU	Protocol Data Unit
PL	Physical Layer
PLMN	Public Land Mobile Network
PTP	Point to Point
QoS	Quality of Service
RACH	Random Access Channel
REJ	Reject Frame
RLC	Radio Link Control
RNR	Receive Not Ready Frame
RR	Radio Resource Management
RR	Receive Ready Frame
RTD	Real Time Difference
RTOS	Real Time Operating System
SABM	Set Asynchronous Balanced Mode
SACCH	Slow Associated Control Channel
SAP	Service Access Point
SAPI	Service Access Point Identifier
SDCCH	Slow Dedicated Control Channel
SDU	Service Data Unit
SGSN	Serving GPRS Support Node
SIM	Subscriber Identity Module
SM	Session Management
SMS	Short Message Service
SMSCB	Short Message Service Cell Broadcast
SNDCP	Subnetwork Dependant Convergence Protocol
SNSM	SNDCP-SM
SS	Supplementary Services
TAP	Test Application Program
TBF	Temporary Block Flow
TCH	Traffic Channel
TCH/F	Traffic Channel Full Rate
TCH/H	Traffic Channel Half Rate
TCP	Transmission Control Protocol
TDMA	Time Division Multiple Access
TE	Terminal Equipment - e. g. a PC

TFI	Temporary Flow Identifier
TLLI	Temporary Logical Link Identifier
TMSI	Temporary Mobile Subscriber Identity
TQI	Temporary Queuing Identifier
UA	Unnumbered Acknowledgement Frame
UI	Unnumbered Information Frame
USF	Uplink State Flag
V(A)	Acknowledgement State Variable
V(R)	Receive State Variable
V(S)	Send State Variable
VPLMN	Visiting Public Land Mobile Network

1.2 Terms

Entity:	Program which executes the functions of a layer
Message:	A message is a data unit which is transferred between the entities of the same layer (peer-to-peer) of the mobile and infrastructure side. Message is used as a synonym to protocol data unit (PDU). A message may contain several information elements.
Primitive:	A primitive is a data unit which is transferred between layers on one component (mobile station or infrastructure). The primitive has an operation code which identifies the primitive and its parameters.
Service Access Point:	A Service Access Point is a data interface between two layers on one component (mobile station or infrastructure).

2 Overview

The Protocol Stacks are used to define the functionality of the GSM protocols for interfaces. The GSM specifications are normative when used to describe the functionality of interfaces, but the stacks and the subdivision of protocol layers does not imply or restrict any implementation.

The protocol stack for GPRS consists of several entities. Each entity has one ore more service access points, over which the entity provides a service for the upper entity.

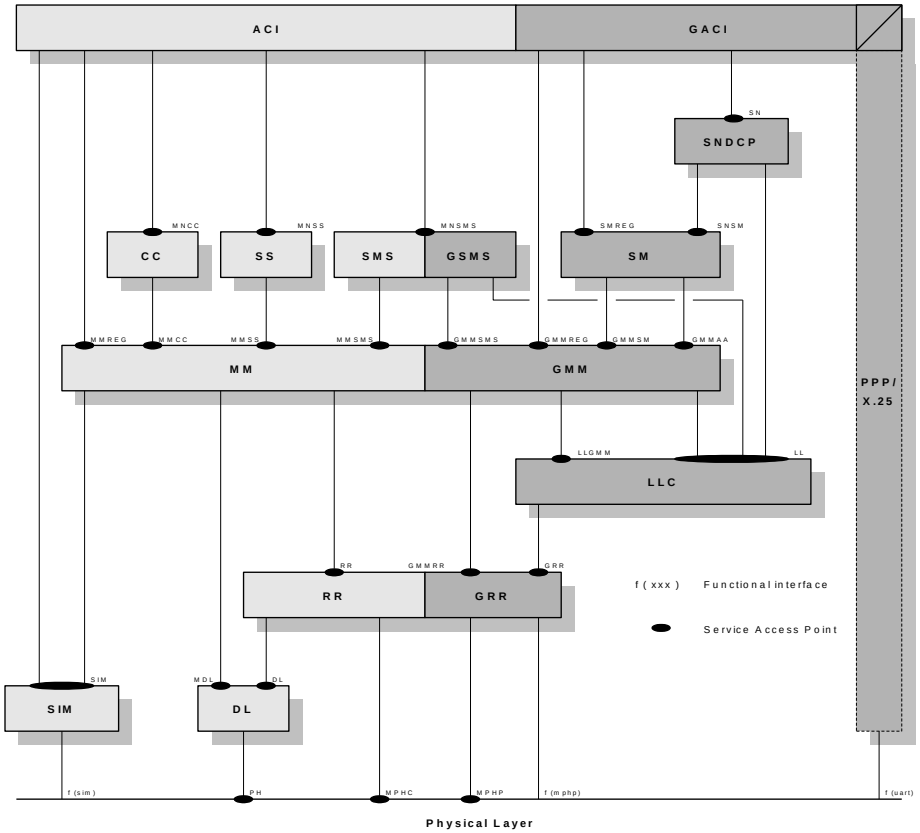


Figure 2-1: Architecture of the GSM/GPRS protocol stack

The information units passed via the SAPs are called primitives and consists of an operation code and several parameters. See the Users Guide for details.

The entities of the GPRS protocol stack are:

2.1 GRR (RLC/MAC) – Radio Link Control/Medium Access Control

This layer contains two functions: The Radio Link Control function provides a radio-solution-dependent reliable link. The Medium Access Control function controls the access signalling (request and grant) procedures for the radio channel, and the mapping of LLC frames onto the GSM physical channel.

2.2 LLC – Logical Link Control

The LLC entity provides multiple highly reliable logical links for asynchronous data transfer between the MS and the network. It supports variable-length information frames, acknowledged and unacknowledged data transfer, flow and sequence control, error detection and recovery, notification of unrecoverable errors, user identity confidentiality, and ciphering of user data.

2.3 GMM – GPRS Mobility Management

The GMM entity provides procedures for the mobility of the MS, such as informing the network of its present location, and user identity confidentiality. It manages the GMM context (attach, detach, routing area updating), supports security functions such as authentication of user and MS, controls ciphering of user data, and initiates the response to paging messages.

2.4 SM – Session Management

The main function of the session management (SM) is to support PDP context handling of the user terminal. Session Management activates, modifies and deletes the contexts for packet data protocols (PDP). Session Management services are provided at the SMREG-SAP and the SNSM-SAP for anonymous and non-anonymous access. The non-anonymous and anonymous access procedures for PDP context activation and PDP context deactivation are available at the SMREG-SAP. In addition there exists a PDP context modification for non-anonymous PDP contexts.

2.5 SNDCP - Subnetwork Dependant Convergence Protocol

SNDCP carries out all functions related to transfer of Network layer Protocol Data Units (N-PDUs) over GPRS in a transparent way. SNDCP helps to improve channel efficiency by means of compression techniques. The set of protocol entities above SNDCP consists of commonly used network protocols. They all use the same SNDCP entity, which then performs multiplexing of data coming from different sources to be sent using the service provided by the LLC layer.

2.6 GACI – GPRS AT Command Interpreter

The ACI is the GPRS extension of the ACI. It is specified in GSM 07.60. It is responsible for processing of the GPRS related AT Commands to setup, activate and deactivate the PDP context parameter. It also provides funtionallity for the interworking between GMM/SM/SNDCP and a packet oriented protocol like PPP.

2.7 USART - Universal Synchronous Asynchronous Receiver Transmitter Driver

The USART is a hardware component that facilitates a connection between the mobile station and terminal equipment (e.g. a PC). This interface uses some of the circuits described in V.24.

The data exchange provided by this unit is serial and asynchronous (synchronous communication is not in the scope of this document). A driver that uses interrupts to manage a circular buffer for the sending and receiving direction is necessary in order to use this component in the GPRS. The driver has to be able to perform flow control.

3 Introduction

Initiates TE protocol handler

Initiates Over the air connections

Interwork MS/TE protocol and over the air protocol

Interprets GPRS specific AT commands

Query of MS status/capability

Management of PDP context data and QOS data, storage/recovery from SIM?

Control of SMS service preferences

Attachment control, need to know IMSI attachment from MM (via ACI ??????)

General access to state information of lower layers. In principle should get this from 'controlling' entity if GSM and GPRS co-exist.

GPRS AT commands supported.

3.1 MS/TE protocols supported

3.1.1 PPP

Single PDP context

MO only, no answer capability

can network re-activate a current PPP connection it deactivated or shall a remote deactivation cause link release ?

could extend to support multiple PDP contexts,

or allow answer as long as PDP context established a priori

what is really required ?

3.1.2 X25

For Future Implementation. Up to 11 parallel PDP contexts.

3.2 Managed Data

PDP structure

PDP context

QOS – modem dictates max throughput & mean transfer parameters, obviously neither can exceed transfer rate of modem.

Need to track attach state of (G)MM IMSI and GPRS, report the latter (ACI reports the former)

QOS requested can current & requested be merged ?

Current QOS

QOSmin

XID list

pdp state

nsapi connection

4 Protocol

<R.LLC.GEN_REQS.A.001>

4.1 AT Command Interpretation

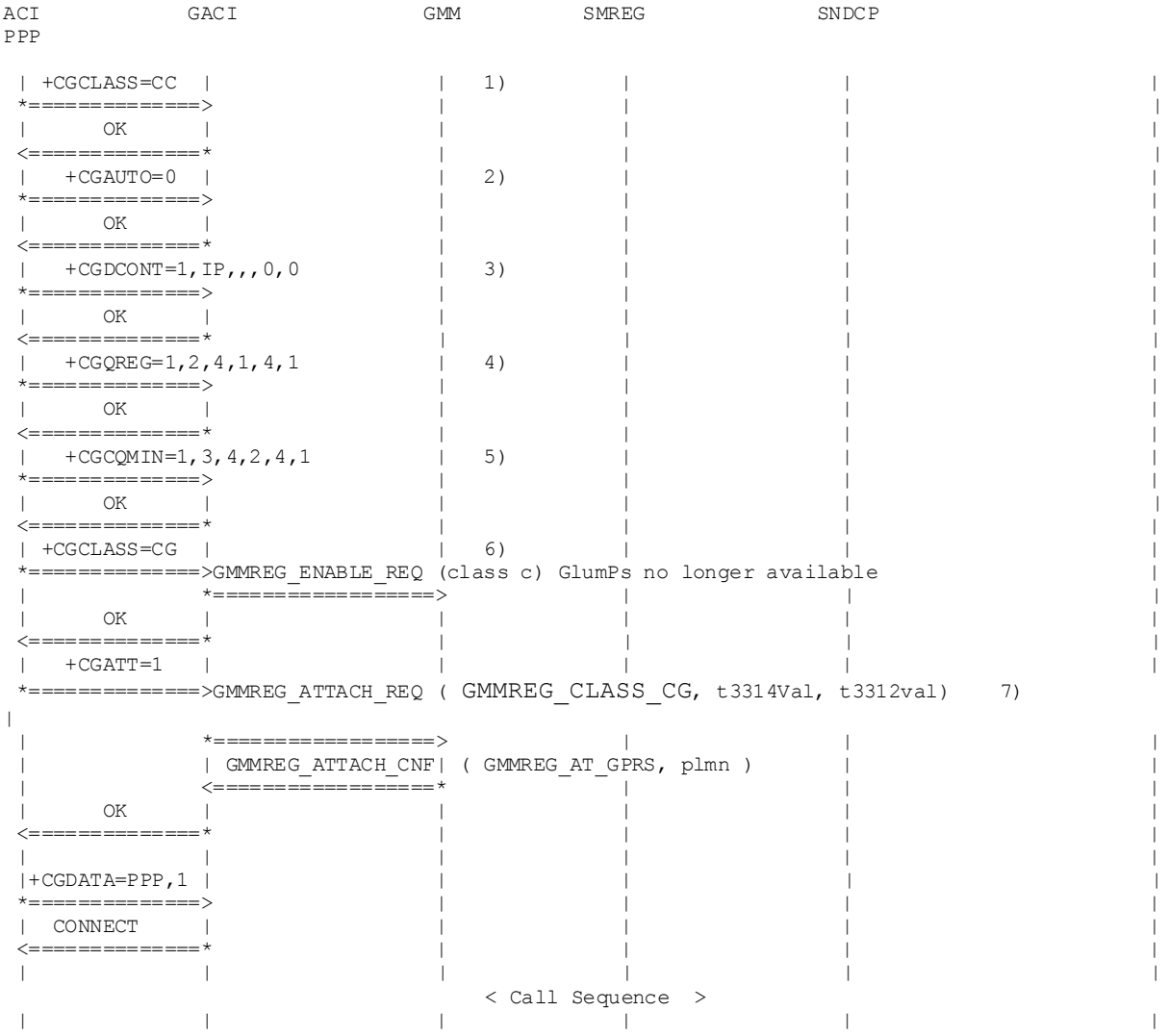
Have no means with current PPP interface to accept AT commands once the link is made i.e. the TE cannot directly establish or disable PDP contexts once enabled. A suspend/resume mechanism would achieve this. Network can do both, but how to notify TE of this via PPP interface ? What is the functionality required here ?

4.2 SIM storage of data

Initial functionality does not support persistent PDP context definitions at present

4.3 Call Setup Using AT commands

4.3.1 PDP context definition , Call set up



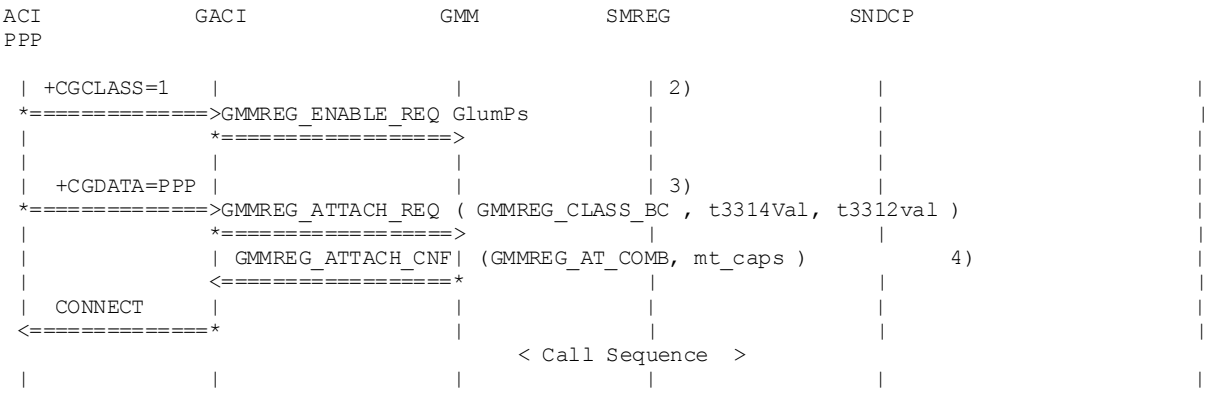
1) Initialise MS as Circuit Call Only Class C mobile mode, not IMSI attached.
2) Automatic Response Off, modem compatibility off
3) Define PDP context 1 as Internet Protocol, unspecified access point name, unspecified PDP address, no data compression, no header compression. The APN value will be requested as part of protocol (i.e. PPP) start up, as may the PDP address, if the PDP address is not specified a dynamic one is allocated [GSM 07.60 10.2.1].
4) Reliability QOS for PDP context 1, normal priority (2), best effort delay (4), reliability class 1 (1), peak throughput 64kbits/s(4), mean throughput best effort (1)
5) Minimum QOS for PDP context 1, low priority (3), best effort delay (4), reliability class 2 (2), peak throughput 64kbits/s (4), mean throughput best effort (1)

Notes 4,5 : GACI uses the LLC Frame mode for reliability class.[GSM3.60 15.2.3] Reliability classes 1,2 are thus interpreted as requiring Acknowledged data transfer, the others as unacknowledged.

6) Changes MS to GPRS Only Class C mobile mode. This causes an implicit enabling of the GPRS functionality, but not an implicit attachment.
7) Explicit GPRS attachment to current cell.
Connect with TE using PPP protocol and context number 1 (as specified in sequence)

4.3.2 Implicit context set up and call

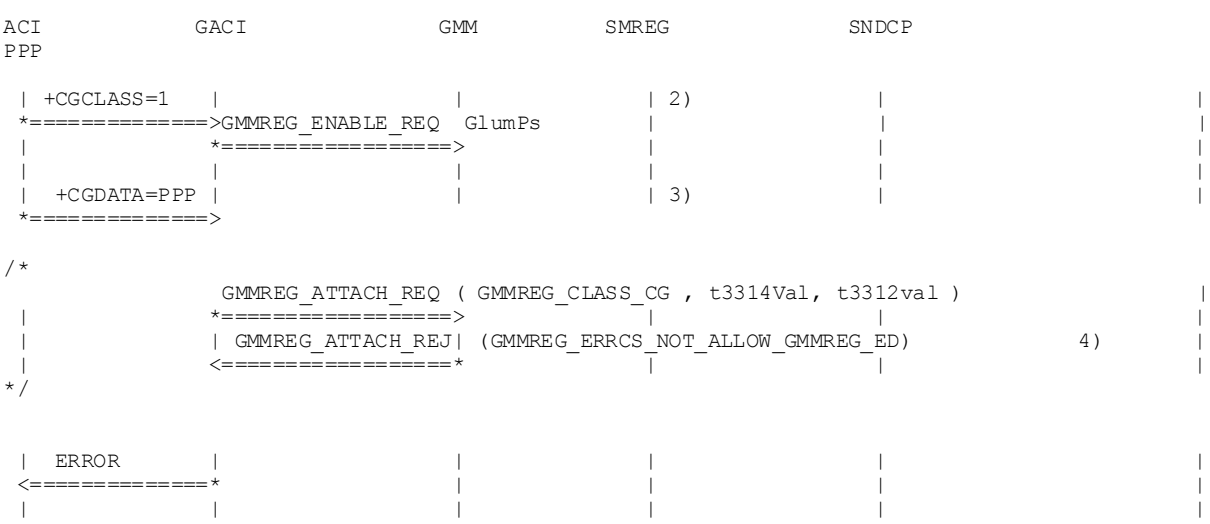
1)



1) Assume MS is in CC mode and that default defined PDP context and quality of service are available, mobile IMSI attached.
2) Changes MS to GPRS Only Class C mobile mode. This causes an implicit enabling of the GPRS functionality, but not an implicit attachment.
3) Connect using default parameters and a PPP stack between TE and MT. Causes an implicit attach as not currently attached.
4) If attach type does not match correct GPRS and IMSI attach states, it will be rejected (see next MSC).

4.3.3 Implicit context set up and call, incorrect mobile class

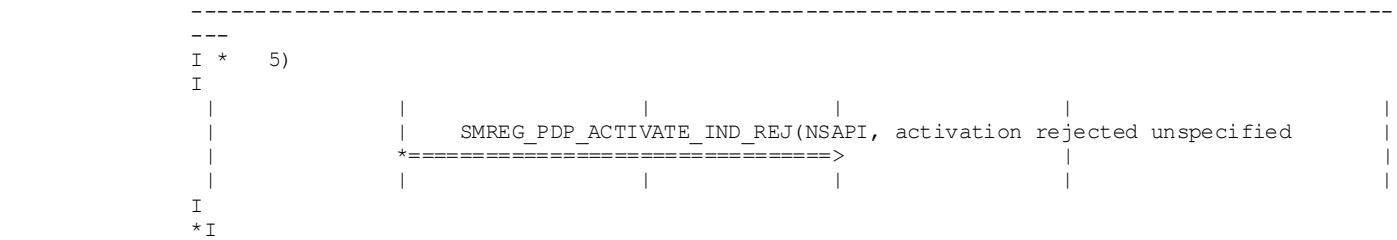
1)



1) Assume MS is in CC mode and that default defined PDP context and quality of service are available, mobile IMSI attached.
2) Changes MS to GPRS Only Class C mobile mode. This causes an implicit enabling of the GPRS functionality, but not an implicit attachment.
3) Connect using default parameters and a PPP stack between TE and MT. Causes an implicit attach as not currently attached.
4) Rejected as IMSI already registered, exact error cause unclear from SAPI.

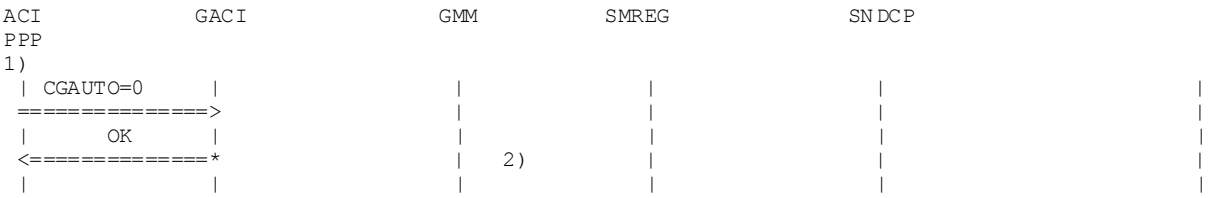
4.3.4 Automatic Answer

1)



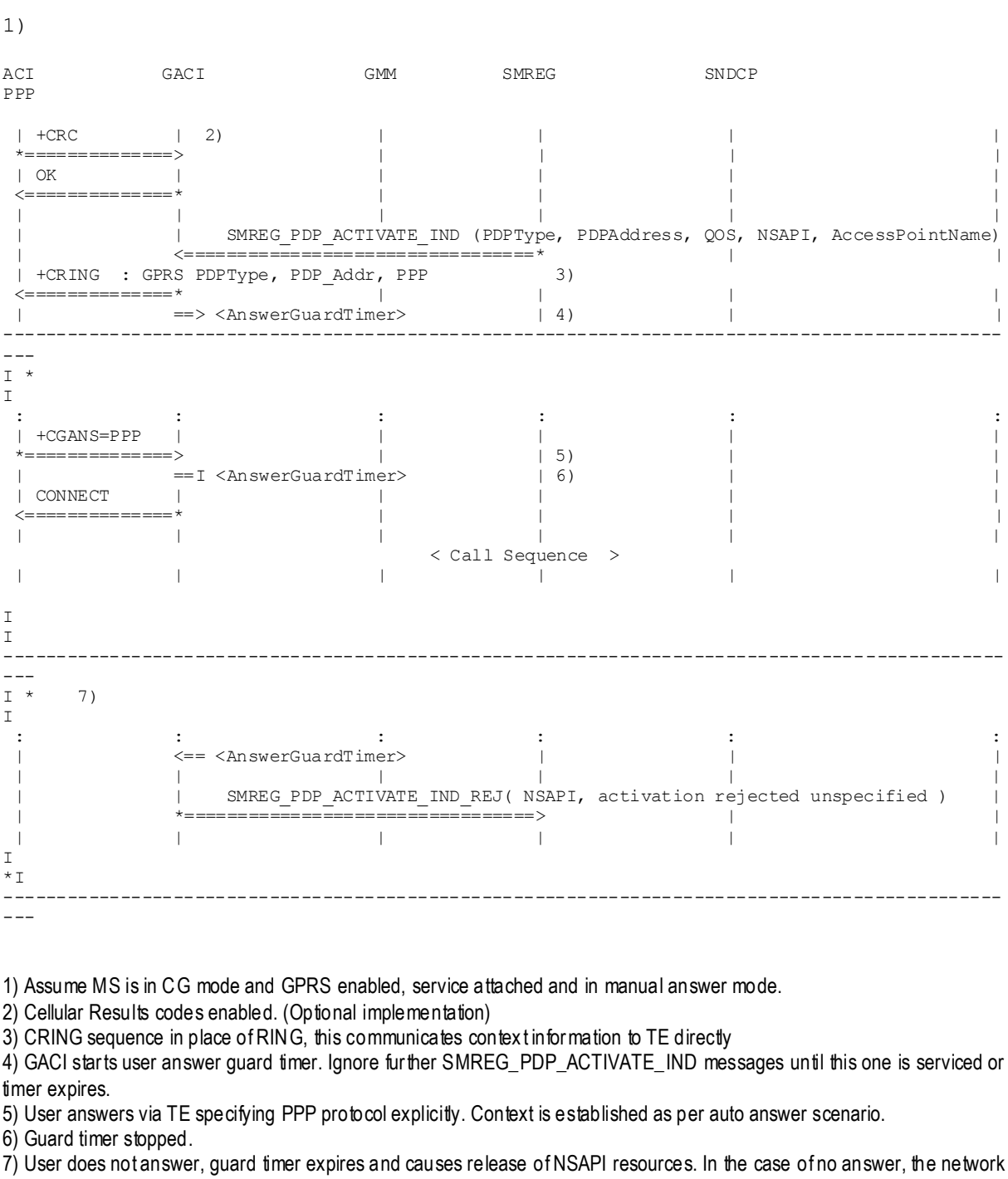
1) Assume MS is in CG mode and GPRS enabled, IMSI attached, GPRS service not attached.
2) Enables auto answer mode, implicit attach connects to network.
3) The network provides PDP context information via the primitive, SMREG will allocate the NSAPI, which should be used by GACI to establish the PDP context. It is unclear how SMREG can fill in the QOS information at present
4) If the PDP context is adequately specified, GACI establishes the PDP context using the supplied PDP data and defaults for other data (i.e. PPP protocol).
5) If the PDP context is inadequately specified it must be rejected as SMREG reserves resources (i.e. a NSAPI and a TI) for the expected PDP establishment. Specifically the PDP context requires a static address to be specified in order to perform a network initiated connection.

4.3.5 Change back to Manual answer mode



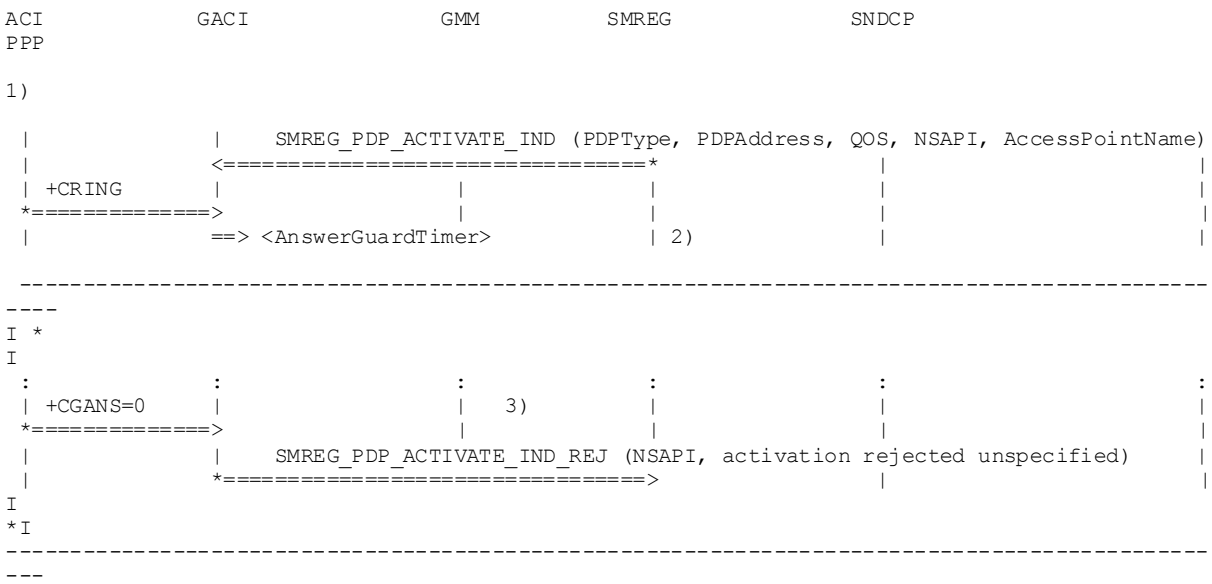
1) Assume MS is in CG mode and GPRS enabled, service attached and in auto answer mode.
2) Now in manual answer mode GPRS still attached and enabled. The user could detach and disable explicitly.

4.3.6 Manual Answer



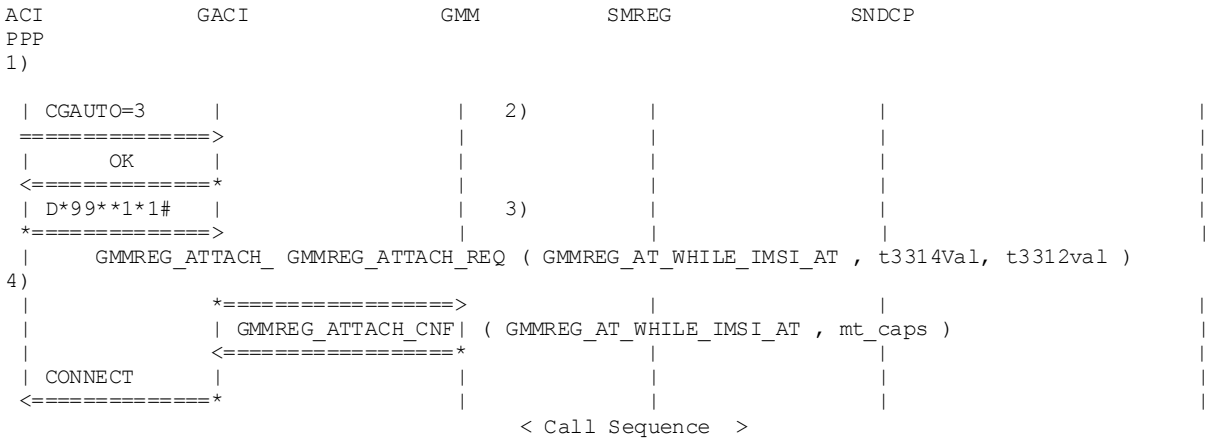
1) Assume MS is in CG mode and GPRS enabled, service attached and in manual answer mode.
2) Cellular Results codes enabled. (Optional implementation)
3) CRING sequence in place of RING, this communicates context information to TE directly
4) GACI starts user answer guard timer. Ignore further SMREG_PDP_ACTIVATE_IND messages until this one is serviced or timer expires.
5) User answers via TE specifying PPP protocol explicitly. Context is established as per auto answer scenario.
6) Guard timer stopped.
7) User does not answer, guard timer expires and causes release of NSAPI resources. In the case of no answer, the network may repeat the call attempt up to 5 times.

4.3.7 Manual Reject



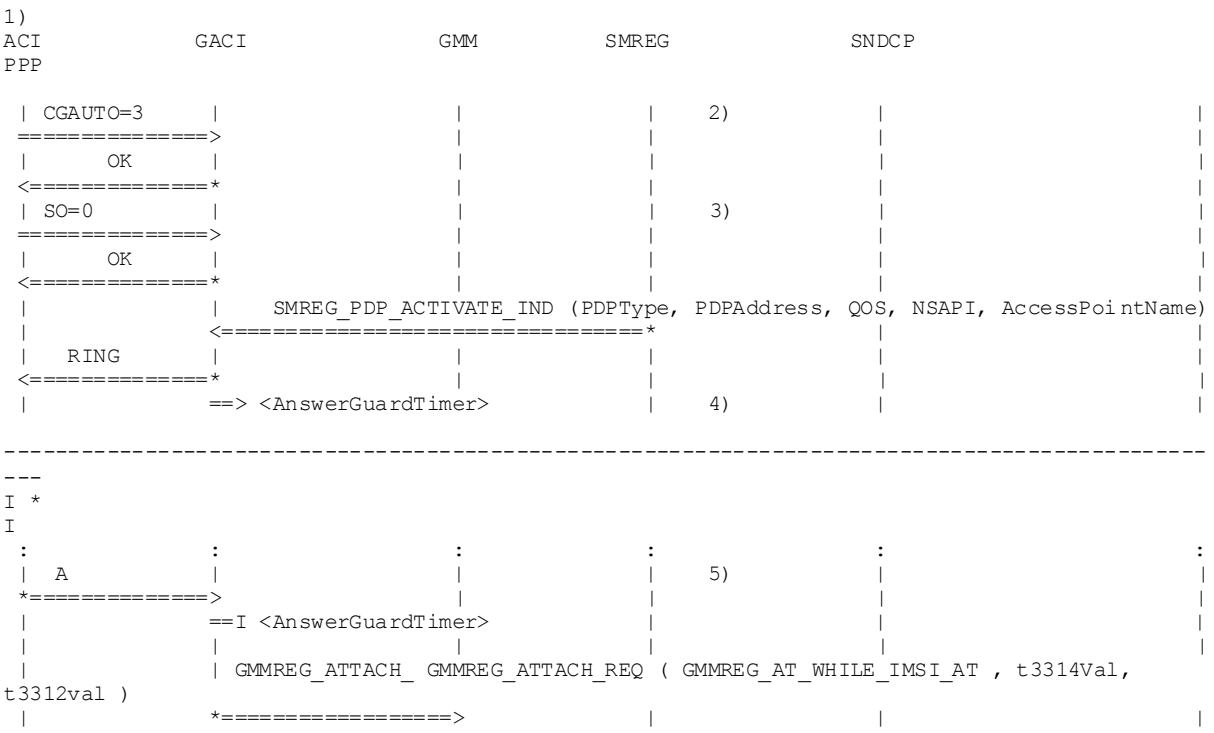
1) Assume MS is in CG mode and GPRS enabled, service attached and in manual answer mode.
2) GACI starts user answer guard timer. Ignore further SMREG_PDP_ACTIVATE_ND messages until this one is serviced or timer expires.
3) Reject incoming call and release NSAPI resources.
4) Timeout scenario same as previous MSC.

4.3.8 Call set up using D command.



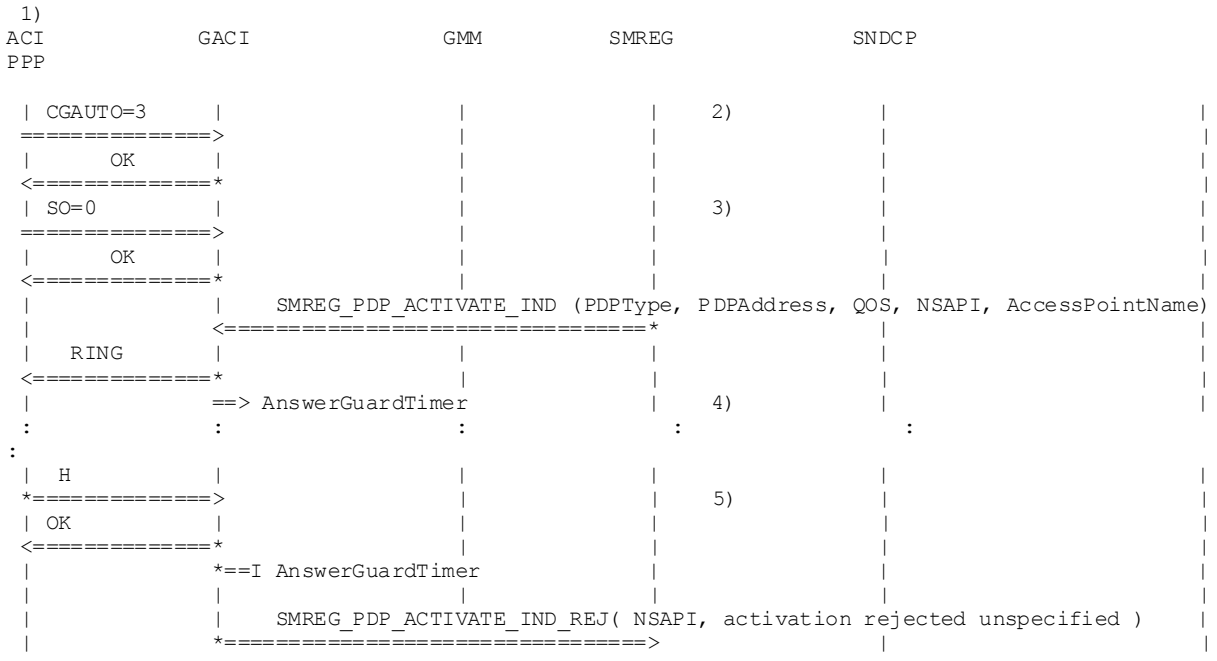
1) Assume MS is in CG mode and GPRS enabled, service not attached, context 1 defined
2) Place mobile into modem compatibility mode.
3) Dial 99 is interpreted as GPRS context activate command, to unspecified called address, in this case using 1 (PPP) protocol and PDP context 1.
4) Implicit attach performed.

4.3.9 Call Answer using A command



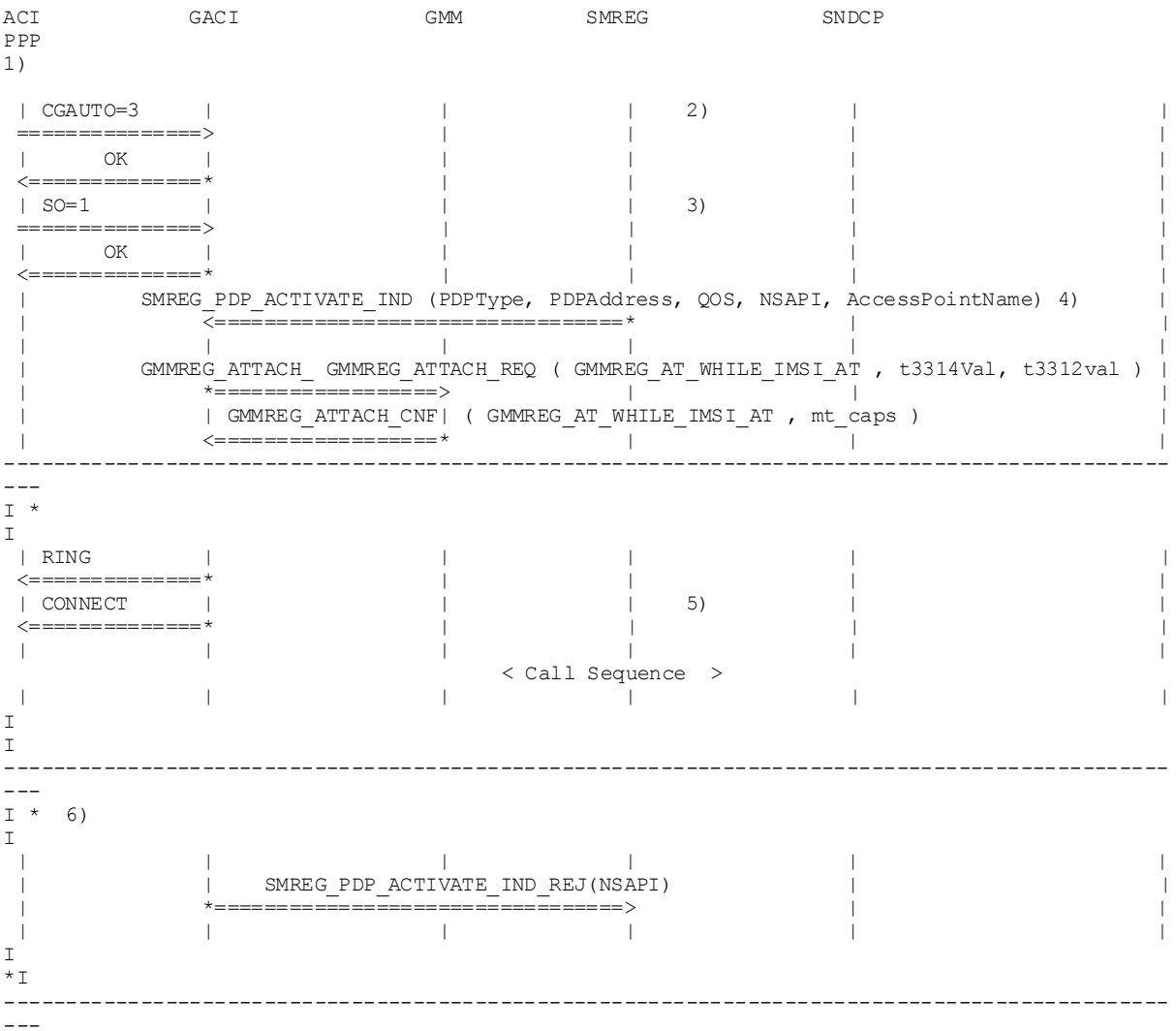
1) Assume MS is in CG mode and GPRS enabled, service not attached.
2) Modem compatibility mode.
3) Auto answer with 'A' disabled.
4) Guard timeout scenario as normal.
5) User answers via TE PDP context is as supplied by SMREG_PDP_ACTIVATE_IND plus default MT TE protocol (i.e. PPP). Implicit attach. Context is established as per auto answer scenario.

4.3.10 Call Reject using H command



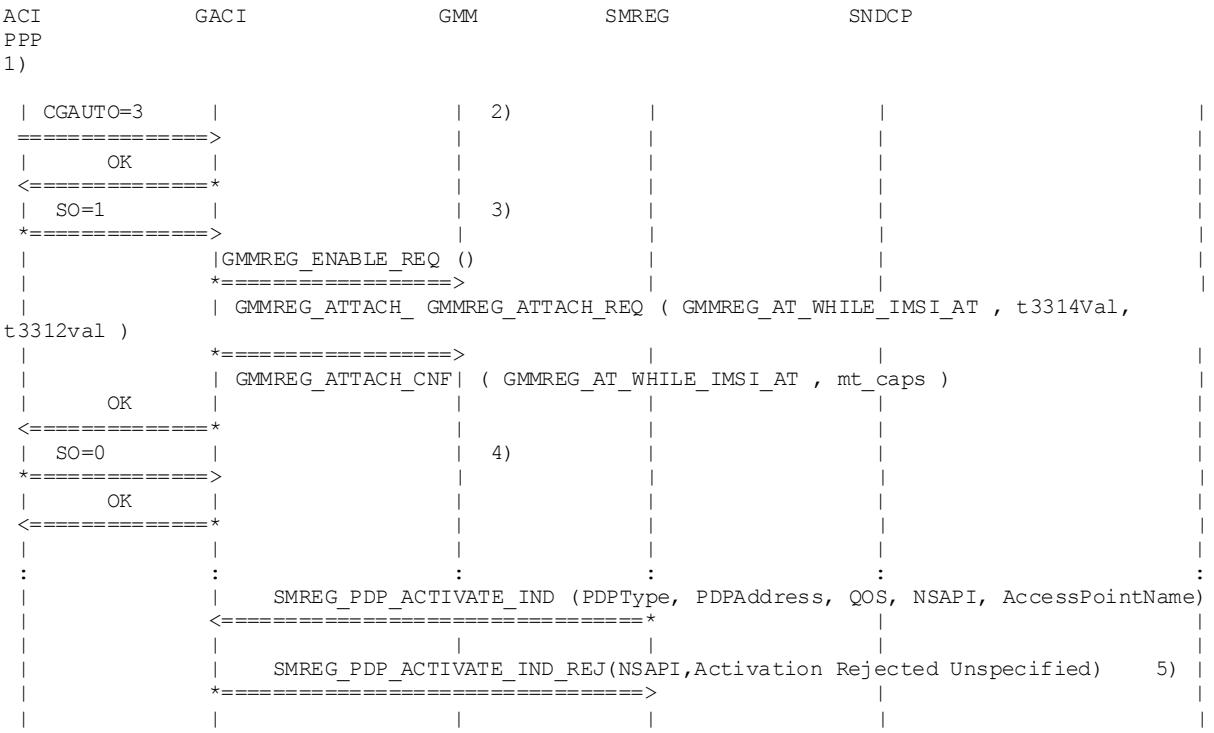
1) Assume MS is in CG mode and GPRS enabled, service not attached.
2) Modem compatibility mode.
3) Auto answer with 'A' disabled.
4) Guard timeout scenario as normal.
5) User rejects with H command, NSAPI resources cleared by SMREG_PDP_ACTIVATE_IND_REJ

4.3.11 Auto Answer using S0 operation



1) Assume MS is in CG mode and GPRS enabled, GPRS service not attached, mobile previously IMSI attached.
2) Enable Modem compatibility mode
3) Enables compatibility auto answer mode, implicit attach connects to network.
4) The network provides PDP context information via the primitive, SMREG will allocate the NSAPI, which should be used by GACI to establish the PDP context. It is unclear how SMREG can fill in the QOS information at present
5) If the PDP context is adequately specified, GACI establishes the PDP context using the supplied PDP data and defaults for other data (i.e. PPP protocol).
6) Inadequate PDP information results in indication rejection

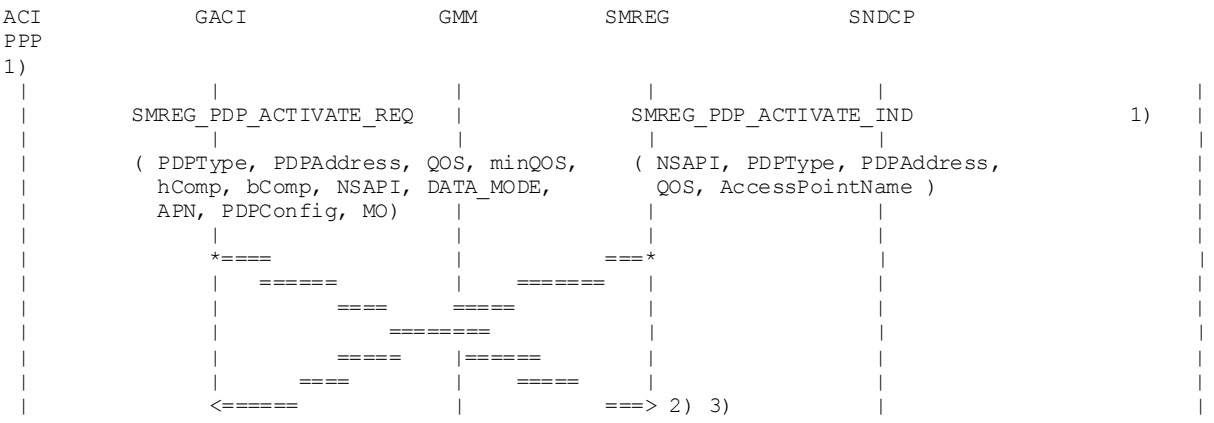
4.3.12 Compatibility On, Automatic Response Off, Incoming call attempt



1) Assume MS is in CG mode and GPRS disabled, neither GPRS nor IMSI services attached.
2) Enable Modem compatibility mode
3) Enables auto answer mode, implicit attach connects to network.
4) Disables auto answer mode, does not detach from network.
5) Rejects incoming call attempt.

????????? Indication to MMI that mobile can/cannot receive calls. ??????????????

4.3.13 Incoming/Outgoing Context Activation collision



1) User attempt to activate a PDP context at the same time as the Network attempts to activate one.

2) SMREG receives an MO tagged SMREG,. Both GACI and SMREG have independently assigned the same NSAPI values to their PDP contexts.

SMREG expects an MT tagged ACTIVATE_REQ, but has received a MO one. It releases the MT resources and reserves (new) MO ones for the NSAPI. The MT call is effectively dropped. SMREG must reject network PDP activation attempt (insufficient resources).

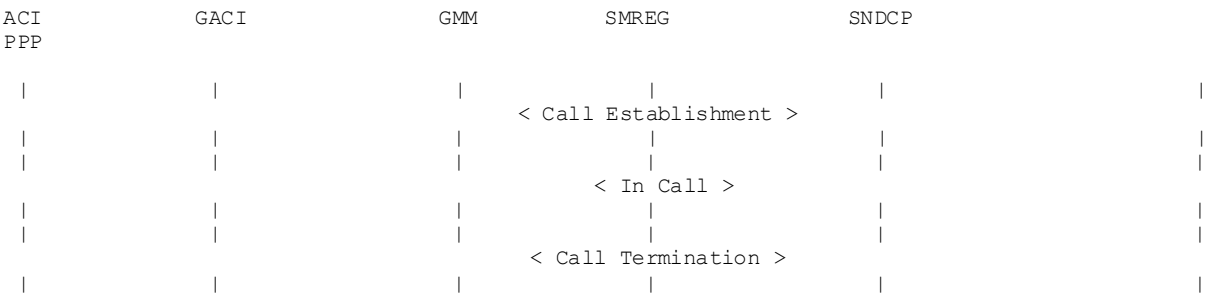
GACI ignores ACTIVATE_IND on the NSAPI as it is not free (GACI is using it to attempt the MO call).

3) Different NSAPIS used, but more PDP contexts required than allowed for SMREG (in initial implementation, only 1 allowed)

SMREG releases MT resources on receipt of ACTIVATE_REQ, as it can only support one PDP context MO context in establishment has priority over MT. It must again reject the network connection attempt due to insufficient resources.

4.4 Call Management Scenarios

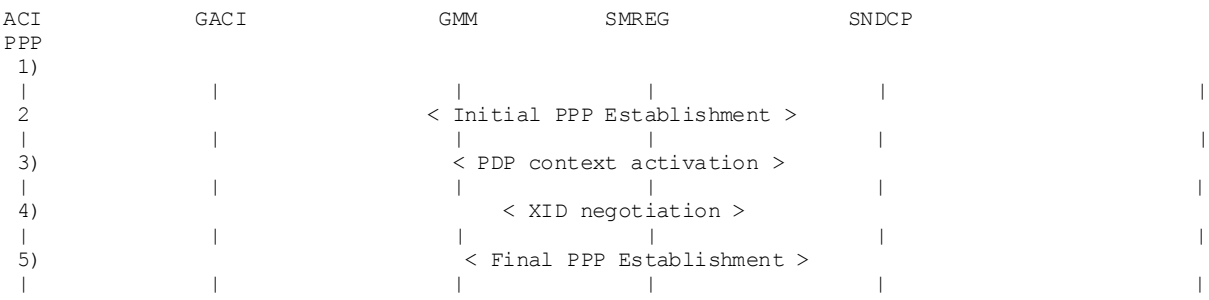
The Operation of GACI during a GPRS call may be viewed as three sub phases as illustrated by the HMSCs below :



Initially, only PPP related scenarios are considered.

4.4.1 Call Establishment Scenarios

The call establishment phase can again be broken down into sub phases as below :



1) The TE PPP daemon is assumed to be previously started by the AT CONNECT response.
2) PPP can be established either as defined address or anonymous, if anonymous, have to use specific primitives. Anonymous activation occurs when no IMSI is available (3.60 - 9.9.2.3).

[????? Scenario where user WANTS to activate anonymously even though IMSI defined (equivalent to withholding CLI for analogue phones) – how is this indicated ???????]

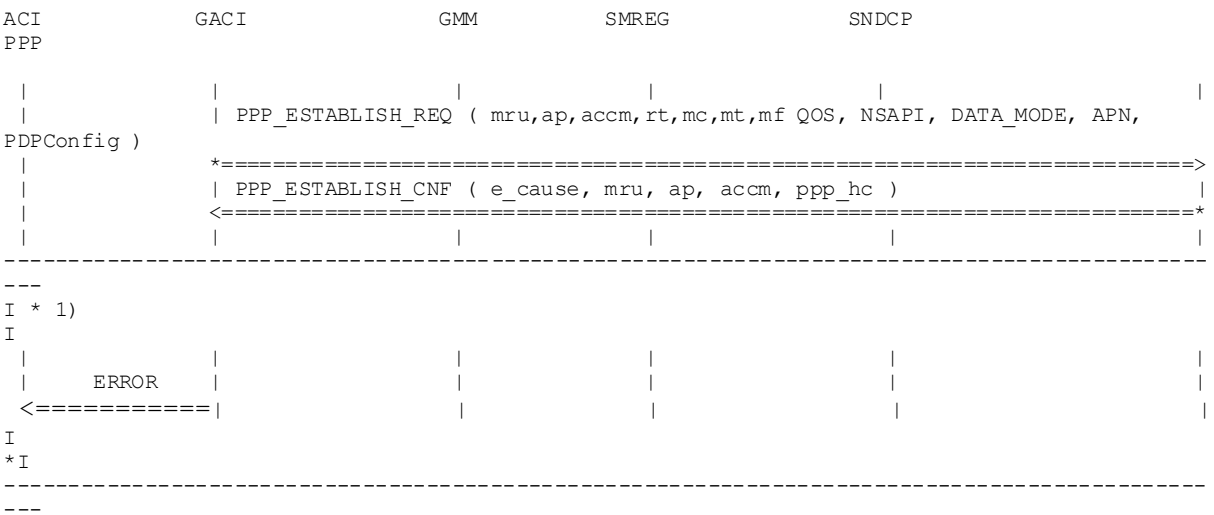
[is the definition of anonymous really if the mobile is IMSI **ATTACHED** ? i.e. if no SIM cannot IMSI attach. User can elect to GPRS attach only, GPRS and IMSI attach or IMSI attach. This would mean anonymous GPRS PDP context, full GPRS context and an attempt to auto attach respectively. Presume auto would try combined attach if SIM card/IMSI available or GPRS only if not. – doesn't appear so, as lack of IMSI will cause lower layer problems]

Initial PPP phase define characteristics of PPP link and obtain compression capability (if any) of TE.
PPP provides config (authentication) options for PDP activation.
PPP protocol can only handle one PDP set up.
Others could be activated prior to CONNECT via AT commands, but problem of multiplexing them – only support single PDP context for PPP protocol.

[In theory, a single PDP context could also be set up prior to PPP establishment, (without security authentication), making PDP establishment during call set up optional too. – is this a practical option ??????]

3) Normal PDP context establishment may be via static or dynamic addressing (3.60 - 9.2.1).
For Network requested PDP activation, only static addressing is appropriate.
Anonymous activation uses dynamic addressing only (3.60 - 9.9.2.3).
4) Optional, SMREG makes decision to accept change to QOS, relevant to GACI as QOS can change from acknowledged to unacknowledged requiring a change in GACI interworking.
5) Informs the PPP protocol stack of the success (or otherwise) of the PDP establishment and whether to use TE local header compression. Once this phase has been successfully completed, the call is active (or rejected).

4.4.1.1 Initial PPP Establishment

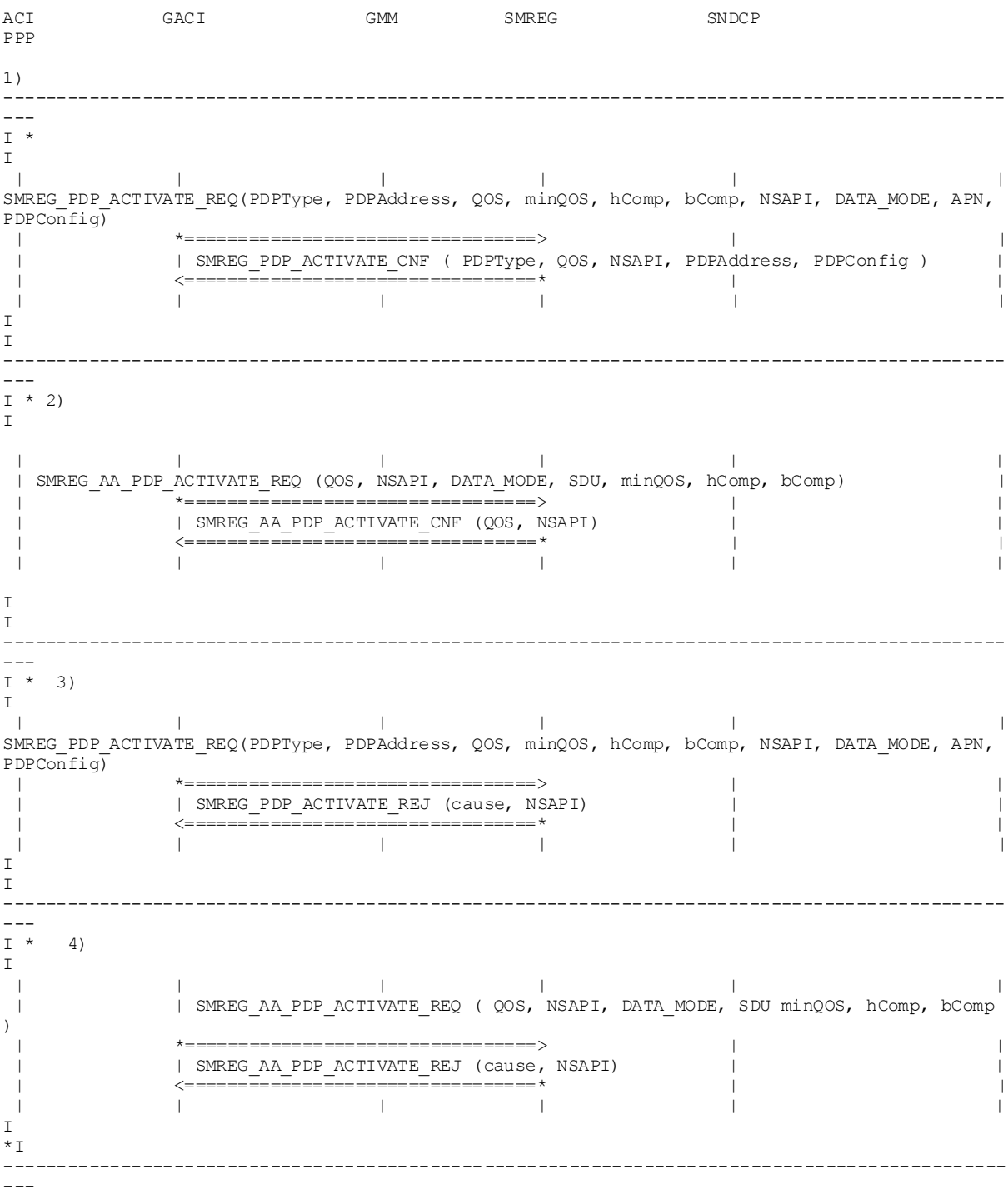


1) If e_cause is not PPP_EST_OK abort whole call establishment, signal ERROR to AT, otherwise process to context activation.

4.4.1.2 PDP context activation

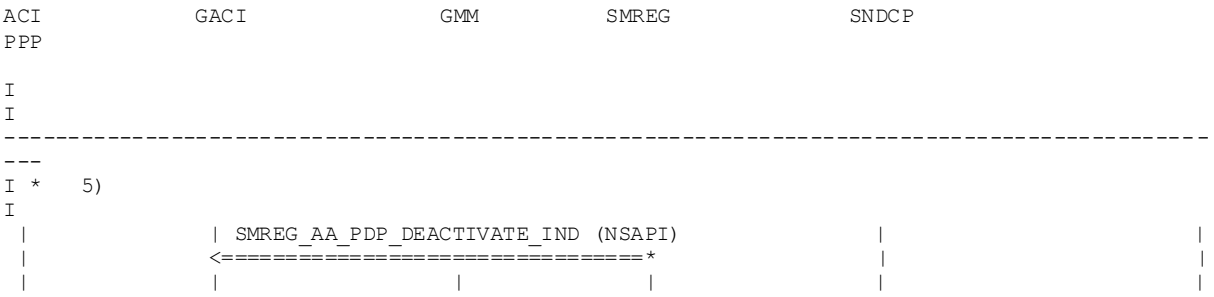
A PDP context could have been established prior to PPP activation by use of AT commands.

For the PPP implementation, only a single active PDP context is supported.



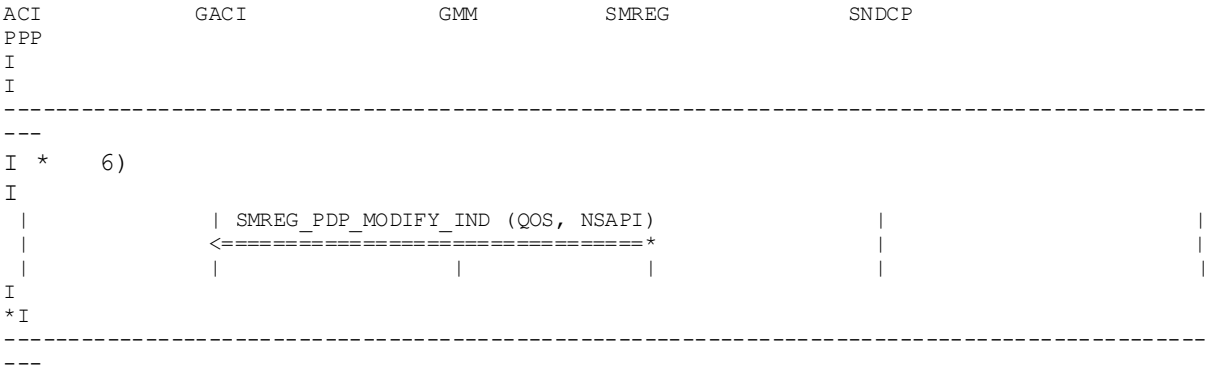
1) Full IMSI available, successful establishment of context, if context requested a dynamic address, it will be returned as part of the SMREG_PDP_ACTIVATE_CNF.
2) No IMSI available, if address available, it is ignored. Anonymous context successfully established.
3) Full IMSI available, context establishment rejected, erroneous set up data or existing PDP context (PPP supports 1 only).
4) No IMSI available, context establishment rejected context (PPP supports 1 only).

Cases 3 and 4 still need to perform the Final PPP Establishment phase to inform the PPP of the failure of the context establishment, the reject cause is passed on to the PPP stack in the e_cause parameter.



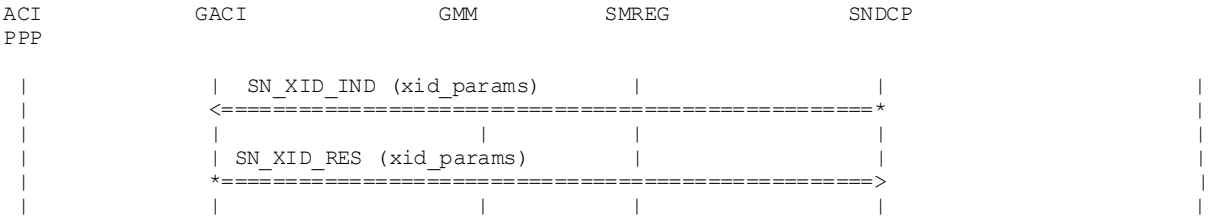
5) Subsequent receipt of a deactivate command prior to final PPP establishment requires the Final PPP Establishment phase to inform the PPP of the failure of the context establishment.

After case 1) the network can send the following :



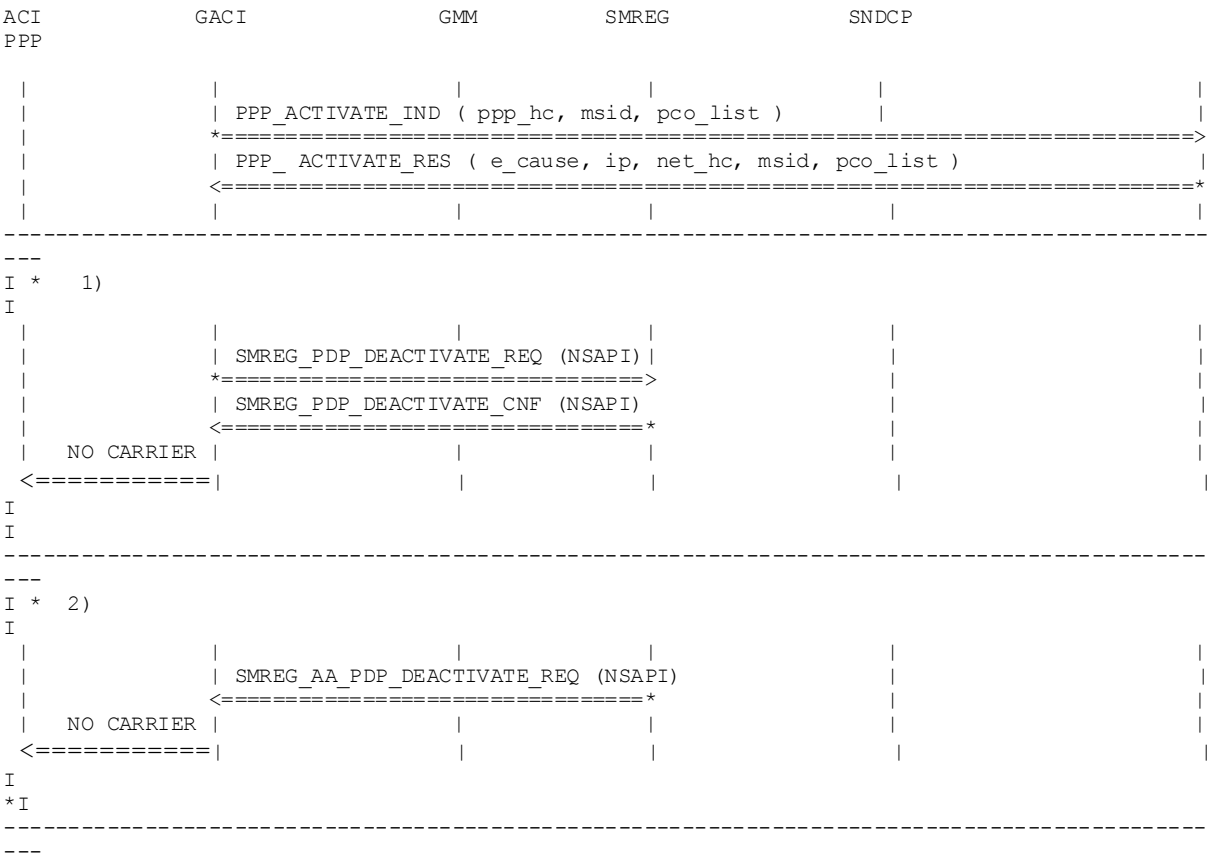
6) The QOS has already been changed by SMREG, the new QOS replaces the current one derived from the _ACTIVATE_CNF primitive and is used in the Final PPP Establishment phase.

4.4.1.3 XID negotiation



Changes to compression requirements are noted, this may update the remote compression ppp_hc parameter used in the Final PPP Establishment phase.

4.4.1.4 Final PPP Establishment phase

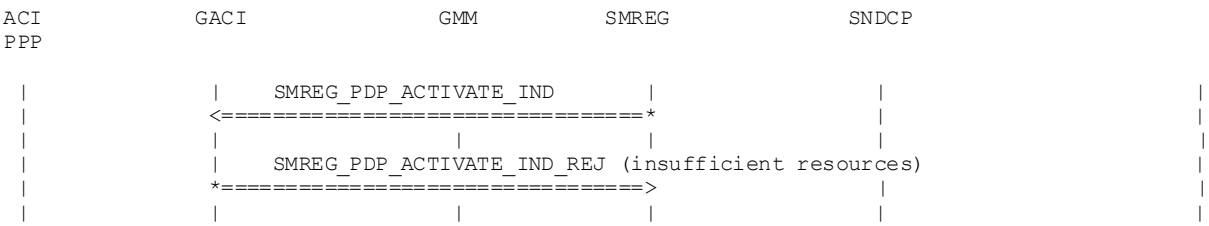


1) If e_cause is not PPP_EST_OK, final establishment has failed, clear the context resources and return control to AT interpreter with ERROR. 'Normal' context case. Assumes that PPP daemon is stopped after PPP issues a PPP_ACTIVATE_RES indicating failure to establish link.

2) For error condition with anonymous context, no deactivation confirmation is expected.

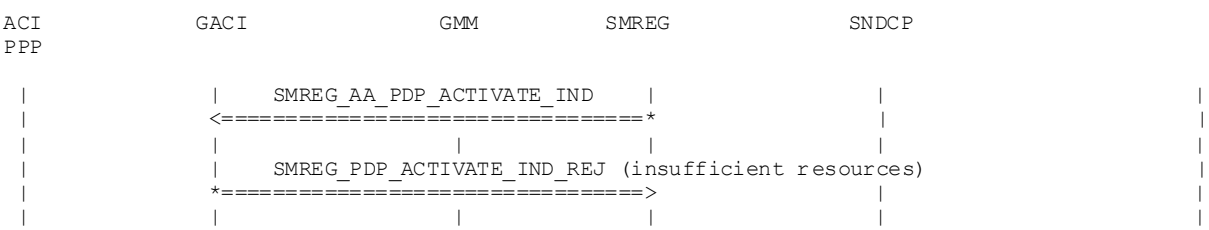
4.4.2 In call Scenarios

4.4.2.1 Attempted PDP activation whilst PDP established



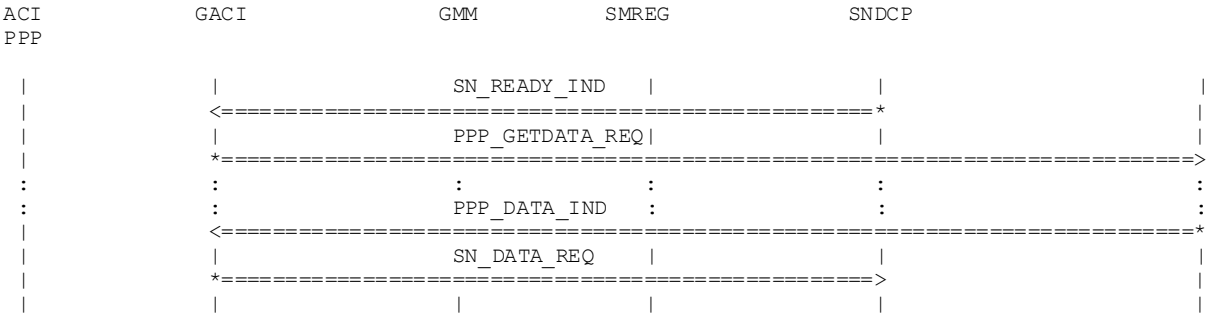
Only supporting one PDP context with the initial PPP protocol stack.

4.4.2.2 Attempted Anonymous PDP activation whilst PDP established

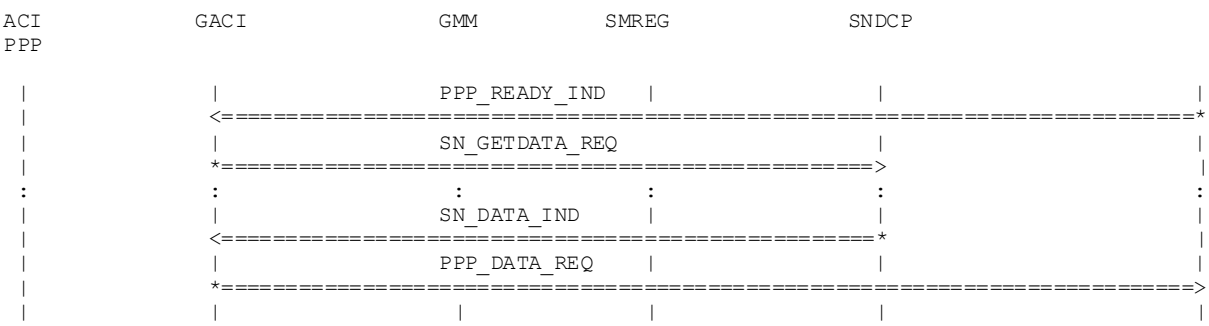


Only supporting one PDP context with the initial PPP protocol stack.

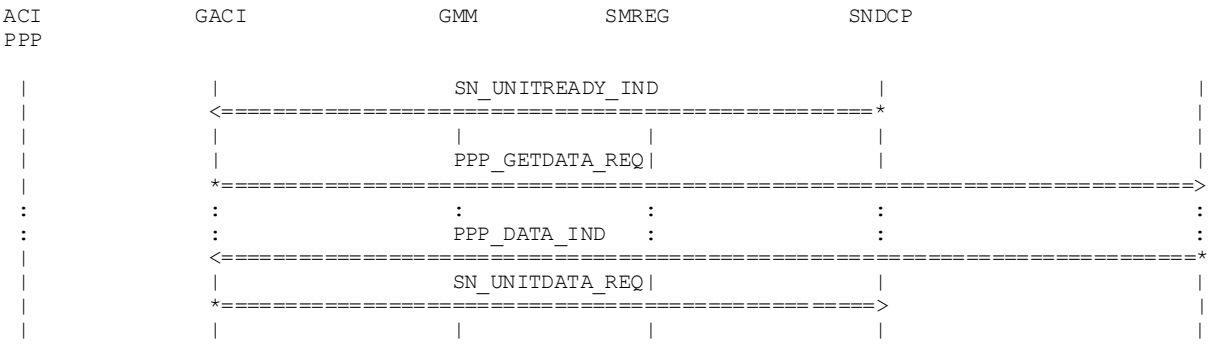
4.4.2.3 Data transfer from TE to MS – acknowledged QOS



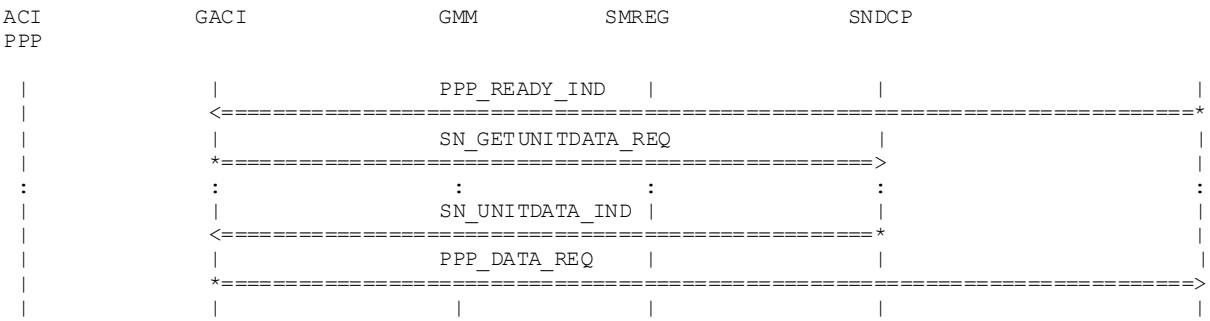
4.4.2.4 Data transfer from MS to TE – acknowledged QOS



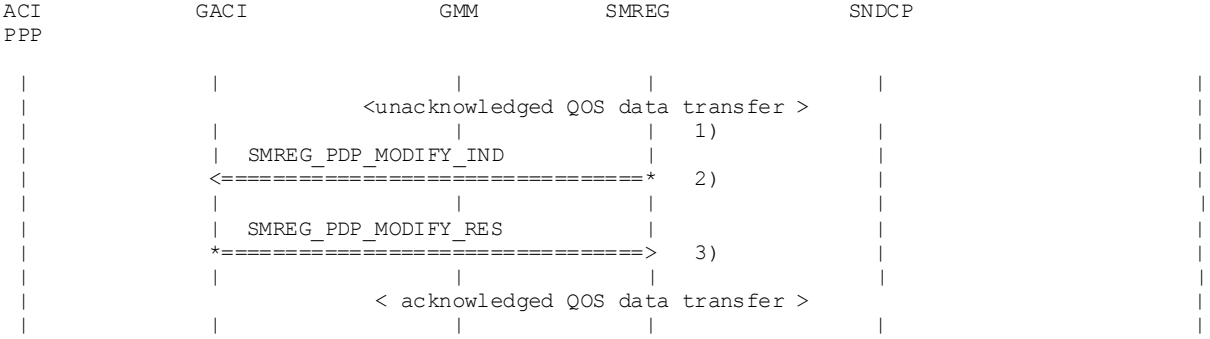
4.4.2.5 Data transfer from TE to MS – unacknowledged QOS



4.4.2.6 Data transfer from MS to TE – unacknowledged QOS



4.4.2.7 Network PDP context modification

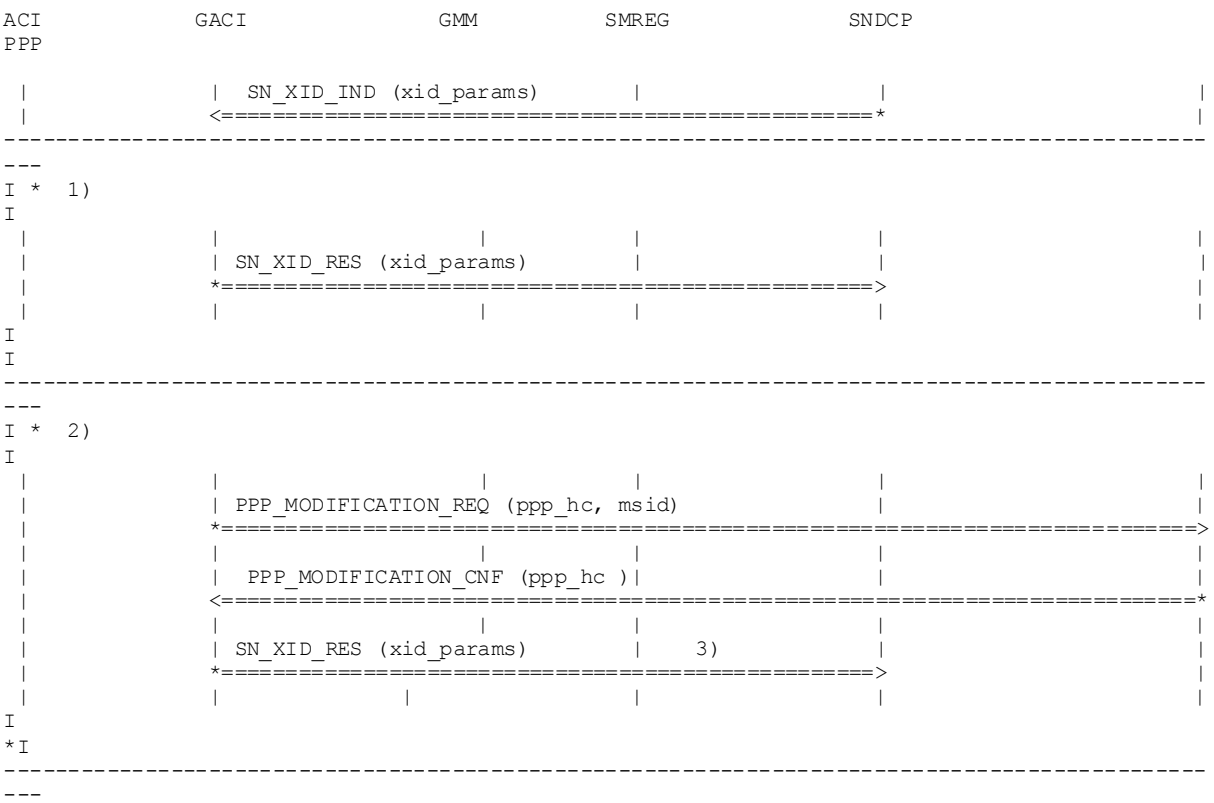


-GSM 3.60 9.2.3 can only change QOS and radio priority, from the perspective of GACI, this is merely an indication of potential current QOS change.

1) QOS negotiation and radio priority are handled by lower layers.
SMREG causes SN to halt flow control whilst context modification in progress.

2) If context QOS involves change of acknowledgement protocol, any existing data hels by GACI for outward transmission to network now uses new protocol.
3) Have to explicitly acknowledge receipt of modify primitive to free flow control again.

4.4.2.8 Network XID modification



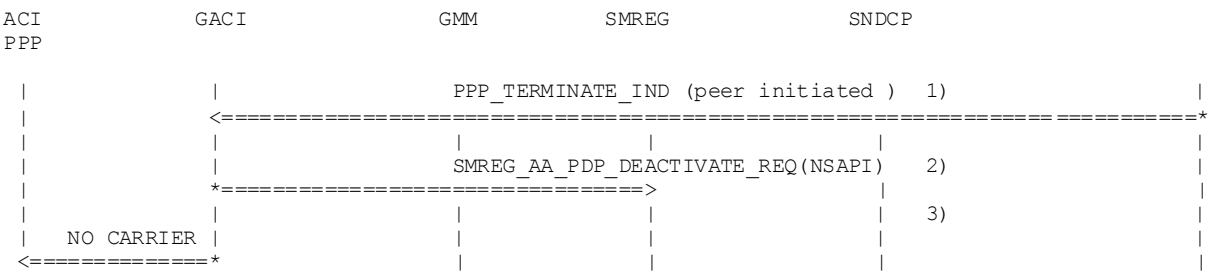
From the perspective of GACI the only relevant xid change is if SM attempts to change remote header compression.
First assumption is that header compression is only done remotely. If not a flag is required to indicate local compression.

1) No change in header compression status, just accept the change by returning the data in a _RES primitive.
Flow control halts data transfer until XID negotiation resolved.
2) Change in header compression requiring remote negotiation, extract TE relevant data and send via PPP.
3) Return new compression settings if TE accepted the change or old ones if otherwise. (Failure to accept the change to compression algorithm could result in the network deactivating the context). Flow control resumes data transfer.

4.4.3 Call Termination Scenarios

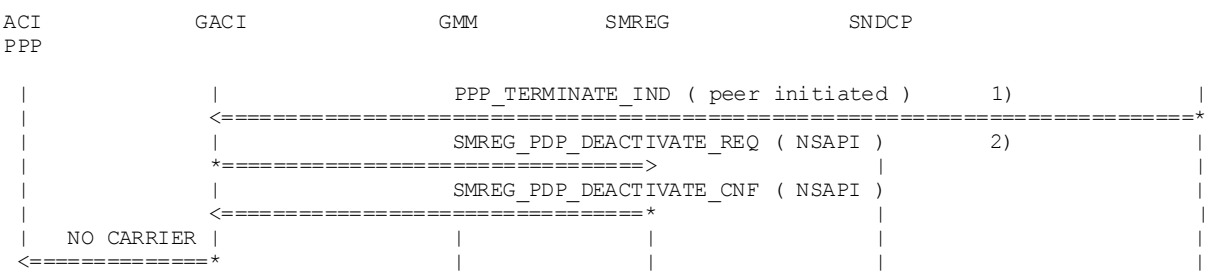
The Call is terminated on indication from the network, the TE or the deactivation of the last remaining PDP context. If TE terminated, the current PDP contexts are gracefully deactivated.
The receipt of PPP_TERMINATE_IND is assumed to signify that the PPP daemon has stopped.

4.4.3.1 PPP terminated Anonymous call



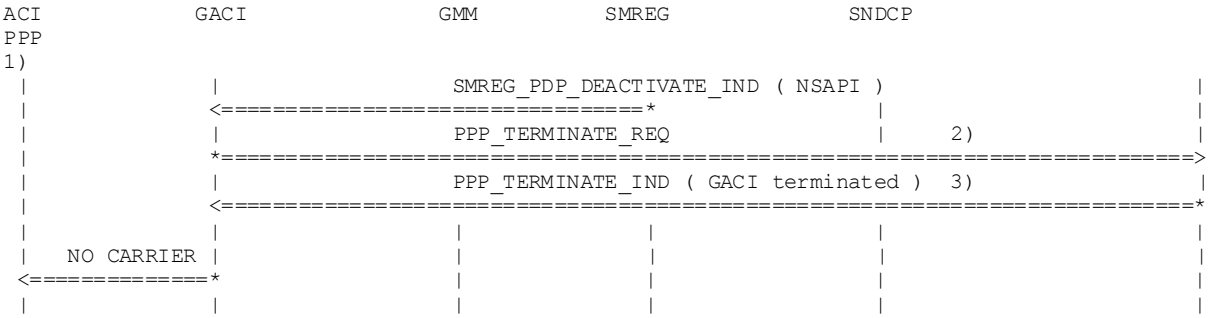
1) PPP_TERMINATE_IND signifies that the TE PPP daemon has ceased.
2) PDP contexts are deactivated for each current active context (if more than one supported).
3) No explicit confirmation of deactivation from the network.

4.4.3.2 PPP Terminated Context



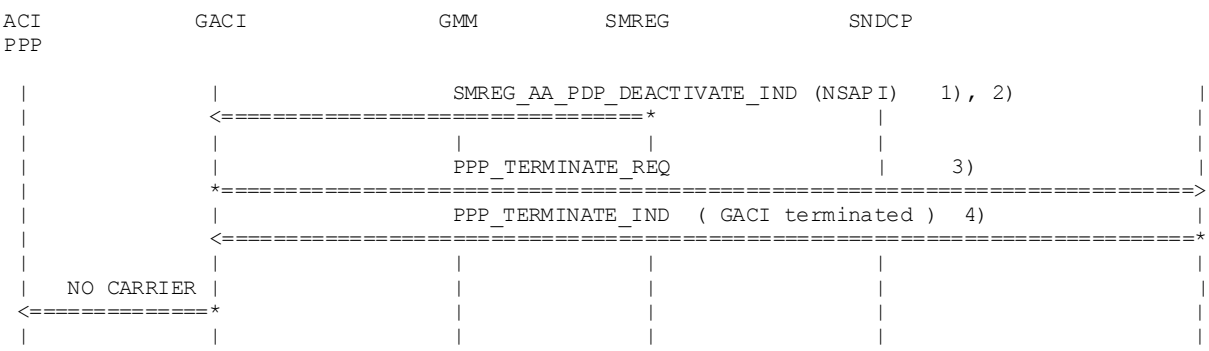
1) PPP_TERMINATE_IND signifies that the TE PPP daemon has ceased.
2) PDP contexts are deactivated for each current active context (if more than one supported).

4.4.3.3 Network Terminated Context



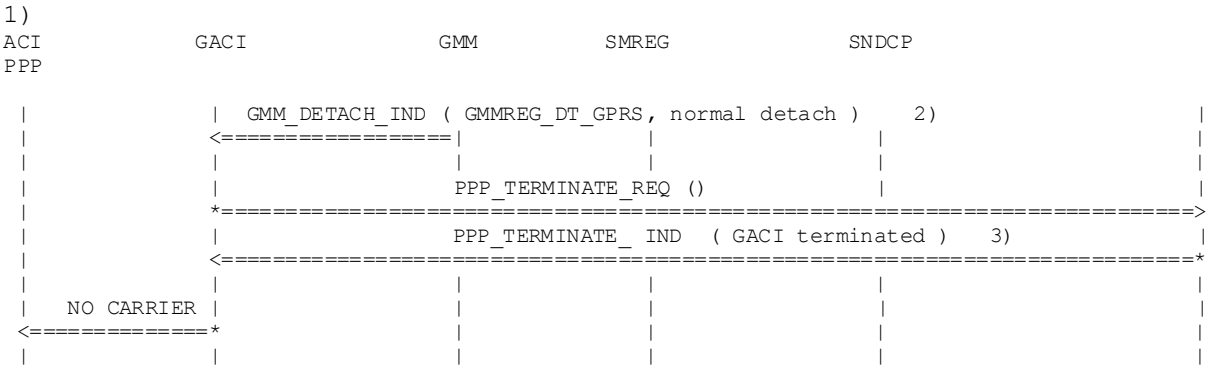
1) Context deactivated at GACI i.e. no further data transferred to/from SN for this PDP context.
2) Termination of last (or only) PDP context causes PPP link termination.
3) Termination of PPP causes TE PPP daemon to suspend and AT OK to be received as confirmation.

4.4.3.4 Network Terminated Anonymous Context



1) SMREG shall send a list of NSAPIs, but list size is 1 for PPP.
2) Context deactivated at GACI i.e. no further data transferred to/from SN for this PDP context.
3) Termination of last (or only) PDP context causes PPP link termination.
4) Termination of PPP causes TE PPP demon to suspend and AT OK to be receives as confirmation.

4.4.3.5 Network Detach



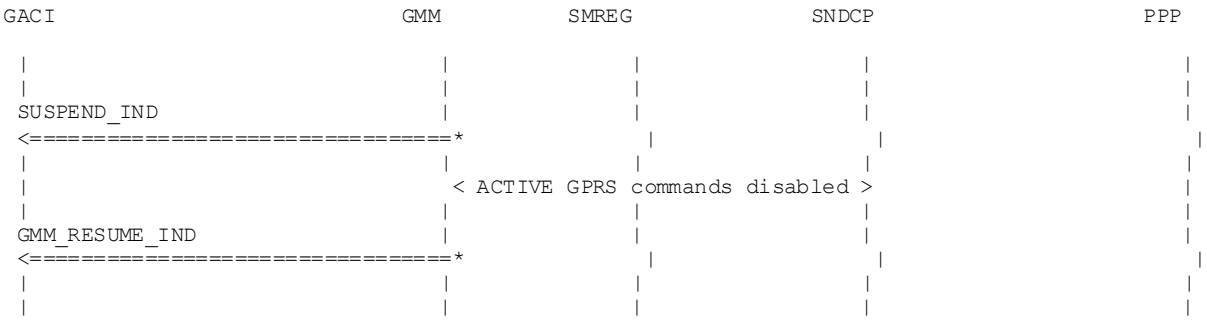
1) Assume GPRS attached only. Unclear what to do if detach_ind detach type does not match expected types.
2) All contexts are deactivated (by GMM), whether normal or anonymous.
3) Termination of PPP causes TE PPP daemon to suspend.

This can happen during PPP establishment ! .

4.4.4 Circuit switched Packet Data Interworking Scenarios

Note cct switched call includes SS establishment, SMS outgoing messages on GSM route and circuit data calls as well as voice calls. Mode B operation.

4.4.4.1 Circuit switched page



CCT switch continues as per normal G23 screnario

GPRS resources disabled at MM/GMM layer

GMM signals suspension to GACI

Appendices

A. Acronyms

DS-WCDMA	Direct Sequence/Spread Wideband Code Division Multiple Access

B. Glossary

International Mobile Telecommunication 2000 (IMT-2000/ITU-2000)	Formerly referred to as FPLMTS (Future Public Land-Mobile Telephone System), this is the ITU's specification/family of standards for 3G. This initiative provides a global infrastructure through both satellite and terrestrial systems, for fixed and mobile phone users. The family of standards is a framework comprising a mix/blend of systems providing global roaming. <URL: http://www.imt-2000.org/>