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3RD GENERATION
PARTNERSHIP
PROJECT 2
"3GPP2"

cdma2000 Wireless IP Network Standard: Accounting Services and 3GPP2 RADIUS VSAs

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1 **General Description**

2 This Chapter describes the off-line accounting procedures and the Usage Data Records. It
3 describes all the 3GPP2 VSAs used to support the capabilities described in this series of
4 specifications X.S0011-001-C to X.S0011-006-C.

1 **1 Glossary and Definitions**

2 See X.S0011-001-C.

1 **2 References**

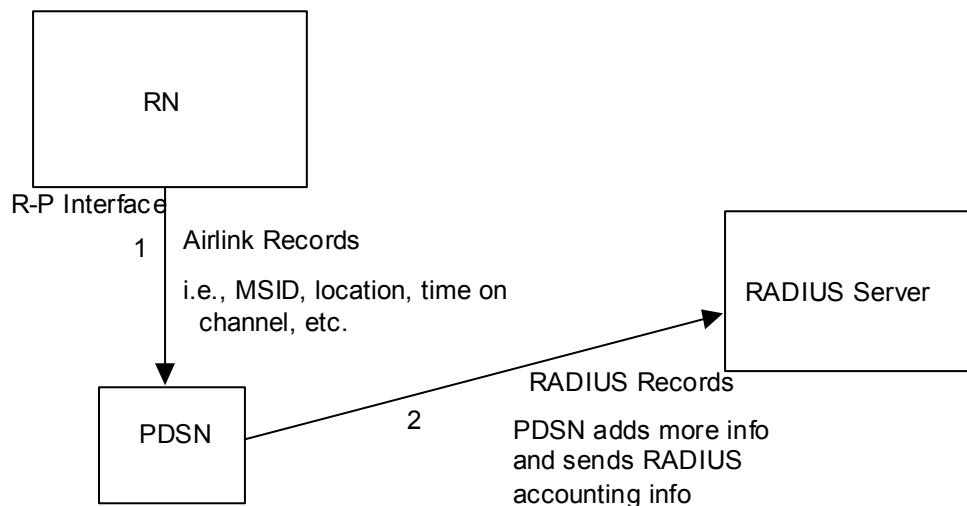
2 See X.S0011-001-C.

1 3 Accounting

2 3.1 General

3 3.1.1 Usage Data Records

4 Packet Accounting parameters are divided into radio specific parameters collected by the RN,
 5 and IP network specific parameters collected by the Serving PDSN. The Serving PDSN shall
 6 merge radio specific parameters contained in R-P and P-P interface messages called Airlink
 7 Records with IP network specific ones to form one or more Usage Data Records (UDR). After
 8 merging, the Serving PDSN shall use RADIUS accounting messages to send UDR information to
 9 the Visited RADIUS Server. This is outlined as below in Figure 1, and further detailed in the
 10 subsequent sections. The Serving PDSN shall maintain UDR information until it receives positive
 11 acknowledgment from the RADIUS server that the RADIUS server has correctly received the
 12 RADIUS message. Likewise, the RADIUS server shall maintain the UDR until the record is
 13 delivered to a Home RADIUS server, or removed by the operator billing system. The method by
 14 which information is moved from a RADIUS server to a billing system is beyond the scope of this
 15 specification as is the summary, reconciliation, and billing process used by the carriers.



16
17 **Figure 1. Accounting Architecture**

18 3.1.2 Remote Address Accounting

19 The PDSN shall support remote address based accounting by counting the number of octets
 20 exchanged between the MS and a remote IP address during a packet data session. The PDSN
 21 shall allow for enabling of this accounting functionality on a per user (i.e., NAI) basis, as specified
 22 in the User Profile information received from the Home RADIUS server during access
 23 procedures.

24 The PDSN shall support the Remote IPv4/IPv6 Address and Remote Address Table Index
 25 attributes as defined in Section 4. The Home RADIUS server may use multiple instances of the
 26 Remote IPv4/IPv6 Address and Remote Address Table Index attributes in the RADIUS Access-
 27 Accept message to authorize remote address accounting for the user for specific remote
 28 addresses. A Remote IPv4/IPv6 Address attribute shall contain an address mask/prefix-length,
 29 so that a given address and mask/prefix-length indicates multiple addresses to be used for

1 remote address accounting for the user¹. The table indices specified by the Home RADIUS
2 server point to tables of addresses stored at the PDSN. The method of provisioning the tables at
3 the PDSN and the corresponding table indices at the Home RADIUS server is outside the scope
4 of this specification.

5 The PDSN shall support the Remote IPv4/IPv6 Address Octet Count attribute to count the
6 number of octets sent/received to/from a given remote address or set of remote addresses. The
7 attribute contains a counter for forward traffic, a counter for reverse traffic, and either the table
8 index, remote IP address or a set of remote addresses with the same mask or prefix length (if
9 present), as specified in section 4. The PDSN shall generate a single Remote IPv4/IPv6 Address
10 Count attribute for all matching entries in a table when directed by the Remote Address Table
11 Index attribute to “summarize.” Otherwise, when not directed to summarize or for remote
12 addresses or subnets identified explicitly via Remote IPv4/IPv6 Address attributes, the PDSN
13 shall generate a Remote IPv4/IPv6 Address Octet Count attribute for each remote address or set
14 of remote addresses as represented by a mask or prefix length used during a packet data
15 session and authorized for the user by the RADIUS server. Hence, a UDR may contain multiple
16 instances of the Remote IPv4/IPv6 Address Octet Count attribute. Therefore, the PDSN and the
17 RADIUS server shall be capable of supporting multiple instances of the Remote IPv4/IPv6
18 Address Octet Count attribute in the RADIUS Accounting-Request (Stop) record and Interim-
19 Update messages. A remote address mask or prefix-length shall be used to indicate a range of
20 addresses for remote address accounting. The PDSN shall aggregate the octet counts for all the
21 remote IP addresses of that mask or prefix and generate one Remote IPv4/IPv6 Address Octet
22 Count attribute.

23 If the Remote Address Table Index is used for remote address based accounting, the current
24 method is not easily scalable to multi-domain support, due to issues with table provisioning and
25 synchronization between realms. In this case, the remote address functionality shall be limited to
26 a single realm support from an access provider network point of view. All PDSNs in a single
27 realm shall have the same set of tables. There is no explicit support in this specification for
28 coordinating table indices across realms. The Home RADIUS server shall be of the same realm
29 as the PDSN or it shall have coordinated its indices with the realm that owns the PDSN.

30 It is the responsibility of the Visited RADIUS server to ensure the remote address table indices
31 returned in a RADIUS Access-Accept message are consistent with the tables stored in the
32 PDSN. For example, the Visited RADIUS server may filter out the Remote Address Table Index
33 attributes contained in the RADIUS Access-Accept messages received from uncoordinated
34 realms.

35 When a packet is received in the forward direction, the PDSN shall examine the source IPv4
36 address of the packet or the source prefix of the IPv6 address (as indicated by the prefix-length
37 Sub-Type). If the source IPv4 address matches a remote IPv4 address for the user or the source
38 prefix of the IPv6 address matches a remote IPv6 prefix for the user, the PDSN shall create a
39 Remote IPv4/IPv6 Address Octet Count attribute as part of the UDR if it does not exist and shall
40 increment the octet counts.

41 When a packet is received in the reverse direction, the PDSN shall examine the destination IP
42 address of the packet. If the destination IP address matches a remote address for the user, the
43 PDSN shall create an instance of the Remote IPv4/IPv6 Address Octet Count attribute if it does
44 not exist and shall increment octet counts.

45 Both IPv4 and IPv6 remote addresses are supported in remote address accounting. The
46 structure of remote address tables and the method of communicating such information to the
47 PDSN are outside the scope of this specification.

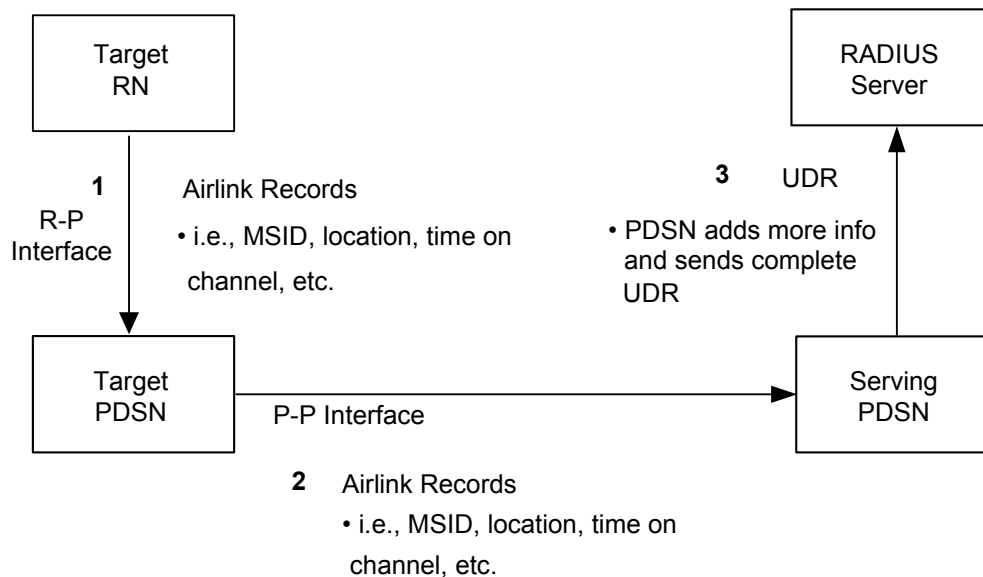
¹ An address mask of all ones means that all bits of the address shall be matched.

1 3.1.3 Accounting and Fast Handoff

2 If a P-P session exists, the Target PDSN shall forward the airlink records received from the
 3 Target RN to the Serving PDSN over the P-P interface. The Target PDSN shall not alter the
 4 airlink records. The Serving PDSN shall perform accounting functions for the data exchanged
 5 over the P-P connection per Section 3.5.1, treating the Target PDSN as if it were a PCF. Once
 6 the Serving PDSN combines these with IP network specific parameters, the UDR is sent to the
 7 RADIUS server as a RADIUS Accounting-Request record. This is outlined as below in Figure 2,
 8 and detailed in the subsequent sections.

9 Upon fast handoff, the Target PDSN shall store a copy of the airlink records received at pre-setup
 10 of the R-P session for each R-P connection. The Target PDSN shall update the copy of the
 11 Airlink Record received upon pre-setup of an R-P connection due to inter-PCF continuation of
 12 fast handoff on the Target PDSN (Figure 3, X.S0011-003-C).

13 Also, the Serving PDSN copies some of the data from the current UDR or UDRs to the new UDR
 14 or UDRs while fast handoff is in progress. The PDSN accounting procedures ensure that no
 15 double counting of usage occurs.



16
17

18 **Figure 2. Accounting Architecture With Fast Handoff**

19 3.1.4 Accounting Attribute Notation

20 A lower case letter implies an accounting attribute in an airlink record whereas a capital letter
 21 implies an accounting attribute in a UDR. Thus attributes in Table 1- Table 4 that apply to airlink
 22 records use lower case letters, and attributes in Table 5 and Table 6 that apply to UDRs use
 23 upper case letters.

24 3.2 Airlink Records

25 The RN generates one of four types of airlink records over the R-P interface:

- 26 • An R-P Connection Setup Airlink Record when the RN establishes an R-P
27 connection.
- 28 • An Active Start Airlink Record when the MS has connected the associated over-the
29 air service instance.

- 1 • An Active Stop Airlink Record when the MS has released the associated over-the-air
- 2 service instance.
- 3 • A Short Data Burst (SDB) Airlink Record when a forward or reverse short data burst
- 4 is exchanged with the MS.

5 The PCF uses the R-P Connection ID as the PCF Session Identifier Key in R-P setup messages.

6 All the airlink records shall include a sequence number initialized to zero at R-P connection
 7 setup. The sequence number is unique for a single identification triplet (R-P Connection ID, PCF
 8 ID, and MSID). Upon receiving the R-P connection setup airlink record, the Serving PDSN
 9 updates the UDR with the airlink record information and stores the sequence number. The PCF
 10 shall increment the sequence number modulo 256 in the subsequent airlink record transmitted
 11 over the corresponding R-P connection. The Serving PDSN shall compare the received
 12 sequence number with the previously stored sequence number (N). If the received sequence
 13 number is in the range from (N+1) modulo 256 to (N+127) modulo 256, inclusive, the PDSN shall
 14 act accordingly based on the information contained in the airlink record, and shall update its
 15 stored sequence number. If the received sequence number is in the range from (N-128) modulo
 16 256 to (N-1) modulo 256, inclusive, the Serving PDSN shall ignore the message. The same
 17 procedure continues for all the subsequent airlink records, until the closing of the R-P connection.
 18 In the event of retransmission, the PCF shall retransmit with the same sequence number, and the
 19 Serving PDSN shall not update the UDR if the same sequence number corresponding to a single
 20 identification triplet is received. There should be only one outstanding unacknowledged airlink
 21 record at any given time.

22 When an R-P Connection Setup Airlink Record is received with a new R-P connection ID over an
 23 existing P-P connection, the serving PDSN shall start a new UDR for the new R-P connection as
 24 specified in section 3.5.1.

25 Detailed specifications of airlink records are in [4].

26 **3.2.1 R-P Connection Setup Airlink Record**

27 Table 1 contains fields present in the R-P Connection Setup airlink records.

28

Item	Parameter	Max Payload Length (octets)	Format
y1	Airlink Record Type = 1 (Connection Setup)	4	integer
y2	R-P Connection ID	4	integer
y3	Airlink Sequence Number	4	integer
a1	MSID	15	string
a2	ESN	15	string
a3 ²	MEID	14	string
d3	Serving PCF	4	ip-addr
d4	BSID	12	string

29 **Table 1. R-P Connection Setup Airlink Fields**

30 Each R-P connection and each airlink record is indexed via the R-P Connection ID.

31

² Either a2 or a3, or both shall be included.

1 3.2.2 Active Start Airlink Record

2 Table 2 contains fields present in Active Start airlink records.

3

Item	Parameter	Max Payload Length (octets)	Format
y1	Airlink Record Type = 2 (Active Start)	4	integer
y2	R-P Connection ID	4	integer
y3	Airlink Sequence Number	4	integer
e1	User Zone	4	integer
f1	Forward FCH Mux Option ³	4	integer
f2	Reverse FCH Mux Option	4	integer
f5	Service Option	4	integer
f6	Forward Traffic Type (Primary, Secondary)	4	integer
f7	Reverse Traffic Type (Primary, Secondary)	4	integer
f8	FCH Frame Size (0/5/20 ms)	4	integer
f9	Forward FCH RC	4	integer
f10	Reverse FCH RC	4	integer
f14	DCCH Frame Size (0/5/20ms)	4	integer
f16	Forward PDCH RC	4	integer
f17	Forward DCCH Mux Option	4	integer
f18	Reverse DCCH Mux Option	4	integer
f19	Forward DCCH RC	4	integer
f20	Reverse DCCH RC	4	integer
i4	Airlink Priority	4	integer

4

Table 2. Active Start Airlink Fields

5 If the e1, f1, f2, f5, f16, f17, f18, and/or i4 parameters in Table 2 change during the active
6 session, the RN sends an Active Stop Airlink Record followed by an Active Start Airlink Record
7 with the new parameters.

8 f1 to f10, f14, f16 and f17 to f20 are fields from the cdma2000^{®4} Service Configuration Record in
9 [5-9].

10 3.2.3 Active Stop Airlink Record

11 Table 3 contains fields present in Active Stop Airlink Records.

12

Item	Parameter	Max Payload Length (octets)	Format
y1	Airlink Record Type = 3 (Active Stop)	4	integer
y2	R-P Connection ID	4	integer
y3	Airlink Sequence Number	4	integer
g8	Active Connection Time in Seconds	4	integer

³ Forward/Reverse FCH Mux Option parameters correspond to the Forward/Reverse Mux Option parameters defined in the previous version of this specification.

⁴ cdma2000[®] is the trademark for the technical nomenclature for certain specifications and standards of the Organizational Partners (OPs) of 3GPP2. Geographically (and as of the date of publication), cdma2000[®] is a registered trademark of the Telecommunications Industry Association (TIA USA) in the United States.

1

Table 3. Active Stop Airlink Fields**3.2.4 SDB Airlink Record**

Table 4 contains fields present in SDB Airlink Records.

4

Item	Parameter	Max Payload Length (octets)	Format
y1	Airlink Record Type = 4 (SDB)	4	integer
y2	R-P Connection ID	4	integer
y3	Airlink Sequence Number	4	integer
y4	Mobile Originated/Mobile Terminated Indicator	4	Integer
g10/g11	SDB Octet Count	4	Integer

5

Table 4. SDB Airlink Fields**3.3 PDSN Usage Data Record (UDR)**

Table 5 contains the complete UDR and the description of each field.

8

Item	Parameter	Description
A. Mobile Identifiers		
A1	MSID	MS ID (e.g., IMSI, MIN, IRM)
A2	ESN	Electronic Serial Number
A3	MEID	Mobile Equipment Identifier
B. User Identifiers		
B1	Source IP Address	IPv4 address of the MS.
B2	Network Access Identifier (NAI)	user@domain construct which identifies the user and home network of the MS.
B3	Framed-IPv6-Prefix	MS IPv6 prefix.
B4	IPv6 Interface ID	MS IPv6 interface identifier.
C. Session Identifiers		
C1	Account Session ID	The Account Session ID is a unique accounting ID created by the Serving PDSN that allows start and stop RADIUS records from a single R-P connection or P-P connection to be matched
C2	Correlation ID	The Correlation ID is a unique accounting ID created by the Serving PDSN for each packet data session that allows multiple accounting events for each associated R-P connection or P-P connection to be correlated.
C3	Session Continue	This attribute when set to 'true' means it is not the end of a Session and an Accounting Stop is immediately followed by an Account Start Record. 'False' means end of a session.
C4	Beginning Session	The attribute when set to 'true' means new packet data session is established; 'false' means continuation of previous packet data session. This attribute is contained in a RADIUS Accounting-Request (Start) record.
C5	Service Reference ID	This is the service instance reference ID received from the RN in an A11 Registration-Request message.
D. Infrastructure Identifiers		
D1	Home Agent	The IPv4 address of the HA
D2	PDSN Address	The IPv4 address of the PDSN.
D3	Serving PCF	The IP address of the serving PCF, i.e., the PCF in the serving RN.
D4	BSID	SID + NID + Cell Identifier type 2
D5	IPv6 PDSN Address	The IPv6 address of the PDSN
D6	Foreign Agent Address	The IPv4 address of the FA-CoA
E. Zone Identifiers		
E1	User Zone	Tiered Services user zone.
F. Session Status		

F1	Forward FCH Mux Option	Forward Fundamental Channel multiplex option
F2	Reverse FCH Mux Option	Reverse Fundamental Channel multiplex option
F5	Service Option	CDMA service option as received from the RN
F6	Forward Traffic Type	Forward direction traffic type – either Primary or Secondary
F7	Reverse Traffic Type	Reverse direction traffic type – either Primary or Secondary
F8	FCH Frame Size	Specifies the FCH Frame Size
F9	Forward FCH RC	The format and structure of the radio channel in the forward Fundamental Channel. A set of forward transmission formats that are characterized by data rates, modulation characterized, and spreading rates. [6]
F10	Reverse FCH RC	The format and structure of the radio channel in the reverse Fundamental Channel. A set of reverse transmission formats that are characterized by data rates, modulation characterized, and spreading rates. [6]
F11	IP Technology	Identifies the IP technology to use for this call: Simple IP or Mobile IP.
F12	Compulsory Tunnel Indicator	Indicator of invocation of compulsory tunnel established on behalf of MS for providing private network and/or ISP access during a single packet data connection.
F13	Release Indicator	Specifies reason for sending a stop record.
F14	DCCH Frame Size	Specifies Dedicated Control Channel (DCCH) frame size.
F15	Always On	Specifies the status of Always On service.
F16	Forward PDCH RC	The Radio Configuration of the Forward Packet Data Channel. (This parameter can be used as an indication that the MS is 1xEV DV capable.)
F17	Forward DCCH Mux Option	Forward Dedicated Control Channel multiplex option
F18	Reverse DCCH Mux Option	Reverse Dedicated Control Channel multiplex option
F19	Forward DCCH RC	The format and structure of the radio channel in the forward Dedicated Control Channel. A set of forward transmission formats that are characterized by data rates, modulation characterized, and spreading rates. [6]
F20	Reverse DCCH RC	The format and structure of the radio channel in the reverse Dedicated Control Channel. A set of reverse transmission formats that are characterized by data rates, modulation characterized, and spreading rates. [6]
G. Session Activity		
G1	Data Octet Count (Terminating)	The total number of octets in IP packets sent to the user, as received at the PDSN from the IP network (i.e. prior to any compression and/or fragmentation).
G2	Data Octet Count (Originating)	The total number of octets in IP packets sent by the user.
G3	Bad PPP frame count	The total number of PPP frames from the MS dropped by the PDSN due to uncorrectable errors.
G4	Event Time	This is an event timestamp which indicates one of the following: The start of an accounting session if it is part of a RADIUS start message The end of an accounting session if it is part of a RADIUS stop message An Interim-Update accounting event if it is part of a RADIUS Interim-Update message.
G5	Remote IPv4 Address Octet Count	Contains the octet count associated with one or more remote IPv4 address; used for source/destination accounting.
G6	Remote IPv6 Address Octet Count	Contains the octet count associated with one or more remote IPv6 address; used for source/destination accounting.
G8	Active Time	The total active connection time on traffic channel in seconds.
G9	Number of Active Transitions	The total number of non-active to Active transitions by the user.
G10	SDB Octet Count (Terminating)	The total number of octets sent to the MS via Short Data Bursts.
G11	SDB Octet Count (Originating)	The total number of octets sent by the MS via Short Data Bursts.
G12	Number of SDBs (Terminating)	The total number of Short Data Burst transactions with the MS.
G13	Number of SDBs (Originating)	The total number of Short Data Burst transactions with the MS.

G14	Number of HDLC layer octets received	The count of all octets received in the reverse direction by the HDLC layer in the PDSN.
G15	Inbound Mobile IP Signaling Octet Count	This is the total number of octets in registration requests and solicitations sent by the MS.
G16	Outbound Mobile IP Signaling Octet Count	This is the total number of octets in registration replies and agent advertisements sent to the MS prior to any compression and/or fragmentation.
G17	Last User Activity Time	This is a Timestamp (in number of seconds from Jan 1 1970 UTC) of the last known activity of the user.
I. Quality of Service		
I1	IP Quality of Service (QoS)	This attribute is deprecated.
I4	Airlink Priority	Identifies Airlink Priority associated with the user. This is the user's priority associated with the packet data service.
Y. Airlink Record Specific Parameters⁵		
Y1	Airlink Record Type	3GPP2 Airlink Record Type, see [4]
Y2	R-P Connection ID	Identifier for the R-P Connection. This is the GRE key that uniquely identifies an R-P connection (an A10 connection) between the PCF and the PDSN.
Y3	Airlink Sequence Number	Sequence number for Airlink records. Indicates the sequence of airlink records for an R-P connection.
Y4	Mobile Originated / Mobile Terminated Indicator	Used only in SDB airlink records. Indicates whether the SDB is Mobile Originated or Mobile Terminated.(0=Mobile Originated and 1=Mobile Terminated)
Z. Container		
Z1	Container	3GPP2 Accounting Container attribute. This attribute is used to embed 3GPP2 VSAs and/or RADIUS accounting attributes AVPs. This attribute is further described in section 4.

1

Table 5. Complete UDR

2 **3.4 Accounting Formats**

3 The RADIUS server shall support RADIUS attribute formats as defined in RFC 2865 and RFC
4 2866. The RN airlink records transmitted across the R-P interface and the P-P interface shall
5 follow the RADIUS format encapsulated in a MIP vendor specific attribute (attribute type 38).
6 Table 6 lists each accounting parameter and its associated RADIUS attribute.

7 Note: Attributes of type "26" defined in RFC 2865 and RFC 2866 are vendor specific, and are
8 used to transport 3GPP2 specific parameters. Attribute value types 26/60 to 26/69 within the
9 3GPP2 vendor specific space are reserved. The default Vendor ID value in Vendor Specific
10 attributes shall be 5535 defined in IANA in order for cdma2000 packet data service to support
11 global roaming. 3GPP2 attribute formats not defined in section 4 are included in Table 6.

⁵ The Airlink Record Specific Parameters (Y1-Y4) are not included in the RADIUS Accounting records.

1

RADIUS Attribute Definitions						
Item	Parameter	Type/ Vendor Type	Maximum Payload Length (in octets)	Format	Field	Special Values

2

A. Mobile Identifiers

A1	MSID	31	15	string	Calling-Station-Id	See [4].
A2	ESN	26/52	15	string	3GPP2_ESN	ASCII string of ESN. See [4].
A3	MEID	26/116	14	string	3GPP2_MEID	ASCII string of MEID. See [4].

3

B. User Identifiers

B1	Source IP Address	8	4	ip-addr	Framed-IP-Address	See RFC 2865.
B2	Network Access Identifier (NAI)	1	72	string	User-Name	See RFC 2865.
B3	Source IPv6 Prefix	97	4-20	IPv6-prefix	Framed-IPv6-Prefix	See RFC 3162.
B4	IPv6 Interface ID	96	10	string	Framed-Interface-ID	See RFC 3162.

4

C. Session Identifiers

C1	Account Session ID	44	8	string	Acct-Session-Id	ASCII string of session ID
C2	Correlation ID	26/44	8	string	Correlation ID	ASCII string of Correlation ID
C3	Session Continue	26/48	4	integer	3GPP2_Session_cont	0=False, 1=True
C4	Beginning Session	26/51	4	integer	3GPP2_Begin_Session	0=False, 1=True
C5	Service Reference ID	26/94	variable	integer	3GPP2_SR_ID	See Section 4

5

D. Infrastructure Identifiers

D1	Home Agent	26/7	4	ip-addr	3GPP2_HA_IP_Addr	A HA IP address used during a MIP session by the user as defined in RFC 2002.
D2	PDSN Address	4	4	ip-addr	NAS-IP-Address	IPv4 address of the RADIUS client in the PDSN
D3	Serving PCF	26/9	4	ip-addr	3GPP2_PCF_IP_Addr	The serving PCF is the PCF in the serving RN.
D4	BSID	26/10	12	string	3GPP2_BSID	A number formed from the concatenation of SID (4 octets)+ NID (4 octets)+ Cell Identifier (type 2) (4 octets). In the Cell Identifier the 12 upper bits are the Cell Id and the lower 4 bits are the Sector. Each item is encoded using hexadecimal uppercase ASCII characters.
D5	IPv6 PDSN Address	95	16	Ipv6-addr	NAS-IPv6-Address	See RFC 3162.
D6	Foreign Agent Address	26/79	4	ip-addr	3GPP2_FA_CoA	The IPv4 address of the FA-CoA

6

E. Zone Identifiers

E1	User Zone	26/11	4	integer	3GPP2_User_ID	Least significant 16 bits hold user zone ID (UZ_ID) next significant 15 bits hold user zone system ID (UZ_SID) and most significant bit always zero. UZ_ID and UZ_SID are defined in [10].
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7

F. Session Status

F1	Forward FCH Mux Option	26/12	4	integer	3GPP2_F_FCH_MUX	See [6]
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F2	Reverse FCH Mux Option	26/13	4	integer	3GPP2_R_FCH_MUX	See [6]
F5	Service Option	26/16	4	integer	3GPP2_SO	See [6]
F6	Forward Traffic Type	26/17	4	integer	3GPP2_FTYPE	0=Primary, 1=Secondary
F7	Reverse Traffic Type (Primary, Secondary)	26/18	4	integer	3GPP2_RTYPE	0=Primary, 1=Secondary
F8	FCH Frame Size	26/19	4	integer	3GPP2_FFSIZE	0=no fundamental, 1=5ms and 20ms mixed frame, 2=20ms frame
F9	Forward FCH RC	26/20	4	integer	3GPP2_FRC	See [6]
F10	Reverse FCH RC	26/21	4	integer	3GPP2_RRC	See [6]
F11	IP Technology	26/22	4	integer	3GPP2_IP_Tech	1=Simple IP, 2=Mobile IP
F12	Compulsory Tunnel Indicator	26/23	4	integer	3GPP2_Comp_Flag	0=no tunnel 1=non-secure tunnel 2=secure tunnel
F13	Release Indicator	26/24	4	integer	3GPP2_Reason_Ind	Reasons for stop record: 0=unknown 1=PPP/Service timeout 2=Handoff 3=PPP termination 4=Mobile IP registration failure 5= Abnormal Terminations 6=Termination due to Resource management 7=Service instance released 8=VolumeQuota reached, Service instance released (use for PrePaid packet data service) 9=DurationQuota reached, Service instance released (use for PrePaid packet data service) 10=Incompatible PrePaid accounting information (use for PrePaid packet data service) 11=Airlink Parameter Change (e1,f1,f2,i4 etc) 12=Time of Day Timer expiration 13 = Dormant by Accounting-Stop-triggered-by-Active-Stop
F14	DCCH Frame Size (0/5/20ms)	26/50	4	integer	3GPP2_DFSSIZE	0=no DCCH, 1=5ms and 20ms mixed frame, 2=20ms frame, 3=5ms frame
F15	Always On	26/78	4	integer	3GPP2_Always_ON	Always On 0=no 1=yes
F16	Forward PDCH RC	26/83	4	integer	3GPP2_F_PDCH_RC	See [6]
F17	Forward DCCH Mux Option	26/84	4	integer	3GPP2_F_DCCH_MUX	See [6]
F18	Reverse DCCH Mux Option	26/85	4	integer	3GPP2_R_DCCH_MUX	See [6]
F19	Forward DCCH RC	26/86	4	integer	3GPP2_FDRC	See [6]
F20	Reverse DCCH RC	26/87	4	integer	3GPP2_RDRC	See [6]

1

G. Session Activity

3. Accounting

G1	Data Octet Count (Terminating)	43	4	integer	Acct-Output-Octets	See RFC 2865.
G2	Data Octet Count (Originating)	42	4	integer	Acct-Input-Octets	See RFC 2865.
G3	Bad PPP Frame Count	26/25	4	integer	3GPP2_Bad_Frame_Count	
G4	Event Time	55	4	time	Event-Timestamp	See RFC 2869.
G5	Remote IPv4 Address Octet Count	26/72	variable	octet string		See Section 4
G6	Remote IPv6 Address Octet Count	26/97	variable	octet string		See Section 4
G8	Active Time	26/49	4	integer	3GPP2_Active_Time	This is the active time reported by the RN in the Active Stop Airlink Record, see [4].
G9	Number of Active Transitions	26/30	4	integer	3GPP2_Num_Active	
G10	SDB Octet Count (Terminating)	26/31	4	integer	3GPP2_SDB_Input-Octets	This is the SDB octet count reported by the RN in the SDB Airlink Record, see [4].
G11	SDB Octet Count (Originating)	26/32	4	integer	3GPP2_SDB_Output-Octets	This is the SDB octet count reported by the RN in the SDB Airlink Record, see [4].
G12	Number of SDBs (Terminating)	26/33	4	integer	3GPP2_NumSDB_Input	
G13	Number of SDBs (Originating)	26/34	4	integer	3GPP2_NumSDB_Output	
G14	Number of HDLC layer octets received	26/43	4	integer	3GPP2_Num_Bytes_Received_Total	The count of all octets received in the reverse direction by the HDLC layer in the PDSN.
G15	Inbound Mobile IP Signaling Octet Count	26/46	4	Integer	3GPP2_Mobile_IP_Signaling_Inbound_Count	This is the total number of octets in registration requests and solicitations sent by the MS.
G16	Outbound Mobile IP Signaling Octet Count	26/47	4	Integer	3GPP2_Mobile_IP_Signaling_Outbound_Count	This is the total number of octets in registration replies and agent advertisements, sent to the MS.
G17	Last User Activity Time	26/80	4	Integer	3GPP2_Last User Activity Time	Timestamp (in number of seconds from Jan 1 1970 UTC) of the last known activity of the user.
1	I. Quality of Service					
I1	IP Quality of Service	26/36	4	integer	3GPP2_IP_QOS	This attribute is deprecated
I4	Airlink Priority	26/39	4	integer	3GPP2_Air_Priority	Least significant 4 bits hold the priority associated with the packet data service.
2	Z. Container					
Z1	Container	26/6	Variable	string	3GPP2_Container	See Section 4

Table 6. Accounting Parameter Attribute RADIUS Definitions

1 3.5 PDSN Procedures

2 The following events cause the PDSN to take accounting action:

- 3 • Reception of R-P Connection Setup Airlink Record over R-P or P-P interface.
- 4 • R-P or P-P connection termination at the PDSN.
- 5 • Data service establishment or PPP renegotiation on the PDSN. This includes a PPP session and packet service session (Simple IP or Mobile IP).
- 6 • Data service termination on the PDSN. This includes releasing the PPP session, or release of a packet service session (Simple IP or Mobile IP).
- 7 • Arrival of forward direction or reverse direction user data.
- 8 • Reception of Active Start Airlink Record.
- 9 • Reception of Active Stop Airlink Record.
- 10 • Reception of SDB Airlink Record.
- 11 • Interim-Update record trigger.
- 12 • Stop record trigger.
- 13 • Time of day timer expiry.

16 Each packet data session (i.e., Simple IP and/or Mobile IPv4 session) is identified with a
 17 Correlation ID provided to the HAAA at the time authentication/authorization is performed. Each
 18 individual Simple IPv4, Mobile IPv4, and Simple IPv6 session shall be accounted for
 19 independently. All UDR information is stored and transmitted per tuple of {assigned IPv4 address
 20 or IPv6 prefix, NAI, R-P connection ID}. However, simultaneous Simple IPv4 and Simple IPv6
 21 shall use a common Correlation ID because they use a common authentication/authorization
 22 procedure. During the lifetime of the Simple IP and/or Mobile IP session, UDRs are created,
 23 modified, maintained, copied, and released for each individual connection. The Serving PDSN
 24 shall create one UDR per R-P connection ID. An R-P connection may be directly connected to
 25 the serving PDSN or indirectly connected via a P-P connection.

26 The PDSN closes a UDR when any of the following events occur:

- 27 • An existing R-P or P-P connection is closed.
- 28 • The PDSN determines the packet data session associated with the Correlation ID
 29 has ended.

30 At an initial R-P connection establishment, a UDR is created and initialized from relevant airlink
 31 records. When there is a new R-P or P-P connection due to a handoff for an existing packet data
 32 session, or when a new packet data session for an existing R-P or P-P connection is created, or
 33 when there is a new R-P connection for an existing packet data session, a UDR is created by
 34 copying data from a previous UDR. For example, during a fast handoff, the PDSN copies packet
 35 data session information (e.g., IP address and NAI) from the previous UDR associated with the
 36 source RN to the new UDR associated with the new RN. Similarly, if the MS sends an LCP
 37 Configure-Request message over the main service instance to restart the PPP session, the
 38 PDSN copies R-P or P-P connection data (e.g., F1-F20) from all current UDRs of the entire
 39 packet data session to new UDRs for the new packet data session. The Serving PDSN closes
 40 the previous UDRs and sends accounting records to the RADIUS server.

41 Furthermore, during a fast handoff, either two R-P connections, or an R-P and P-P connection, or
 42 two P-P connections with the same SR_ID and MSID may exist momentarily due to the PDSN
 43 bicasting⁶. Since the MS can connect to only one RN for a given service instance, the PDSN
 44 accounting procedures ensure that double counting between the current and new (copy) never
 45 occurs despite the PDSN bicasting of data to both service instances.

46 RADIUS accounting messages are generated from the information in the UDR. The Correlation
 47 ID is used to match different accounting records (Account Session IDs) across R-P connections

⁶ Bicasting occurs when the A11-Registration Request or P-P-Registration Request has the 'S' bit set to 1.

1 or P-P connections for a single packet data session. One Correlation ID for all R-P and P-P
 2 connections is maintained for a packet data session for each NAI and IP pair within the same
 3 Serving PDSN. The Account Session ID ⁷ is used to match a single RADIUS Start and Stop pair.
 4 A different Account Session ID is used for each R-P connection and/or P-P connection. A new R-
 5 P connection due to intra-PDSN handoff between PCFs shall result in a new R-P Connection ID
 6 and Account Session ID. A new P-P connection due to fast handoff between the PDSNs shall
 7 result in a new R-P Connection ID and Account Session ID. An intra-PDSN handoff at the Target
 8 PDSN, while in fast handoff (Figure 3, X.S0011-003-C), shall result in a new R-P connection ID
 9 and Account Session ID at the Serving PDSN. The MSID and SR_ID are used to select the
 10 proper UDR after an intra-PDSN handoff. One R-P Connection ID may be associated with
 11 multiple simultaneous NAI, IP pairs in the Serving PDSN (i.e., multiple packet data sessions).

12 Airlink records are only associated with an R-P connection ID. The Serving PDSN matches the
 13 R-P Connection ID in the airlink record to the R-P Connection ID in the appropriate UDR(s). If
 14 more than one UDR matches, the actions are applied to all UDRs.

15 Some events cause certain UDR fields to change in the middle of a session. When this happens,
 16 one of two approaches shall be taken: (1) a container attribute as specified in Section 4 is
 17 created and the changed fields are embedded in that container attribute. This allows the UDR to
 18 continue to accumulate accounting information after an event without transmitting a RADIUS
 19 message. Alternatively (2), the PDSN may send a RADIUS Stop record to capture accounting
 20 data before the event, followed by a RADIUS Start record with the new field values. In fact, a
 21 PDSN may send a RADIUS Stop and RADIUS Start anytime during a single session as long as
 22 no accounting data is lost. In these cases, the PDSN shall send the same Correlation ID in both
 23 the RADIUS Start and RADIUS Stop records.

24 The subsequent sections specify the actions to take for each event.

25 **3.5.1 R-P Connection Setup Airlink Record Arrives**

26 If the Serving PDSN receives an R-P Connection Setup Airlink Record with a new R-P
 27 connection ID over an R-P or P-P connection as a result of an Intra PDSN handoff or Inter PDSN
 28 fast handoff, then the serving PDSN shall use the MSID and SR_ID to find the correct UDR, and,
 29 either:

- 30 • Create a new Container attribute in the UDR with Container-Reason ← Handoff,
 31 Event-timestamp ← current time and attributes D2 (in case of an IPv6 PDSN, D5),
 32 D3, D4, G1, G2, G3, and G8-17, and all instances of G5/G6.
- 33 • Use information received from the RN to fill in the following fields: D3 and D4. The
 34 PDSN fills in D2 (in case of an IPv6 PDSN, D5).
- 35 • Zero fields G1, G2, G3, G8-17; all instances of G5/G6 in the newly created
 36 accounting container are eliminated.
- 37 • Mark the UDR as pending⁸ if the "S" bit in the A11 Registration-Request message or
 38 P-P Registration-Request message that carries the Session Setup Airlink Record is
 39 set to '1'.
- 40 • When the Active Stop Airlink Record for the previous R-P or P-P connection arrives,
 41 update the accounting fields inside the newly created accounting container. (See
 42 section 3.5.6 for further processing of the Airlink Stop Record).

43 Or:

- 44 • Create a copy of the current UDR.

⁷ The use of the Account session ID as described in this section does not apply to the container accounting procedures.

⁸ A "pending" UDR is one for which usage data is not accumulated because another UDR is accumulating usage data, e.g., because of bicasting.

- 1 • Use information received from the RN to fill the following fields in the copy UDR: D3
2 and D4. The PDSN fills in D2 (in case of an IPv6 PDSN, D5).
3 • Zero fields G1, G2, G3, and G8-17 in the copy UDR; all instances of G5/G6 in the
4 copy UDR are eliminated.
5 • Send a RADIUS Accounting-Request (Start) record containing a new Account
6 Session ID and the same Correlation ID.
7 • Mark the new UDR as pending if the “S” bit in the A11 Registration-Request
8 message or P-P Registration-Request message that carries the Session Setup
9 Airlink Record is set to '1'.
10 • When the Active Stop Airlink Record for the previous R-P or P-P connection arrives,
11 update the current UDR and send a RADIUS Accounting-Request (Stop) record
12 based on the current UDR. The RADIUS Accounting-Request (Stop) record contains
13 a Session Continue attribute with the value set to 1 (True), the same Correlation ID,
14 and the original session ID. (See section 3.5.6 for further processing of the Airlink
15 Stop Record).

16 Otherwise, the Serving PDSN shall use the R-P Connection Setup Airlink record (from the current
17 RN) to fill the following fields of the new UDR:

- 18 • A1, A2, A3, D3, and D4.
19 • Zero fields G1-G17.

20 The Serving PDSN shall populate the remaining fields of the UDR as specified in sections 3.5.2
21 and 3.5.5.

22 **3.5.2 Packet Data Session Establishment**

23 After the PDSN establishes a packet data session (i.e., Simple IP or Mobile IP) on the main
24 service instance, or a new R-P connection setup associated with an auxiliary service instance
25 occurs with an existing packet data session, the Serving PDSN shall:

- 26 • Fill the following fields: B1, (in case of IPv6 MS, B3), B2, C1, C2, C4, D1, D2 (in case
27 of IPv6 PDSN, D5), F11, F12, and I1.
28 • Send a RADIUS Accounting-Request (Start) record based on the current UDR.

29 **3.5.3 Packet Data Session Termination**

30 After the Serving PDSN terminates a packet data session to the MS for every UDR, the Serving
31 PDSN shall:

- 32 • Add a Session Continue attribute in the UDR with the value set to 0 (False).
33 • Send a RADIUS Accounting-Request (Stop) record based on the current UDR.
34 • Delete the UDR after receiving acknowledgment from the RADIUS server that it has
35 successfully received the UDR.

36 If an A11 Registration-Request message is received with lifetime 0 for the main service instance
37 and the Accounting-Stop- triggered-by-Active-Stop-Indication is set to 1 for the user, the PDSN
38 shall not⁹ trigger a RADIUS Accounting-Request (stop) record merely based on this indication.

39 If the reason for the packet data session termination is due to the MS sending an LCP Configure-
40 Request message, and if the MS is not in a fast handoff state, then for every UDR the Serving
41 PDSN shall:

- 42 • Create a copy of the current UDR using A1, A2, A3, D3, D4, F1-F20 and I4 from the
43 current UDR in the new UDR.
44 • Zero fields G1, G2, G3, and G8-13 in the new UDR.
45 • Add a Session Continue attribute in the current UDR with the value set to 0 (False).

⁹ To prevent from sending two consecutive RADIUS Accounting-Request (stop) records at packet data session termination.

- 1 • Send a RADIUS Accounting-Request (Stop) record based on the current UDR.
 2 • Delete the current UDR after receiving acknowledgment from the RADIUS server
 3 that it has successfully received the UDR.
 4 • Follow Packet Data Session Establishment accounting procedures for each new
 5 UDR immediately after packet data session establishment.

6 **3.5.4 User Data Through PDSN**

7 For any user data processed by the Serving PDSN in the forward direction, the Serving PDSN
 8 shall use the MS IP address and SR_ID to find the correct UDR. If the UDR is not pending then
 9 the PDSN shall:

- 10 • Increment G1 before compression by the number of octets in IP packets¹⁰ sent to the
 11 user.
 12 • Increment G16 before compression by the number of octets in Mobile IP signaling
 13 packets¹¹ sent to the user.
 14 • If the source IP address of the user packet is one of the remote addresses
 15 authorized for the user for destination based accounting, a G5/G6 instance is created
 16 in the UDR for this address (if one does not exist already and no applicable
 17 summarized instance exists already), and the Forward Octet Count field in this
 18 G5/G6 instance is incremented before compression as necessary.

19 For any user data processed by the Serving PDSN in the reverse direction, the Serving PDSN
 20 shall use the MS IP address and SR_ID to find the correct UDR. If the UDR is not pending then
 21 the PDSN shall:

- 22 • Increment G2 after decompression by the number of octets in IP packets¹² sent by
 23 the user.
 24 • Increment G14 by the number of octets received at the HDLC layer.
 25 • Increment G15 after decompression by the number of octets in Mobile IP signaling
 26 packets sent by the user.
 27 • If the destination IP address of the user packet is one of the remote addresses
 28 authorized for the user for destination based accounting, a G5/G6 is created in the
 29 UDR for this address (if one does not exist already and no applicable summarized
 30 instance exists already), and the Reverse Octet Count field in this G5/G6 instance is
 31 incremented after decompression as necessary.

32 If the UDR is pending, the PDSN shall not modify the accounting usage data of the UDR.

33 **3.5.5 Active Start Airlink Record Arrives**

34 When the Serving PDSN receives an Active Start Airlink record from the RN or Target PDSN, the
 35 Serving PDSN performs the following.

36 If the UDR is new (some fields are blank), the Serving PDSN shall:

- 37 • Set UDR fields according to airlink record: E1 ← e1, F1-F10 ← f1-f10, F14←f14,
 38 F16←f16, F17-F20←f17-f20, and I4 ← i4
 39 • If the UDR is pending, mark it as not pending.

40 Else, if the airlink record indicates parameters E1, F1, F2, F5, F16, F17, F18 or I4 have changed,
 41 and not as a result of a handoff, the Serving PDSN shall either:

- 42 • Create a new Container attribute in the UDR with Container-Reason ← Parameter
 43 change, Event-timestamp ← current time and attributes E1, F1, F2, F16, F17, F18,
 44 G1, G2, G3, G8-G17, I4, and all instances of G5/G6.

¹⁰ This includes Mobile IP signaling octets.

¹¹ This means IP, UDP, and the MIP message payload above UDP.

¹² This includes Mobile IP signaling octets.

- 1 • Set UDR fields according to the airlink record. E1 ← e1, F1 ← f1, F2 ← f2, F5 ← f5,
2 F16 ← f16, F17 ← f17, F18 ← f18, I4 ← i4, and zero fields G1, G2, G3, and G8-17.
3 All current instances of G5/G6 in the UDR are eliminated.

4 Or:

- 5 • Add a Session Continue attribute in the current UDR with the value set to 1 (True).
6 • Send a RADIUS Accounting-Request (Stop) record based on the current UDR.
7 • Set UDR fields according to airlink record. E1 ← e1, F1 ← f1, F2 ← f2, F5 ← f5, F16
8 ← f16, F17 ← f17, F18 ← f18, I4 ← i4 and zero fields G1, G2, G3, and G8-17. All
9 current instances of G5/G6 in the UDR are eliminated.
10 • Send a RADIUS Accounting-Request (Start) record based on UDR containing a new
11 Account Session ID and same Correlation ID.

12 Else,

- 13 • If the Accounting-Stop- triggered-by-Active-Stop-Indication is set for the user and
14 Active Start Airlink for the main service instance is received by PDSN, a RADIUS
15 Accounting-Request (Start) message with a new Account Session ID is sent for main
16 service instance based on the current UDR.

17 Finally, the PDSN shall increment G9 by one.

18 **3.5.6 Active Stop Airlink Record Arrives**

19 When the Serving PDSN receives an Active Stop Airlink record from the RN, the PDSN shall:

- 20 • Increment G8 by the value of g8.
21 • Set G17¹³ with the current time if Active Stop is used to indicate last activity.

22 If the Serving PDSN receives an A11 Registration-Request for the main service instance
23 containing a non-zero lifetime and an Active Stop Airlink record, and if the Accounting-Stop-
24 triggered-by-Active-Stop-Indication is set to 1 for the user, the PDSN shall send a RADIUS
25 Accounting-Request (Stop) record based on the current UDR including a Session Continue
26 attribute with the value set to 1 (True). The PDSN shall zero fields G1, G2, G3, G8-16 and all
27 current instances of G5/G6, D4, E1, F1-F10, F14 and I4 in the UDR are eliminated.

28 **3.5.7 SDB Airlink Record Arrives**

29 The PDSN shall increment G1/G2 for all forward/reverse user data corresponding to the MS IP
30 address. When the Serving PDSN receives an SDB airlink record from the RN or the Target
31 PDSN, the Serving PDSN shall use the MS IP address and SR_ID to find the correct UDR or
32 UDRs in the event of multiple packet data sessions.

33 If the mobile originated / mobile terminated indicator is equal to one (mobile terminated SDB), the
34 Serving PDSN shall:

- 35 • Increment G10 by the value of g10.
36 • Increment G12 by one.

37 If the mobile originated / mobile terminated indicator is equal to zero (mobile originated SDB), the
38 Serving PDSN shall use the MS IP address and SR_ID to find the correct UDR. The PDSN shall:

- 39 • Increment G11 by the value of [g10g11](#).
40 • Increment G13 by one.

¹³ If Active Stop alone is used to set G17, it may not reflect the most recent activity of the user by the time the Accounting record is sent to the Home RADIUS server. If Active Stop is not used to set the G17, the PDSN may use implementation specific methods to populate G17.

1 **3.5.8 Interim-Update Record Trigger**

2 When the Interim-Update Record Trigger initiates, the Serving PDSN shall send a RADIUS
3 Accounting-Request Interim-Update record based on the current UDR. The Interim-Update
4 Record Trigger is an operator configurable time interval since the last RADIUS accounting record
5 was sent for a UDR. The Interim-Update Record Trigger may not be applied to dormant sessions
6 as per the local PDSN policy.

7 **3.5.9 Stop Record Trigger**

8 Additional conditions may trigger a RADIUS Accounting-Request (Stop) record to be sent by the
9 PDSN such as:

- 10 • When the size of the RADIUS accounting record to be sent for the UDR exceeds an
11 operator configurable threshold.
- 12 • Any time during a session as an implementation dictates.

13 When the Stop Record Trigger initiates, the PDSN shall add a Session Continue attribute in the
14 UDR with the value set to 1 (True). The PDSN shall send a RADIUS Accounting-Request (Stop)
15 record based on the current UDR and fields G1, G2, G3, G8-17 are zeroed and all current
16 instances of G5/G6 in the UDR are eliminated. Immediately afterwards, the PDSN shall send a
17 RADIUS Accounting-Request (Start) record based on the current UDR containing a new Account
18 Session ID and the same Correlation ID.

19 **3.5.10 Time of Day Timer Expires**

20 The time of day timer(s) shall be a set of operator configurable parameters for certain time(s) of
21 day. These timers may be used, for example, to delineate peak and off-peak billing hour
22 boundaries.

23 When an accounting time of day timer expires, the Serving PDSN shall either:

- 24 • Create a new Container attribute in the UDR with Container-Reason ← Tariff
25 Boundary, Event-timestamp ← current time and attributes G1, G2, G3, and G8-G16.
26 Instances of G5/G6 are copied to the container.
- 27 • Zero fields G1, G2, G3, and G8-16. All current instances of G5/G6 in the UDR are
28 eliminated.

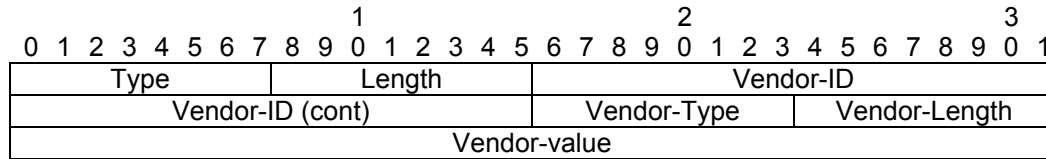
29 Or,

- 30 • Add a Session Continue attribute in the UDR with the value set to 1 (True).
- 31 • Send a RADIUS Accounting-Request (Stop) record based on the current UDR.
- 32 • Zero fields G1, G2, G3, and G8-16. All current instances of G5/G6 in the UDR are
33 eliminated.
- 34 • Send a RADIUS Accounting-Request (Start) record based on current UDR
35 containing a new Account Session ID and the same Correlation ID.

1 4 3GPP2 RADIUS Attributes

2 Figure 3 shows the general Vendor Specific Format for all 3GPP2 RADIUS attributes. The type
3 and vendor ID are the same for every attribute. The vendor ID of 5535 is used to indicate 3GPP2.
4 Note: All integers are in network byte order.

5



6

Figure 3. 3GPP2 RADIUS Attribute Format

7 IKE Pre-shared Secret Request:

8 Indicates that the PDSN needs a pre-shared secret for Phase 1 IKE negotiation with the HA. This
9 may appear in a RADIUS Access-Request message for MIP, but not for Simple IP.

10 Type: 26
11 Length = 12
12 Vendor ID: 5535
13 Vendor-Type = 1
14 Vendor-Length = 6
15 Vendor-Value =
16 1 - The PDSN requests a pre-shared secret for IKE

17 Security Level:

18 Indicates the type of security that the home network mandates on the visited network; this
19 attribute optionally appears in the RADIUS Access-Accept message.

20 Type: 26
21 Length = 12
22 Vendor ID: 5535
23 Vendor-Type = 2
24 Vendor-Length = 6
25 Vendor-Value =
26 1 - IPSec for registration messages (deprecated)
27 2 - IPSec for tunnels (deprecated)
28 3 - IPSec for tunnels and registration messages
29 4 - No IPSec security

30 Pre-Shared Secret:

31 A pre-shared secret for IKE that, may appear in a RADIUS Access-Accept message.

32 Type: 26
33 Length = 24
34 Vendor ID: 5535
35 Vendor-Type = 3
36 Vendor-Length = 18
37 Vendor-Value = binary value of the pre-shared secret

38 Reverse Tunnel Specification:

39 Indicates the style of reverse tunneling that is required, and optionally appears in a RADIUS
40 Access-Accept message.

41 Type: 26
42 Length = 12
43 Vendor ID: 5535

- 1 Vendor-Type = 4
- 2 Vendor-Length = 6
- 3 Vendor-Value =
- 4 0 - Reverse tunneling is not required.
- 5 1 - Reverse tunneling is required.

6 **Differentiated Services Class Option:**

7 This attribute is deprecated and is replaced by the Allowed Differentiated Services Marking
 8 attribute. The Home RADIUS server authorizes differentiated services via the Differentiated
 9 Services Class Options attribute, and optionally appears in a RADIUS Access-Accept message.

- 10 Type: 26
- 11 Length = 12
- 12 Vendor ID: 5535
- 13 Vendor-Type = 5
- 14 Vendor-Length = 6
- 15 Vendor-Value
- 16 0 - Best Effort
- 17 10 - AF11
- 18 12 - AF12
- 19 14 - AF13
- 20 18 - AF21
- 21 20 - AF22
- 22 22 - AF23
- 23 26 - AF31
- 24 28 - AF32
- 25 30 - AF33
- 26 34 - AF41
- 27 36 - AF42
- 28 38 - AF43
- 29 46 - EF

30 The above values are taken from RFC 2597 and RFC 2598. There is no intention to convey the
 31 actual traffic specification parameters of the differentiated services service.

32 **Accounting Container:**

33 Contains embedded 3GPP2 VSAs and/or RADIUS accounting attributes.

34

1												2												3											
0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1				
Type						Length						Vendor-ID																							
Vendor-ID (cont)						Vendor-Type						Vendor-Length																							
Container-Reason						Event-Timestamp Type = 55						Event-Timestamp Length = 6																							
Event-Timestamp Value																																			
Embedded 3GPP2 <u>VSA</u> s and/or <u>RADIUS</u> accounting attributes <u>AVPs</u>																																			

35 **Figure 4. Accounting Container VSA format**

- 36 Type: 26
- 37 Length ≥ 224
- 38 Vendor-ID: 5535
- 39 Vendor-Type: 6
- 40 Vendor-Length ≥ 168
- 41 Container-Reason:
- 42 1. Tariff Boundary
- 43 2. Parameter Change
- 44 3. Handoff

1 Event-Timestamp: Value = The Value field is four octets encoding an unsigned integer
2 with the number of seconds since January 1, 1970 00:00 UTC.

3 Embedded 3GPP2 VSAs and/or RADIUS accounting attributesAVPs: One or more parameters
4 relating to Container-Reason above.

5 **Home Agent:**

6 The address of the HA that appears in a RADIUS Access-Request message, RADIUS Access-
7 Accept message, and accounting messages.

8 Type: 26

9 Length = 12

10 Vendor ID: 5535

11 Vendor-Type = 7

12 Vendor-Length = 6

13 Vendor-Value = 4 octet IP address.

14 **KeyID:**

15 Contains the KeyID parameter used during IKE exchange between the PDSN and the HA. This
16 VSA may be returned from the Home RADIUS server to the PDSN in the RADIUS Access-Accept
17 message.

18 Type: 26

19 Length = 28

20 Vendor ID: 5535

21 Vendor-Type = 8

22 Vendor-Length = 22

23 Vendor-Value =

24 A number formed from the concatenation of the Home RADIUS IP Address, and
25 the FA IP address, and a 32-bit timestamp, where each address is encoded
26 using eight hexadecimal ASCII characters. The timestamp contains the number
27 of seconds since January 1, 1970 00:00 UTC.

28 **'S' Key:**

29 Contains the 'S' secret parameter used to make Pre-shared secret. This parameter is returned by
30 the Home RADIUS to the HA in the RADIUS Access-Accept message.

31 Type: 26

32 Length: greater than 9

33 Vendor ID: 5535

34 Vendor-Type = 54

35 Vendor-Length = 3 or greater

36 Vendor-Value = binary value of the secret.

37 **'S' Request:**

38 Indicates whether the HA requests a shared secret "S". This appears in a RADIUS Access-
39 Request message to the Home RADIUS server:

40 Type: 26

41 Length = 12

42 Vendor ID: 5535

43 Vendor-Type = 55

44 Vendor-Length = 6

45 Vendor-Value =

46 1. The HA requests a 'S' secret for IKE

47 **'S' lifetime:**

48 Contains the lifetime of 'S' secret parameter used to make Pre-shared secret. This parameter is
49 returned by the Home RADIUS to the HA in the RADIUS Access-Accept message.

50 Type: 26

1 conjunction with the Remote Address Mask (below), to define the range of
 2 address to be monitored.
 3

4 Sub-Type (=2): Sub-Type for remote IPv4 address mask.
 5 Length: length of remote IPv4 address mask attribute (=6 octets)
 6 Remote Address Mask:

7 The Remote Address Mask Sub-Type contains an IPv4 address mask that
 8 defines a set of remote addresses to be used for remote address based
 9 accounting.
 10

11 Sub-Type (=3): this Sub-Type indicates the characteristics of the IPv4 address with
 12 respect to PrePaid Packet Data Service.
 13 Length: length of the Qualifier (=4 octets).

14 Qualifier bitmap where bit 0 is LSB:
 15 Bit0=1 – Exempt from PrePaid accounting.
 16 All other values reserved for future use.

17 **Remote IPv6 Address:**

18 Allows the PDSN to identify an IP address to be used for remote address based accounting for
 19 the user. It is only used in RADIUS Access-Accept messages. Up to ten instances of the attribute
 20 shall be supported in one RADIUS Access-Accept message.

21

										1										2										3									
0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
Type										Length										Vendor-ID																			
Vendor-ID (cont)										Vendor-Type										Vendor-Length																			
Sub-Type (=1)										Length										Value (Remote IPv6 address)																			
Value (Remote IPv6 address)																																							
Value (Remote IPv6 address)																																							
Value (Remote IPv6 address)																																							
Value (Remote IPv6 address)										Sub-Type (=2)										Length																			
Value (Prefix length)																																							
Sub-Type (=3)										Length										Qualifier																			

22 **Figure 6. Remote IPv6 Address VSA format**

23 Type: 26
 24 Length ≥ 32
 25 Vendor ID: 5535
 26 Vendor-Type: 70
 27 Vendor-Length ≥ 26
 28

29 Sub-Type (=1): type for remote IPv6 address attribute.
 30 Length: length of remote IPv6 address attribute (=18 octets).
 31 Remote IPv6 Address:

32 The Remote IPv6 Address field contains a corresponding IPv6 address to be
 33 used for remote address based accounting for the user.
 34

35 Sub-Type (=2): Sub-Type for prefix length.
 36 Length: length of prefix length attribute (=6 octets).
 37 Prefix Length:

38 The prefix length specifies the number of leading bits that must be matched. The
 39 prefix length is less than or equal to 128.
 40

41 Sub-Type (=3): this Sub-Type indicates the characteristics of the IPv6 address with
 42 respect to PrePaid Packet Data Service.

- 1 Length: length of the Qualifier (=4 octets).
- 2 Qualifier bitmap where bit 0 is LSB:
- 3 Bit0=1 – Exempt from PrePaid accounting.
- 4 All other values reserved for future use.

5 **Remote Address Table Index:**

6 Contains the index to remote addresses used to generate remote address accounting records.
 7 The Home RADIUS server returns this parameter to the PDSN in the RADIUS Access-Accept
 8 message.

9

										1										2										3									
0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
Type										Length										Vendor-ID																			
Vendor-ID (cont)										Vendor-Type					Vendor-Length																								
Sub-Type (=1)					Length					Remote Address Table Index																													
Sub-Type (=2)					Length					Qualifier																													

10 **Figure 7. Remote Address Table Index VSA format**

- 11 Type: 26
- 12 Length ≥12
- 13 Vendor ID: 5535
- 14 Vendor-Type: 71
- 15 Vendor-Length ≥ 6
- 16
- 17 Sub-Type (=1): Table Index
- 18 Length: length of the Table index value (=4 octets).
- 19 Remote Address Table Index:
- 20 The Table Index is an identifier to a table of remote addresses, available at the
- 21 PDSN, used for remote-based accounting for the user.
- 22
- 23 Sub-Type (=2): this Sub-Type indicates the characteristics of the content of the table
- 24 Index with respect to PrePaid Packet Data Service.
- 25 Length: length of the Qualifier (=4 octets).
- 26 Qualifier bitmap where bit 0 is LSB:
- 27 Bit0=1 – Exempt from PrePaid accounting.
- 28 Bit1=1 –Summarize Remote Address IPv4/IPv6 Octet Count
- 29 All other values reserved for future use.

30 **Remote IPv4 Address Octet Count:**

31 This attribute indicates an IPv4 address and how many octets have been received from and sent
 32 to this address over the course of the service being provided to the user. It is only present in
 33 RADIUS Accounting-Records where the Acct-Status-Type is set to Stop or Interim-Update.

34

										1										2										3									
0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
Type										Length										Vendor-ID																			
Vendor-ID (cont)										Vendor-Type					Vendor-Length																								
Sub-Type (=1)					Length					Value (Remote IPv4 address)																													
Value (Remote IPv4 address)										Sub-Type (=2)					Length																								
Value (remote IPv4 address mask)																																							
Sub-Type (=3)					Length					Value (Forward Octet Count)																													
Value (Forward Octet Count)										Sub-Type (=4)					Length																								
Value (Reverse Octet Count)																																							
Sub-Type (=5)					Length					Remote Address Table Index																													

Sub-Type (=6)	Length	Forward Octet Count Overflow
Sub-Type (=7)	Length	Reverse Octet Count Overflow

Figure 8. Remote IPv4 Address Octet Count format

1
2 Type: 26
3 Length ≥ 24
4 Vendor ID: 5535
5 Vendor-Type: 72
6 Vendor-Length ≥ 18
7
8 Sub-Type (=1): Sub-Type for remote IPv4 address attribute. If present, Sub-Type 5 shall
9 not be present.
10 Length: length of remote IPv4 address attribute (6 octets)
11 Remote Address:
12 The Remote Address Field contains an IPv4 address used for destination-based
13 remote IPv4 address based accounting by the user.
14
15 Sub-Type (=2): Sub-Type for remote IPv4 address mask. If present, Sub-Type 5 shall not
16 be present.
17 Length: length of remote IP address mask attribute (=6 octets)
18 Remote Address Mask:
19 The Remote Address Mask Sub-Type contains an IPv4 address mask that
20 defines a set of remote addresses to be used for remote address based
21 accounting.
22
23 Sub-Type (=3): Sub-Type for Forward Octet Count attribute.
24 Length: length of Forward Octet Count attribute (6 octets)
25 Forward Octet Count:
26 The Forward Octet Count Field indicates how many octets have been received
27 from the Remote Address.
28
29 Sub-Type (=4): Sub-Type for Reverse Octet Count attribute.
30 Length: length of Reverse Octet Count attribute (6 octets)
31 Reverse Octet Count:
32 The Reverse Octet Count Field indicates how many octets have been sent to the
33 Remote Address.
34
35 Sub-Type (=5): Table Index for summarized Remote IPv4 Address Octet Count, if
36 present Sub-Type 1 and Sub-Type 2 shall not be present.
37 Length: length of table index (4 bytes)
38 Table Index:
39 The table index from the associated Remote Address Table Index attribute.
40
41 Sub-Type (=6): Sub-Type for Forward Octet Count Overflow.
42 Length: length of Forward Octet Count Overflow attribute (= 4 octets)
43 Forward Octet Count Overflow:
44 The optional Forward Octet Count Overflow Sub-Type is used to indicate how
45 many times the Forward Octet Count counter has wrapped around 2^{32} over the
46 course of the service being provided.
47
48 Sub-Type (=7): Sub-Type for Reverse Octet Count Overflow.
49 Length: length of Reverse Octet Count Overflow attribute (= 4 octets)
50 Reverse Octet Count Overflow:
51 The optional Reverse Octet Count Overflow Sub-Type is used to indicate how
52 many times the Reverse Octet Count counter has wrapped around 2^{32} over the
53 course of the service being provided.

1 **Allowed Differentiated Services Marking:**

2 Specifies if the user is able to mark packets with AF (A), EF (E). The Max Class (i.e., Max
3 Selector Class), specifies that the user may mark packets with a Class Selector Code Point that
4 is less than or equal to Max Class. This attribute may appear in a RADIUS Access-Accept
5 message.

6

										1																				2																				3									
0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9										
Type										Length										Vendor-ID																																							
Vendor-ID (cont)										Vendor-Type										Vendor-Length																																							
Sub-Type (=1)										Length										A E C			Unused																																				
Sub-Type (=2)										Length										Max class										Unused																													
Sub-Type (=3)										Length										RT marking										Unused																													

7

Figure 9. Allowed Differentiated Services Marking VSA format

8

Type: 26

9

Length = 20

10

Vendor ID: 5535

11

Vendor-Type: 73

12

Vendor-Length = 14

13

14

Sub-Type (=1): flags for Allowed Diffserv class

15

Length: 3 flags (= 4 octets)

16

"A" bit set means the user can send packets with AF DSCPs.

17

"E" bit set means the user can send packets with EF DSCP.

18

"O" bit set means the use can mark packets for experimental or local use.

19

20

Sub-Type (=2): Max class selection marking

21

Length: (=4 octets)

22

Value: See Reverse tunnel marking.

23

24

Sub-Type (=3): Reverse tunnel marking

25

Length: (= 4 octets)

26

RT-Marking:

27

'000000' = Default or Best Effort Forwarding, also Selector Class 0

28

'001010' = AF11

29

'001100' = AF12

30

'001110' = AF13

31

'010010' = AF21

32

'010100' = AF22

33

'010110' = AF23

34

'011010' = AF31

35

'011100' = AF32

36

'011110' = AF33

37

'100010' = AF41

38

'100100' = AF42

39

'100110' = AF43

40

'101110' = EF

41

'001000' = Selector Class 1

42

'010000' = Selector Class 2

43

'011000' = Selector Class 3

44

'100000' = Selector Class 4

45

'101000' = Selector Class 5

46

'110000' = Selector Class 6

47

'111000' = Selector Class 7

1 Other six bit long patterns are legal for this attribute, but are not standardized and therefore may
 2 have unpredictable behavior in public networks and other networks not configured to accept non-
 3 standard markings.

4 **Service Option Profile:**

5 This attribute specifies the authorized packet data service options, the maximum number of
 6 simultaneous service instances of the given service option number (n), and the total maximum
 7 number of simultaneous service instances. This attribute may appear in a RADIUS Access-
 8 Accept message.

								1																2																3							
0 1 2 3 4 5 6 7 8 9				0 1 2 3 4 5 6 7 8 9				0 1 2 3 4 5 6 7 8 9				0 1 2 3 4 5 6 7 8 9				0 1 2 3 4 5 6 7 8 9				0 1 2 3 4 5 6 7 8 9				0 1 2 3 4 5 6 7 8 9																							
Type								Length								Vendor-ID																															
Vendor-ID (cont)																Vendor-Type								Vendor-Length																							
Maximum service instances total																																															
Sub-Type (=1)								Length								Service Option n								Max number of service instances of Service Option n																							

14
 15 **Figure 10. Service Option Profile VSA format**

16 Type: 26
 17 Length ≥ 16
 18 Vendor ID: 5535
 19 Vendor-Type: 74
 20 Vendor-Length ≥ 10
 21 Maximum Service Instances total:
 22 The maximum number of service instances the user is allowed to establish
 23 regardless of the service option numbers. '1' represents one service instance, i.e.,
 24 the main service instance. '0' is not an allowed value.
 25 Sub-Type (=1): Sub-Type for service option
 26 Length: length for service option attribute in octets (4 octets)
 27 Service Option n: Service Option number:
 28 Maximum Number of Service instances of service option n
 29 Sub-Type 1 may be repeated, once for each authorized service option.

30 **DNS-Update-Required:**

31 Indicates whether the HA is required to send DNS Update to the DNS server for a user. This VSA
 32 optionally appears in a RADIUS Access-Accept message from the Home RADIUS server in
 33 response to a RADIUS Access-Request message from the HA that contains the DNS-Update-
 34 Capability VSA. This VSA is included in a RADIUS Access-Accept message from the Home
 35 RADIUS server to the HA only when the DNS update is enabled through the subscriber's profile.

36 Type: 26
 37 Length = 12
 38 Vendor ID: 5535
 39 Vendor-Type = 75
 40 Vendor-Length = 6
 41 Vendor-Value =
 42 1 - HA performs DNS Update.
 43 All other values reserved for future use. If used, the HA shall discard the VSA
 44 and shall not perform DNS Update.

45 **Always On:**

46 A VSA used to indicate if the user has the "Always On" service or not.

47 Type: 26
 48 Length = 12
 49 Vendor ID: 5535

1 Vendor-Type = 78
 2 Vendor-Length = 6
 3 Vendor-Value =
 4 0 - Inactive
 5 1 - Active

6 **Foreign Agent Address:**

7 The IPv4 address of the PDSN CoA contained in RRQ.
 8 Type: 26
 9 Length = 12
 10 Vendor ID: 5535
 11 Vendor-Type = 79
 12 Vendor-Length = 6
 13 Vendor-Value =
 14 FA IPv4 Address

15 **MN-AAA Removal Indication:**

16 When received in a RADIUS Access-Accept message, the PDSN shall not include the MN-AAA
 17 Authentication and MN-FA challenge extensions when relaying the RRQ to the HA.
 18 Type: 26
 19 Length = 12
 20 Vendor ID: 5535
 21 Vendor-Type = 81
 22 Vendor-Length = 6
 23 Vendor-Value =
 24 1 - MN-AAA not required

25 **RN Packet Data Inactivity Timer:**

26 This is the value of the RN packet data inactivity timer available for use in the radio network for a
 27 packet data session. This attribute optionally appears in the RADIUS Access-Accept message.
 28 Type: 26
 29 Length: = 12
 30 Vendor ID: 5535
 31 Vendor-Type = 82
 32 Vendor-Length = 6
 33 Vendor-Value = the value of the RN Packet Data Inactivity Timer specified as an integer
 34 according to [4].

35 **Session Termination Capability (STC):**

36 The value shall be bitmap encoded rather than a raw integer. This attribute shall be included in a
 37 RADIUS Access-Request message to the Home RADIUS server and shall contain the value 3 to
 38 indicate that the PDSN and HA support both Dynamic authorization with RADIUS and
 39 Registration Revocation for Mobile IPv4. The attribute shall also be included in the RADIUS
 40 Access-Accept message and shall contain the preferred resource management mechanism by
 41 the home network, which shall be used for the session and may include values 1 to 3.

42 Type: 26
 43 Length = 12
 44 Vendor ID: 5535
 45 Vendor-Type = 88
 46 Vendor-Length = 6
 47 Vendor-Value =
 0x00000001 Only Dynamic Authorization Extensions to RADIUS is use.
 0x00000010 Note 1 Only Registration Revocation in Mobile IPv4 is used.
 0x00000011 Both Dynamic Authorization Extensions to RADIUS and
 Registration Revocation in Mobile IPv4 are used.

48 Note 1: For PrePaid service, value 2 is not allowed.

1 **Allowed Persistent TFTs:**

2 This attribute specifies the number of simultaneous persistent TFTs that may be established by
3 the user. Persistent TFTs are those that exist at the PDSN regardless of the state of the
4 corresponding service instance. The user shall also be authorized for the same number of
5 persistent header generation contexts and Header compression context associated with the
6 persistent TFT. This attribute may appear in a RADIUS Access-Accept message.

1												2												3											
0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1				
Type						Length						Vendor-ID																							
Vendor-ID (cont)												Vendor-Type						Vendor-Length																	
Maximum Persistent TFTs																																			

11 **Figure 11. Allowed Persistent TFTs VSA format**

12 Type: 26
13 Length = 12
14 Vendor ID: 5535
15 Vendor-Type: 89
16 Vendor-Length = 6
17 Maximum Persistent TFTs:
18 The maximum number of Persistent TFTs, Header Removal and Header
19 Compression Contexts the user is allowed to create.

20 **PrePaidAccountingQuota (PPAQ):**

21 This attribute specifies the characteristics for PrePaid accounting of the volume and/or duration of
22 a packet data session. It shall be present in all on-line RADIUS Access-Request and on-line
23 RADIUS Access-Accept messages and may be included in other RADIUS Access-Accept
24 messages. Non-used Sub-Types by the PPC and PPS shall be omitted.

25

1												2												3											
0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1				
Type						Length						Vendor-ID																							
Vendor-ID (cont)												Vendor-Type						Vendor-Length																	
Sub-Type (=1)						Length						Value(QuotaIdentifier)																							
Value (QuotaIdentifier)												Sub-Type (=2)						Length																	
Value (VolumeQuota)																																			
Sub-Type (=3)						Length						Value(VolumeQuotaOverflow)																							
Sub-Type (=4)						Length						Value(VolumeThreshold)																							
Value (VolumeThreshold)												Sub-Type (=5)						Length																	
Value(VolumeThresholdOverflow)												Sub-Type (=6)						Length																	
Value (DurationQuota)																																			
Sub-Type (=7)						Length						Value(DurationThreshold)																							
Value (DurationThreshold)												Sub-Type (=8)						Length																	
Value (Update-Reason)												Sub-Type (=9)						Length																	
PrePaidServer (IPv4 or IPv6 Address)																																			
PrePaidServer (IPv6 Address)																																			
PrePaidServer IPv6 Address)																																			
PrePaidServer (IPv6 Address)																																			

26 **Figure 12. PrePaidAccountingQuota (PPAQ) VSA format**

27 Type: 26
28 Length: variable, greater than 8
29 Vendor-ID: 5535
30 Vendor-Type: 90
31 Vendor-Length: variable, greater than 2

1 Sub-Type (=1): Sub-Type for QuotaIdentifier attribute
2 Length: length of QuotaIdentifier attribute (= 6 octets)
3 QuotaIdentifier (QID):
4 The QuotaIdentifier Sub-Type is generated by the PrePaid server at allocation of
5 a Volume and/or Duration Quota. The on-line quota update RADIUS Access-
6 Request message sent from the PPC to the PPS shall include a previously
7 received QuotaIdentifier.
8

9 Sub-Type (=2): Sub-Type for VolumeQuota attribute
10 Length: length of VolumeQuota attribute (= 6 octets)
11 VolumeQuota (VQ):
12 The optional VolumeQuota Sub-Type is only present if Volume Based charging is
13 used. In RADIUS Access-Accept message (PPS to PPC direction), it indicates
14 the Volume (in octets) allocated for the session by the PrePaid server. In on-line
15 RADIUS Access-Request message (PPC to PPS direction), it indicates the total
16 used volume (in octets) for both forward and reverse traffic applicable to PrePaid
17 accounting¹⁴. If a Tariff Switch condition was reached during the session, this
18 Sub-Type contains the complete (before and after) volume used, while the
19 VolumeUsedAfterTariffSwitch attribute contains the volume used after the tariff
20 switch condition.
21

22 Sub-Type (=3): Sub-Type for VolumeQuotaOverflow
23 Length: length of VolumeQuotaOverflow attribute (= 4 octets)
24 VolumeQuotaOverflow (VQO):
25 The optional VolumeQuotaOverflow Sub-Type is used to indicate how many
26 times the VolumeQuota counter has wrapped around 2^{32} over the course of the
27 service being provided.
28

29 Sub-Type (=4): Sub-Type for VolumeThreshold attribute
30 Length: length of VolumeThreshold attribute (= 6 octets)
31 VolumeThreshold (VT):
32 The VolumeThreshold Sub-Type shall always be present if VolumeQuota is
33 present in a RADIUS Access-Accept message (PPS to PPC direction). It is
34 generated by the PrePaid server and indicates the volume (in octets) that shall
35 be used before requesting quota update. This threshold should not be larger than
36 the VolumeQuota.
37

38 Sub-Type (=5): Sub-Type for VolumeThresholdOverflow
39 Length: length of VolumeThresholdOverflow attribute (= 4 octets)
40 VolumeThresholdOverflow (VTO):
41 The optional VolumeThresholdOverflow Sub-Type is used to indicate how many
42 times the VolumeThreshold counter has wrapped around 2^{32} over the course of
43 the service being provided.
44

45 Sub-Type (=6): Sub-Type for DurationQuota attribute
46 Length: length of DurationQuota attribute (= 6 octets)
47 DurationQuota (DQ):
48 The optional DurationQuota Sub-Type is only present if Duration Based charging
49 is used. In RADIUS Access-Accept message (PPS to PPC direction), it indicates
50 the Duration (in seconds) allocated for the session by the PrePaid server. In on-
51 line RADIUS Access-Accept message (PPC to PPS direction), it indicates the

¹⁴ Remote Address identified as exempt from PrePaid accounting shall not be accounted for in the volume used returned in the VolumeQuota.

1 total Duration (in seconds) since the start of the accounting session related to the
 2 QuotaID.
 3

4 Sub-Type (=7): Sub-Type for DurationThreshold attribute
 5 Length: length of DurationThreshold attribute (= 6 octets)
 6 DurationThreshold (DT):

7 The DurationThreshold Sub-Type shall always be present if DurationQuota is
 8 present in a RADIUS Access-Accept message (PPS to PPC direction). It
 9 represents the duration (in seconds) that shall be used by the session before
 10 requesting quota update. This threshold should not be larger than the
 11 DurationQuota and shall always be sent with the DurationQuota.
 12

13 Sub-Type (=8): Sub-Type for Update-Reason attribute
 14 Length: length of Update-Reason attribute (= 4 octets)
 15 Update-Reason attribute (UR):

16 The Update-Reason Sub-Type shall be present in the on-line RADIUS Access-
 17 Request message (PPC to PPS direction). It indicates the reason for initiating the
 18 on-line quota update operation. Update reasons 4, 5, 6, 7 and 8 indicate that the
 19 associated resources are released at the client side, and therefore the PPS shall
 20 not allocate a new quota in the RADIUS Access-Accept message.

- 21 1. Pre-initialization
- 22 2. Initial request
- 23 3. Threshold reached
- 24 4. Quota reached
- 25 5. Remote Forced disconnect
- 26 6. Client Service termination
- 27 7. Main SI released
- 28 8. Service Instance not established
- 29 9. Tariff Switch Update

30
 31 Sub-Type (=9): Sub-Type for PrePaidServer attribute
 32 Length: Length of PrePaidServer (IPv4 = 6 octets, IPv6= 18 octets)
 33 PrePaidServer:

34 The optional, multi-value PrePaidServer indicates the address of the serving
 35 PrePaid System. If present, the Home RADIUS server uses this address to route
 36 the message to the serving PrePaid Server. The attribute may be sent by the
 37 Home RADIUS server. If present in the incoming RADIUS Access-Accept
 38 message, the PDSN shall send this attribute back without modifying it in the
 39 subsequent RADIUS Access-Request message, except for the first one. If
 40 multiple values are present, the PDSN shall not change the order of the
 41 attributes.

42 **PrePaidAccountingCapability (PPAC):**

43 This attribute specifies the capability for PrePaid accounting for a packet data session. It contains
 44 the possible capabilities of the PrePaid client and the selected (by the PrePaid server) capability
 45 for the session. The absence of this VSA indicates that the client is not capable of PrePaid
 46 Accounting and the session shall not use PrePaid accounting.

47

										1										2										3									
0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
Type										Length										Vendor-ID																			
										Vendor-ID (cont)										Vendor-Type										Vendor-Length									
Sub-Type (=1)										Length										Value(AvailableInClient)																			
Value (AvailableInClient)										Sub-Type (=2)										Length																			
Value (SelectedForSession)																																							

1 Type: 26
 2 Length: variable, greater than 8
 3 Vendor-ID: 5535
 4 Vendor-Type: 92
 5 Vendor-Length: variable, greater than 2
 6 Sub-Type (=1): Sub-Type for RRQ Lifetime attribute
 7 Length: length of RRQ Lifetime attribute (= 6 octets)
 8 RRQ Lifetime:
 9 Shall be included in the initial RADIUS Access-Request message and
 10 subsequent on-line RADIUS Access-Request if duration based PrePaid is
 11 provided for the session. It contains the MIP RRQ integer value lifetime received
 12 in the MIP RRQ message. In the RADIUS Access-Accept message, it contains
 13 the MIP RRQ integer value lifetime that shall be used in the MIP RRP.
 14
 15 Sub-Type (=2): Sub-Type for Used Lifetime from Existing Session attribute
 16 Length: length of Used Lifetime from Existing Session attribute (= 6 octets)
 17 Used Lifetime from Existing Session:
 18 Shall be included in the RADIUS Access-Request message at re-registration and
 19 updated RRQ (new CoA) if duration based PrePaid is provided for the session, it
 20 contains the used MIP RRQ lifetime value from an existing MIP session with the
 21 same NAI and Home Address.

22 **Accounting-Stop-triggered-by-Active-Stop-Indication:**

23 When received in a RADIUS Access-Accept message, the PDSN shall trigger Accounting-
 24 Request (Stop) and (Start) for the main service instance at transition between dormant and active
 25 states.

26 Type: 26
 27 Length = 12
 28 Vendor ID: 5535
 29 Vendor-Type = 93
 30 Vendor-Length = 6
 31 Vendor-Value =
 32 1 – Accounting report at active/dormant transitions

33 **Service Reference ID:**

34 Specifies the reference ID of the service instance as received in the A11 Registration Request. If
 35 the service instance is the main service instance, the main SI Indicator Sub-Type shall be
 36 included.

37

1												2												3											
0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1				
Type												Length												Vendor-ID											
Vendor-ID (cont)												Vendor-Type												Vendor-Length											
Sub-Type (=1)												Length												Value (SR_ID)											
Sub-Type (=2)												Length												Value(Main SI Indicator)											

38 **Figure 15. Service Reference ID format**

39 Type: 26
 40 Length ≥ 12
 41 Vendor ID: 5535
 42 Vendor-Type: 94
 43 Vendor-Length ≥ 6
 44 Sub-Type (=1): SR_ID
 45 Length: (= 4 octets)
 46 Contains the SR_ID value received in the A11 Registration-Request message.

1 Vendor ID: 5535
2 Vendor-Type¹⁸: 97
3 Vendor-Length ≥18
4
5 Sub-Type (=1): Sub-Type for remote IPv6 address attribute. If present, Sub-Type 5 shall
6 not be present.
7 Length: length of remote address attribute (18 octets)
8 Remote Address:
9 The Remote Address Field contains an IPv6 address used for destination-based
10 remote IPv6 address based accounting by the user.
11
12 Sub-Type (=2): Sub-Type for prefix length. If present, Sub-Type 5 shall not be present.
13 Length: length of prefix length attribute (=4)
14 Prefix Length:
15 The prefix length specifies the number of leading bits that must be matched. The
16 prefix length is less than or equal to 128.
17
18 Sub-Type (=3): Sub-Type for Forward Octet Count attribute.
19 Length: length of Forward Octet Count attribute (6 octets)
20 Forward Octet Count:
21 The Forward Octet Count Field indicates how many octets have been received
22 from the Remote Address.
23
24 Sub-Type (=4): Sub-Type for Reverse Octet Count attribute.
25 Length: length of Reverse Octet Count attribute (6 octets)
26 Reverse Octet Count:
27 The Reverse Octet Count Field indicates how many octets have been sent to the
28 Remote Address.
29
30 Sub-Type (=5): Table Index for summarized Remote IPv6 Address Octet Count, if
31 present Sub-Type 1 and Sub-Type 2 shall not be present.
32 Length: length of table index (4 bytes)
33 Table Index:
34 The table index from the associated Remote Address Table Index attribute.
35
36 Sub-Type (=6): Sub-Type for Forward octet count Overflow.
37 Length: length of Forward octet count Overflow attribute (= 4 octets)
38 Forward Octet Count Overflow:
39 The optional Forward Octet Count Overflow Sub-Type is used to indicate how
40 many times the Forward Octet Count counter has wrapped around 2³² over the
41 course of the service being provided.
42
43 Sub-Type (=7): Sub-Type for Reverse Octet Count Overflow.
44 Length: length of Reverse Octet Count Overflow attribute (= 4 octets)
45 Reverse Octet Count Overflow:
46 The optional Reverse Octet Count Overflow Sub-Type is used to indicate how
47 many times the Reverse Octet Count counter has wrapped around 2³² over the
48 course of the service being provided.
49 **PrePaidTariffSwitching (PTS):**
50 This VSA specifies the characteristics for PrePaid accounting When Tariff Switching is used. If
51 the PTS VSA is included in the on-line RADIUS Access-Request/Accept messages or RADIUS
52 Access-Accept message, the PPAQ VSA shall also be included. It may be present in on-line
53 RADIUS Access-Request and on-line RADIUS Access-Accept messages and may be included in
54 other RADIUS Access-Accept messages. Non-used Sub-Types by the PPS shall be omitted.

1

								1								2								3							
0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1
Type								Length								Vendor-ID															
Vendor-ID (cont)																Vendor-Type								Vendor-Length							
Sub-Type (=1)								Length								Value(QuotalDentifier)															
Value (QuotalDentifier)																Sub-Type (=2)								Length							
Value (VolumeUsedAfterTariffSwitch)																															
Sub-Type (=3)								Length								Value(VolumeUsedATSOOverflow)															
Sub-Type (=4)								Length								Value(TariffSwitchInterval)															
Value (TariffSwitchInterval)																Sub-Type (=5)								Length							
Value [TimeIntervalafterTariffSwitchUpdate]																															

Figure 17. PrePaidTariffSwitch (PTS) VSA format

2

3 Type: 26

3

4 Length: variable, greater than 8

4

5 Vendor-ID: 5535

5

6 Vendor-Type: 98

6

7 Vendor-Length: variable, greater than 2

7

8 Sub-Type (=1): Sub-Type for QuotalDentifier attribute

8

9 Length: length of QuotalDentifier attribute (= 6 octets)

9

10 QuotalDentifier (QID):

10

11 The QuotalDentifier Sub-Type is generated by the PrePaid server at allocation of
 12 a Volume Quota. The on-line quota update RADIUS Access-Request message
 13 sent from the PPC to the PPS shall include a previously received QuotalDentifier.
 14 The QuotalDentifier value used in the PTS VSA shall be the same to the one
 15 included in the PPAQ VSA.

11

12

13

14

15

16

17 Sub-Type (=2): Sub-Type for VolumeUsedAfterTariffSwitch attribute

17

18 Length: length of VolumeUsedAfterTariffSwitch attribute (= 6 octets)

18

19 VolumeUsedAfterTariffSwitch (VUATS):

19

20 The VolumeUsedAfterTariffSwitch Sub-Type is only present if Volume Based
 21 charging is used and the RADIUS message is an on-line RADIUS Access-
 22 Request message (PPC to PPS direction). It indicates the total used volume (in
 23 octets) for both forward and reverse traffic applicable to PrePaid accounting after
 24 a Tariff Switch condition was reached during the session. If no Tariff Switch
 25 condition was reached, the PTS VSA shall not be present in the on-line RADIUS
 26 Access-Request message. The total volume used before and after the Tariff
 27 Switch is reported in the VolumeQuota Sub-Type in the associated PPAQ VSA.

20

21

22

23

24

25

26

27

28

29 Sub-Type (=3): Sub-Type for VolumeUsedATSOOverflow

29

30 Length: length of VolumeUsedATSOOverflow attribute (= 4 octets)

30

31 VolumeUsedATSOOverflow (VUATSO):

31

32 The optional VolumeUsedAfterTariffSwitchOverflow Sub-Type is used to indicate
 33 how many times the VolumeUsedAfterTariffSwitch counter has wrapped around
 34 2^32 over the course of the service being provided.

32

33

34

35

36 Sub-Type (=4): Sub-Type for TariffSwitchInterval attribute

36

37 Length: length of TariffSwitchInterval attribute (= 6 octets)

37

38 TariffSwitchInterval (TSI):

38

39 The TariffSwitchInterval Sub-Type is present if Volume Based charging is used
 40 and the RADIUS message is a RADIUS Access-Accept (PPS to PPC direction).
 41 It indicates the interval (in seconds) between the time stamp (G4) of the
 42 corresponding on-line RADIUS Access-Request and the next tariff switch
 43 condition. If no Tariff Switch condition is required, the PTS VSA shall not be
 44 present. The total volume used before and after the Tariff Switch is reported in

39

40

41

42

43

44

1 the VolumeQuota Sub-Type in the PPAQ VSA, and the volume used after the
 2 Tariff Switch is reported in the VolumeUsedAfterTariffSwitch Sub-Type in the
 3 PTS VSA.

4
 5 Sub-Type (=5): Sub-Type for TimeIntervalafterTariffSwitchUpdate attribute
 6 Length: Length of TimeIntervalafterTariffSwitchUpdate (=6 octets)
 7 TimeIntervalafterTariffSwitchUpdate (TITSU):
 8 The TimeIntervalafterTariffSwitchUpdate Sub-Type may be present when
 9 Volume Based tariff switching is used. The Home RADIUS/PPS may send it to
 10 the PPC in the RADIUS Access-Accept message only if the TSI Sub-Type is also
 11 present. It corresponds to the duration after TSI where an on-line RADIUS
 12 Access-Request message may be sent by the PrePaid capable PDSN to report
 13 VUATS before the next tariff switch condition is triggered in the Home
 14 RADIUS/PPS.

15 **DNS Server IP Address:**

16 This VSA may be present in a RADIUS Access-Accept message. It includes a Primary and a
 17 Secondary DNS server IP addresses.
 18

										<u>1</u>																				<u>2</u>																				<u>3</u>									
<u>0</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>0</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>0</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>0</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>0</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>										
<u>Type</u>										<u>Length</u>										<u>Vendor-ID</u>																																							
<u>Vendor-ID (cont)</u>										<u>Vendor-Type</u>										<u>Vendor-Length</u>																																							
<u>Sub-Type (=1)</u>										<u>Length</u>										<u>Value (Primary DNS IPv4 address)</u>																																							
<u>Value (Primary DNS IPv4 address)</u>										<u>Sub-Type (=2)</u>										<u>Length</u>																																							
<u>Value (Secondary DNS IPv4 address)</u>										<u>Value (Secondary DNS IPv4 address)</u>																																																	
<u>Sub-Type (=3)</u>										<u>Length</u>										<u>M</u>										<u>Unused</u>										<u>Sub-Type (=4)</u>																			
<u>Length</u>										<u>Entity-Type</u>										<u>Unused</u>																																							

19 **Figure 18. DNS Server IP Address VSA**

20 Type: 26
 21 Length: 28
 22 Vendor ID: 5535
 23 Vendor-Type: 117
 24 Vendor-Length: 22
 25 Sub-Type (=1):
 26 Length: (=4 octets)
 27 Vendor-Value:
 28 Primary DNS server IP Address.
 29 Sub-Type (=2):
 30 Length: (= 4 octets)
 31 Vendor-Value:
 32 Secondary DNS server IP Address.
 33 Sub-Type (=3): Flag
 34 Length: (=1 octet)
 35 Vendor-Value:
 36 "M" bit set to 1 indicates to the PDSN that the Primary and Secondary DNS IP
 37 addresses provided by the Home RADIUS server shall override the Primary and
 38 Secondary DNS addresses if provided also by the Visited RADIUS server.
 39 Sub-Type (=4):
 40 Length: (=1 octet)
 41 Vendor-Value:
 42 "Entity-Type" The network entity that inserted in the DNS server IP address.
 43 Currently the following types are defined:
 44 HAAA = 1
 45 VAAA = 2

1 5 3GPP2 VSA Table

2 The following table¹⁵ provides a guide to the 3GPP2 vendor specific attributes that may be found
 3 in the RADIUS Access-Request, RADIUS Access-Accept messages and RADIUS Accounting-
 4 Request messages (following the RADIUS standard approach). The VSA types with vendor ID
 5 5535 are reserved and shall only be allocated by published 3GPP2 specifications. The entries in
 6 the table are defined as follows:

7

0	This attribute shall not be present.
0+	Zero or more instances of this attribute may be present.
0-1	Zero or one instance of this attribute may be present.
1	Exactly one instance of this attribute shall be present.

8

VSA	Type	Access-Request	Access-Accept	Accounting Start	Accounting Stop	Accounting Interim-Update
IKE Pre-shared Secret Request	26/01	0-1	0	0	0	0
Security Level	26/02	0	0-1	0	0	0
Pre-shared Secret	26/03	0	0-1	0	0	0
Reverse Tunnel Specification	26/04	0	0-1	0	0	0
Differentiated Services Class Option	26/05	0	0-1	0	0	0
Container	26/06	0	0	0	0+	0+
Home Agent	26/07	0-1	0-1	0-1	0-1	0-1
KeyID	26/08	0	0-1	0	0	0
Serving PCF	26/09	0	0	1	1	1
BSID	26/10	0	0	1	1	1
User Zone	26/11	0	0	0-1	0-1	0-1
Forward Mux Option	26/12	0	0	0-1	0-1	0-1
Reverse Mux Option	26/13	0	0	0-1	0-1	0-1
Service Option	26/16	0-1	0	1	1	1
Forward Traffic Type	26/17	0	0	0-1	0-1	0-1
Reverse Traffic Type	26/18	0	0	0-1	0-1	0-1
Fundamental Frame Size	26/19	0	0	0-1	0-1	0-1
Forward Fundamental RC	26/20	0	0	0-1	0-1	0-1
Reverse Fundamental RC	26/21	0	0	0-1	0-1	0-1
IP Technology	26/22	0-1	0	1	1	1
Compulsory Tunnel Indicator	26/23	0	0-1	1	1	1
Release Indicator	26/24	0	0	0	1	0
Bad PPP Frame Count	26/25	0	0	0	0-1	0-1
Number of Active Transitions	26/30	0	0	0	1	1

¹⁵ See X.S0011-006-C for attributes of PrePaid Accounting.

SDB Octet Count (Terminating)	26/31	0	0	0	0-1	0-1
SDB Octet Count (Originating)	26/32	0	0	0	0-1	0-1
Number of SDBs (Terminating)	26/33	0	0	0	0-1	0-1
Number of SDBs (Originating)	26/34	0	0	0	0-1	0-1
IP Quality of Service	26/36	0	0	0-1	0-1	0-1
Airlink Priority ¹⁶	26/39	0	0	0-1	0-1	0-1
Airlink Record Type ¹⁶	26/40	0	0	0	0	0
Airlink Sequence Number ¹⁶	26/42	0	0	0	0	0
Number of HDLC layer bytes received	26/43	0	0	0	0-1	0-1
Correlation ID	26/44	1	0-1	1	1	1
Mobile Originated / Mobile Terminated Indicator ¹⁶	26/45	0	0	0	0	0
Inbound Mobile IP Signaling Octet Count	26/46	0	0	0	0-1	0-1
Outbound Mobile IP Signaling Octet Count	26/47	0	0	0	0-1	0-1
Session Continue	26/48	0	0	0	1	0-1
Active Time	26/49	0	0	0	0-1	0-1
DCCH Frame Format	26/50	0	0	0-1	0-1	0-1
Beginning Session	26/51	0	0	0-1	0	0
ESN	26/52	0	0	0-1	0-1	0-1
'S' Key	26/54	0	0-1	0	0	0
'S' Request	26/55	0-1	0	0	0	0
'S' Lifetime	26/56	0	0-1	0	0	0
MN-HA SPI	26/57	0-1	0	0	0	0
MN-HA Shared Key	26/58	0	0-1	0	0	0
Remote Ipv4 Address	26/59	0	0+	0	0	0
Reserved ¹⁷	26/60-69					
Remote Ipv6 Address	26/70	0	0+	0	0	0
Remote Address Table Index	26/71	0	0+	0	0	0
Remote IPv4 Address Octet Count	26/72	0	0	0	0+	0+
Allowed Differentiated Services Marking	26/73	0	0-1	0	0	0
Service Option Profile	26/74	0	0-1	0	0	0
DNS-Update-Required	26/75	0	0-1	0	0	0
Always On	26/78	0	0-1	0-1	0-1	0-1
Foreign Agent Address	26/79	0-1	0	0	0	0

¹⁶ The attribute is used over the R-P interface in Airlink Records, they are not sent to the Home RADIUS server in Accounting Records.

¹⁷ Reserved for RN usage.

Last User Activity Time	26/80	0	0	0	0-1	0-1
MN-AAA Removal Indication	26/81	0	0-1	0	0	0
RN Packet Data Inactivity Timer	26/82	0	0-1	0	0	0
Forward PDCH RC	26/83	0	0	0-1	0-1	0-1
Forward DCCH Mux Option	26/84	0	0	0-1	0-1	0-1
Reverse DCCH Mux Option	26/85	0	0	0-1	0-1	0-1
Forward DCCH RC	26/86	0	0	0-1	0-1	0-1
Reverse DCCH RC	26/87	0	0	0-1	0-1	0-1
Session Termination Capability	26/88	1	1	0	0	0
Allowed Persistent TFTs	26/89	0	0-1	0	0	0
PrePaidAccounting Quota (PPAQ)	26/90	0	0-1	0	0	0
PrePaidAccounting Capability (PPAC)	26/91	0-1	0-1	0	0	0
MIP Lifetime	26/92	0-1	0-1	0	0	0
Accounting-Stop-triggered-by-Active-Stop-Indication	26/93	0	0-1	0	0	0
Service Reference ID	26/94	0-1	0	1	1	1
DNS-Update-Capability	26/95	0-1	0	0	0	0
Remote IPv6 Address Octet Count ¹⁸	26/97	0	0	0	0+	0+
PrePaidTariffSwitch (PTS)	26/98	0	0-1	0	0	0
<u>MEID</u>	<u>26/116</u>	<u>0</u>	<u>0</u>	<u>0-1</u>	<u>0-1</u>	<u>0-1</u>
<u>DNS Server IP Address</u>	<u>26/117</u>	<u>0</u>	<u>0+</u>	<u>0</u>	<u>0</u>	<u>0</u>

1

Table 7. Complete list of 3GPP2 VSAs

¹⁸ Previous version of this specification used 26/80 as a value type for the Remote IPv6 Address Count VSA. This version of the specification changed the VSA type to 26/97, because 26/80 has been assigned to G17 (Last User Activity Time) currently deployed by the cdma2000 wireless industry.

1 6 RADIUS Disconnect Attribute Table

2 The following table provides a guide to the RADIUS attributes found in the RADIUS Disconnect-
3 Request, RADIUS Disconnect-ACK and RADIUS Disconnect-NAK messages. The entries in the
4 table are defined as follows:

5

0	This attribute shall not be present.
0+	Zero or more instances of this attribute may be present.
0-1	Zero or one instance of this attribute may be present.
1	Exactly one instance of this attribute shall be present.

6

Attribute	Type	Disconnect-Request	Disconnect-ACK
Correlation ID	26/44	0-1	0
User-Name	1	1	0
Framed-IP address	8	0-1	0
Calling-Station ID	31	0-1	0
DisconnectReason	26/96	0-1	0
NAS-Identifier	32	1	0
Framed-IPv6-Prefix	97	0-1	0
Framed-Interface-ID	96	0-1	0

7

Table 8. Attributes of RADIUS Disconnect messages

1 **Annex A: Interim-Update RADIUS Accounting** (normative)

2 A RADIUS Interim-Update Accounting record (with Acct-Status-Type = Interim-Update (3)) shall
3 contain all of the attributes found in an Accounting (Stop) message with the exception of the Acct-
4 Term-Cause and Release-Indicator attributes. The Session Continue attribute, if included, shall
5 be set to 1. The values of the attributes in the RADIUS Interim-Update Accounting record shall be
6 cumulative since the RADIUS Accounting-Request (Start) record.

7 Since the accounting information is cumulative, the PDSN shall ensure that only a single
8 generation of an Interim-Update Accounting message for a given NAI and IP address is present
9 in retransmission queues at any given time.

10 The PDSN may add a random delay between RADIUS Interim-Update Accounting messages for
11 separate sessions. This will ensure that a cycle where all messages are sent at once is
12 prevented.