Technical Document - Confidential

GSM

MESSAGE SEQUENCE CHARTS

WAP OVERVIEW

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Notes:

1. Initial version
2. Review
3. ACI Initialisation MSC changed, Deactivation MSC added
4. Activation and Deactivation changed

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

1.1 Abbreviations

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
CHAP	Challenge Handshake Authentication Protocol
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	GPRS AT Command Interpreter
GMM	GPRS Mobility Management
GP	Guard Period
GRR	GPRS RR
GSM	Global System for Mobile Communication
HDLC	High-level Data Link Control
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
IPCP	Internet Protocol Control Protocol
ITU	International Telecommunication Union
IWF	Interworking Function
Kc	Ciphering Key
L	Length Indicator
LAI	Location Area Information
LCP	Link Control Protocol
LISR	Low level Interrupt Service Routine
LLC	Logical Link Control

LPD	Link Protocol Discriminator
LQM	Link Quality Monitoring
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
MT	Mobile Termination
N(R)	Receive Number
N(S)	Send Number
NC	Network Control
NCC	National Colour Code
NCP	Network Control Protocol
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
PAP	Password Authentication Protocol
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
PPP	Point-to-Point Protocol
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
UART	Universal Asynchronous Receiver Transmitter
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.

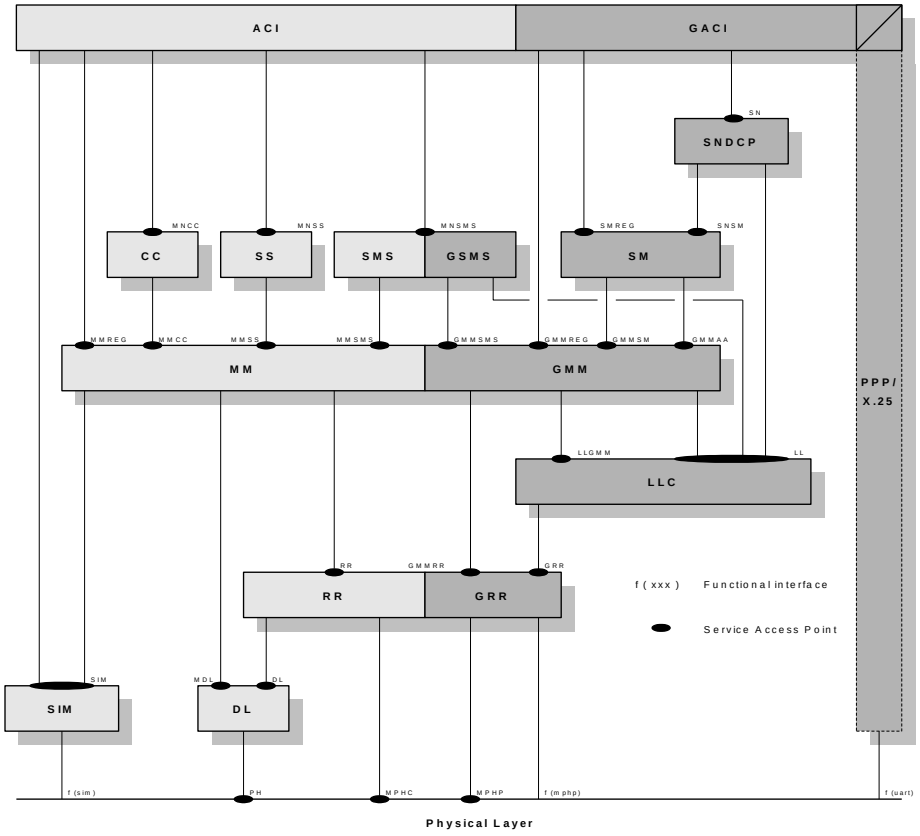


Figure 2.1: Architecture of the GSM/GPRS protocol stack

3 Introduction

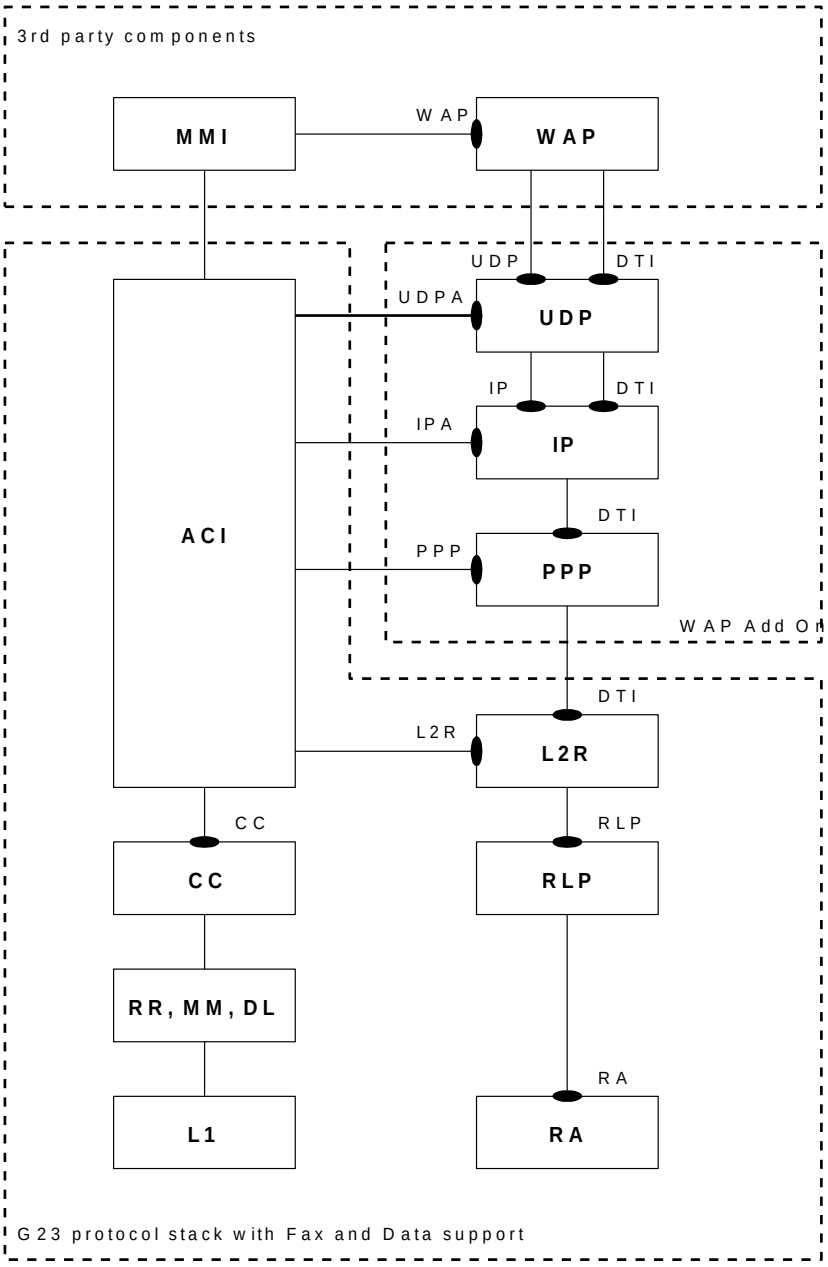


Figure 3.1: Architecture of the WAP/G23 protocol stack

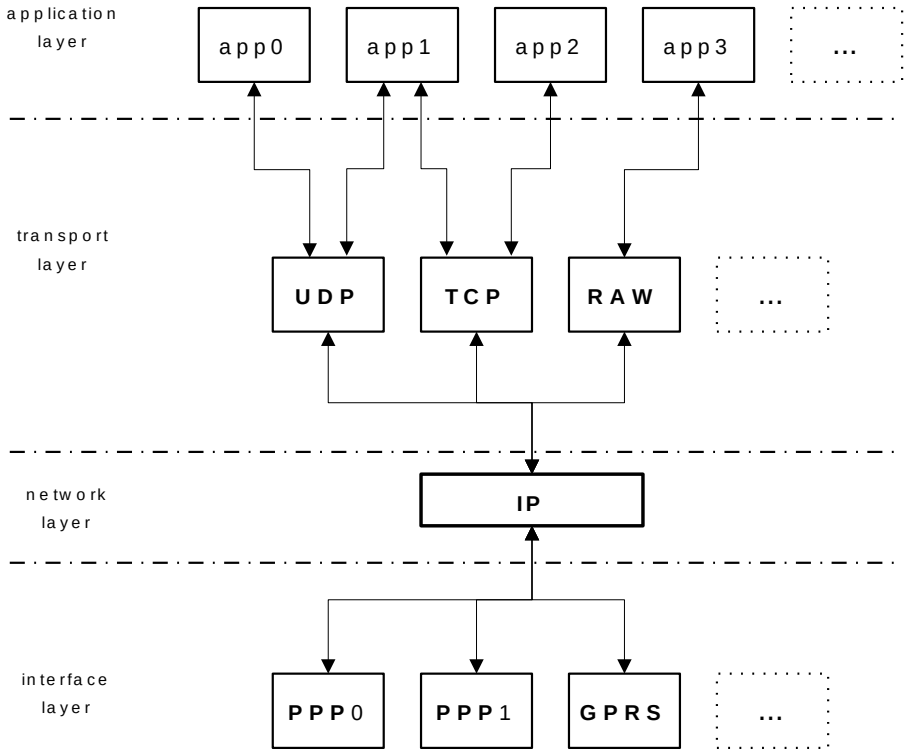
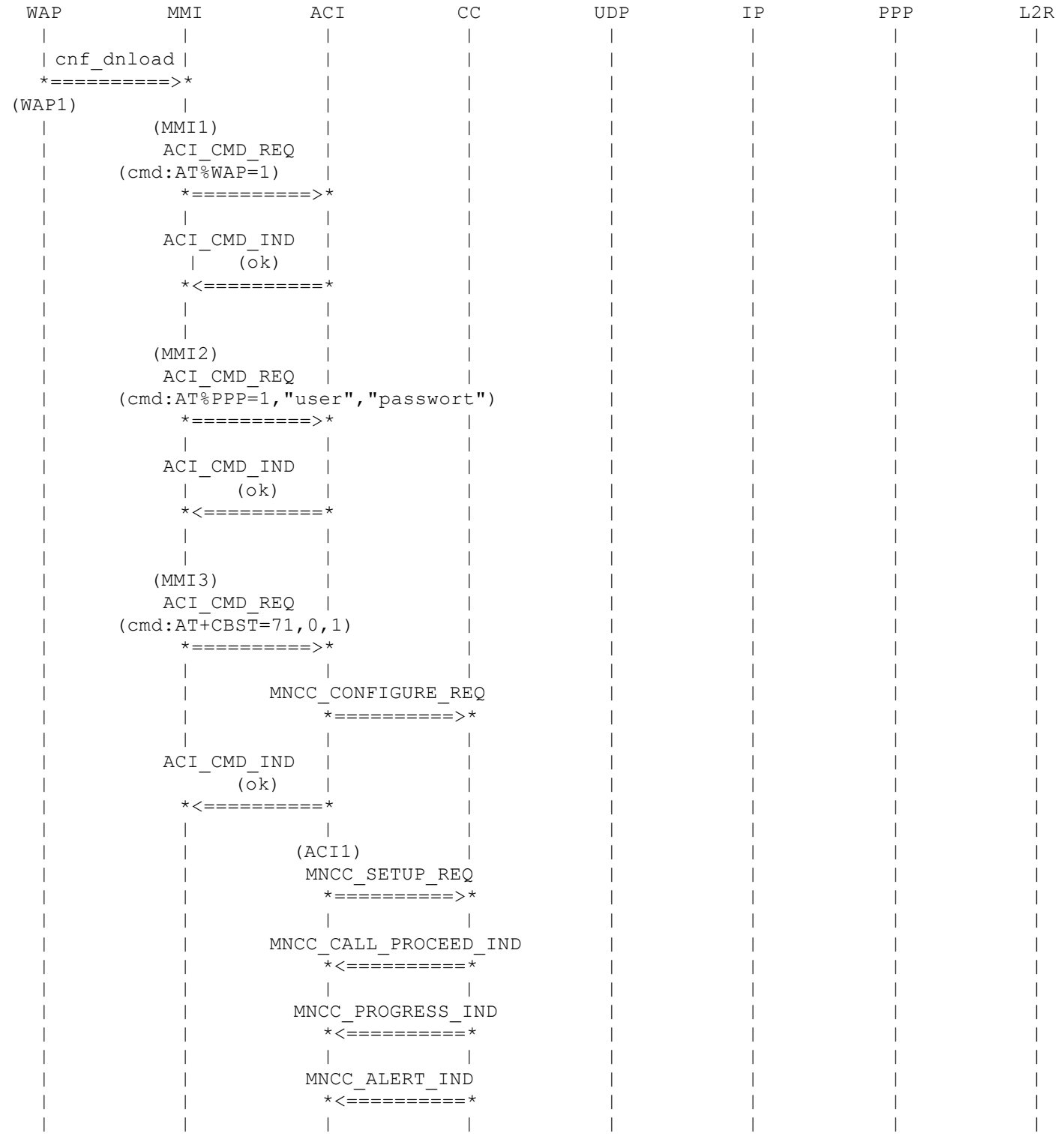


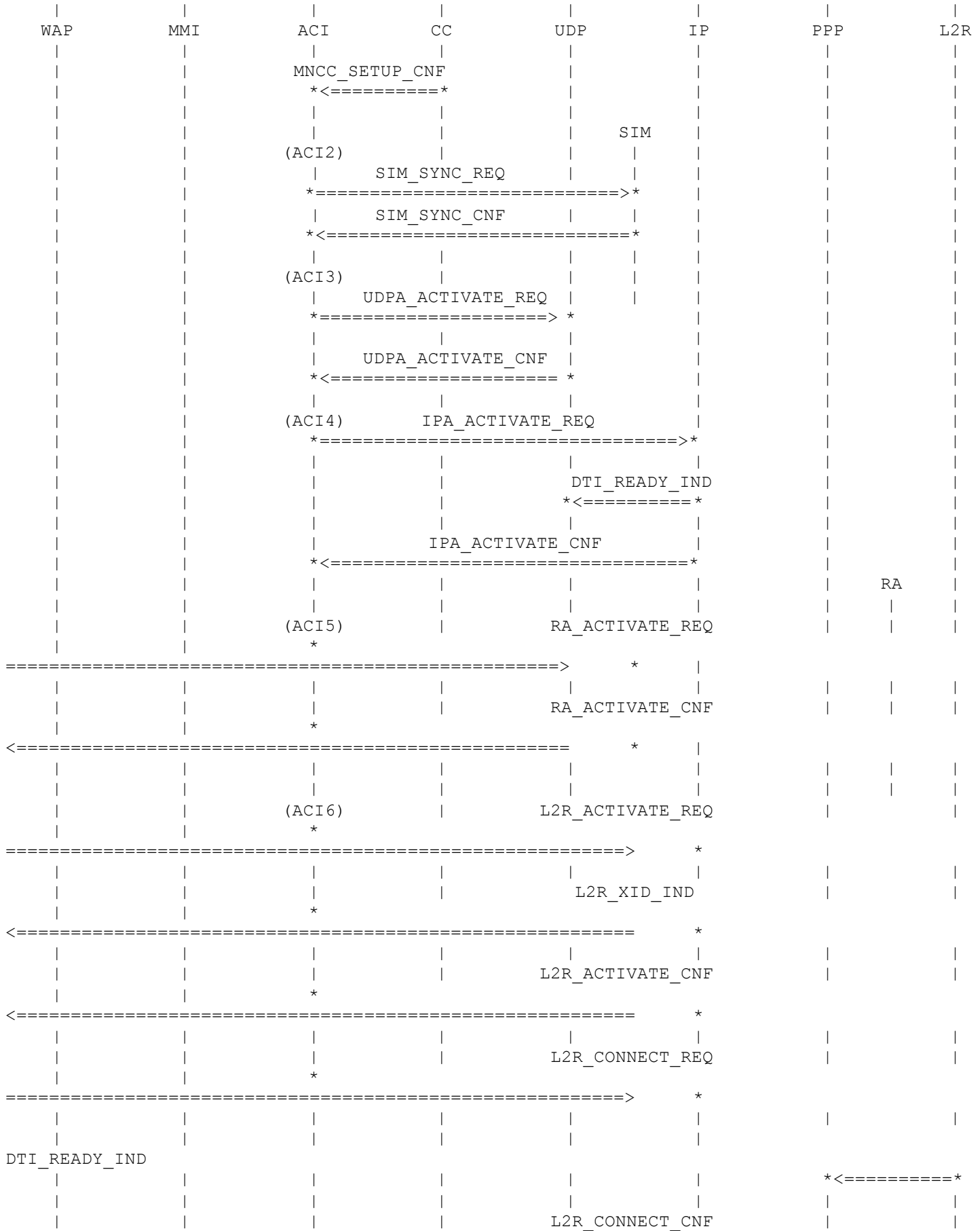
Figure 2.1: IP Stack Overview

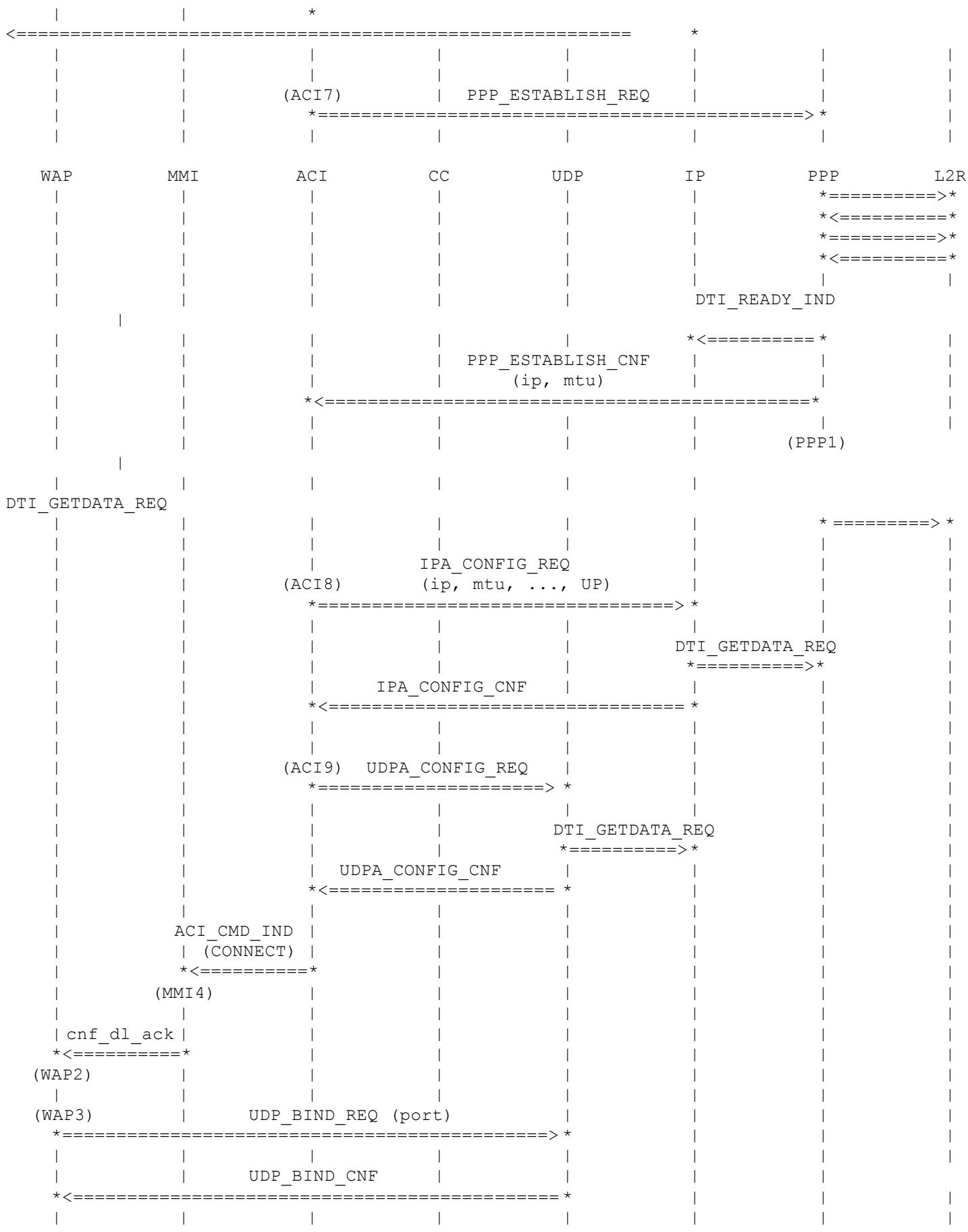
4 Protocol

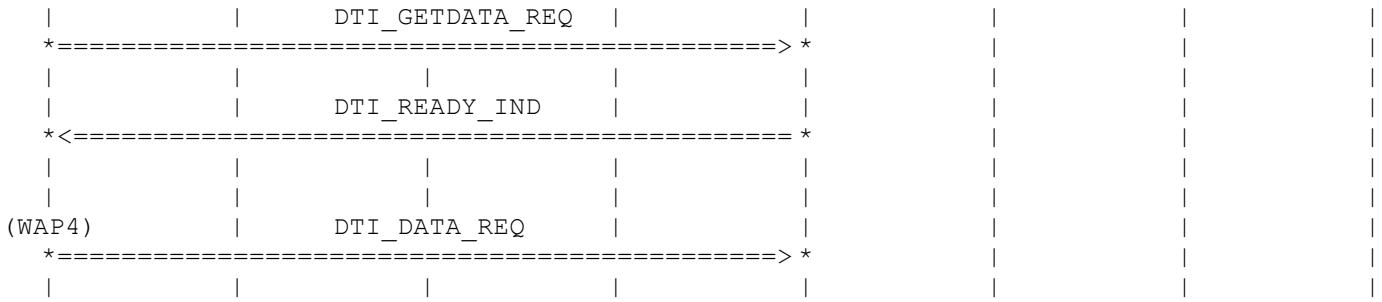
4.1 Call setup and data transfer

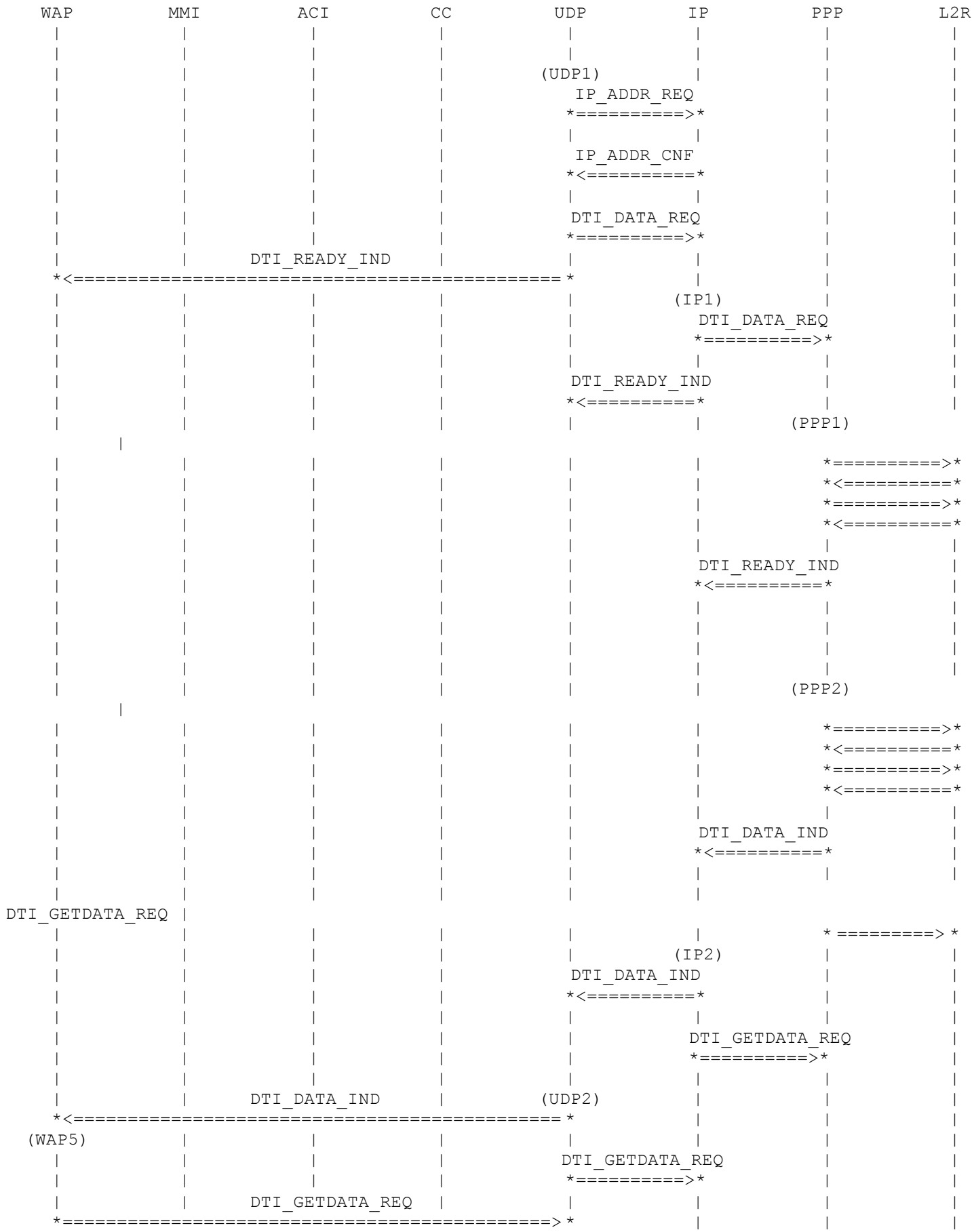
4.1.1 Activation and initialisation of the WAP entities, downlink and uplink DTI transfer




WAP
MMI
ACI
CC
UDP
IP
PPP
L2R
RA
SIM
MNCC_SETUP_CNF
(ACI2)
SIM_SYNC_REQ
SIM_SYNC_CNF
(ACI3)
UDPA_ACTIVATE_REQ
UDPA_ACTIVATE_CNF
(ACI4)
IPA_ACTIVATE_REQ
DTI_READY_IND
IPA_ACTIVATE_CNF
(ACI5)
RA_ACTIVATE_REQ
RA_ACTIVATE_CNF
(ACI6)
L2R_ACTIVATE_REQ
L2R_XID_IND
L2R_ACTIVATE_CNF
L2R_CONNECT_REQ
DTI_READY_IND
L2R_CONNECT_CNF


WAP
MMI
ACI
CC
UDP
IP
PPP
L2R
(ACI7)
PPP_ESTABLISH_REQ
DTI_READY_IND
PPP_ESTABLISH_CNF
(ip, mtu)
(PPP1)
DTI_GETDATA_REQ
IPA_CONFIG_REQ
(ACI8)
(ip, mtu, ..., UP)
DTI_GETDATA_REQ
IPA_CONFIG_CNF
(ACI9)
UDPA_CONFIG_REQ
DTI_GETDATA_REQ
UDPA_CONFIG_CNF
ACI_CMD_IND
(CONNECT)
(MMI4)
cnf_dl_ack
(WAP2)
(WAP3)
UDP_BIND_REQ (port)
UDP_BIND_CNF


DTI_GETDATA_REQ
DTI_READY_IND
(WAP4)
DTI_DATA_REQ


WAP
MMI
ACI
CC
UDP
IP
PPP
L2R
(UDP1)
IP_ADDR_REQ
IP_ADDR_CNF
DTI_DATA_REQ
DTI_READY_IND
(IP1)
DTI_DATA_REQ
DTI_READY_IND
(PPP1)
(PPP2)
DTI_GETDATA_REQ
(IP2)
DTI_DATA_IND
DTI_GETDATA_REQ
DTI_DATA_IND
(UDP2)
(WAP5)
DTI_GETDATA_REQ
DTI_GETDATA_REQ

| | | | | | | |

(ACI1)
ACI configure CC for the WAP with MNCC_SETUP_REQ. Parity sub-address, bearer cap. parameter and numbering mode. CC send MNCC_CALL_PROCEED_IND, MNCC_PROGRESS_IND, MNCC_ALERT_IND and the confirm primitive MNCC_SETUP_CNF.

(ACI2)
ACI send SIM_SYNC_REQ to indicate start call. SIM confirm the message.

(ACI3)
ACI activate UDP.

(ACI4)
ACI activate IP. IP confirm and send DTI_READY_IND to UDP.

(ACI5)
ACI activate RA.

(ACI6)
ACI activate and configure L2R. ACI send L2R_CONNECT_REQ to indicate L2R shall set up the DTI links. L2R send a DTI_READY_IND and L2R_CONNECT_CNF to indicate ready for DTI primitives.

(ACI7)
ACI send PPP_ESTABLISH_REQ. PPP configure PEER, send a DTI_READY_IND to IP and PPP_ESTABLISH_CNF to ACI. With this primitive ACI receives IP source address.

(ACI8)
ACI configure IP. IP send DTI_GETDATA_REQ to PPP and DTI_READY_IND to indicate ready for DTI primitives. IP confirm to ACI.

(ACI9)
ACI configure UDP. UDP send DTI_GETDATA_REQ to PPP and DTI_READY_IND to indicate ready for DTI primitives. UDP confirm to ACI.

(IP1)
IP process DTI_DATA_REQ primitive from UDP and send it to PPP.

(IP2)
IP process DTI_DATA_IND primitive from PPP and send it to UDP.

(MMI1)
MMI configures ACI for the next call to be a WAP call.

(MMI2)
MMI configures ACI to use PPP and set User and Password.

(MMI3)
ACI send command for selecting bearer service type, AT+CBST=71,0,1, with 71 = 9600 Bit/s V110, 0 = asynchronous and 1 = non transparent.

(MMI4)
MMI receives ACI_CMD_IND with the message CONNECT from ACI. The entities are know configured and the DTI – links are established.

(PP1)
After receiving DTI_DATA_REQ primitive from IP. PPP process and send it to L2R. PPP send DTI_READY_IND to indicate ready for next DTI_DATA_REQ primitive.

(PP2)
PPP receives DTI_DATA_IND primitive from L2R. After processing the primitive is send to IP. With the primitive DTI_GETDATA_REQ to L2R, PPP indicate ready for knew DTI_DATA_IND primitive.

(UDP1)
After receiving DTI_DATA_REQ primitive from WAP, UDP send IP_ADDR_REQ to IP. IP confirm this primitive with the correct IP source address. UDP process the data primitive and send it to PPP. With DTI_READY_IND to WAP, UDP indicate ready for knew DTI_DATA_REQ primitive.

(UDP2)
After received DTI_DATA_IND primitive from IP. UDP process it and send it to WAP. With DTI_GETDATA_REQ_to IP, UDP indicate ready for knew DTI_DATA_IND primitive.

(WAP1)
WAP sends a confirm_download to MMI in order to establish a connection.

(WAP2)
WAP receives message confirm_download_ack. The entities are configured and the DTI – links are established.

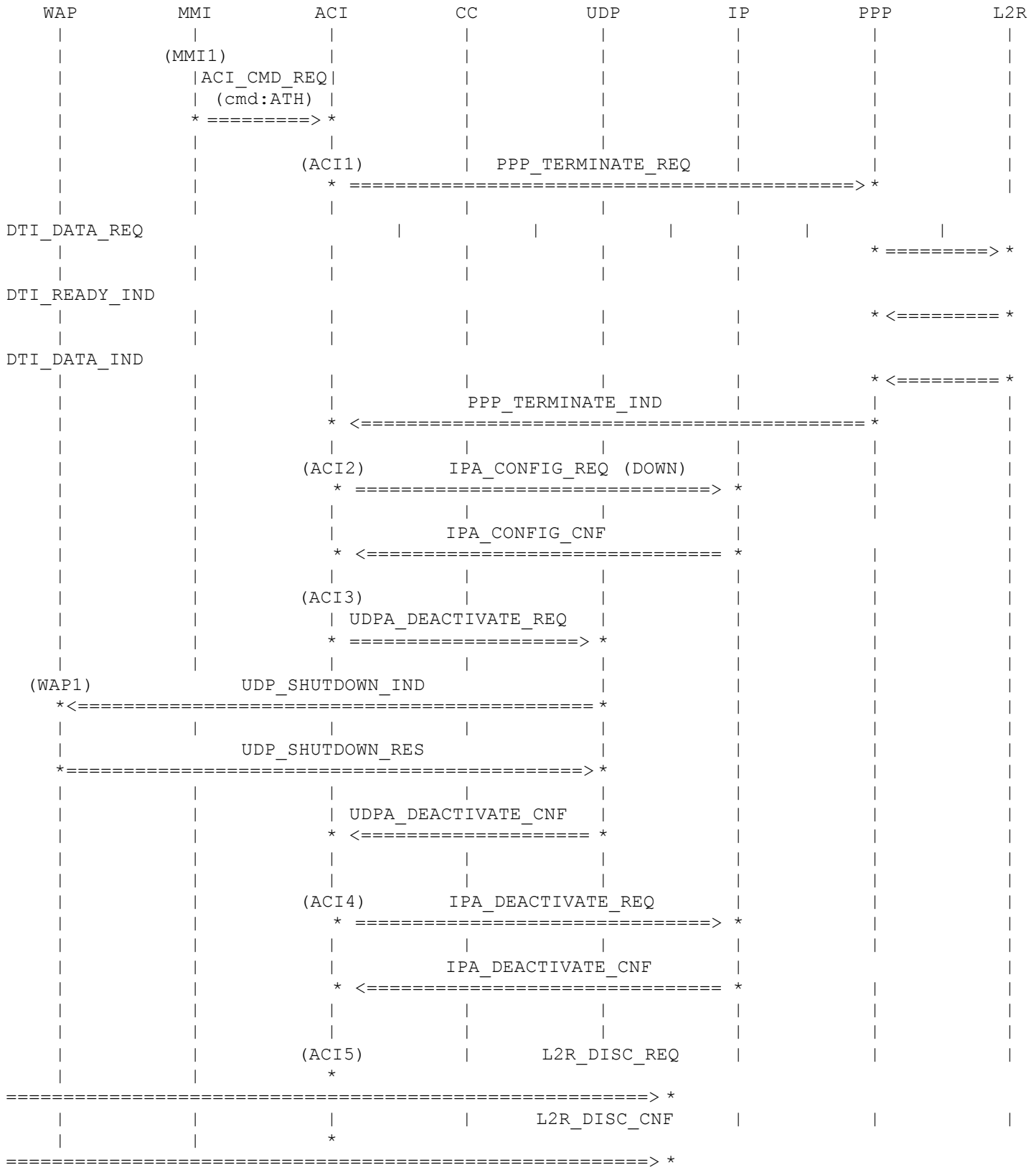
(WAP3)
WAP start with configure the PORT to UDP. UDP confirm the request. WAP send a DTI_GETDATA_REQ to indicate ready for DTI_DATA_IND packets. UDP send a DTI_READY_IND and indicate ready for DTI_DATA_REQ packets.

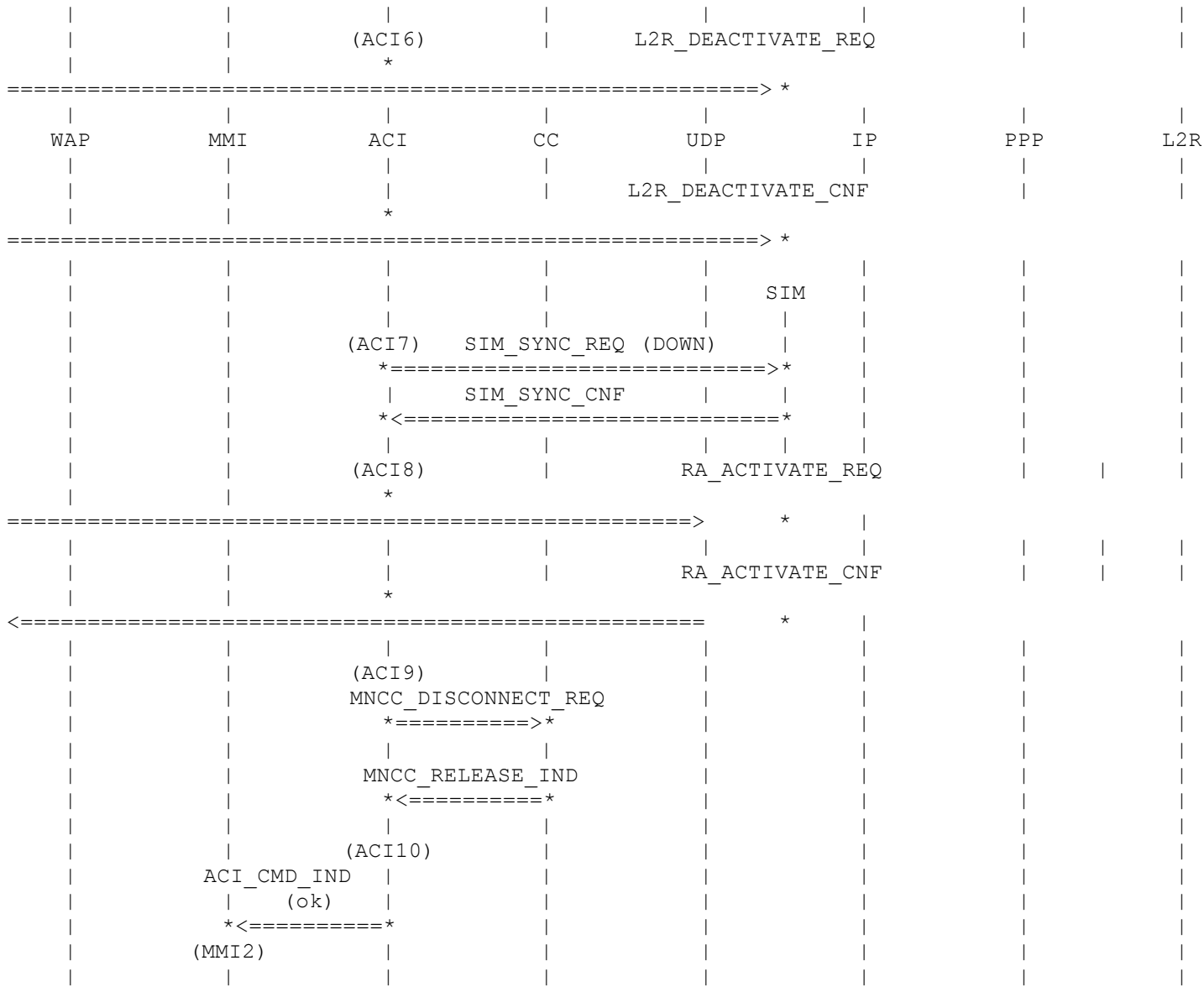
(WAP4)
WAP send the first DTI_DATA_REQ packet to UDP. UDP request IP source address from IP, send the DTI_DATA_REQ packet to IP, and DTI_READY_IND primitive to WAP.

(WAP5)
WAP receives DTI_DATA_IND primitive from UDP.

4.2 Disconnect and Deactivation

4.2.1 Disconnect- and deactivation of the Transport Layer/IP Stack from MMI





(ACI1)
After receiving ACI_CMD_REQ (cmd: ATH) from MMI, ACI send PPP_TERMINATE_REQ to PPP. PPP terminate PEER over L2R entity and send the primitive PPP_TERMINATE_IND to ACI.

(ACI2)
ACI configure IP to go down. IP confirm the message back.

(ACI3)
ACI deactivate UDP with UDPA_DEACTIVATE_REQ. UDP send UDP_SHUTDOWN_IND to WAP to indicate that UDP is deactivated. WAP confirm with UDPA_DEACTIVATE_RES.

(ACI4)
ACI deactivates IP.

(ACI5)
ACI disconnect L2R.

(ACI6)
ACI deactivates L2R. (L2R deactivate RA and RLP).

(ACI7)
ACI send SIM_SYNC_REQ (DOWN) to indicate deactivation and SIM confirm with SIM_SYNC_CNF.

(ACI8)
ACI disconnect RA.
(ACI9)
ACI disconnect CC.

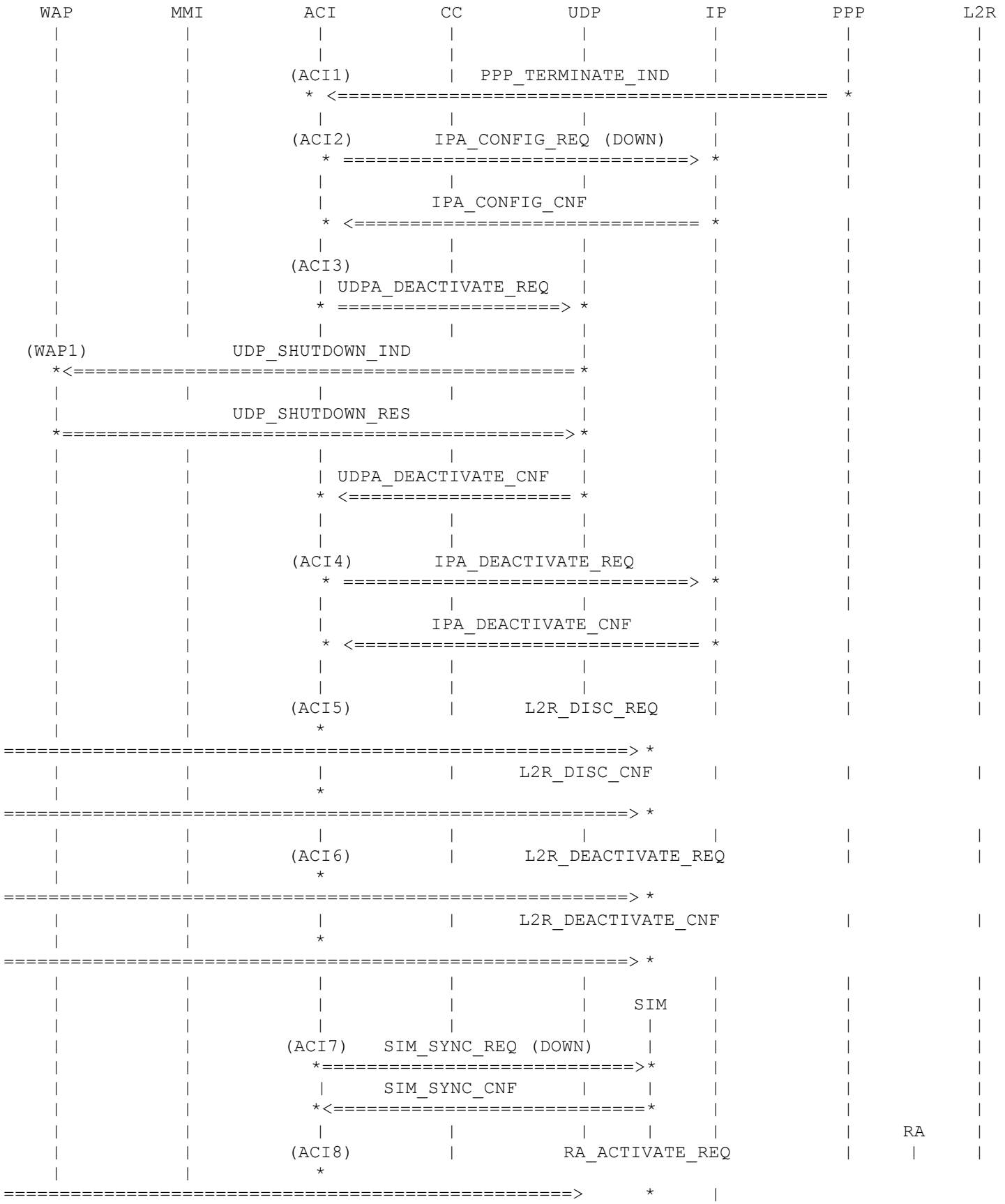
(ACI10)
ACI send ok message to MMI.

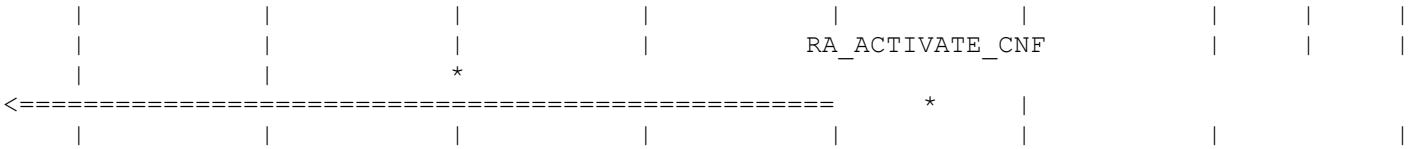
(MMI1)
MMI start disconnect and termination of the WAP protocol stack.

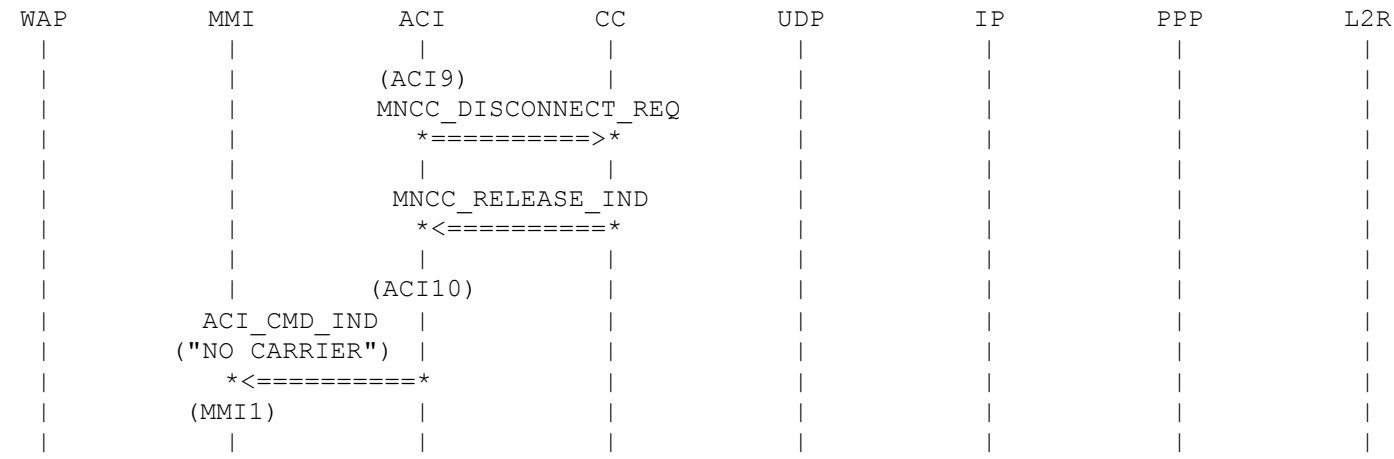
(MMI2)
MMI receives the message ok from ACI that the WAP protocol stack have been terminated.

(WAP1)
WAP receives a shutdown indication from UDP. It confirm the message to UDP.

4.2.2 Disconnect- and deactivation from PPP




RA_ACTIVATE_CNF



(ACI1)
After receiving PPP_TERMINATE_IND from PPP, ACI start deactivation of the entities.

(ACI2)
ACI configure IP to go down. IP confirm the message back.

(ACI3)
ACI deactivate UDP with UDPA_DEACTIVATE_REQ. UDP send UDP_SHUTDOWN_IND to WAP to indicate that UDP is deactivated. WAP confirm with UDPA_DEACTIVATE_RES.

(ACI4)
ACI deactivates IP.

(ACI5)
ACI disconnect L2R.

(ACI6)
ACI deactivates L2R.

(ACI7)
ACI send SIM_SYNC_REQ (DOWN) to indicate deactivation and SIM confirm with SIM_SYNC_CNF.

(ACI8)
ACI disconnect RA.

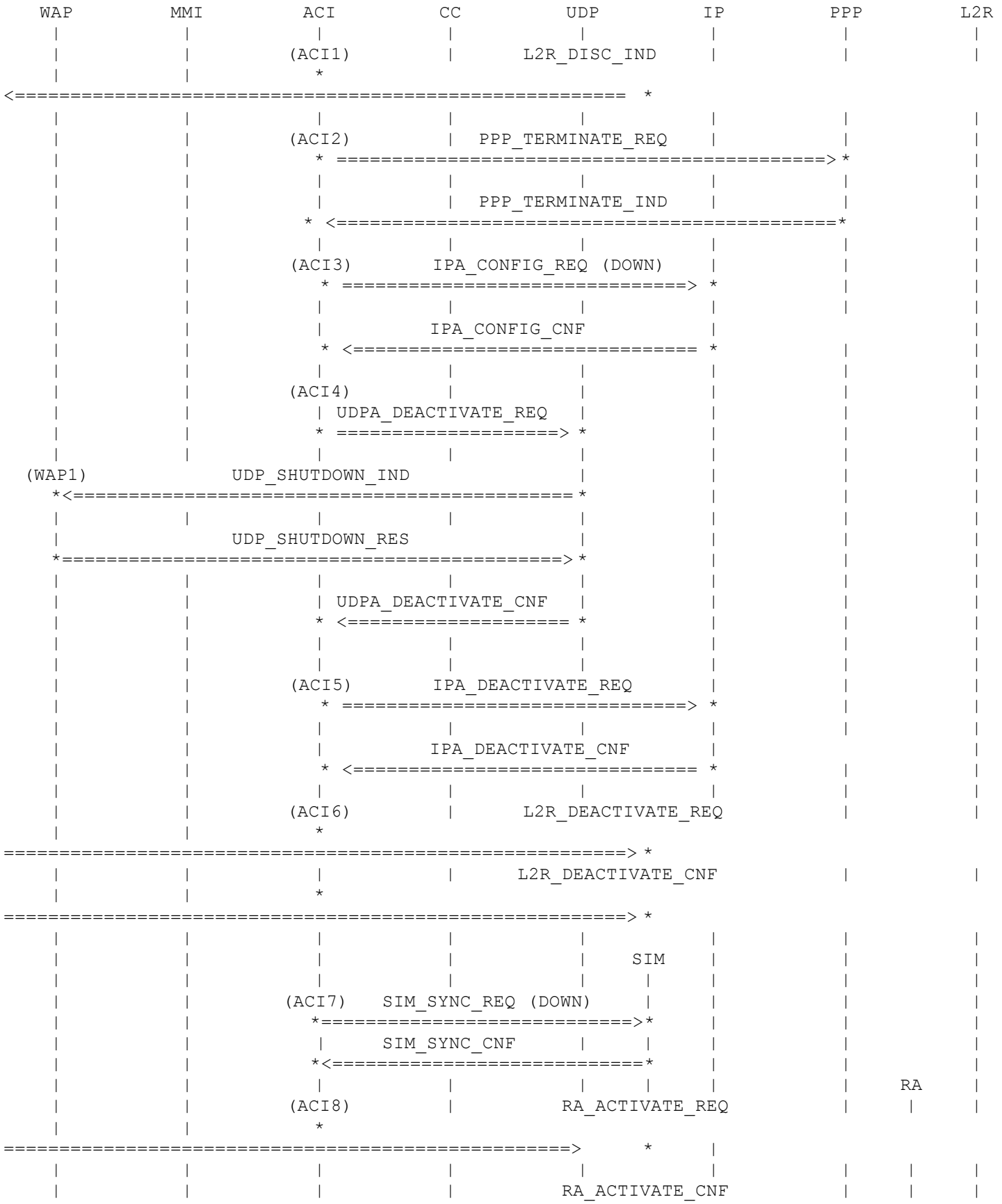
(ACI9)
ACI disconnect CC.

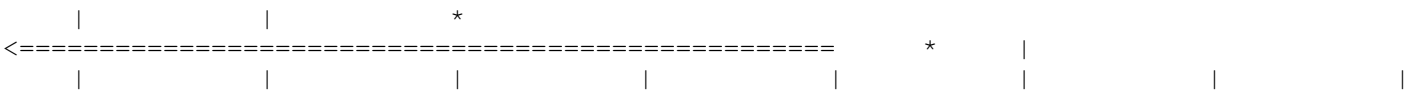
(ACI10)
ACI send "NO CARRIER" message to MMI.

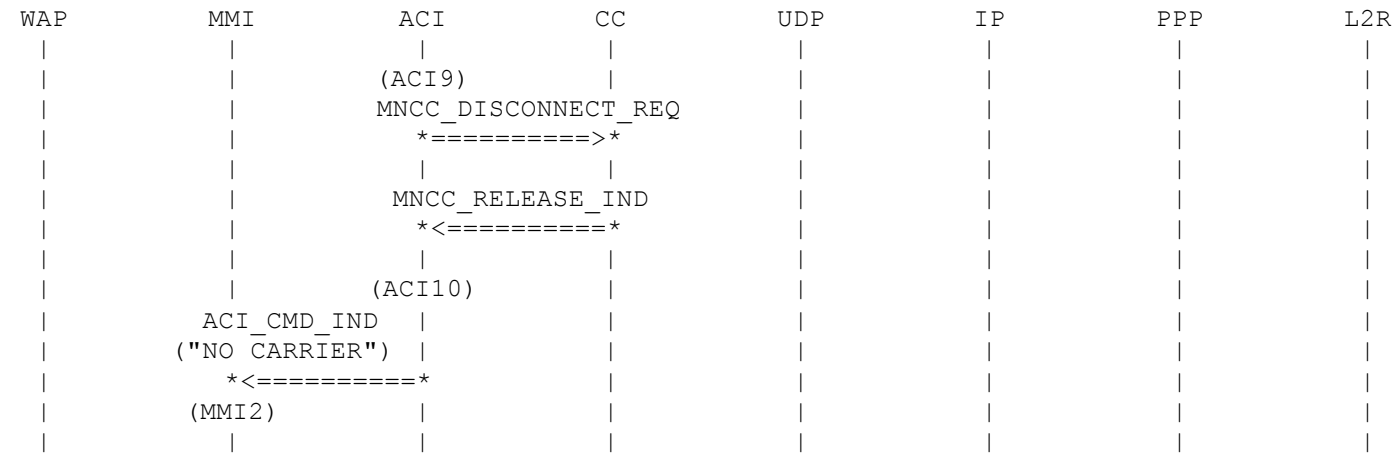
(MMI1)
MMI receives the message "NO CARRIER" from ACI that the WAP protocol stack have been terminated.

(WAP1)
WAP receives a shutdown indication from UDP. It confirm the message to UDP.

4.2.3 Disconnect- and deactivation from L2R







(ACI1)
After receiving L2R_DISC_IND from L2R, ACI start deactivation of the entities.

(ACI2)
ACI terminate PPP with PPP_TERMINATE_REQ. PPP confirm the message to ACI.

(ACI3)
ACI configure IP to go down. IP confirm the message back.

(ACI4)
ACI deactivate UDP with UDPA_DEACTIVATE_REQ. UDP send UDP_SHUTDOWN_IND to WAP to indicate that UDP is deactivated. WAP confirm with UDPA_DEACTIVATE_RES.

(ACI5)
ACI deactivates IP.

(ACI6)
ACI disconnect L2R.

(ACI7)
ACI send SIM_SYNC_REQ (DOWN) to indicate deactivation and SIM confirm with SIM_SYNC_CNF.

(ACI8)
ACI disconnect RA.

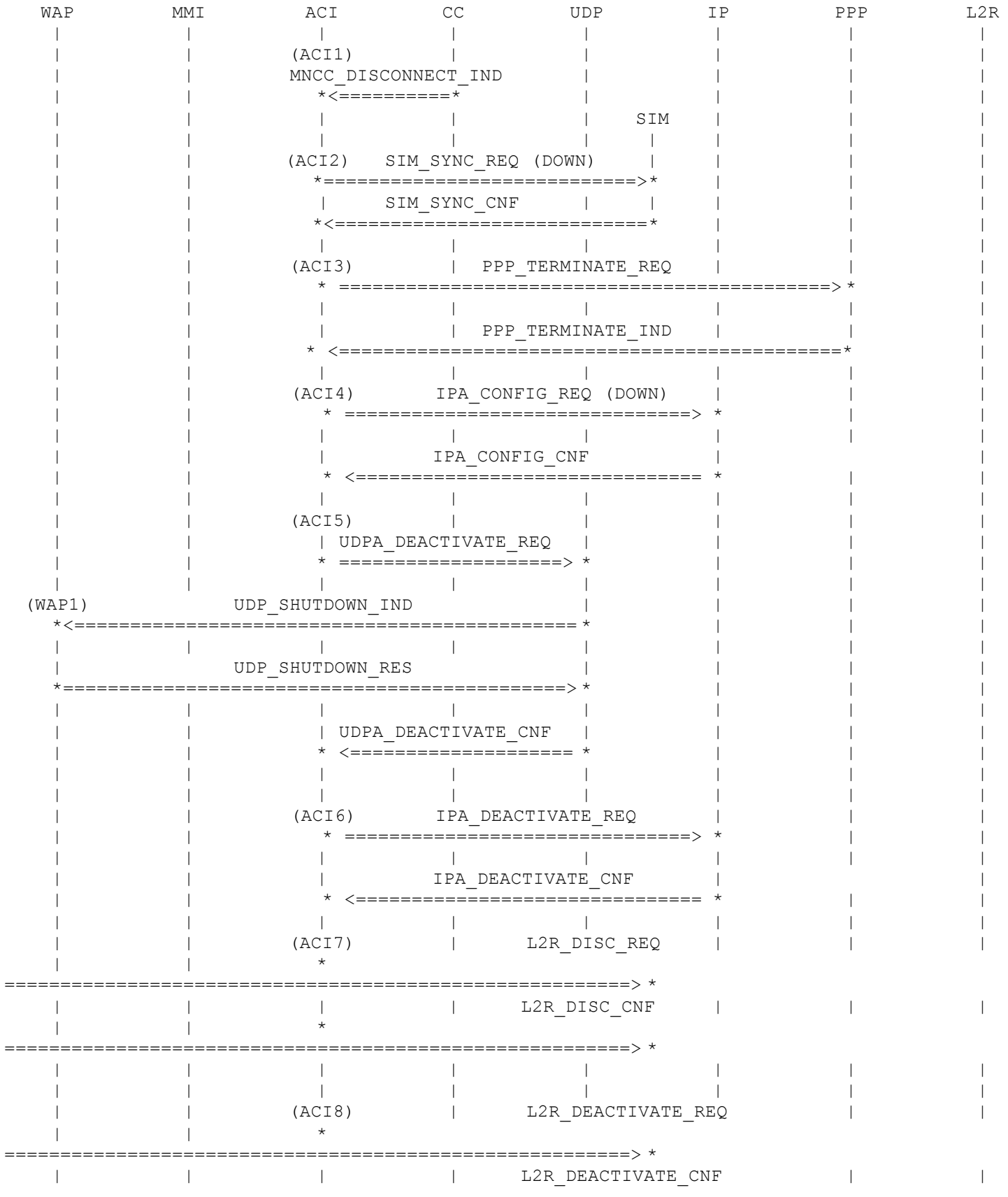
(ACI9)
ACI disconnect CC.

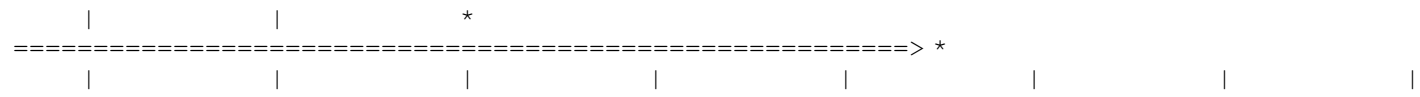
(ACI10)
ACI send "NO CARRIER" message to MMI.

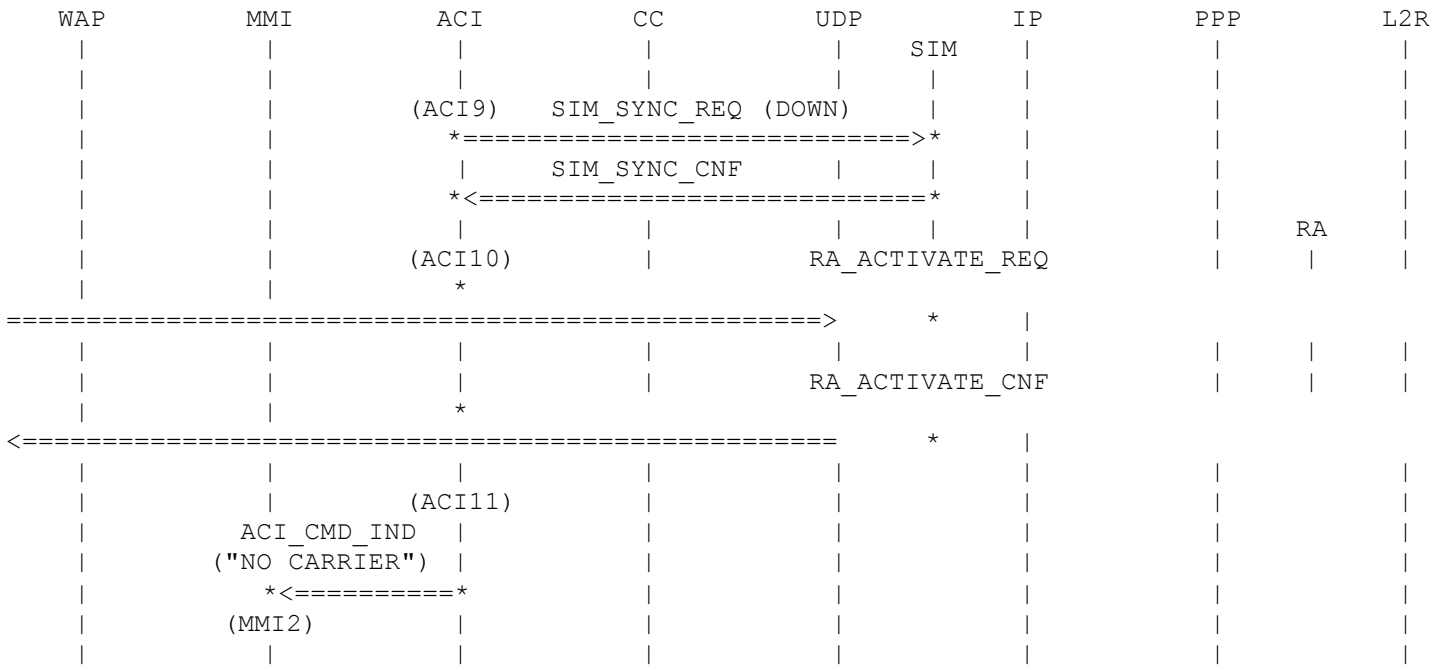
(MMI1)
MMI receives the message "NO CARRIER" from ACI that the WAP protocol stack have been terminated.

(WAP1)
WAP receives a shutdown indication from UDP. It confirm the message to UDP.

4.2.4 Disconnect- and deactivation from CC







(ACI1)
After receiving MNCC_DISCONNECT_IND from CC, ACI start deactivation of the entities.

(ACI2)
ACI configure PPP to terminate. PPP confirm the message to ACI.

(ACI3)
ACI configure IP to go down. IP confirm the message back.

(ACI4)
ACI deactivate UDP with UDPA_DEACTIVATE_REQ. UDP send UDP_SHUTDOWN_IND to WAP to indicate that UDP is deactivated. WAP confirm with UDPA_DEACTIVATE_RES.

(ACI5)
ACI deactivates IP.

(ACI6)
ACI disconnect L2R.

(ACI7)
ACI deactivates L2R. (L2R deactivate RA and RLP).

(ACI8)
ACI send SIM_SYNC_REQ (DOWN) to indicate deactivation and SIM confirm with SIM_SYNC_CNF.

(ACI9)
ACI disconnect RA.

(ACI10)
ACI disconnect CC.

(ACI11)
ACI send "NO CARRIER" message to MMI.

(MMI1)
MMI receives the message "NO CARRIER" from ACI that the WAP protocol stack have been terminated.

(WAP1)
WAP receives a shutdown indication from UDP. It confirm the message to UDP.

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/>