3GPP TSG CN Plenary
Meeting #11, Palm Springs, U.S.A
14th - 16th March 2001

Tdoc NP-010044

Source: **TSG_CN WG 3**

Title: **CRs to R99 Work Item "GPRS"**

Agenda item: **7.13**

Document for: **APPROVAL**

Introduction:

This document contains **6** CRs on **R99** Work Item **"GPRS"**, that have been agreed by **TSG_CN WG3**, and are forwarded to TSG CN Plenary meeting **#11** for approval.

Doc-2nd-Level	Spec	CR	Rev	Cat	Subject	Phase	Version-Current	Workitem
N3-010072	27.060	014		F	DHCP lease renewal	R99	3.4.0	GPRS
N3-010071	29.061	015		F	DHCP lease renewal	R99	3.4.0	GPRS
N3-010112	07.60	A021		F	Removal of IHOSS and OSP	R98	7.1.0	GPRS
N3-010114	27.060	015		A	Removal of IHOSS and OSP	R99	3.4.0	GPRS
N3-010113	09.61	A016		F	Removal of IHOSS and OSP	R98	7.2.0	GPRS
N3-010115	29.061	016		A	Removal of IHOSS and OSP	R99	3.4.0	GPRS

3GPP TSG CN3 #15
Beijing, China, 15 - 19January 2000

***Document* N3-010071**
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

⌘	**29.061**	**CR**	**015**	⌘ **rev**	**-**	⌘ **Current vers**	**3.4.0**	⌘

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

Title:	⌘	DHCP lease renewal		
Source:	⌘	TSG_CN WG3		
Work item code:	⌘	GPRS	***Date:*** ⌘	2001-01-15
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:	⌘	Clarifications needed on the lease time configuration and the behaviour when the lease expires. Incorrect behaviour will occur unless the PDP Context is deactivated and reactivated again if the IP address is changed following a DHCP lease renewal
Summary of change:	⌘	In case of DHCP lease expires the TE shall deactivate the PDP Context
Consequences if not approved:	⌘	It might lead to incompatible TE and MT implementations

Clauses affected:	⌘	13.1		
Other specs affected:	⌘	[ ] Other core specifications [ ] Test specifications [ ] O&M Specifications	⌘	3GPP TS 27.060
Other comments:	⌘			

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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.

13 Interworking with PDN (DHCP)

13.1 General

In current LAN environments the most commonly used configuration protocol is DHCP (Dynamic Host Configuration Protocol, [20]). It provides a mechanism for passing a large set of configuration parameters to hosts connected to a TCP/IP network (IP address, sub-net mask, domain name, MTU, etc.) in an automatic manner. Moreover DHCP may assign IP addresses to clients for a finite lease time, allowing for sequential reassignment of addresses to different users.

The lease time is chosen by the administrator of the DHCP server (in the external network), and is therefore out of the scope of this specification.

The Packet Domain offers the end user the possibility to run DHCP end-to-end the same way as he does when connected directly to a LAN (e.g. an enterprise Intranet). No modifications should be required in common implementations of DHCP clients and servers. However a Packet Domain-specific DHCP relay agent [21] is needed in the GGSN so as to allow correct routing of DHCP requests and replies between the TE and the DHCP servers.

At PDP context activation no IP address is allocated, this is done afterwards through DHCP. After the TE's configuration has been completed by DHCP, the PDP context is updated by means of the GGSN-initiated PDP Context Modification Procedure in order to reflect the newly assigned IP address.

In the following cases the corresponding PDP context shall be deactivated and the whole procedure starting with PDP context activation shall be restarted by the MS

- if the DHCP lease expires
- if the DHCP renewal is rejected by the DHCP server
- if the IP address is changed during the renewal process. Usually when the lease is renewed, the IP address remains unchanged. However, if for any reason (e.g. poor configuration of the DHCP server), a different IP address is allocated during the lease renewal process the PDP Context shall be deactivated.

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CHANGE REQUEST

⌘	**27.060**	**CR**	**014**	⌘ **rev**	**-**	⌘ **Current vers**	**3.4.0** ⌘

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

Title:	⌘	DHCP lease renewal		
Source:	⌘	TSG_CN WG3		
Work item code:	⌘	GPRS	***Date:*** ⌘	2001-01-15
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:	⌘	Clarifications needed on the lease time configuration and the behaviour when the lease expires. Incorrect behaviour will occur unless the PDP Context is deactivated and reactivated again if the IP address is changed following a DHCP lease renewal
Summary of change:	⌘	In case of DHCP lease expires the TE shall deactivate the PDP Context
Consequences if not approved:	⌘	It might lead to incompatible TE and MT implementations

Clauses affected:	⌘	7.3.7		
Other specs affected:	⌘	[ ] Other core specifications [ ] Test specifications [ ] O&M Specifications	⌘	3GPP TS 29.061
Other comments:	⌘			

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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.

7.3.7 PDP Context Deactivation

The PDP Deactivation may be performed automatically or manually depending on the manufacturer's implementation and configuration. The following cases are valid:

- if the connection between the MT and the TE is broken then the MT may perform the PDP Context Deactivation procedure;
- if the radio connection is broken then the MT may inform the TE;
- if the DHCP lease expires or the renewal is rejected by the DHCP server or the IP Address is changed during DHCP lease renewal, the TE may deactivate the PDP context.
- if the TE deactivates the last PDP context then the MT may perform the PS Detach procedure.

3GPP TSG-CN3 Meeting #16
Sophia Antipolis, France, 26 Feb-02 Mar 2001

Tdoc N3-010112

CR-Form-v3

CHANGE REQUEST

⌘	**07.60**	**CR**	**A021**	⌘ rev	**-**	⌘	Current version:	**7.1.0** ⌘

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

Title:	⌘	Removal of IHOSS and OSP		
Source:	⌘	TSG_CN WG3		
Work item code:	⌘	GPRS	***Date:*** ⌘	2001-02-12
Category:	⌘	**F**	***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:	⌘	It was decided at TSG-SA#8 to remove the IHOSS service from R98 and onwards (SP-000197). This CR aligns the targeted specification accordingly. Furthermore, since the 'Modem and ISDN Interworking' WI has previously been deleted there is also no need anymore for the Octet Stream Protocol (OSP).
Summary of change:	⌘	This CR deletes the OSP and IHOSS from the specification text.
Consequences if not approved:	⌘	The specification is not aligned with the R98 02.60 and 03.60.

Clauses affected:	⌘	3.2, 11, A, B	
Other specs affected:	⌘	[X] Other core specifications ⌘ [ ] Test specifications [ ] O&M Specifications	02.60, 03.60, 04.08, 07.07, 09.60, 09.61
Other comments:	⌘	The issue was discussed and postponed at CN3#8 (N3-000029) for R'99.	

3.2 Abbreviations

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

APN	Access Point Name
GGSN	Gateway GPRS Support Node
GPRS	General Packet Radio Service
GSN	GPRS Support Node
GTP	GPRS Tunnelling Protocol
HDLC	High Level Data Link Control
ICMP	Internet Control Message Protocol
~~IHOSS~~	~~Internet Hosted Octet Stream Service~~
IETF	Internet Engineering Task Force
IP	Internet Protocol
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
LA	Location Area
LAPB	Link Access Protocol Balanced
LCP	Link Control Protocol
LLC	Logical Link Control
MAC	Medium Access Control
ME	Mobile Equipment
MS	Mobile Station
MT	Mobile Termination
NCP	Network Control Protocol
~~OSP~~	~~Octet Stream Protocol~~
~~OSP:IHOSS~~	~~Octet Stream Protocol for Internet Hosted Octet Stream Service~~
PAD	Packet Assembler/Disassembler
PDN	Packet Data Network
PDP	Packet Data Protocol , e.g., IP, X.25 or PPP
PDU	Protocol Data Unit
PSPDN	Packet Switched Public Data Network
PTM	Point To Multipoint
PTP	Point To Point
PVC	Permanent Virtual Circuit
RA	Routing Area
SGSN	Serving GPRS Support Node
SNDCP	SubNetwork Dependent Convergence Protocol
TE	Terminal Equipment
TCP	Transmission Control Protocol
UDP	User Datagram Protocol

************************* **Next changed section** **

11 Internet Hosted Octet Stream Service (IHOSS)

Void.

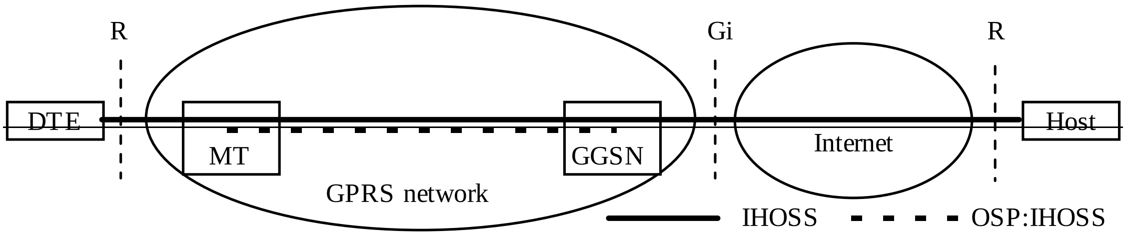
~~11.1 Introduction~~

~~This section describes the MS aspects of the GPRS Internet Hosted Octet Stream Service (IHOSS). This is a MO-only, connection-oriented service that carries an unstructured octet (character) stream between a GPRS MS and an Internet Host.~~

~~IHOSS uses OSP:IHOSS which is a subset of the Octet Stream Protocol (OSP) PDP type to provide a 'character pipe' between the MS and the GGSN. In the GGSN there is a relay function between the OSP and the Internet Host protocol~~

~~(usually TCP). An annex to this specification contains the generic description of OSP. The features of OSP that are used by OSP:IHOSS are described later in this section.~~

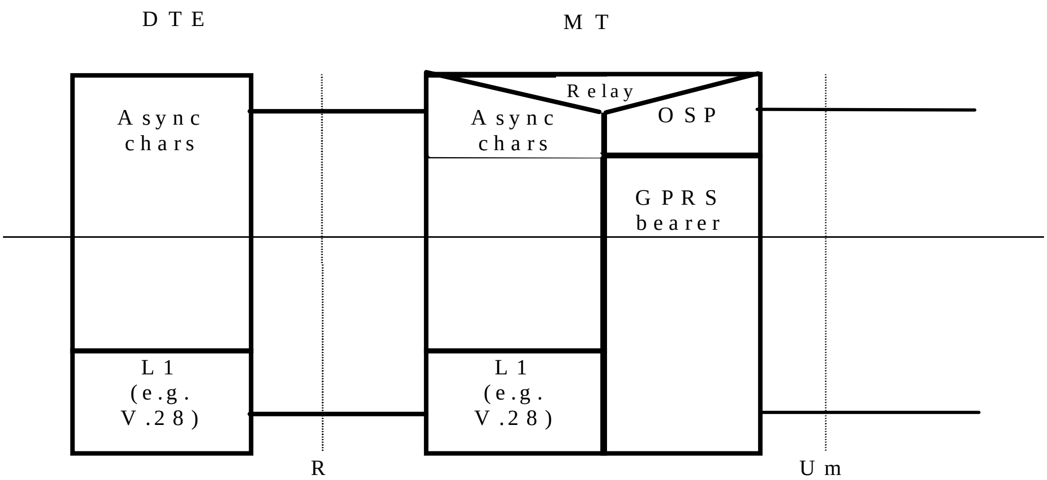
~~Figure 10 shows the scope of IHOSS and OSP:IHOSS.~~



~~Figure 10: Scope of the Internet Hosted Octet Stream Service and Octet Stream Protocol~~

~~11.2 Example of protocol stacks at the MT~~

~~Figure 11 shows an example of the protocol stacks at the MT. The MT contains a relay function between OSP and an asynchronous character interface.~~



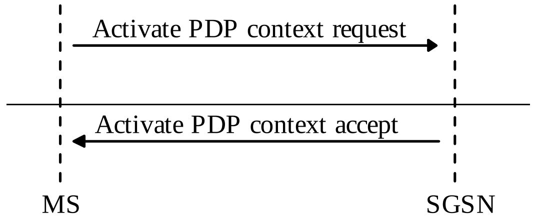
~~Figure 11: Example of protocol stacks for an MT with an asynchronous serial interface~~

~~11.3 IHOSS connection control and OSP PDP context management~~

~~Establishing an IHOSS connection involves setting up two segments, the PLMN segment (using the OSP) between the MS and GGSN, and the Internet segment between the GGSN and the Internet Host. There is a one-to-one mapping between the PLMN segment of an IHOSS connection and an OSP:IHOSS context. When the IHOSS connection is established, an OSP PDP context is activated. When the connection is released, the context is deactivated. It is possible for a suitably designed MT to activate multiple simultaneous OSP PDP contexts (subject to any limits imposed by the GPRS network), each context supporting one IHOSS connection.~~

~~11.3.1 Connection establishment and PDP context activation~~

~~Establishing the PLMN segment of an IHOSS connection follows the normal procedures for PDP context activation described in GSM 03.60 using messages described in GSM 04.08 (MS-SGSN) and GSM 09.60 (SGSN-GGSN). Figure 12 illustrates the procedure when TCP is used over the Internet.~~



~~Figure 12: IHOSS connection establishment~~

~~The MS requests that an OSP PDP context be set up by sending an Activate PDP context request message. The PDP type is set to OSP:IHOSS. The PDP configuration options may provide information to enable the GGSN to set up a connection to the Internet host. (Alternatively this information may be derived from subscription information in the HLR and configuration information within the GGSN.)~~

~~In the case where TCP is used over the Internet, the response accepting the context activation request is returned to the MS only when the TCP connection to the Internet host has been established. If the TCP connection attempt fails, an Activate PDP context reject message is returned.~~

~~In the case where UDP is used over the Internet, the response accepting the context activation request is returned to the MS only when at least a successful DNS lookup of the Internet host name has been completed. If the lookup fails, an Activate PDP context reject message is returned. (The GGSN may perform additional checks before responding to the context activation request.)~~

~~The format of the Activate PDP context request message is shown below:~~

~~Activate PDP Context Request (~~
~~NSAPI = generated within MS,~~
~~PDP type = OSP:IHOSS,~~
~~PDP address = null,~~
~~APN = as required or null - this may be provided by the HLR,~~
~~QoS requested = as defined in the generic OSP specification or null - this may be provided by the HLR,~~
~~PDP configuration options = (Internet hostname, port number, protocol type, maximum GGSN buffer sizes, OSP version number - all optional)~~
~~)~~

~~The format of the PDP configuration options is described in a later section.~~

~~11.3.2 Connection release and PDP context deactivation~~

~~When the IHOSS connection is released the OSP:IHOSS context is deactivated. The disconnection can be originated either by the MT or the Internet host, or exceptionally by the SGSN under fault conditions. The MT initiates disconnection by sending a Deactivate PDP context request. This is acknowledged by the receipt of a Deactivate PDP context accept which indicates that the Internet connection has been cleared. An Internet host or SGSN initiated disconnection is signalled to the MT by the receipt of a Deactivate PDP context request which it acknowledges by sending a Deactivate PDP context accept.~~

~~11.4 OSP:IHOSS subset of OSP~~

~~11.4.1 Required features~~

~~The following features of OSP are required for the OSP:IHOSS subset of OSP:~~

~~11.4.1.1 User data transport~~

~~This is as specified in the generic OSP description~~

~~11.4.1.2 Flow control~~

~~This shall map on to the local flow control mechanism at the DTE-MT interface.~~

~~11.4.2 Optional features~~

~~The following features of OSP are optional for the OSP:IHOSS subset of OSP:~~

~~11.4.2.1 Break handling~~

~~The OSP break procedure may be mapped on to the local break mechanism at the DTE-MT interface.~~

~~11.4.2.2 Packet Assembler/Disassembler~~

~~If the DTE-MT interface is character-oriented, a PAD is required in the OSP entity in the MT. The PAD may have pre-set values for the forwarding criteria parameters or they may configurable using, for example, an AT command.~~

~~If the interface to the application is block-oriented, for example in an embedded system, the PAD function is not needed.~~

~~11.4.2.3 GGSN maximum buffer size negotiation~~

~~Although the OSP entity in the GGSN does not have a PAD, it still requires buffers to hold the relayed packets. The following GGSN PAD parameters (in the Protocol Configuration Options) may be used to specify the maximum buffer sizes for the two directions of data transfer.~~

~~PAD Parameter~~	~~Direction~~
~~Assembly buffer max size (253)~~	~~GGSN to MS~~
~~Disassembly buffer max size (254)~~	~~MS to GGSN~~

~~11.4.3 Not-required features~~

~~The following features of OSP are not required for the OSP:IHOSS subset of OSP:~~

~~Control block transport~~

~~Remote configuration of OSP PAD in the GGSN (appart from the optional GGSN buffer size configuration - see above).~~

~~OSP protocol version negotiation (OSP:IHOSS uses the default version (0) of OSP.)~~

~~11.5 Protocol option parameters~~

~~All these parameters in the PDP context activation request are optional. If not provided by the MT, this information may be derived from subscription information in the HLR and configuration information within the GGSN. The parameters use the syntax described in GSM 04.08.~~

~~11.5.1 Hostname~~

~~This refers to the Internet host to which the connection will be made.~~

~~Option ID 128~~

~~Lengthnumber of characters in the Hostname~~

~~Contents - an IA5 character string which is the fully formed domain name extended hostname.~~

~~11.5.2 Port Number~~

~~This refers to the TCP or UDP port on the host identified by Hostname, which forms the endpoint of the Internet side of the connection.~~

~~Option ID 129~~

~~Lengthnumber of characters in the Port Number~~

~~Contents an IA5 character string which is the Port Number in decimal.~~

~~Note. If no port number is specified, a default value of 23 is used by the GGSN.~~

~~11.5.3 Protocol Type - TCP or UDP~~

~~This refers to the protocol used over IP on the GGSN to Internet host segment of the connection. The options available are Transmission Control Protocol (TCP) or User Datagram Protocol (UDP).~~

~~Option ID 130~~

~~Length3~~

~~Contents an IA5 character string which is either "TCP" or "UDP". All other values are reserved.~~

~~If no Protocol Type is specified, TCP is used by the GGSN.~~

~~11.5.4 GGSN PAD parameters (maximum buffer sizes only)~~

~~The GGSN PAD options parameter is described in the generic OSP specification.~~

**************************** Next changed section **

Annex A (informative): Summary of AT commands for GPRS

This informative annex lists the AT commands for GPRS that are fully described in GSM 07.07.

Table A.1: Summary of AT commands for GPRS

Command	Description
+CGACT	PDP context activate or deactivate
+CGANS	Manual response to a network request for PDP context activation
+CGATT	GPRS attach or detach
+CGAUTO	Automatic response to a network request for PDP context activation
+CGCLASS	GPRS mobile station class
+CGCLOSP	<Void>~~Configure local Octet Stream PAD parameters~~
+CGCLPAD	Configure local triple-X PAD parameters
+CGDATA	Enter data state
+CGDCONT	Define PDP context
+CGEREP	Control unsolicited GPRS event reporting
+CGPADDR	Show PDP address
+CGREG	GPRS network registration status
+CGQMIN	Quality of service profile (minimum acceptable)
+CGQREQ	Quality of service profile (requested)
+CGSMS	Select service for MO SMS messages

Table A.2: Summary of GPRS Extensions to existing GSM AT commands

Command	Description
+CEER	Extended error report (refer to 07.07)
+CMEE	Report mobile equipment error (refer to 07.07)
+CR	Service reporting control (refer to 07.07)
+CRC	Cellular result codes (refer to 07.07)

Table A.3: Summary of AT commands for GPRS modem compatibility mode

Command	Description
A	Answer - manual acceptance of a network request for PDP context activation
D	Dial - request GPRS service
H	On-hook - manual rejection of a network request for PDP context activation
S0	Automatic answering control - automatic acceptance of a network request for PDP context activation

**************************** Next changed section **

Annex B (informative): Octet Stream Protocol (OSP) PDP type

Void.

~~B.1 Scope~~

~~The Octet Stream Protocol (OSP) is used to carry an unstructured octet (character) stream between the MS and GGSN. It is used to provide a 'character pipe' to allow a MS to communicate (via the GGSN) with an arbitrary Internet host, or other character-based service. Unlike PDP types such as IP and X.25, OSP has no existence outside the PLMN. In the MS there is a character stream at the R reference point together with some optional control signals. In the GGSN there is~~

~~a relay function, carrying the same character stream and control signals between the OSP entity and a fixed network protocol stack.~~

~~An OSP entity has two modes of operation. In octet mode, it uses a Packet Assembly function to assemble a number of user octets into a single packet for more efficient transport by the underlying packet protocol. A complementary Packet Disassembly function in the same OSP entity performs the reverse operation. In block mode, an OSP entity's Packet Assembly and Disassembly functions are bypassed. Data is transferred between the OSP user and the OSP entity in blocks of octets. Each block of octets is carried in a single packet of the underlying protocol. The selection of octet or block mode is made independently for each OSP entity as an implementation or configuration decision before a connection is established and remains fixed for the duration of that connection.~~

~~An example of the use of block mode is when OSP is used for interworking with a fixed network where the octet stream is also carried in packets. The use of the block mode in the OSP entity in the GGSN avoids the use of back-to-back PADs. Block mode could also be used in a MS where the MT function is embedded in a larger piece of equipment and the application transfers data in blocks of octets.~~

~~OSP uses the services of SNDCP between the MS and SGSN, and the services of GTP between the SGSN and GGSN. The Quality of Service is determined mainly by that provided by the underlying layers. However, the end-to-end delay may be affected by the presence of the PAD (Packet Assembler/Disassembler) function. For most applications it is anticipated that a reliable (acknowledged) service will be provided by the underlying layers.~~

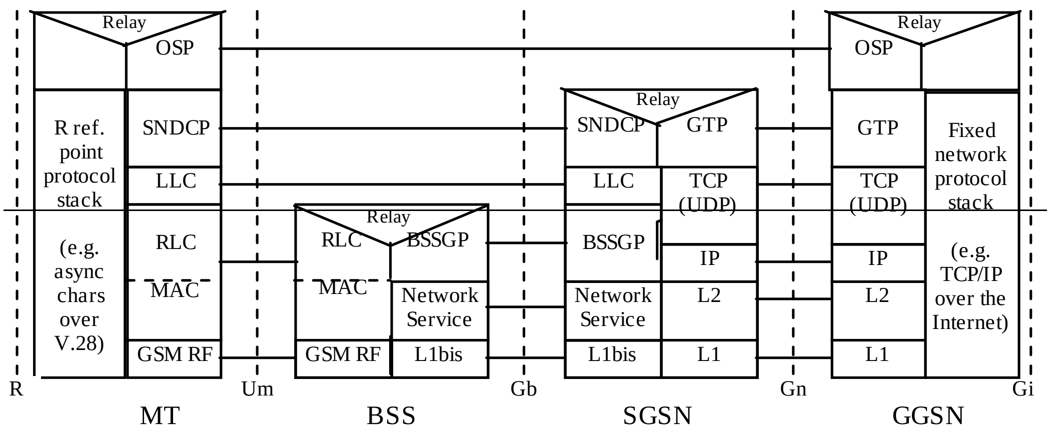
~~In summary, the main functions of OSP are:~~

- ~~transport of an unstructured octet stream,~~
- ~~Packet Assembly/Disassembly (to make efficient use of network resources),~~
- ~~end-to-end flow control.~~

~~In addition OSP may provide:~~

- ~~transport of a 'break' signal,~~
- ~~transport of blocks of control information between the OSP users,~~
- ~~user control of packet assembly buffer forwarding,~~
- ~~direct OSP user access to the underlying packet service, bypassing the PAD.~~

~~Figure B.1 shows how OSP fits into the overall GPRS protocol model.~~

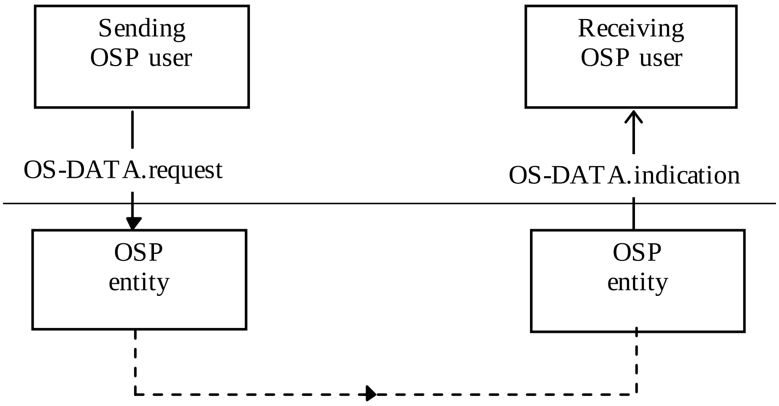


~~Figure B.1: Relationship of OSP to the rest of the GPRS protocol architecture~~

~~B.2 Service primitives~~

~~B.2.1 Service Primitives provided by the OSP layer~~

~~The service provided by the OSP layer to its user (the layer above) is described in terms of service primitives. An example of the use of the OS-DATA.request and OS-DATA.indications primitives to transfer an octet or block of octets from one OSP user to another is shown in figure B.2.~~



~~Figure B.2: An example of the use of the OS-DATA primitives~~

~~The primitives provided by the OSP layer are listed in Table B.1.~~

~~Table B.1: OSP layer service primitives~~

~~Generic Name~~	**~~Type~~**				**~~Parameters~~**
	~~Request~~	~~Indication~~	~~Response~~	~~Confirm~~	
~~OSP User (MS or GGSN) <---> OSP~~					
~~OS-DATA~~	~~X~~	~~X~~	-	-	~~D-PDU (single octet or block of octets)~~
~~OS-UNITDATA~~	~~X~~	~~X~~	-	-	~~D-PDU (single octet or block of octets)~~
~~OS-FLOWCONTROL~~	~~X~~	~~X~~	-	-	~~Requested flow control state (STOP or START)~~
~~OS-BREAK~~	~~X~~	~~X~~	-	-	~~none~~
~~OS-CONTROL~~	~~X~~	~~X~~	-	-	~~C-PDU (block of octets)~~
~~OS-FORWARD~~	~~X~~	-	-	-	~~none~~

~~B.2.1.1 OS-DATA.request~~

~~Request used by the OSP user for transmission of a D-PDU. In octet mode, the D-PDU consists of a single octet. In block mode the D-PDU consists of a block of octets. This primitive is used when the underlying protocol layers are providing a reliable service.~~

~~B.2.1.2 OS-DATA.indication~~

~~Indication used by the OSP entity to deliver the received D-PDU to the OSP user. In octet mode, the D-PDU consists of a single octet. In block mode the D-PDU consists of a block of octets.~~

~~B.2.1.3 OS-UNITDATA.request~~

~~Request used by the OSP user for transmission of a D-PDU. In octet mode, the D-PDU consists of a single octet. In block mode the D-PDU consists of a block of octets. This primitive is used when the underlying protocol layers are providing an unreliable service.~~

~~B.2.1.4 OS-UNITDATA.indication~~

~~Indication used by the OSP entity to deliver the received D-PDU to the OSP user. In octet mode, the D-PDU consists of a single octet. In block mode the D-PDU consists of a block of octets.~~

~~B.2.1.5 OS-FLOWCONTROL.request~~

~~Request used by the OSP user for the peer OSP user to update its flow control state.~~

~~B.2.1.6 OS-FLOWCONTROL.indication~~

~~Indication used by the OSP entity to request the OSP user to update its flow control state.~~

~~B.2.1.7 OS-BREAK.request~~

~~Request used by the OSP user to send a break signal to the peer OSP user.~~

~~B.2.1.8 OS-BREAK.indication~~

~~Indication used by the OSP entity to deliver a break signal to the OSP user.~~

~~B.2.1.9 OS-CONTROL.request~~

~~Request used by the OSP user to request transmission of a C-PDU. The C-PDU consists of a block of octets. The reliability of the transmission is determined by the lower layer protocols.~~

~~B.2.1.10 OS-CONTROL.indication~~

~~Indication used by the OSP entity to deliver a received C-PDU to the OSP user.~~

~~B.2.1.11 OS-FORWARD.request~~

~~Request used by the OSP user to cause immediate forwarding of the OSP Packet Assembly buffer.~~

~~B.2.2 Service Primitives Used by the OSP Layer~~

~~The OSP layer uses the service primitives provided by the SNDCP layer (see Table B.2) and the GTP layer (see table B.3). SNDCP is specified in GSM 04.65 and GTP in GSM 09.60.~~

~~Table B.2: SNDCP service primitives used by the OSP entity~~

~~Generic~~	**~~Type~~**				**~~Parameters~~**
~~Name~~	~~Request~~	~~Indication~~	~~Response~~	~~Confirm~~	

~~**OSP <---> SNDCP**~~					
~~SN-DATA~~	~~X~~	~~X~~	-	-	~~N-PDU, NSAPI~~
~~SN-UNITDATA~~	~~X~~	~~X~~	-	-	~~N-PDU, NSAPI, protection mode~~

~~B.2.2.1 SN-DATA.request~~

~~Request used by the SNDCP user for acknowledged transmission of an N-PDU. The successful transmission of an SN-PDU shall be confirmed by the LLC layer. The SN-DATA.request primitive conveys the NSAPI to identify the PDP using the service.~~

~~B.2.2.2 SN-DATA.indication~~

~~Indication used by the SNDCP entity to deliver a received N-PDU to the SNDCP user. Successful reception has been acknowledged by the LLC layer.~~

~~B.2.2.3 SN-UNITDATA.request~~

~~Request used by the SNDCP user for unacknowledged transmission of an N-PDU. The SN-UNITDATA.request primitive conveys the NSAPI to identify the PDP using the service and protection mode to identify the requested transmission mode.~~

~~B.2.2.4 SN-UNITDATA.indication~~

~~Indication used by the SNDCP entity to deliver a received N-PDU to the SNDCP user.~~

~~Table B.3: GTP service primitives used by the OSP entity~~

~~**Generic**~~	~~**Type**~~				~~**Parameters**~~
~~**Name**~~	~~Request~~	~~Indication~~	~~Response~~	~~Confirm~~	
~~**OSP <---> GTP**~~					
~~GT-DATA~~	~~X~~	~~X~~	-	-	~~N-PDU, TID~~
~~GT-UNITDATA~~	~~X~~	~~X~~	-	-	~~N-PDU, TID~~

~~B.2.2.5 GT-DATA.request~~

~~Request used by the GTP user for acknowledged transmission of an N-PDU. The successful transmission of an SN-PDU shall be confirmed by the TCP layer. The SN-DATA.request primitive conveys TID to identify the PDP using the service.~~

~~B.2.2.6 GT-DATA.indication~~

~~Indication used by the GTP entity to deliver the received N-PDU to the GTP user. Successful reception has been acknowledged by the TCP layer.~~

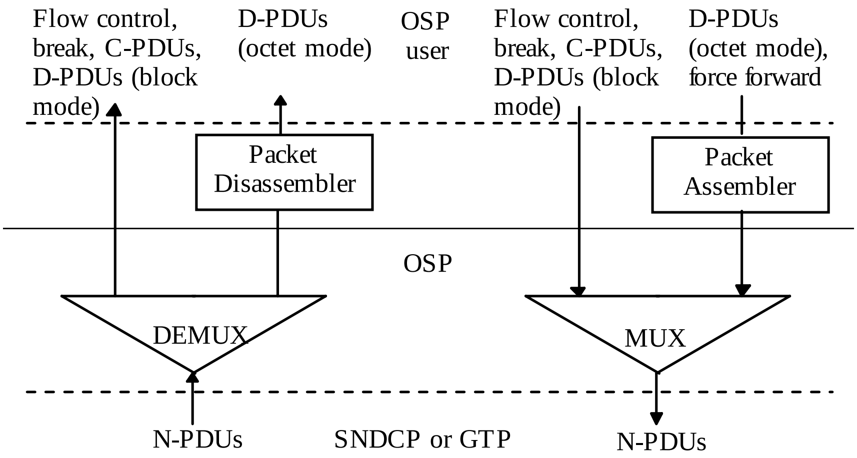
~~B.2.2.7 GT-UNITDATA.request~~

~~Request used by the GTP user for unacknowledged transmission of an N-PDU. The SN-UNITDATA.request primitive conveys TID to identify the PDP using the service. This uses UDP as the path protocol.~~

~~B.2.2.8 GT-UNITDATA.indication~~

~~Indication used by the GTP entity to deliver the received N-PDU to the GTP user.~~

~~B.3 OSP Functional model~~



~~Figure B.3: OSP functional model~~

~~The main functions of the OSP entity are shown in figure B.3.~~

~~At the sending side, in octet mode, octets from the OSP user (D-PDUs) are accumulated by the Packet Assembler until some forwarding criterion is satisfied. Forwarding can be forced by the user if required. The resulting packet is then passed to the multiplexing function (MUX). In block mode, D-PDUs are passed directly to the MUX. The MUX combines these packets of user data with flow control requests and optionally break requests and control blocks (C-PDUs). (A control block is a delimited set of octets whose maximum size is determined by the limits imposed by the underlying protocol.) The resulting stream of N-PDUs is passed to the SNDCP or GTP layer below.~~

~~At the receiving side, the N-PDUs from the SNDCP or GTP layer below are passed to the demultiplexing (DEMUX) function. Here the packets of user data, flow control indications, and (if implemented) break indications and control blocks (C-PDUs) are separated out. In block mode, the packets of user data are passed directly to the OSP user. In octet mode, they are passed to the Packet Disassembler which regenerates the original stream of octets (D-PDUs).~~

~~B.4 OSP N-PDU (packet) format~~

~~Each N-PDU shall contain an integral number of octets, and shall comprise a header part and a data part. An N-PDU shall contain data from zero or more D-PDUs or a single C-PDU. (D-PDUs and C-PDUs may not be mixed in the same N-PDU.)~~

~~The bit and octet numbering convention used in this specification is illustrated in figure B.4. The bits are grouped into octets. The bits of an octet are shown horizontally and are numbered from 1 to 8. Multiple octets are shown vertically and are numbered from 1 to N.~~

~~Bit~~	~~8~~	~~7~~	~~6~~	~~5~~	~~4~~	~~3~~	~~2~~	~~1~~
~~Octet 1~~								
~~2~~								
~~…~~								
~~N-1~~								
~~Octet N~~								

~~Figure B.4: Numbering convention~~

~~N-PDUs are transferred between the OSP layer and the SNDCP or GTP layer in ascending numerical octet order (i.e., octet 1, 2, …, N-1, N).~~

~~B.4.1 OSP header~~

~~The OSP header is contained in octet 1. The use of bits 1-4 and bit 8 are described below. Bits 5-7 are not used in this version of the protocol and shall be set to zero by the sender and ignored by the receiver.~~

~~B.4.1.1 Bit 1 - Extension (E)~~

~~This is provided to allow the OSP header in future versions of the protocol to consist of more than one octet. In this version of the protocol E shall always be set to 1 by the sender and checked by the receiver.~~

~~B.4.1.2 Bit 2 - Ready to Receive (RTR) - flow control~~

~~This bit indicates if the OSP entity that sent the N-PDU is able to receive data from its peer OSP entity.~~

~~RTR = 0 not ready to receive~~

~~RTR = 1 ready to receive~~

~~B.4.1.3 Bit 3 - Break Request (BR)~~

~~This bit requests that the receiving OSP entity shall signal a break to its user.~~

~~BR = 0 no break~~

~~BR = 1 signal break~~

~~B.4.1.4 Bit 4 - Break Acknowledge (BA)~~

~~This bit indicates that the sending OSP entity has signalled a break to its user in response to a Break Request.~~

~~BA = 0 no acknowledge break~~

~~BA = 1 acknowledge break~~

~~B.4.1.5 bit 8 - payload type (PT)~~

~~This bit indicates whether the payload contains user data or a control block .~~

~~PT = 0 data (zero or more D-PDUs)~~

~~PT = 1 control (zero or one C-PDU)~~

~~B.4.2 OSP payload~~

~~This consists of one of the following:~~

~~B.4.2.1 User data~~

~~This consists of zero or more (up to some maximum - TBD) octets of user data (zero or more D-PDUs).~~

~~B.4.2.2 Control block~~

~~This consists of the contents of zero or one C-PDU.~~

~~B.5 Packet Assembly/Disassembly (PAD) function~~

~~In order to make efficient use of the network resources, particularly the radio resource, D-PDUs (octets) received from the OSP user are not forwarded immediately but are placed in a buffer. When some forwarding criterion is satisfied, the contents of the buffer are forwarded in the payload of an N-PDU to the layer below. At the receiving end, the payload of an N-PDU received from the layer below is placed in a buffer and the octets are delivered to the OSP user as a stream of D-PDUs (octets). The PAD is used only when the OSP entity is operating in octet mode. It is not used when the OSP entity is operating in block mode.~~

~~B.5.1 Packet Assembler~~

~~The packet assembler shall be able to detect the following forwarding criteria. When any one criterion is satisfied, the contents of the buffer shall be forwarded in an N-PDU (of type User Data) to the layer below, subject to any flow control condition. Whenever a buffer is forwarded, the inactivity timer is stopped (if it is running).~~

~~B.5.1.1 Buffer full~~

~~The buffer contents are forwarded when the number of octets in the buffer reaches the value of the maximum buffer size parameter.~~

~~The maximum N-PDU size is equal to the maximum buffer size plus the size of the OSP header. It should be chosen so as to make efficient use of the network resources, particularly the radio resources. Although it is possible to calculate the overhead imposed by the various underlying protocol layers, it is not possible to predict exactly how an N-PDU will be mapped on to radio frames even if the channel coding is known. This is because the SNDCP layer may use data compression, the efficiency of which depends on the compressibility of the data. However, since the SNDCP layer is able to segment and reassemble long N-PDUs, it is recommended that the maximum N-PDU size should be several times the largest radio frame size, allowing for a typical compression ratio of, say, 2:1. This will ensure that most radio frames are full.~~

~~The maximum size for the packet assembly buffer is specified by PAD parameter 253. The value is in the range 1-65535 octets.~~

~~The maximum size for the packet disassembly buffer is specified by PAD parameter 254. The value is in the range 1-65535 octets.~~

~~B.5.1.2 Inactivity timer expiry~~

~~Whenever an octet is placed in the buffer the inactivity timer shall be started, set to the value of the inactivity time parameter. When the timer expires, the buffer contents are forwarded. The timer has the following functions:~~

~~1. to ensure that octets don't remain in the buffer for ever.~~

~~2. to detect significant gaps in the stream of octets and try to ensure that these gaps match the N-PDU boundaries. This is beneficial for data that at the user level is in blocks of octets, e.g. a PPP frame. It means that the trailing octets of a~~

~~block do not get delayed (since they are forwarded when the timer expires). Also, because the timer is restarted whenever a new octet appears, it ensures that blocks do not get split unless the buffer becomes full.~~

~~3. to give interactive traffic a reasonable response time.~~

~~The inactivity time parameter should be set to be longer than the inter-octet time but shorter than the inter-block time to ensure optimum forwarding of blocked data. It shall be possible to set it to an infinite time, i.e. the timer never expires.~~

~~The maximum buffer delay timer is specified by PAD parameter 4 and values shall be in the range 1-255 (units of 1/20 of a second). Additionally, the value 0 disables the timer. The default value is 0.~~

~~B.5.1.3 Maximum Buffer Delay timer expiry (optional)~~

~~When the first octet is placed into the (empty) buffer, a maximum buffer delay timer may optionally be started, set to the value of the maximum buffer delay parameter. When the timer expires, the buffer contents are forwarded. Thistimer ensures that no octet is delayed in the buffer for more than the specified time.~~

~~The maximum buffer delay timer is specified by PAD parameter 255 and values shall be in the range 1-255 (units of 1/2 of a second). Additionally, the value 0 disables the timer. The default value is 0.~~

~~B.5.1.4 Special character(s)~~

~~Whenever an octet has been placed in the buffer, it is compared (lower 7 bits only) with a list of 'special characters'. If it matches, the buffer is forwarded.~~

~~The possible characters and combinations of characters are specified by PAD parameter 3. Permitted values are listed below.~~

~~Value~~	~~Characters~~
~~0~~	~~disabled~~
~~1~~	~~A-Z, a-z, 0-9~~
~~2~~	~~CR~~
~~4~~	~~ESC, BEL, ENQ, ACK~~
~~8~~	~~DEL, CAN DC2~~
~~16~~	~~ETX, EOT~~
~~32~~	~~HT, LF, VT, FF~~
~~64~~	~~all characeters between NUL and US not listed above~~

~~Values may be added to create further combinations, e.g., 34 (=2+32) corresponds to CR, HT, LF, VT, FF.~~

~~B.5.1.5 Change in flow control state~~

~~An N-PDU (type User Data) carries flow control information in the OSP header as well as user data in the payload. If there is a need to signal a change in the Ready to Receive condition, the buffer shall be forwarded immediately with the appropriate (new) value of RTR in the OSP header, unless the change has already been signalled using an N-PDU with an empty payload.~~

~~B.5.1.6 Immediate forwarding request~~

~~When the OSP entity receives a OS-FORWARD.request primitive from its user, it shall immediately forward the buffer unless it is empty.~~

~~B.5.2 Packet Disassembler~~

~~The packet disassembler shall forward the contents of the N-PDU (type User data) payload to the OSP user, subject to any local flow control condition.~~

~~B.6 Flow control~~

~~The OSP entity maintains two variables indicating the readiness of the local OSP entity (itself) and the remote OSP entity (its peer) to receive data.~~

~~Local - variable RTRL~~

~~The value of RTRL is updated as a result of the receipt of OS-FLOWCONTROL.request primitives from the OSP user and changes in buffer conditions within the OSP entity. When the user requests STOP, RTRL shall immediately be set to 0. When the user requests START, RTRL may be set to 1 immediately or this may be delayed subject to buffer conditions.~~

~~The value of RTRL is copied into the RTR bit of every N-PDU transmitted. Whenever RTRL changes, an N-PDU is sent immediately to signal the change to the peer OSP entity. This may be done by either sending an N-PDU with an empty payload or immediately forwarding the packetiser buffer.~~

~~RTRL may also be set to 0 or 1 by the OSP entity as a result of buffer conditions within the OSP entity.~~

~~Remote - variable RTRR~~

~~The value of RTRR is updated from the RTR bit of every N-PDU received. When RTRR changes to 0, an OS-FLOWCONTROL.indication(STOP) primitive shall be sent immediately to the OSP user. When RTRR changes to 1, an OS-FLOWCONTROL.indication (START) primitive may be sent immediately to the OSP user or this may be delayed subject to buffer conditions.~~

~~STOP and START indications may also be sent at any time as a result of buffer conditions within the OSP entity.~~

~~B.7 Break handling~~

~~When an OSP entity receives an OS-BREAK.request from its user it shall immediately send an N-PDU (type User Data) with the Break Request (BR) bit in the OSP header set to 'signal break' and an empty payload. Any data in the packetiser buffer shall be discarded and not transmitted in the N-PDU. Further data received from the OSP user shall be processed in the normal way. The OSP entity shall discard any buffered data already received from its peer entity and, when operating over a reliable service, shall continue discarding received N-PDUs (type user data) until it receives one with the Break Acknowledge (BA) bit in the OSP header set to 'acknowledge break '. Any data in the received N-PDU shall be processed in the normal way. N-PDUs (type control) are not discarded.~~

~~When operating over an unreliable service, the OSP entity sending ‘signal break’ shall protect itself from the risk of lockup resulting from the loss of either or both of the N-PDUs containing ‘signal break’ or ‘break acknowledge’. This is implementation-dependent. (A simple implementation could resume processing received N-PDUs immediately and ignore any received ‘break acknowledge’.)When an OSP entity receives an N-PDU (type User Data) with the BR bit set to 'signal break' it shall immediately signal a break to its user with an OS-BREAK.indication. The OSP entity shall discard all buffered data for both directions of flow and acknowledge the break by sending an N-PDU (type User Data) with the Break Acknowledge (BA) bit in the OSP header set to 'acknowledge break'. This may either be sent immediately with no data or wait until one of the forwarding criteria is satisfied.~~

~~B.8 Control block transport~~

~~An OSP user may use the OS-CONTROL.request primitive to send a C-PDU (block of control information) consisting of zero or more octets to its peer user. An N-PDU (type Control Block) is sent immediately, regardless of whether there is any data in the packetiser buffer or flow control condition. If it is necessary to forward the buffer contents before sending the control block, the OSP user should issue an OS-FORWARD.request before the OS-CONTROL.request. The C-PDU is delivered immediately to the receiving OSP user with the OS-CONTROL.indication primitive, regardless of the state of the depacketiser buffer or local flow control condition. The octet ordering within the block and the block boundaries are preserved.~~

~~B.9 Quality of Service~~

~~The Quality of Service (QoS) provided by the OSP layer is determined almost entirely by that provided by the underlying protocol layers. However, the Packet Assembly and Disassembly functions introduce an additional variable delay into the transmission path. This delay can be limited at the risk of making less efficient use of network resources (particularly radio resources). The PAD function is described in detail in its own section.~~

~~The QoS provided by the underlying protocol layers is defined by the QoS profile assigned to the OSP context.~~

~~Precedence class - as required~~

~~Delay class - as required but should be consistent with the PAD forwarding strategy~~

~~Reliability class - class 1 for reliable service, class 3 for unreliable service~~

~~Peak throughput class - as required~~

~~Mean throughput class - as required~~

~~B.10 OSP version~~

~~In order to allow the possible coexistence in the future of multiple versions of OSP, each version shall be assigned a version number. The use of a particular version may be negotiated by the peer OSP entities using the OSP version subparameter of the protocol configuration options parameter in the PDP context activation request, accept and reject messages. The default in the event of no negotiation taking place is this initial version (0).~~

~~B.11 Protocol Configuration Options~~

~~The following generic OSP configuration options parameters are defined for use in the various PDP Context Activation control messages. They use the syntax described in GSM 04.08. Option IDs 0-127 are reserved for generic use. Additional parameters with IDs in the range 128-255 may be defined for specific uses of the OSP.~~

~~Parameter values may be negotiated between the MT and GGSN OSP entities. This is a two phase negotiation with the MT making a set of proposals and the GGSN either accepting each value or proposing an alternative. The MT must either accept the new set or the connection attempt fails. The alternative values are proposed in either a PDP context activation accept or reject message.~~

~~The accept message should be used if there is a reasonable likelihood that the alternative will be acceptable to the MT, e.g. a downgrading of buffer size, since the connection may then immediately continue. If the alternative is unacceptable the MT immediately deactivates the context.~~

~~The reject message should be used if it is likely that the alternative will not be acceptable, or if a significant charge would be incurred if the context were to be activated by the GGSN and then immediately deactivated by the MT. If the alternative is acceptable the MT may reattempt context activation using the values suplied by the GGSN.~~

~~B.11.1 OSP version~~

~~This parameter is optional. It allows the MT and GGSN to negotiate a mutually acceptable version of OSP. If omitted, the initial (version 0) of OSP is assumed.~~

~~Option ID 0~~

~~Length1~~

~~Contents 0 indicates this (initial) version of OSP. Other values are reserved for future versions.~~

~~B.11.2 GGSN PAD parameters~~

~~This options parameter is optional and may be used if the OSP entity in the GGSN contains a PAD function. It allows the MT and GGSN to negotiate a mutually acceptable set of PAD parameters for the GGSN PAD. The maximum buffer size parameters may be negotiated even when the OSP entity in the GGSN does not contain a PAD. If not relevant to the GGSN OSP entity, the PAD options parameter shall be ignored.~~

~~Option ID 1~~

~~Length3n (n = number of PAD parameters)~~

~~Contents Pairs of (PAD parameter, value)~~

~~The PAD parameter is 1 octet in length. The value is 2 octets in length.~~

~~Valid PAD parameters are listed in the section describing the Packet Assembly/Disassembly function.~~

************************* **End of changes** **

3GPP TSG-CN3 Meeting #16
Sophia Antipolis, France, 26 Feb-02 Mar 2001

Tdoc N3-010113

CR-Form-v3

CHANGE REQUEST

⌘	**09.61**	**CR**	**A016**	⌘	rev	**-**	⌘	Current version: **7.2.0**	⌘

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:	⌘ Removal of IHOSS and OSP			
Source:	⌘ TSG_CN WG3			
Work item code:	⌘ GPRS		***Date:*** ⌘	2001-02-12
Category:	⌘ **F**		***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: ⌘	It was decided at TSG-SA#8 to remove the IHOSS service from R98 and onwards (SP-000197). This CR aligns the targeted specification accordingly. Furthermore, since the 'Modem and ISDN Interworking' WI has previously been deleted there is also no need anymore for the Octet Stream Protocol (OSP).
Summary of change: ⌘	This CR deletes the OSP and IHOSS from the specification text.
Consequences if not approved: ⌘	The specification is not aligned with the R 98 02.60 and 03.60.

Clauses affected: ⌘	3.2, 13	
Other specs affected: ⌘	[X] Other core specifications ⌘ [ ] Test specifications [ ] O&M Specifications	02.60, 03.60, 04.08, 07.07, 07.60, 09.60
Other comments: ⌘	The issue was discussed and postponed at CN3#8 (N3-000030) for R'99.	

3.2 Abbreviations

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

APN	Access Point Name
ATM	Asynchronous Transfer Mode
BG	Border Gateway
BOC	Bell Operating Company
CHAP	Challenge Handshake Authentication Protocol
DHCP	Dynamic Host Configuration Protocol
DNS	Domain Name Server
DNIC	Data Network Identification Code
DSE	Data Switch Exchange
GGSN	Gateway GPRS Support Node
IC	Interexchange Carrier
ICMP	Internet Control Message Protocol
IETF	Internet Engineering Task Force
~~IHOSS~~	~~Internet Hosted Octet Stream Service~~
IP	Internet Protocol
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
ISDN	Integrated Services Digital Network
ISP	Internet Service Provider
LATA	Local Access and Transport Area
LAPB	Link Access Protocol Balanced
LAC	L2TP Access Concentrator
LNS	L2TP Network Server
MS	Mobile Station
MT	Mobile Terminal
~~OSP~~	~~Octet Stream Protocol~~
~~OSP:IHOSS~~	~~Octet Stream Protocol for Internet Hosted Octet Stream Service~~
PDN	Packet Data Network
PDU	Protocol Data Unit
PHF	Packet Handler Function
PNIC	Pseudo Network Identification Code
PPP	Point-to-Point Protocol
PPSN	Public Packet Switched Network
PSDN	Packet Switched Data Network
PSPDN	Packet Switched Public Data Network
RADIUS	Remote Authentication Dial In User Service
SGSN	Serving GPRS Support Node
SMDS	Switched Multimegabit Data Service
TE	Terminal Equipment
TCP	Transmission Control Protocol
UDP	User Datagram Protocol

************************ **Next changed section** ***

13 Internet Hosted Octet Stream Service (IHOSS)

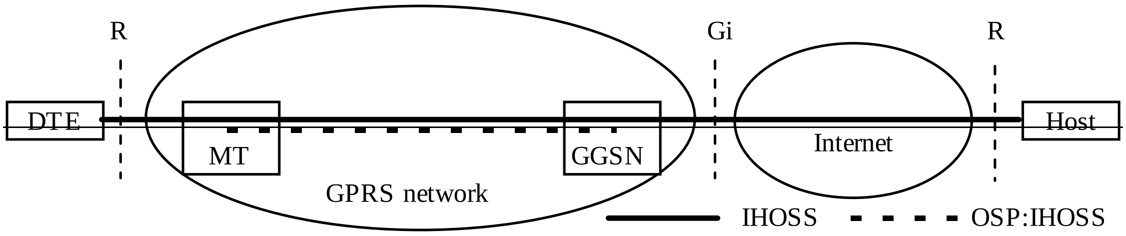
Void.

~~13.1 Introduction~~

~~This section describes the GGSN aspects of the GPRS Internet Hosted Octet Stream Service (IHOSS). This is a MO-only, connection-oriented service that carries an unstructured octet (character) stream between a GPRS MS and an Internet Host.~~

~~IHOSS uses OSP:IHOSS which is a subset of the Octet Stream Protocol (OSP) PDP type to provide a 'character pipe' between the MS and the GGSN. In the GGSN there is a relay function between the OSP and the Internet Host protocol (usually TCP). An annex to GSM 07.60 contains the generic description of OSP. The subset of features of OSP that are used by OSP:IHOSS is also described in GSM 07.60.~~

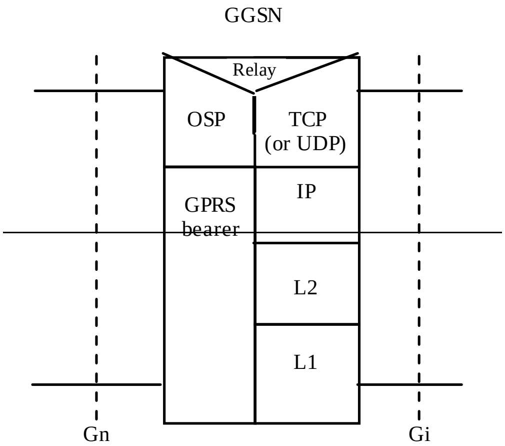
~~Figure 17 shows the scope of IHOSS and OSP:IHOSS.~~



~~Figure 17: Scope of the Internet Hosted Octet Stream Service and Octet Stream Protocol~~

~~13.2 Protocol stacks at the GGSN~~

~~Figure 18 shows the protocol stacks at the GGSN. The GGSN contains a relay function between OSP and and the protocol used on the Internet (usually TCP, alternatively UDP).~~



~~Figure 18: Protocol stacks at the GGSN~~

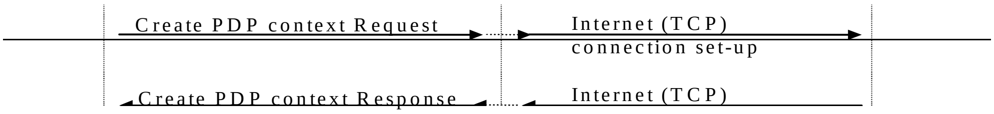
~~13.3 IHOSS connection control and OSP PDP context management~~

~~Establishing an IHOSS connection involves setting up two segments, the PLMN segment (using the OSP) between the MS and GGSN, and the Internet segment between the GGSN and the Internet Host. There is a one-to-one mapping between the PLMN segment of an IHOSS connection and an OSP:IHOSS context. When the IHOSS connection is established, an OSP PDP context is activated. When the connection is released, the context is deactivated. Each context supports only one IHOSS connection.~~

~~13.3.1 Connection establishment and PDP context activation~~

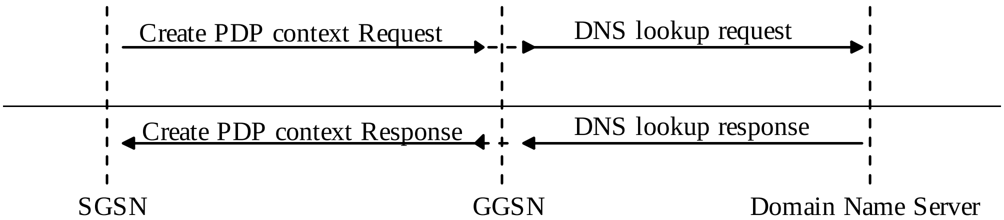
~~Establishing the PLMN segment of an IHOSS connection follows the normal procedures for PDP context activation described in GSM 03.60 using messages described in GSM 04.08 (MS-SGSN) and GSM 09.60 (SGSN-GGSN).~~

~~A request to establish an IHOSS connection is signalled to the GGSN by the receipt of a Create PDP context Request message from an SGSN with the PDP type set to OSP:IHOSS. The PDP configuration options may provide information to enable the GGSN to set up a connection to the Internet host. (The contents and format of the PDP configuration options are described in GSM 07.60.) Alternatively this information may be derived from subscription information in the HLR and configuration information within the GGSN.~~



~~Figure 19: IHOSS connection establishment (TCP over the Internet)~~

~~In the case where TCP is used over the Internet (figure 19), the response creating the context activation request is returned to the SGSN only when the TCP connection to the Internet host has been established. If the TCP connection attempt fails, the request to create a context is rejected.~~



~~Figure 20: IHOSS connection establishment (UDP over the Internet)~~

~~In the case where UDP is used over the Internet (figure 20), the response accepting the context activation request is returned to the SGSN only when a successful DNS lookup of the Internet host name has been completed. If the lookup fails, the request to create a context is rejected. (The GGSN may perform additional checks before responding to the context activation request but these are not specified here.)~~

~~13.3.2 Connection release and PDP context deactivation~~

~~When the IHOSS connection is released the OSP:IHOSS context is deactivated. The disconnection can be originated either by the MS or the Internet host (TCP only), or exceptionally by the SGSN under fault conditions. An MS-initiated or SGSN-initiated disconnection is signalled to the GGSN by the receipt of a Delete PDP context request from an SGSN.~~

~~In the case where TCP is used over the Internet, the GGSN first clears the TCP connection and then sends a Delete PDP context response to the SGSN.~~

~~In the case where UDP is used over the Internet, the GGSN sends a Delete PDP context response to the SGSN immediately, there being no actual Internet connection to clear.~~

~~The GGSN signals an Internet host-initiated disconnection to the SGSN by sending a Delete PDP context request.~~

~~13.4 OSP:IHOSS - TCP (UDP) relay~~

~~13.4.1 Required feature~~

~~13.4.1.1 Flow control~~

~~The OSP flow control procedures shall map on to the TCP flow control procedures. There is no flow control mapping in the case of UDP.~~

~~13.4.2 Optional features~~

~~13.4.2.1 Break handling~~

~~The OSP break procedure may map on to the TCP break procedure. There is no break mapping in the case of UDP.~~

~~13.4.2.2 GGSN maximum buffer size~~

~~Although the OSP entity in the GGSN does not have a PAD, it still requires buffers to hold the relayed packets. The GGSN PAD maximum buffer size parameters (in the Protocol Configuration Options) may be used to specify the maximum buffer sizes for the two directions of data transfer. Details are given in GSM 07.60.~~

**************************** End of changes **

3GPP TSG-CN3 Meeting #16
Sophia Antipolis, France, 26 Feb-02 Mar 2001

Tdoc N3-010114

CR-Form-v3

CHANGE REQUEST

⌘	**27.060**	**CR 015**	⌘ rev	**-**	⌘ Current version:	**3.4.0** ⌘

*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:	⌘	Removal of IHOSS and OSP		
Source:	⌘	TSG_CN WG3		
Work item code:	⌘	GPRS	***Date:*** ⌘	2001-02-12
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:	⌘	It was decided at TSG-SA#8 to remove the IHOSS service from R98 and onwards (SP-000197). This CR aligns the targeted specification accordingly. Furthermore, since the 'Modem and ISDN Interworking' WI has previously been deleted there is also no need anymore for the Octet Stream Protocol (OSP).
Summary of change:	⌘	This CR deletes the OSP and IHOSS from the specification text.
Consequences if not approved:	⌘	The specification is not aligned with the R99 22.060 and 23.060.

Clauses affected:	⌘	'Foreword', 3.2, 5, 11, A, B			
Other specs affected:	⌘	X	Other core specifications	⌘	22.060, 23.060, 24.008, 27.007, 29.060, 29.061
			Test specifications		
			O&M Specifications		
Other comments:	⌘	The issue was discussed and postponed at CN3#8 (N3-000029).			

Foreword

This Technical Specification (TS) has been produced by the 3rd Generation Partnership Project (3GPP).

The present document defines the requirements for TE-MT interworking over the R-reference point for the Packet Domain, within the GSM and 3GPP systems.~~ In addition, annex B describes the Octet Stream Protocol (OSP) PDP type.~~

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 the present document, 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 or greater 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 document.

**************************** Next changed section **

3.2 Abbreviations

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

APN	Access Point Name
GGSN	Gateway GPRS Support Node
GPRS	General Packet Radio Service
GSN	GPRS Support Node
GTP-U	GPRS Tunnelling Protocol for user plane
HDLC	High Level Data Link Control
ICMP	Internet Control Message Protocol
IETF	Internet Engineering Task Force
~~IHOSS~~	~~Internet Hosted Octet Stream Service~~
IP	Internet Protocol
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
LA	Location Area
LCP	Link Control Protocol
LLC	Logical Link Control
MAC	Medium Access Control
MCML	Multi-Class Multi-Link PPP
ME	Mobile Equipment
MP	Multilink PPP
MS	Mobile Station
MT	Mobile Termination
NCP	Network Control Protocol
~~OSP~~	~~Octet Stream Protocol~~
~~OSP:IHOSS~~	~~Octet Stream Protocol for Internet Hosted Octet Stream Service~~
~~PAD~~	~~Packet Assembler/Disassembler~~

PDCP	Packet Data Convergence Protocol
PDN	Packet Data Network
PDP	Packet Data Protocol , e.g., IP or PPP
PDU	Protocol Data Unit
PPP	Point-to-Point Protocol
PS	Packet Switched
PTM	Point To Multipoint
PTP	Point To Point
PVC	Permanent Virtual Circuit
RA	Routing Area
SGSN	Serving GPRS Support Node
SNDCP	SubNetwork Dependent Convergence Protocol
TCP	Transmission Control Protocol
TE	Terminal Equipment
TFT	Traffic Flow Template
UDP	User Datagram Protocol

************************* **Next changed section** ***

5 Functions to support data services

The main functions of the MT to support data services are:

- physical connection at the reference point R;
- flow control between TE and MT;
- mapping of user signalling to/from the Packet Domain bearer;
- mapping of packets belonging to different flows to appropriate PDP contexts;
- support of data integrity between the terminal equipment and the Packet Domain bearer;
- ~~functions to support character based data;~~
- functions to support packet based data.

************************* **Next changed section** ***

11 Internet Hosted Octet Stream Service (IHOSS)

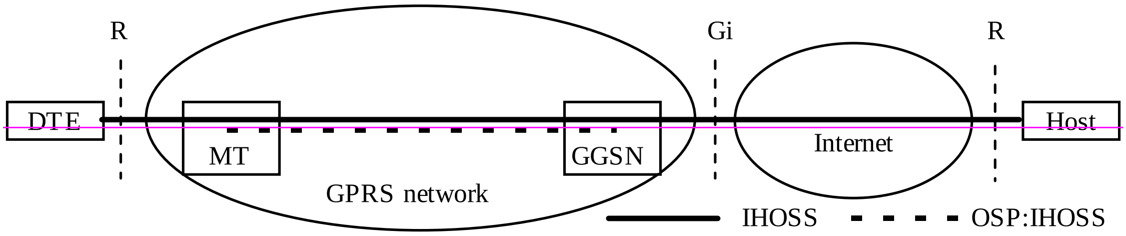
Void.

~~11.1 Introduction~~

~~This subclause describes the MS aspects of the Packet Domain Internet Hosted Octet Stream Service (IHOSS). This is a MO-only, connection-oriented service that carries an unstructured octet (character) stream between a MS supporting Packet Switched services and an Internet Host.~~

~~IHOSS uses OSP:IHOSS which is a subset of the Octet Stream Protocol (OSP) PDP type to provide a 'character pipe' between the MS and the GGSN. In the GGSN there is a relay function between the OSP and the Internet Host protocol (usually TCP). An annex to the present document contains the generic description of OSP. The features of OSP that are used by OSP:IHOSS are described later in this subclause.~~

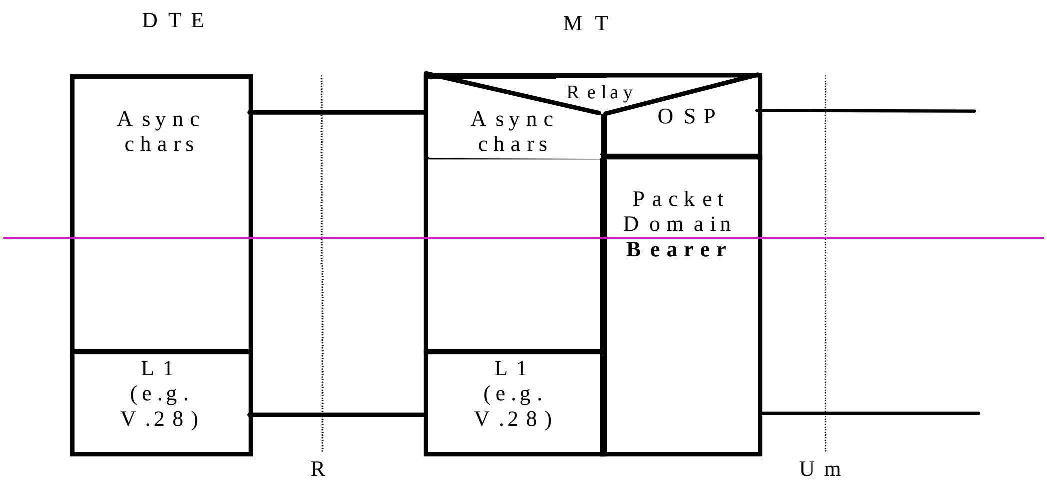
~~Figure 10 shows the scope of IHOSS and OSP:IHOSS.~~



~~Figure 10: Scope of the Internet Hosted Octet Stream Service and Octet Stream Protocol~~

~~11.2 Example of protocol stacks at the MT~~

~~Figure 11 shows an example of the protocol stacks at the MT. The MT contains a relay function between OSP and an asynchronous character interface.~~



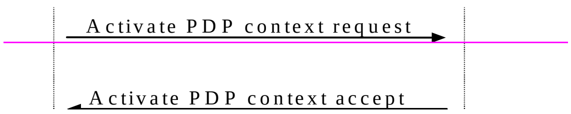
~~Figure 11: Example of protocol stacks for a MT with an asynchronous serial interface~~

~~11.3 IHOSS connection control and OSP PDP context management~~

~~Establishing an IHOSS connection involves setting up two segments, the PLMN segment (using the OSP) between the MS and GGSN, and the Internet segment between the GGSN and the Internet Host. There is a one-to-one mapping between the PLMN segment of an IHOSS connection and an OSP:IHOSS context. When the IHOSS connection is established, an OSP PDP context is activated. When the connection is released, the context is deactivated. It is possible for a suitably designed MT to activate multiple simultaneous OSP PDP contexts (subject to any limits imposed by the Packet Domain network), each context supporting one IHOSS connection.~~

~~11.3.1 Connection establishment and PDP context activation~~

~~Establishing the PLMN segment of an IHOSS connection follows the normal procedures for PDP context activation described in 3G TS 23.060 using messages described in 3G TS 24.008 (MS-SGSN) and 3G TS 29.060 (SGSN-GGSN). Figure 12 illustrates the procedure when TCP is used over the Internet.~~



~~Figure 12: IHOSS connection establishment~~

~~The MS requests that an OSP PDP context be set up by sending an Activate PDP context request message. The PDP type is set to OSP:IHOSS. The PDP configuration options may provide information to enable the GGSN to set up a connection to the Internet host (Alternatively this information may be derived from subscription information in the HLR and configuration information within the GGSN).~~

~~In the case where TCP is used over the Internet, the response accepting the context activation request is returned to the MS only when the TCP connection to the Internet host has been established. If the TCP connection attempt fails, an Activate PDP context reject message is returned.~~

~~In the case where UDP is used over the Internet, the response accepting the context activation request is returned to the MS only when at least a successful DNS lookup of the Internet host name has been completed. If the lookup fails, an Activate PDP context reject message is returned (The GGSN may perform additional checks before responding to the context activation request).~~

~~The format of the Activate PDP context request message is shown below:~~

- ~~Activate PDP Context Request (~~
- ~~NSAPI = generated within MS,~~
- ~~PDP type = OSP:IHOSS,~~
- ~~PDP address = null,~~
- ~~APN = as required or null - this may be provided by the HLR,~~
- ~~QoS requested = as defined in the generic OSP specification or null - this may be provided by the HLR,~~
- ~~PDP configuration options = (Internet hostname, port number, protocol type, maximum GGSN buffer sizes, OSP version number - all optional)~~
- ~~)~~

~~The format of the PDP configuration options is described in a later clause.~~

~~11.3.2 Connection release and PDP context deactivation~~

~~When the IHOSS connection is released the OSP:IHOSS context is deactivated. The disconnection can be originated either by the MT or the Internet host, or exceptionally by the SGSN under fault conditions. The MT initiates disconnection by sending a Deactivate PDP context request. This is acknowledged by the receipt of a Deactivate PDP context accept which indicates that the Internet connection has been cleared. An Internet host or SGSN initiated disconnection is signalled to the MT by the receipt of a Deactivate PDP context request which it acknowledges by sending a Deactivate PDP context accept.~~

~~11.4 OSP:IHOSS subset of OSP~~

~~11.4.1 Required features~~

~~The following features of OSP are required for the OSP:IHOSS subset of OSP.~~

~~11.4.1.1 User data transport~~

~~This is as specified in the generic OSP description.~~

~~11.4.1.2 Flow control~~

~~This shall map on to the local flow control mechanism at the DTE-MT interface.~~

~~11.4.2 Optional features~~

~~The following features of OSP are optional for the OSP:IHOSS subset of OSP.~~

~~11.4.2.1 Break handling~~

~~The OSP break procedure may be mapped on to the local break mechanism at the DTE-MT interface.~~

~~11.4.2.2 Packet Assembler/Disassembler~~

~~If the DTE-MT interface is character-oriented, a PAD is required in the OSP entity in the MT. The PAD may have pre-set values for the forwarding criteria parameters or they may configurable using, for example, an AT command.~~

~~If the interface to the application is block-oriented, for example in an embedded system, the PAD function is not needed.~~

~~11.4.2.3 GGSN maximum buffer size negotiation~~

~~Although the OSP entity in the GGSN does not have a PAD, it still requires buffers to hold the relayed packets. The following GGSN PAD parameters (in the Protocol Configuration Options) may be used to specify the maximum buffer sizes for the two directions of data transfer.~~

~~PAD Parameter Direction;~~

~~Assembly buffer max size (253) GGSN to MS;~~

~~Disassembly buffer max size (254) MS to GGSN.~~

~~11.4.3 Not-required features~~

~~The following features of OSP are not required for the OSP:IHOSS subset of OSP:~~

- ~~Control block transport;~~
- ~~remote configuration of OSP PAD in the GGSN (appart from the optional GGSN buffer size configuration - see above);~~
- ~~OSP protocol version negotiation (OSP: IHOSS uses the default version (0) of OSP).~~

~~11.5 Protocol option parameters~~

~~All these parameters in the PDP context activation request are optional. If not provided by the MT, this information may be derived from subscription information in the HLR and configuration information within the GGSN. The parameters use the syntax described in 3G TS 24.008.~~

~~11.5.1 Hostname~~

~~This refers to the Internet host to which the connection will be made.~~

~~Option ID 128.~~

~~Lengthnumber of characters in the Hostname:~~

~~Contents an IA5 character string which is the fully formed domain name extended hostname.~~

~~11.5.2 Port Number~~

~~This refers to the TCP or UDP port on the host identified by Hostname, which forms the endpoint of the Internet side of the connection.~~

~~Option ID 129.~~

~~Lengthnumber of characters in the Port Number.~~

~~Contents an IA5 character string which is the Port Number in decimal.~~

~~NOTE: If no port number is specified, a default value of 23 is used by the GGSN.~~

~~11.5.3 Protocol Type - TCP or UDP~~

~~This refers to the protocol used over IP on the GGSN to Internet host segment of the connection. The options available are Transmission Control Protocol (TCP) or User Datagram Protocol (UDP).~~

~~Option ID 130.~~

~~Length3.~~

~~Contents an IA5 character string which is either “TCP” or “UDP”. All other values are reserved.~~

~~If no Protocol Type is specified, TCP is used by the GGSN.~~

~~11.5.4 GGSN PAD parameters (maximum buffer sizes only)~~

~~The GGSN PAD options parameter is described in the generic OSP specification.~~

**************************** Next changed section ***

Annex A (informative): Summary of AT commands for the Packet Domain

This informative annex lists the AT commands for the Packet Domain that are fully described in 3G TS 27.007.

Table A.1: Summary of AT commands for the packet domain

Command	Description
+CGACT	PDP context activate or deactivate
+CGANS	Manual response to a network request for PDP context activation
+CGATT	PS attach or detach
+CGAUTO	Automatic response to a network request for PDP context activation
+CGCLASS	PS mobile station class
+CGCLOSP	<VOID>~~Configure local Octet Stream PAD parameters~~
+CGCLPAD	<VOID>
+CGDATA	Enter data state
+CGDCONT	Define PDP context
+CGEREP	Control unsolicited PS event reporting
+CGPADDR	Show PDP address
+CGREG	Packet Domain network registration status
+CGQMIN	Quality of service profile (minimum acceptable)
+CGQREQ	Quality of service profile (requested)
+CGSMS	Select service for MO SMS messages

Table A.2: Summary of Packet Domain Extensions to existing GSM AT commands

Command	Description
+CEER	Extended error report (refer to 27.007)
+CMEE	Report mobile equipment error (refer to 27.007)
+CR	Service reporting control (refer to 27.007)
+CRC	Cellular result codes (refer to 27.007)

Table A.3: Summary of AT commands for Packet Domain modem compatibility mode

Command	Description
A	Answer – manual acceptance of a network request for PDP context activation
D	Dial – request Packet Domain service
H	On-hook - manual rejection of a network request for PDP context activation
S0	Automatic answering control - automatic acceptance of a network request for PDP context activation

************************* **Next changed section** ***

Annex B (informative): Octet Stream Protocol (OSP) PDP type

Void.

~~B.1 Scope~~

~~The Octet Stream Protocol (OSP) is used to carry an unstructured octet (character) stream between the MS and GGSN. It is used to provide a 'character pipe' to allow a MS to communicate (via the GGSN) with an arbitrary Internet host, or other character-based service. Unlike PDP types such as IP and X.25, OSP has no existence outside the PLMN. In the MS there is a character stream at the R reference point together with some optional control signals. In the GGSN there is a relay function, carrying the same character stream and control signals between the OSP entity and a fixed network protocol stack.~~

~~An OSP entity has two modes of operation. In octet mode, it uses a Packet Assembly function to assemble a number of user octets into a single packet for more efficient transport by the underlying packet protocol. A complementary Packet Disassembly function in the same OSP entity performs the reverse operation. In block mode, an OSP entity's Packet Assembly and Disassembly functions are bypassed. Data is transferred between the OSP user and the OSP entity in blocks of octets. Each block of octets is carried in a single packet of the underlying protocol. The selection of octet or block mode is made independently for each OSP entity as an implementation or configuration decision before a connection is established and remains fixed for the duration of that connection.~~

~~An example of the use of block mode is when OSP is used for interworking with a fixed network where the octet stream is also carried in packets. The use of the block mode in the OSP entity in the GGSN avoids the use of back-to-back PADs. Block mode could also be used in a MS where the MT function is embedded in a larger piece of equipment and the application transfers data in blocks of octets.~~

~~OSP uses the services of SNDCP between the MS and SGSN, and the services of GTP between the SGSN and GGSN. The Quality of Service is determined mainly by that provided by the underlying layers. However, the end-to-end delay may be affected by the presence of the PAD (Packet Assembler/Disassembler) function. For most applications it is anticipated that a reliable (acknowledged) service will be provided by the underlying layers.~~

~~In summary, the main functions of OSP are:~~

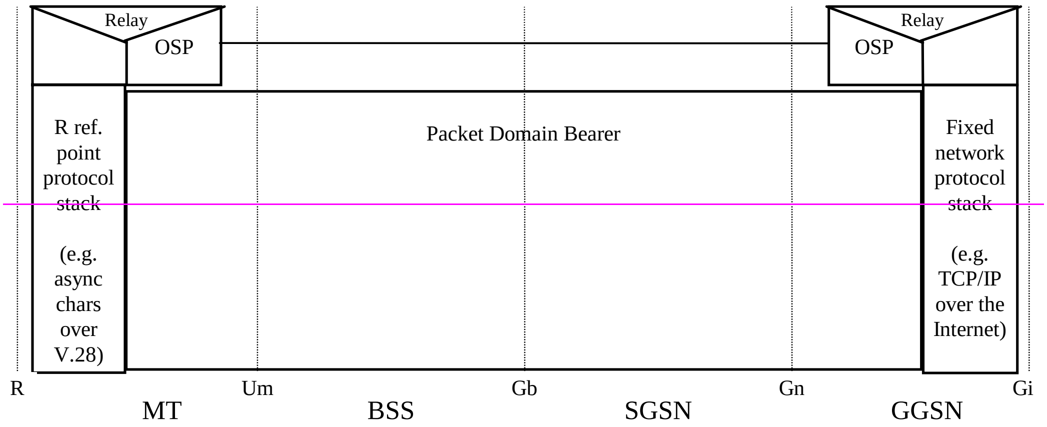
- ~~transport of an unstructured octet stream;~~
- ~~Packet Assembly/Disassembly (to make efficient use of network resources);~~
- ~~end-to-end flow control.~~

~~In addition OSP may provide:~~

- ~~transport of a 'break' signal;~~
- ~~transport of blocks of control information between the OSP users;~~
- ~~user control of packet assembly buffer forwarding;~~

~~- direct OSP user access to the underlying packet service, bypassing the PAD.~~

~~Figure B.1 shows how OSP fits into the overall Packet Domain protocol model.~~



~~Figure B.1: Relationship of OSP to the rest of the packet domain protocol architecture~~

~~B.2 Service primitives~~

~~B.2.1 Service Primitives provided by the OSP layer~~

~~The service provided by the OSP layer to its user (the layer above) is described in terms of service primitives. An example of the use of the OS-DATA.request and OS-DATA.indications primitives to transfer an octet or block of octets from one OSP user to another is shown in figure B.2.~~

~~Figure B.2: An example of the use of the OS-DATA primitives~~

~~The primitives provided by the OSP layer are listed in table B.1.~~

~~**Table B.1: OSP layer service primitives**~~

~~Generic Name~~	~~Type~~				~~Parameters~~
	~~Request~~	~~Indication~~	~~Response~~	~~Confirm~~	
~~**OSP User (MS or GGSN) <---> OSP**~~					
~~OS-DATA~~	~~X~~	~~X~~	~~-~~	~~-~~	~~D-PDU (single octet or block of octets)~~
~~OS-UNITDATA~~	~~X~~	~~X~~	~~-~~	~~-~~	~~D-PDU (single octet or block of octets)~~
~~OS-FLOWCONTROL~~	~~X~~	~~X~~	~~-~~	~~-~~	~~Requested flow control state (STOP or START)~~
~~OS-BREAK~~	~~X~~	~~X~~	~~-~~	~~-~~	~~none~~
~~OS-CONTROL~~	~~X~~	~~X~~	~~-~~	~~-~~	~~C-PDU (block of octets)~~
~~OS-FORWARD~~	~~X~~	~~-~~	~~-~~	~~-~~	~~none~~

~~B.2.1.1 OS-DATA.request~~

~~Request used by the OSP user for transmission of a D-PDU. In octet mode, the D-PDU consists of a single octet. In block mode the D-PDU consists of a block of octets. This primitive is used when the underlying protocol layers are providing a reliable service.~~

~~B.2.1.2 OS-DATA.indication~~

~~Indication used by the OSP entity to deliver the received D-PDU to the OSP user. In octet mode, the D-PDU consists of a single octet. In block mode the D-PDU consists of a block of octets.~~

~~B.2.1.3 OS-UNITDATA.request~~

~~Request used by the OSP user for transmission of a D-PDU. In octet mode, the D-PDU consists of a single octet. In block mode the D-PDU consists of a block of octets. This primitive is used when the underlying protocol layers are providing an unreliable service.~~

~~B.2.1.4 OS-UNITDATA.indication~~

~~Indication used by the OSP entity to deliver the received D-PDU to the OSP user. In octet mode, the D-PDU consists of a single octet. In block mode the D-PDU consists of a block of octets.~~

~~B.2.1.5 OS-FLOWCONTROL.request~~

~~Request used by the OSP user for the peer OSP user to update its flow control state.~~

~~B.2.1.6 OS-FLOWCONTROL.indication~~

~~Indication used by the OSP entity to request the OSP user to update its flow control state.~~

~~B.2.1.7 OS-BREAK.request~~

~~Request used by the OSP user to send a break signal to the peer OSP user.~~

~~B.2.1.8 OS-BREAK.indication~~

~~Indication used by the OSP entity to deliver a break signal to the OSP user.~~

~~B.2.1.9 OS-CONTROL.request~~

~~Request used by the OSP user to request transmission of a C-PDU. The C-PDU consists of a block of octets. The reliability of the transmission is determined by the lower layer protocols.~~

~~B.2.1.10 OS-CONTROL.indication~~

~~Indication used by the OSP entity to deliver a received C-PDU to the OSP user.~~

~~B.2.1.11 OS-FORWARD.request~~

~~Request used by the OSP user to cause immediate forwarding of the OSP Packet Assembly buffer.~~

~~B.2.2 Service Primitives Used by the OSP Layer~~

~~The OSP layer uses the service primitives provided by the SNDCP layer (see table B.2) and the GTP layer (see table B.3). SNDCP is specified in GSM 04.65 and GTP in 3G TS 29.060.~~

~~Table B.2: SNDCP service primitives used by the OSP entity~~

~~Generic Name~~	~~Type~~				~~Parameters~~
	~~Request~~	~~Indication~~	~~Response~~	~~Confirm~~	
~~OSP <---> SNDCP~~					
~~SN-DATA~~	~~X~~	~~X~~	~~-~~	~~-~~	~~N-PDU, NSAPI~~
~~SN-UNITDATA~~	~~X~~	~~X~~	~~-~~	~~-~~	~~N-PDU, NSAPI, protection mode~~

~~B.2.2.1 SN-DATA.request~~

~~Request used by the SNDCP user for acknowledged transmission of an N-PDU. The successful transmission of an SN-PDU shall be confirmed by the LLC layer. The SN-DATA.request primitive conveys the NSAPI to identify the PDP using the service.~~

~~B.2.2.2 SN-DATA.indication~~

~~Indication used by the SNDCP entity to deliver a received N-PDU to the SNDCP user. Successful reception has been acknowledged by the LLC layer.~~

~~B.2.2.3 SN-UNITDATA.request~~

~~Request used by the SNDCP user for unacknowledged transmission of an N-PDU. The SN-UNITDATA.request primitive conveys the NSAPI to identify the PDP using the service and protection mode to identify the requested transmission mode.~~

~~B.2.2.4 SN-UNITDATA.indication~~

~~Indication used by the SNDCP entity to deliver a received N-PDU to the SNDCP user.~~

~~Table B.3: GTP service primitives used by the OSP entity~~

~~Generic Name~~	~~Type~~				~~Parameters~~
	~~Request~~	~~Indication~~	~~Response~~	~~Confirm~~	
~~OSP <---> GTP~~					
~~GT-DATA~~	~~X~~	~~X~~	~~-~~	~~-~~	~~N-PDU, TID~~
~~GT-UNITDATA~~	~~X~~	~~X~~	~~-~~	~~-~~	~~N-PDU, TID~~

~~B.2.2.5 GT-DATA.request~~

~~Request used by the GTP user for acknowledged transmission of an N-PDU. The successful transmission of an SN-PDU shall be confirmed by the TCP layer. The SN-DATA.request primitive conveys TID to identify the PDP using the service.~~

~~B.2.2.6 GT-DATA.indication~~

~~Indication used by the GTP entity to deliver the received N-PDU to the GTP user. Successful reception has been acknowledged by the TCP layer.~~

~~B.2.2.7 GT-UNITDATA.request~~

~~Request used by the GTP user for unacknowledged transmission of an N-PDU. The SN-UNITDATA.request primitive conveys TID to identify the PDP using the service. This uses UDP as the path protocol.~~

~~B.2.2.8 GT-UNITDATA.indication~~

~~Indication used by the GTP entity to deliver the received N-PDU to the GTP user.~~

~~B.3 OSP Functional model~~

~~Figure B.3: OSP functional model~~

~~The main functions of the OSP entity are shown in figure B.3.~~

~~At the sending side, in octet mode, octets from the OSP user (D-PDUs) are accumulated by the Packet Assembler until some forwarding criterion is satisfied. Forwarding can be forced by the user if required. The resulting packet is then passed to the multiplexing function (MUX). In block mode, D-PDUs are passed directly to the MUX. The MUX combines these packets of user data with flow control requests and optionally break requests and control blocks (C-PDUs). (A control block is a delimited set of octets whose maximum size is determined by the limits imposed by the underlying protocol.) The resulting stream of N-PDUs is passed to the SNDCP or GTP layer below.~~

~~At the receiving side, the N-PDUs from the SNDCP or GTP layer below are passed to the demultiplexing (DEMUX) function. Here the packets of user data, flow control indications, and (if implemented) break indications and control blocks (C-PDUs) are separated out. In block mode, the packets of user data are passed directly to the OSP user. In octet mode, they are passed to the Packet Disassembler which regenerates the original stream of octets (D-PDUs).~~

~~B.4 OSP N-PDU (packet) format~~

~~Each N-PDU shall contain an integral number of octets, and shall comprise a header part and a data part. An N-PDU shall contain data from zero or more D-PDUs or a single C-PDU (D-PDUs and C-PDUs may not be mixed in the same N-PDU).~~

~~The bit and octet numbering convention used in the present document is illustrated in figure B.4. The bits are grouped into octets. The bits of an octet are shown horizontally and are numbered from 1 to 8. Multiple octets are shown vertically and are numbered from 1 to N.~~

~~Bit~~	~~8~~	~~7~~	~~6~~	~~5~~	~~4~~	~~3~~	~~2~~	~~1~~
~~Octet 1~~								
~~2~~								
~~…~~								
~~N-1~~								
~~Octet N~~								

~~Figure B.4: Numbering convention~~

~~N-PDUs are transferred between the OSP layer and the SNDCP or GTP layer in ascending numerical octet order (i.e. octet 1, 2, …, N-1, N).~~

~~B.4.1 OSP header~~

~~The OSP header is contained in octet 1. The use of bits 1-4 and bit 8 are described below. Bits 5-7 are not used in this version of the protocol and shall be set to zero by the sender and ignored by the receiver.~~

~~B.4.1.1 Bit 1 - Extension (E)~~

~~This is provided to allow the OSP header in future versions of the protocol to consist of more than one octet. In this version of the protocol E shall always be set to 1 by the sender and checked by the receiver.~~

~~B.4.1.2 Bit 2 - Ready to Receive (RTR) - flow control~~

~~This bit indicates if the OSP entity that sent the N-PDU is able to receive data from its peer OSP entity.~~

~~RTR = 0 not ready to receive.~~

~~RTR = 1 ready to receive.~~

~~B.4.1.3 Bit 3 - Break Request (BR)~~

~~This bit requests that the receiving OSP entity shall signal a break to its user.~~

~~BR = 0 no break.~~

~~BR = 1 signal break.~~

~~B.4.1.4 Bit 4 - Break Acknowledge (BA)~~

~~This bit indicates that the sending OSP entity has signalled a break to its user in response to a Break Request.~~

~~BA = 0 no acknowledge break.~~

~~BA = 1 acknowledge break.~~

~~B.4.1.5 bit 8 - payload type (PT)~~

~~This bit indicates whether the payload contains user data or a control block.~~

~~PT = 0 data (zero or more D-PDUs).~~

~~PT = 1 control (zero or one C-PDU).~~

~~B.4.2 OSP payload~~

~~This consists of one of the following.~~

~~B.4.2.1 User data~~

~~This consists of zero or more (up to some maximum - TBD) octets of user data (zero or more D-PDUs).~~

~~B.4.2.2 Control block~~

~~This consists of the contents of zero or one C-PDU.~~

~~B.5 Packet Assembly/Disassembly (PAD) function~~

~~In order to make efficient use of the network resources, particularly the radio resource, D-PDUs (octets) received from the OSP user are not forwarded immediately but are placed in a buffer. When some forwarding criterion is satisfied, the contents of the buffer are forwarded in the payload of an N-PDU to the layer below. At the receiving end, the payload of an N-PDU received from the layer below is placed in a buffer and the octets are delivered to the OSP user as a stream of D-PDUs (octets). The PAD is used only when the OSP entity is operating in octet mode. It is not used when the OSP entity is operating in block mode.~~

~~B.5.1 Packet Assembler~~

~~The packet assembler shall be able to detect the following forwarding criteria. When any one criterion is satisfied, the contents of the buffer shall be forwarded in an N-PDU (of type User Data) to the layer below, subject to any flow control condition. Whenever a buffer is forwarded, the inactivity timer is stopped (if it is running).~~

~~B.5.1.1 Buffer full~~

~~The buffer contents are forwarded when the number of octets in the buffer reaches the value of the maximum buffer size parameter.~~

~~The maximum N-PDU size is equal to the maximum buffer size plus the size of the OSP header. It should be chosen so as to make efficient use of the network resources, particularly the radio resources. Although it is possible to calculate the overhead imposed by the various underlying protocol layers, it is not possible to predict exactly how an N-PDU will be mapped on to radio frames even if the channel coding is known. This is because the SNDCP layer may use data compression, the efficiency of which depends on the compressibility of the data. However, since the SNDCP layer is able to segment and reassemble long N-PDUs, it is recommended that the maximum N-PDU size should be several times the largest radio frame size, allowing for a typical compression ratio of, say, 2:1. This will ensure that most radio frames are full.~~

~~The maximum size for the packet assembly buffer is specified by PAD parameter 253. The value is in the range 1-65 535 octets.~~

~~The maximum size for the packet disassembly buffer is specified by PAD parameter 254. The value is in the range 1-65 535 octets.~~

~~B.5.1.2 Inactivity timer expiry~~

~~Whenever an octet is placed in the buffer the inactivity timer shall be started, set to the value of the inactivity time parameter. When the timer expires, the buffer contents are forwarded. The timer has the following functions:~~

1. ~~to ensure that octets don't remain in the buffer for ever;~~
2. ~~to detect significant gaps in the stream of octets and try to ensure that these gaps match the N-PDU boundaries. This is beneficial for data that at the user level is in blocks of octets, e.g. a PPP frame. It means that the trailing octets of a block do not get delayed (since they are forwarded when the timer expires). Also, because the timer is restarted whenever a new octet appears, it ensures that blocks do not get split unless the buffer becomes full;~~

3. ~~to give interactive traffic a reasonable response time.~~

~~The inactivity time parameter should be set to be longer than the inter-octet time but shorter than the inter-block time to ensure optimum forwarding of blocked data. It shall be possible to set it to an infinite time, i.e. the timer never expires.~~

~~The maximum buffer delay timer is specified by PAD parameter 4 and values shall be in the range 1-255 (units of 1/20 of a second). Additionally, the value 0 disables the timer. The default value is 0.~~

~~B.5.1.3 Maximum Buffer Delay timer expiry (optional)~~

~~When the first octet is placed into the (empty) buffer, a maximum buffer delay timer may optionally be started, set to the value of the maximum buffer delay parameter. When the timer expires, the buffer contents are forwarded. Thistimer ensures that no octet is delayed in the buffer for more than the specified time.~~

~~The maximum buffer delay timer is specified by PAD parameter 255 and values shall be in the range 1-255 (units of ½ of a second). Additionally, the value 0 disables the timer. The default value is 0.~~

~~B.5.1.4 Special character(s)~~

~~Whenever an octet has been placed in the buffer, it is compared (lower 7 bits only) with a list of 'special characters'. If it matches, the buffer is forwarded.~~

~~The possible characters and combinations of characters are specified by PAD parameter 3. Permitted values are listed below.~~

~~Value~~	~~Characters~~
~~0~~	~~disabled~~
~~1~~	~~A-Z, a-z, 0-9~~
~~2~~	~~CR~~
~~4~~	~~ESC, BEL, ENQ, ACK~~
~~8~~	~~DEL, CAN DC2~~
~~16~~	~~ETX, EOT~~
~~32~~	~~HT, LF, VT, FF~~
~~64~~	~~all characeters between NUL and US not listed above~~

~~Values may be added to create further combinations, e.g., 34 (=2+32) corresponds to CR, HT, LF, VT, FF.~~

~~B.5.1.5 Change in flow control state~~

~~An N-PDU (type User Data) carries flow control information in the OSP header as well as user data in the payload. If there is a need to signal a change in the Ready to Receive condition, the buffer shall be forwarded immediately with the appropriate (new) value of RTR in the OSP header, unless the change has already been signalled using an N-PDU with an empty payload.~~

~~B.5.1.6 Immediate forwarding request~~

~~When the OSP entity receives a OS-FORWARD.request primitive from its user, it shall immediately forward the buffer unless it is empty.~~

~~B.5.2 Packet Disassembler~~

~~The packet disassembler shall forward the contents of the N-PDU (type User data) payload to the OSP user, subject to any local flow control condition.~~

~~B.6 Flow control~~

~~The OSP entity maintains two variables indicating the readiness of the local OSP entity (itself) and the remote OSP entity (its peer) to receive data.~~

~~Local - variable RTRL.~~

~~The value of RTRL is updated as a result of the receipt of OS-FLOWCONTROL.request primitives from the OSP user and changes in buffer conditions within the OSP entity. When the user requests STOP, RTRL shall immediately be set to 0. When the user requests START, RTRL may be set to 1 immediately or this may be delayed subject to buffer conditions.~~

~~The value of RTRL is copied into the RTR bit of every N-PDU transmitted. Whenever RTRL changes, an N-PDU is sent immediately to signal the change to the peer OSP entity. This may be done by either sending an N-PDU with an empty payload or immediately forwarding the packetiser buffer.~~

~~RTRL may also be set to 0 or 1 by the OSP entity as a result of buffer conditions within the OSP entity.~~

~~Remote - variable RTRR.~~

~~The value of RTRR is updated from the RTR bit of every N-PDU received. When RTRR changes to 0, an OS-FLOWCONTROL.indication(STOP) primitive shall be sent immediately to the OSP user. When RTRR changes to 1, an OS-FLOWCONTROL.indication (START) primitive may be sent immediately to the OSP user or this may be delayed subject to buffer conditions.~~

~~STOP and START indications may also be sent at any time as a result of buffer conditions within the OSP entity.~~

~~B.7 Break handling~~

~~When an OSP entity receives an OS-BREAK.request from its user it shall immediately send an N-PDU (type User Data) with the Break Request (BR) bit in the OSP header set to 'signal break' and an empty payload. Any data in the packetiser buffer shall be discarded and not transmitted in the N-PDU. Further data received from the OSP user shall be processed in the normal way. The OSP entity shall discard any buffered data already received from its peer entity and, when operating over a reliable service, shall continue discarding received N-PDUs (type user data) until it receives one with the Break Acknowledge (BA) bit in the OSP header set to 'acknowledge break '. Any data in the received N-PDU shall be processed in the normal way. N-PDUs (type control) are not discarded.~~

~~When operating over an unreliable service, the OSP entity sending ‘signal break’ shall protect itself from the risk of lockup resulting from the loss of either or both of the N-PDUs containing ‘signal break’ or ‘break acknowledge’. This is implementation dependent. (A simple implementation could resume processing received N-PDUs immediately and ignore any received ‘break acknowledge’.)When an OSP entity receives an N-PDU (type User Data) with the BR bit set to 'signal break' it shall immediately signal a break to its user with an OS-BREAK.indication. The OSP entity shall discard all buffered data for both directions of flow and acknowledge the break by sending an N-PDU (type User Data) with the Break Acknowledge (BA) bit in the OSP header set to 'acknowledge break'. This may either be sent immediately with no data or wait until one of the forwarding criteria is satisfied.~~

~~B.8 Control block transport~~

~~An OSP user may use the OS-CONTROL.request primitive to send a C-PDU (block of control information) consisting of zero or more octets to its peer user. An N-PDU (type Control Block) is sent immediately, regardless of whether there is any data in the packetiser buffer or flow control condition. If it is necessary to forward the buffer contents before sending the control block, the OSP user should issue an OS-FORWARD.request before the OS-CONTROL.request. The C-PDU is delivered immediately to the receiving OSP user with the OS-CONTROL.indication primitive, regardless of the state of the depacketiser buffer or local flow control condition. The octet ordering within the block and the block boundaries are preserved.~~

~~B.9 Quality of Service~~

~~The Quality of Service (QoS) provided by the OSP layer is determined almost entirely by that provided by the underlying protocol layers. However, the Packet Assembly and Disassembly functions introduce an additional variable delay into the transmission path. This delay can be limited at the risk of making less efficient use of network resources (particularly radio resources). The PAD function is described in detail in its own clause.~~

~~B.10 OSP version~~

~~In order to allow the possible coexistence in the future of multiple versions of OSP, each version shall be assigned a version number. The use of a particular version may be negotiated by the peer OSP entities using the OSP version subparameter of the protocol configuration options parameter in the PDP context activation request, accept and reject messages. The default in the event of no negotiation taking place is this initial version (0).~~

~~B.11 Protocol Configuration Options~~

~~The following generic OSP configuration options parameters are defined for use in the various PDP Context Activation control messages. They use the syntax described in 3G TS 24008. Option IDs 0-127 are reserved for generic use. Additional parameters with IDs in the range 128-255 may be defined for specific uses of the OSP.~~

~~Parameter values may be negotiated between the MT and GGSN OSP entities. This is a two phase negotiation with the MT making a set of proposals and the GGSN either accepting each value or proposing an alternative. The MT must either accept the new set or the connection attempt fails. The alternative values are proposed in either a PDP context activation accept or reject message.~~

~~The accept message should be used if there is a reasonable likelihood that the alternative will be acceptable to the MT, e.g. a downgrading of buffer size, since the connection may then immediately continue. If the alternative is unacceptable the MT immediately deactivates the context.~~

~~The reject message should be used if it is likely that the alternative will not be acceptable, or if a significant charge would be incurred if the context were to be activated by the GGSN and then immediately deactivated by the MT. If the alternative is acceptable the MT may reattempt context activation using the values supplied by the GGSN.~~

~~B.11.1 OSP version~~

~~This parameter is optional. It allows the MT and GGSN to negotiate a mutually acceptable version of OSP. If omitted, the initial (version 0) of OSP is assumed.~~

~~Option ID 0.~~

~~Length1.~~

~~Contents 0 indicates this (initial) version of OSP. Other values are reserved for future versions.~~

~~B.11.2 GGSN PAD parameters~~

~~This options parameter is optional and may be used if the OSP entity in the GGSN contains a PAD function. It allows the MT and GGSN to negotiate a mutually acceptable set of PAD parameters for the GGSN PAD. The maximum buffer size parameters may be negotiated even when the OSP entity in the GGSN does not contain a PAD. If not relevant to the GGSN OSP entity, the PAD options parameter shall be ignored.~~

~~Option ID 1.~~

~~Length3n (n = number of PAD parameters).~~

~~Contents Pairs of (PAD parameter, value).~~

~~The PAD parameter is 1 octet in length. The value is 2 octets in length.~~

~~Valid PAD parameters are listed in the clause describing the Packet Assembly/Disassembly function.~~

**************************** End of changes **

3GPP TSG-CN3 Meeting #16
Sophia Antipolis, France, 26 Feb-02 Mar 2001

Tdoc N3-010115

CR-Form-v3

CHANGE REQUEST

⌘	**29.061**	**CR**	**016**	⌘ rev	**-**	⌘	Current version:	**3.4.0** ⌘

*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:	⌘	Removal of IHOSS and OSP		
Source:	⌘	TSG_CN WG3		
Work item code:	⌘	GPRS	***Date:*** ⌘	2001-02-12
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:	⌘	It was decided at TSG-SA#8 to remove the IHOSS service from R98 and onwards (SP-000197). This CR aligns the targeted specification accordingly. Furthermore, since the 'Modem and ISDN Interworking' WI has previously been deleted there is also no need anymore for the Octet Stream Protocol (OSP).
Summary of change:	⌘	This CR deletes the OSP and IHOSS from the specification text.
Consequences if not approved:	⌘	The specification is not aligned with the R 99 22.060 and 23.060.

Clauses affected:	⌘	3.2, 14			
Other specs affected:	⌘	X	Other core specifications	⌘	22.060, 23.060, 24.008, 27.007, 27.060, 29.060
			Test specifications		
			O&M Specifications		
Other comments:	⌘	The issue was discussed and postponed at CN3#8 (N3-000030).			

3.2 Abbreviations

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

APN	Access Point Name
ATM	Asynchronous Transfer Mode
BG	Border Gateway
CHAP	Challenge Handshake Authentication Protocol
DHCP	Dynamic Host Configuration Protocol
DNS	Domain Name System
DVMRP	Distance Vector Multicast Routing Protocol
GGSN	Gateway GPRS Support Node
GTP-U	GPRS Tunnelling Protocol for user plane
ICMP	Internet Control Message Protocol
IETF	Internet Engineering Task Force
IGMP	Internet Group Management Protocol
~~IHOSS~~	~~Internet Hosted Octet Stream Service~~
IP	Internet Protocol
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
ISDN	Integrated Services Digital Network
ISP	Internet Service Provider
LAC	L2TP Access Concentrator
LAN	Local Area Network
~~LAPB~~	~~Link Access Protocol Balanced~~
LNS	L2TP Network Server
MIP	Mobile IP
MOSPF	Multicast Open Shortest Path First
MS	Mobile Station
MT	Mobile Terminal
MTU	Maximum Transfer Unit
NAI	Network Access Identifier
~~OSP~~	~~Octet Stream Protocol~~
~~OSP:IHOSS~~	~~Octet Stream Protocol for Internet Hosted Octet Stream Service~~
PAP	Password Authentication Protocol
PDCP	Packet Data Convergence Protocol
PDN	Packet Data Network
PDU	Protocol Data Unit
PIM-SM	Protocol Independant Multicast – Sparse Mode
PPP	Point-to-Point Protocol
PS	Packet Switched
RADIUS	Remote Authentication Dial In User Service
SGSN	Serving GPRS Support Node
SMDS	Switched Multimegabit Data Service
TCP	Transmission Control Protocol
TE	Terminal Equipment
TEID	Tunnel End-point Identifier
UDP	User Datagram Protocol

**************************** **Next changed section** **

14 Internet Hosted Octet Stream Service (IHOSS)

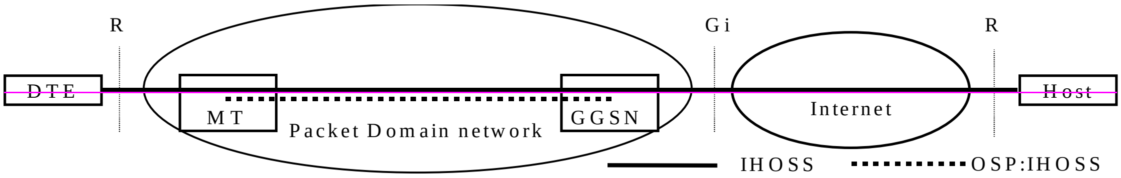
Void.

~~14.1 Introduction~~

~~This subclause describes the GGSN aspects of the Packet Domain Internet Hosted Octet Stream Service (IHOSS). This is a MO-only, connection-oriented service that carries an unstructured octet (character) stream between a Packet Domain MS and an Internet Host.~~

~~IHOSS uses OSP:IHOSS which is a subset of the Octet Stream Protocol (OSP) PDP type to provide a 'character pipe' between the MS and the GGSN. In the GGSN there is a relay function between the OSP and the Internet Host protocol (usually TCP). An annex to 3GPP TS 27.060 contains the generic description of OSP. The subset of features of OSP that are used by OSP:IHOSS is also described in 3GPP TS 27.060.~~

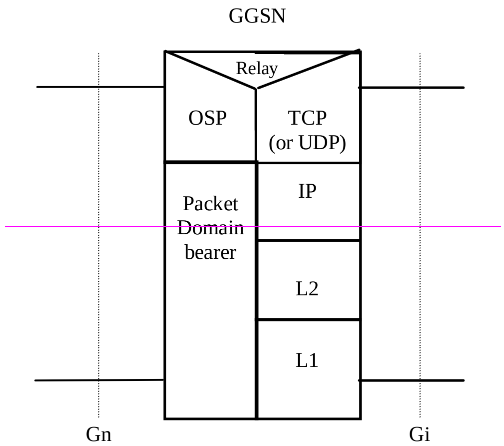
~~Figure 17 shows the scope of IHOSS and OSP:IHOSS.~~



~~Figure 17: Scope of the Internet Hosted Octet Stream Service and Octet Stream Protocol~~

~~14.2 Protocol stacks at the GGSN~~

~~Figure 18 shows the protocol stacks at the GGSN. The GGSN contains a relay function between OSP and and the protocol used on the Internet (usually TCP, alternatively UDP).~~



~~Figure 18: Protocol stacks at the GGSN~~

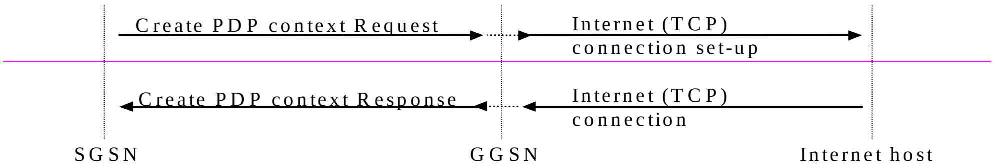
~~14.3 IHOSS connection control and OSP PDP context management~~

~~Establishing an IHOSS connection involves setting up two segments, the PLMN segment (using the OSP) between the MS and GGSN, and the Internet segment between the GGSN and the Internet Host. There is a one-to-one mapping between the PLMN segment of an IHOSS connection and an OSP:IHOSS context. When the IHOSS connection is established, an OSP PDP context is activated. When the connection is released, the context is deactivated. Each context supports only one IHOSS connection.~~

~~14.3.1 Connection establishment and PDP context activation~~

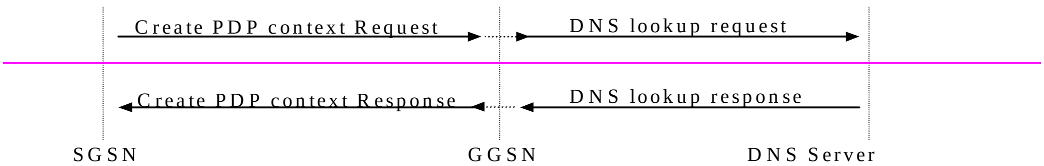
~~Establishing the PLMN segment of an IHOSS connection follows the normal procedures for PDP context activation described in 3GPP TS 23.060 using messages described in 3GPP TS 24.008 [23] (MS-SGSN) and 3GPP TS 29.060 [24] (SGSN-GGSN).~~

~~A request to establish an IHOSS connection is signalled to the GGSN by the receipt of a Create PDP context Request message from an SGSN with the PDP type set to OSP:IHOSS. The PDP configuration options may provide information to enable the GGSN to set up a connection to the Internet host. (The contents and format of the PDP configuration options are described in 3GPP TS 27.060.) Alternatively this information may be derived from subscription information in the HLR and configuration information within the GGSN.~~



~~Figure 19: IHOSS connection establishment (TCP over the Internet)~~

~~In the case where TCP is used over the Internet (figure 19), the response creating the context activation request is returned to the SGSN only when the TCP connection to the Internet host has been established. If the TCP connection attempt fails, the request to create a context is rejected.~~



~~Figure 20: IHOSS connection establishment (UDP over the Internet)~~

~~In the case where UDP is used over the Internet (figure 20), the response accepting the context activation request is returned to the SGSN only when a successful DNS lookup of the Internet host name has been completed. If the lookup fails, the request to create a context is rejected (the GGSN may perform additional checks before responding to the context activation request but these are not specified here).~~

~~14.3.2 Connection release and PDP context deactivation~~

~~When the IHOSS connection is released the OSP:IHOSS context is deactivated. The disconnection can be originated either by the MS or the Internet host (TCP only), or exceptionally by the SGSN under fault conditions. A MS-initiated or SGSN-initiated disconnection is signalled to the GGSN by the receipt of a Delete PDP context request from an SGSN.~~

~~In the case where TCP is used over the Internet, the GGSN first clears the TCP connection and then sends a Delete PDP context response to the SGSN.~~

~~In the case where UDP is used over the Internet, the GGSN sends a Delete PDP context response to the SGSN immediately, there being no actual Internet connection to clear.~~

~~The GGSN signals an Internet host-initiated disconnection to the SGSN by sending a Delete PDP context request.~~

~~14.4 OSP: IHOSS - TCP (UDP) relay~~

~~14.4.1 Required feature~~

~~14.4.1.1 Flow control~~

~~The OSP flow control procedures shall map on to the TCP flow control procedures. There is no flow control mapping in the case of UDP.~~

~~14.4.2 Optional features~~

~~14.4.2.1 Break handling~~

~~The OSP break procedure may map on to the TCP break procedure. There is no break mapping in the case of UDP.~~

~~14.4.2.2 GGSN maximum buffer size~~

~~Although the OSP entity in the GGSN does not have a PAD, it still requires buffers to hold the relayed packets. The GGSN PAD maximum buffer size parameters (in the Protocol Configuration Options) may be used to specify the maximum buffer sizes for the two directions of data transfer. Details are given in 3GPP TS 27.060.~~

**************************** End of changes ***