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**3GPP2 A.S0017-A**

**Version 1.0**

**Date: October 2002**



**3RD GENERATION  
PARTNERSHIP  
PROJECT 2  
"3GPP2"**

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# **Interoperability Specification (IOS) for cdma2000 Access Network Interfaces — Part 7 (A10 and A11 Interfaces)**

**(3G-IOS v4.3)**

**(SDO Ballot Version)**

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## 1.0 Introduction

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### 1.1 Overview

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This document contains the message procedures, bitmaps, information elements, and timers used to define the A10 and A11 interfaces.

#### 1.1.1 Purpose

---

The purpose is to provide the standard for interfacing one or more PDSNs with one or more PCFs. This document defines the functional capabilities, including services and features, of the specified interfaces. These services and features are the defining characteristics that are the basis for the overall system standard.

#### 1.1.2 Scope

---

This standard provides the specification for the Interfaces that coincide with the Reference Point “A<sub>quarter</sub>” defined in the TR45 Network Reference Model shown in [19]. The scope of this standard includes the following topics:

- Descriptions of the specified functional capabilities that provide packet data services across the PCF-PDSN interface;
- Descriptions of the division of responsibility of the functions provided between the PCF and the PDSN without prescribing specific implementations.

## 1.2 References

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### 1.2.1 TIA / EIA

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For ease of cross-referencing, the Telecommunications Industry Association (TIA) / Electronics Industry Association (EIA) references provided in this section are aligned with the 3GPP2 references, provided in section 1.2.2.

- |      |   |
|------|---|
| [1]  | Reserved.   |
| [2]  | Reserved.   |
| [3]  | Reserved.   |
| [4]  | Reserved.   |
| [5]  | Reserved.   |
| [6]  | Reserved.   |
| [7]  | Reserved.   |
| [8]  | TIA/EIA/IS-835-A, <i>cdma2000 Wireless IP Network Standard</i> , May 2001.  |
| [9]  | Reserved.   |
| [10] | Reserved.   |
| [11] | Reserved.   |
| [12] | Reserved.   |
| [13] | TIA/EIA-2001.3-C, <i>Interoperability Specification (IOS) for cdma2000 Access Network Interfaces – Part 3 Features</i> , TBD. |
| [14] | Reserved.   |

- 1 [15] Reserved.
- 2 [16] TIA/EIA-2001.6-C, *Interoperability Specification (IOS) for cdma2000 Access*
- 3 *Network Interfaces – Part 6 (A8 and A9 Interfaces)*, TBD.
- 4 [17] Reserved.
- 5 [18] TIA/EIA/IS-637-B, *Short Message Service for Wideband Spread Spectrum*
- 6 *Systems*, January 2002.
- 7 [19] TIA/EIA/TSB100-A, *Wireless Network Reference Model*, March 2001.

**1.2.2 3GPP2**

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9 The 3GPP2 references are aligned with the TIA/EIA references of section 1.2.1 and are  
 10 provided here for information and cross-reference purposes.

- 11 [1] Reserved.
- 12 [2] Reserved.
- 13 [3] Reserved.
- 14 [4] Reserved.
- 15 [5] Reserved.
- 16 [6] Reserved.
- 17 [7] Reserved.
- 18 [8] 3GPP2 P.S0001-A, *Wireless IP Network Standard*, July 2000.
- 19 [9] Reserved.
- 20 [10] Reserved.
- 21 [11] Reserved.
- 22 [12] Reserved.
- 23 [13] 3GPP2 A.S0013-A, *Interoperability Specification (IOS) for cdma2000 Access*
- 24 *Network Interfaces – Part 3 Features*, TBD.
- 25 [14] Reserved.
- 26 [15] Reserved.
- 27 [16] 3GPP2 A.S0016-A, *Interoperability Specification (IOS) for cdma2000 Access*
- 28 *Network Interfaces – Part 6 (A8 and A9 Interfaces)*, TBD.
- 29 [17] Reserved.
- 30 [18] 3GPP2 C.S0015-A, *Short Message Service (SMS) for Wideband Spread*
- 31 *Spectrum*, January 2002.
- 32 [19] 3GPP2 S.R0005-B, *Network Reference Model for cdma2000 Spread Spectrum*
- 33 *Systems*, April 2001.

**1.2.3 Other**

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- 35 [20] Internet Engineering Task Force, *RFC 2002 – IP Mobility Support*, October
- 36 1996.
- 37 [21] Internet Engineering Task Force, RFC 2865 – Remote Authentication Dial In
- 38 User Service (RADIUS), June 2000.
- 39 [22] Internet Engineering Task Force, *RFC 2866 – RADIUS Accounting*, June 2000.
- 40 [23] Internet Engineering Task Force, RFC 3115 – Mobile IP Vendor/Organization-
- 41 Specific Extensions, April 2001.

**1.3 Terminology**

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**1.3.1 Acronyms**

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<b>Acronym</b>	<b>Meaning</b>
----------------	----------------

<b>Acronym</b>	<b>Meaning</b>
3GPP2	3 <sup>rd</sup> Generation Partnership Project 2
ANID	Access Network Identifiers
BCD	Binary Coded Decimal
BS	Base Station
BSID	Base Station ID
CANID	Current Access Network Identifiers
CDMA	Code Division Multiple Access
CVSE	Critical Vendor/Organization Specific Extension
DAI	Data Available Indicator
DCCH	Dedicated Control Channel
EIA	Electronics Industry Association
ESN	Electronic Serial Number
GRE	Generic Routing Encapsulation
IANA	Internet Assigned Number Authority
IEI	Information Element Identifier
IETF	Internet Engineering Task Force
IMSI	International Mobile Subscriber Identifier
IOS	Interoperability Specification
IP	Internet Protocol
IS	Interim Standard
LSB	Least Significant Bit
MSB	Most Significant Bit
MSID	Mobile Station IDentification
NID	Network Identification
NVSE	Normal Vendor/Organization Specific Extension
PANID	Previous Access Network Identifiers
PCF	Packet Control Function
PDSN	Packet Data Serving Node
QoS	Quality of Service
RADIUS	Remote Authentication Dial In User Service
RC	Radio Configuration, Radio Class
RN-PDIT	Radio Network Packet Data Inactivity Timer
SDB	Short Data Burst
SID	System Identification
SPI	Security Parameter Index
TIA	Telecommunications Industry Association
TLV	Type Length Value

1 **1.3.2 Definitions**

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2 Reserved

3 **1.4 Message Body, Coding, and Ordering of Elements**

---

4 For each A11 Interface message there are a number of information elements that are  
 5 individually defined in section 4.2. Each information element in a given message is  
 6 tagged with a reference in section 4.2, a direction indication (i.e., some elements within a  
 7 message are bi-directional and others are not), and a mandatory/optional type (M/O)  
 8 indicator. Information elements that are marked as optional carry an additional indication  
 9 of being either required (R) or conditional (C) (refer to below). Some information  
 10 elements are reused in multiple messages.

11 The DIRECTION indication associated with each message element pertains to the use of  
 12 that particular message element when used with the particular message (i.e., use of the  
 13 message element may be different in other messages). The format of the DIRECTION  
 14 indication is as follows:

15 **Table 1.4-1 Element Flow DIRECTION Indication**

PCF -> PDSN	Element flows from the PCF to the PDSN
PDSN -> PCF	Element flows from the PDSN to the PCF

16 The inclusion of information elements in each message is specified as follows:

- 17 M Information elements which are mandatory for the message.
- 18 O Information elements which are optional for the message.
- 19 R Required in the message whenever the message is sent.
- 20 C Conditionally required. The conditions for inclusion of this element is  
 21 defined in the operation(s) where the message is used (refer to [13])  
 22 and in footnotes associated with the table defining the order of  
 23 information elements in the message.

24 Information elements which are mandatory for a given message shall be present, and  
 25 appear in the order shown in the message definitions in this chapter.

26 Information elements which are optional for a given message are included as needed for  
 27 specific conditions. When included, they shall appear in the order shown in the message  
 28 definition given in this chapter.

29 An information element can very well be mandatory for some messages and optional for  
 30 other messages.

31 The bitmap tables in the message subsections of 3.0 are patterned after the format for  
 32 the information elements of section 4.2 and use the following conventions:

- 33 ⇒ **Element Name{<# instances>:**
- 34 = Name of information element.
- 35 Different elements within a message are separated by  
 36 double lines.
- 37 Fields within elements are separated by single lines.

1		Octets are renumbered at the beginning of every
2		element.
3	[<values>]	= Set of allowed values.
4	<b>} Element Name</b>	The number of instances of an element is 1 by default.
5		If the <b>Element Name</b> {<# instances ... > <b>Element</b>
6		<b>Name</b> notation is used, the <# instances> notation
7		indicates:
8		n = exactly n occurrences of the element
9		n+ = n or more occurrences of the element
10		1..n = 1 to n inclusive occurrences of the element
11	<b>label {&lt;# instances&gt;:</b>	
12	<octet 1>	
13	<octet m>	
14	<b>} label</b>	= Number of instances of the bracketed set of fields
15		where <# instances> notation indicates:
16		n = exactly n occurrences of the field
17		n+ = n or more occurrences of the field
18		1..n = 1 to n inclusive occurrences of the field
19	SSSS SSSS	
20	...	= Variable length field.
21	SSSS SSSS	

## 1.5 Forward Compatibility Guidelines

---

23 This standard is intended to evolve to accommodate new features and capabilities. To  
 24 ensure that equipment implemented to one revision level interoperates with equipment  
 25 implemented to later revision levels, the following guidelines are defined for the  
 26 processing of messages and for the development of messages in future revisions of this  
 27 standard.

28 Unexpected signaling information may be received at an entity due to differing revision  
 29 levels of signaling protocol at different entities within a network: an entity using a more  
 30 enhanced version of the protocol may send information to an entity implemented at a  
 31 lower level of the protocol which is outside the protocol definition supported at that  
 32 receiving entity.

33 It may happen that an entity receives unrecognized signaling information, i.e., messages,  
 34 element types or element values. This can typically be caused by the upgrading of the  
 35 protocol version used by other entities in the network. In these cases the following  
 36 message processing guidelines are invoked to ensure predictable network behavior.

37 The sending entity shall send messages that are correctly formatted for the version of the  
 38 IOS declared to be implemented by the sending entity. To preserve the interoperability  
 39 between a PDSN and a PCF that have different IOS versions, the use of two element  
 40 types for the Vendor/Organization Specific Extension element is required, starting with

1 the IOS version 4.1. The two types of Vendor/Organization Specific Extension elements  
 2 i.e., the Critical Vendor/Organization Specific Extension (CVSE) and the Normal  
 3 Vendor/Organization Specific Extension (NVSE) are defined in [23] where each  
 4 CVSE/NVSE has a 16 bit application type associated with it. This standard further  
 5 defines the 16-bit application type as an 8-bit application type and an 8-bit application  
 6 sub type. Also, the CVSEs/NVSEs introduced in this standard set the Vendor ID to the  
 7 IANA (Internet Assigned Number Authority) registered 3GPP2 vendor ID.

8 If a receiving entity receives a CVSE that contains an unrecognized application  
 9 type/application sub-type the receiving entity shall reject the message containing this  
 10 application type/application sub-type with an error code indicating that the message was  
 11 rejected due to the presence of an unknown CVSE. To support new features over the A11  
 12 signaling interface, new application types/application sub-types shall be included in an  
 13 NVSE element. If the receiving entity receives an NVSE with an unrecognized  
 14 application type/application sub-type, the receiving entity shall ignore the NVSE and  
 15 process the rest of the A11 signaling message. Within a CVSE or NVSE element  
 16 containing recognized application type and subtype, if any application data fields are not  
 17 recognized, those fields are ignored and the remainder of the element is processed to the  
 18 extent possible.

## 19 **1.6 Message Processing Guidelines**

---

20 The following message processing guidelines apply unless overridden by explicit  
 21 processing directions in other places within this standard.

22 In the guidelines in this section, “optional” includes both “optional – conditional” and  
 23 “optional – required” information elements as indicated in the message tables in section  
 24 3.0.

- 25 1. If a message is received containing a Message Type value which is not defined for  
 26 the revision level implemented then the message shall be discarded and ignored.  
 27 There shall be no change in state or in timers due to receipt of an unknown message.
- 28 2. If a message is received without an expected mandatory information element for the  
 29 revision level implemented then the message shall be discarded and ignored. There  
 30 shall be no change in state or in timers due to receipt of the message.
- 31 3. If a message is received that contains an information element which is defined for  
 32 the revision level implemented but contains invalid values in some fields, these fields  
 33 shall be ignored and the remainder of the information element processed to the extent  
 34 possible. The message and all other information elements shall be processed to the  
 35 extent possible. Failure handling may be initiated if call processing cannot continue.  
 36 Refer also to the message processing guidelines 9 and 10 below.
- 37 4. If a message is received that contains an Information Element Identifier which is not  
 38 defined for the revision level implemented then that element shall be discarded and  
 39 ignored. The message shall be processed to the extent possible. Failure handling may  
 40 be initiated if call processing cannot continue.
- 41 5. If a known but unexpected optional information element is received, that information  
 42 element shall be ignored. The message and all other information elements shall be  
 43 processed.
- 44 6. If a message is received without an expected optional information element the  
 45 message shall be processed to the extent possible. Failure handling may be initiated  
 46 if call processing cannot continue.

- 1 7. If a field within a received information element contains a value which is specified  
 2 as “reserved” or is otherwise not defined in the revision level implemented, this field  
 3 shall be ignored and the remainder of the information element processed to the extent  
 4 possible. In this situation, all other information elements shall be processed to the  
 5 extent possible.
- 6 8. Octets and bits designated as “Reserved” or which are undefined for the revision  
 7 implemented shall be set to zero by a sending entity and ignored by a receiving  
 8 entity.
- 9 9. If an element is received containing a field that is larger than expected, i.e., is  
 10 indicated as having more bits/octetets than expected, then the expected bits/octetets of  
 11 that field shall be processed to the extent possible and the additional bits/octetets shall  
 12 be ignored.
- 13 10. If an element is received containing a field that is smaller than expected, i.e., is  
 14 indicated as having fewer bits/octetets than expected, then the length field or other  
 15 indicator will shall be considered correct and the bits/octetets actually present in the  
 16 element shall be processed to the extent possible. Failure handling may be initiated if  
 17 call processing cannot continue.

## 18 **1.7 Message Definition Guidelines**

---

- 19 1. New messages shall have a Message Type that has never been previously used.
- 20 2. Information Element Identifiers may be reused in future revisions only when:
- 21 • The old use of the element identifier is not used in the new revision, and
  - 22 • The new use of the element identifier is used only in new messages which were  
 23 not defined in previous revisions.
  - 24 • The old use of the element identifier shall be supported within the context of the  
 25 old messages in which it was used.
- 26 3. Defined valid values of Information Elements may be changed in future revisions.  
 27 The new version shall define the error handling when previously valid values are  
 28 received.
- 29 4. Octets and bits which are undefined or which are defined as reserved may be used in  
 30 future revisions.
- 31 5. The Mandatory/Optional designation of Information Elements within a message shall  
 32 not change.
- 33 6. Mandatory Information elements shall be sent in the order specified in section 3.0.
- 34 7. New optional Information Elements in a message shall be defined after all previously  
 35 defined optional Information Elements other than the authentication extension  
 36 information elements (e.g. Mobile-Home Authentication Extension and Registration  
 37 Update Authentication Extension), which shall always be the last information  
 38 element in the message.
- 39 8. All new Information Elements shall be defined with a length field.
- 40 9. New information may be added to the end of an existing Information Element,  
 41 provided that the Information Element is defined with a length field.

## 42 **1.8 Application of Mobile IP**

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43 The A10/A11 interfaces are modeled after Mobile IP; refer to [20]. However, the two  
 44 protocols have been developed to meet different sets of requirements. With respect to the

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model in this specification, the PDSN is the Home Agent, and the PCF emulates the Mobile node and the Foreign Agent. Note that this application of Mobile IP is different from the application of Mobile IP as specified in [8], which occurs at a higher layer and is transparent to the IOS.

By basing the A10/A11 interface on [20], the IOS may reference sections of [20] rather than reproducing much of the text therein. For instance, message and information element formats, extensions, security mechanisms, and codes are borrowed from [20]. Subsequent sections provide explicit references to [20] when text from that document shall be applied.

Note that this standard deviates from [20] in several respects. First, when registering, the PCF uses a fictitious Home Address (= 0.0.0.0). The PDSN acting as a HA shall not attempt to allocate a non-zero IP address, but instead return the Home IP address of 0.0.0.0 in its reply to the PCF. The PDSN uses information in the Session Specific Extension (IMSI and SR\_ID) as an identity of the “Mobile Node”. Second, this standard specifies messages ( Registration Update, Registration Acknowledge, Session Update, and Session Update Acknowledge) not included in [20]. Third, the Registration Request and Registration Reply messages are used not only for performing registrations, but also to exchange other information between the PCF and the PDSN, such as accounting information.

## 2.0 Message Procedures

---

This section describes message procedures for the A10/A11 interface.

### 2.1 A10 Connection Establishment Procedures

---

This section describes message procedures to establish an A10 connection.

#### 2.1.1 A11-Registration Request

---

This message is sent from the PCF to the PDSN to initiate establishment of an A10 connection.

##### 2.1.1.1 Successful Operation

---

The PCF initiates setup of an A10 connection by sending an A11-Registration Request message to the PDSN and starts timer  $T_{\text{regreq}}$ . The A11-Registration Request message is structured as specified in [20] and contains the extensions specified in this standard.

If the connection setup request is acceptable, the PDSN updates its binding record for the A10 connection by creating an association between the PDSN Session Identifier (PDSN SID) and the IMSI, and PCF-Addresses. The PDSN SID shall be identical to the PCF Session Identifier (PCF SID). If both the PCF and the PDSN support a Session Identifier Version higher than '0', the PDSN may choose any PDSN SID. In the case of multiple A10 connections for an MS, each A10 connection has its own binding record and Lifetime ( $T_{\text{lp}}$ ) timer.

The PCF and the PDSN shall use the PCF IP Address (sent in the A11-Registration Request message) and the PDSN IP Address (returned in the A11-Registration Reply message) as the A10 connection endpoints for the transport of user traffic. The PCF IP Address and the PDSN IP Address form the unique link layer ID for each A10 connection. The PCF and the PDSN maintain an association of the mobile's IMSI address with the A10 connection.

If the PCF initiates the setup of the A10 connection due to dormant handoff, the PCF shall include a Mobility Event Indicator and the Current and Previous Access Network Identifiers (CANID and PANID) in the A11-Registration Request message. In the case of Dormant Handoff, the PCF shall initiate the setup of an A10 connection and include a Mobility Event Indicator as a CVSE and the PANID and CANID as an NVSE in the A11-Registration message.

If the PCF initiates the setup of the A10 connection due to hard handoff for which Fast Handoff is indicated, the PCF shall set the flag bit  $S$  to '1', include the anchor PDSN IP address and set the Lifetime timer to  $T_{\text{presetup}}$  in the A11-Registration Request message.

##### 2.1.1.2 Failure Operation

---

If the PCF does not receive an A11-Registration Reply message from the PDSN before timer  $T_{\text{regreq}}$  expires, the PCF may retransmit the A11-Registration Request message. A connection establishment is considered to have failed if no A11-Registration Reply

1 message is received after a configurable number of A11-Registration Request message  
2 retransmissions.

## 3 **2.1.2 A11-Registration Reply**

---

4 The PDSN sends this message to the PCF to either establish or refuse establishment of an  
5 A10 connection.

### 6 **2.1.2.1 Successful Operation**

---

7 Upon receipt of an A11-Registration Request message with a nonzero Lifetime timer, the  
8 PDSN shall respond with an A11-Registration Reply message. If the PDSN accepts the  
9 A10 connection, it shall send a Registration Accepted indication in the message. The PCF  
10 stops timer  $T_{\text{regreq}}$  when it receives the A11-Registration Reply message.

11 If the PDSN has data to send to the PCF when it receives an A11-Registration Request  
12 message, the PDSN shall include a Data Available Indication as a CVSE in the A11-  
13 Registration Reply message.

14 If the PDSN supports Fast Handoff, the PDSN shall include the Anchor P-P Address in  
15 an NVSE in the A11-Registration Reply message.

16 If the selected PDSN does not accept the A10 connection, it shall return an A11-  
17 Registration Reply message with a reject result code. Upon receipt of this message, the  
18 PCF stops timer  $T_{\text{regreq}}$ .

19 The PDSN may return an A11-Registration Reply message with result code '88H'  
20 (Registration Denied – unknown PDSN address). When code '88H' is used, an alternate  
21 PDSN address is included in the A11-Registration Reply message. The address of the  
22 alternate proposed PDSN shall be returned in the Home Agent field of the A11-  
23 Registration Reply message. Upon receipt of this message, the PCF stops timer  $T_{\text{regreq}}$ .

24 On receipt of an A11-Registration Reply message with code '88H', the PCF shall either  
25 initiate establishment of the A10 connection with the proposed PDSN by sending a new  
26 A11-Registration Request message as indicated in this section, or it shall use internal  
27 algorithms to select a new PDSN.

28 On receipt of an A11-Registration Reply message with another result code, depending on  
29 the result code, the PCF may attempt to re-try setting up the A10 connection. If the A10  
30 connection cannot be established, the PCF shall indicate this to the Base Station (BS),  
31 which shall return a failure indication to the MSC. The MSC shall then release the call.

### 32 **2.1.2.2 Failure Operation**

---

33 None.

## 34 **2.2 A10 Connection Operational Procedures**

---

35 This section describes the message procedures for maintaining an A10 connection.

## 2.2.1 A11-Registration Request

---

This message is sent from the PCF to the PDSN to refresh an A10 connection.

### 2.2.1.1 Successful Operation

---

The PCF periodically refreshes the A10 connection with the PDSN by sending an A11-Registration Request message before the A10 connection registration Lifetime ( $T_{rp}$ ) expires, as per procedures specified in [20]. After sending this message, the PCF starts timer  $T_{regreq}$ .

### 2.2.1.2 Failure Operation

---

If the PCF does not receive an A11-Registration Reply message from the PDSN before timer  $T_{regreq}$  expires, the PCF may retransmit the A11-Registration Request message. Refreshment of the connection is considered to have failed if no A11-Registration Reply message is received after a configurable number of A11-Registration Request message retransmissions.

## 2.2.2 A11-Registration Reply

---

The PDSN sends this message to the PCF to acknowledge a refreshment of an A10 connection.

### 2.2.2.1 Successful Operation

---

Upon receipt of an A11-Registration Request message with a nonzero 'lifetime', the PDSN shall respond with an A11-Registration Reply message with an accept indication, including the refreshed Lifetime timer value ( $T_{rp}$ ) for the A10 connection. Upon receipt of this message, the PCF stops timer  $T_{regreq}$ .

If authentication failed during re-registration, the A10 connection is released at the expiration of the Lifetime timer.

If an identification mismatch is detected in the A11-Registration Reply message at re-registration, the A10 connection is released upon expiration of the Lifetime timer.

### 2.2.2.2 Failure Operation

---

None

## 2.3 A10 Connection Release Procedures

---

The release of an A10 connection is controlled by the PCF. For PDSN initiated A10 connection release, the PDSN requests that the PCF release the connection.

### 2.3.1 A11-Registration Request

---

The PCF may initiate release of the A10 connection by sending an A11-Registration Request message to the PDSN with Lifetime field set to zero.

---

### 1 2.3.1.1 Successful Operation

2 The PCF may initiate release of the A10 connection by sending an A11-Registration  
 3 Request message to the PDSN with Lifetime field set to zero. The PCF includes  
 4 accounting related and other information in the A11-Registration Request message. For  
 5 successful operation, the PDSN removes the binding record for the A10 connection and  
 6 saves the accounting related and other information for further processing.

---

### 7 2.3.1.2 Failure Operation

8 If the PCF does not receive an A11-Registration Reply message from the PDSN before  
 9 timer  $T_{\text{regreq}}$  expires, the PCF may retransmit the A11-Registration Request message. On  
 10 failure to receive an A11-Registration Reply message in response to a configurable  
 11 number of A11-Registration Request message retransmissions, the PCF removes the  
 12 binding record for the A10 connection.

---

## 13 2.3.2 A11-Registration Reply

14 The PDSN sends this message to the PCF to acknowledge the teardown of an A10  
 15 connection.

---

### 16 2.3.2.1 Successful Operation

17 Upon receipt of an A11-Registration Request message with Lifetime field set to zero, the  
 18 PDSN shall respond with an A11-Registration Reply message with an accept indication.  
 19 Upon receipt of this message, the PCF removes binding record for the A10 connection  
 20 and stops timer  $T_{\text{regreq}}$ .

---

### 21 2.3.2.2 Failure Operation

22 None

---

## 23 2.3.3 A11-Registration Update

24 The PDSN sends this message to the PCF to initiate release of an A10 connection.

---

### 25 2.3.3.1 Successful Operation

26 The PDSN may initiate release of an A10 connection by sending an A11-Registration  
 27 Update message to the PCF. The Home Agent field in the A11-Registration Update  
 28 message is the PDSN-Address and the Home Address is set to zero. The PCF Session  
 29 Identifier and other session specific information are sent within the Session Specific  
 30 extension. After sending this message, the PDSN starts timer  $T_{\text{regupd}}$ .

---

### 31 2.3.3.2 Failure Operation

32 If the PDSN does not receive an A11-Registration Acknowledge message or an A11-  
 33 Registration Request message (with lifetime equal to '0' and accounting related  
 34 information included) before timer  $T_{\text{regupd}}$  expires, the PDSN may retransmit the A11-  
 35 Registration Update message.

If the PDSN has not received an A11-Registration Acknowledge message or an A11-Registration Request message (with lifetime equal to '0' and accounting related information included) after a configurable number of retransmissions, or upon receipt of an A11-Registration Acknowledge message with an 'update denied' status, the PDSN shall remove all binding record for the A10 connection.

## 2.3.4 A11-Registration Acknowledge

The PCF sends this message to the PDSN to acknowledge receipt of an A11-Registration Update message.

### 2.3.4.1 Successful Operation

Upon receipt of an A11-Registration Update message, the PCF shall send an A11-Registration Acknowledge message. If the PCF accepts the update, it shall send an 'accept' indication in the message. Otherwise, the PCF shall indicate an 'update denied' status. Upon receipt of this message, the PDSN stops timer  $T_{regupd}$ .

For successful operation, the PCF includes accounting related and other information in the Vendor/Organization Specific Extension in the A11-Registration Request message with Lifetime set to zero (0). The PDSN responds with an A11-Registration Reply message with an 'accept' indication and saves the accounting related information and other information for further processing. At this time, both the PCF and the PDSN remove the binding record for the A10 connection.

### 2.3.4.2 Failure Operation

None.

## 2.4 A10 Packet Accounting Procedures

The PCF uses the A11-Registration Request message to send accounting related and other information to the PDSN. The accounting related information is accumulated at the PCF and sent to the PDSN on occurrence of pre-defined triggers, which are listed in Table 2.4-1 below. The occurrence of these predefined triggers is fully specified in [8]. The A10 connection binding record at the PDSN and the PCF may also be updated appropriately depending on the setting of the Lifetime field.

**Table 2.4-1 Accounting Records Generated by the PCF**

Airlink Record Type (Y1)	Accounting Records Generated by the PCF
Y1=1	Connection Setup: Setup of A10 connection initiated
Y1=2	Active Start: A10 connection is associated with the traffic channel(s) or new parameters are set.
Y1=3	Active Stop: A10 connection is disassociated from the traffic channel(s) or parameter settings are no longer valid.
Y1=4	A forward or reverse short data burst (SDB) was exchanged with the mobile

1 If any airlink parameters for an active session change, the PCF generates an “Active Stop  
2 (Y1=3)” accounting record followed by an “Active Start (Y1=2)” accounting record. For  
3 successful operation, the PDSN saves the accounting related and other information for  
4 further processing, and responds with an A11-Registration Reply message with an accept  
5 indication.

6 The Airlink Record information is transferred from the PCF to the PDSN, as RADIUS  
7 protocol encoded attributes, in the Application Data field of a CVSE element. If the  
8 PDSN receives an unexpected airlink record it may reject the A11-Registration Request  
9 message and the A11-Registration Reply message shall contain the code ‘86H’  
10 (Registration Denied – poorly formed request). If the PDSN does not receive an  
11 accounting parameter that is expected, the PDSN may reject the A11-Registration  
12 Request message, and the associated A11-Registration Reply message shall contain the  
13 code ‘8DH’ (Registration Denied – unsupported Vendor ID or unable to interpret  
14 Application Type or Application Sub Type in the CVSE sent by the PCF to the PDSN.)  
15 or the code ‘86H’ (Registration Denied – poorly formed request). If the PDSN receives a  
16 RADIUS attribute that is not expected in a CVSE, the PDSN shall ignore that attribute  
17 and process the remainder of the CVSE to the extent possible. Refer to section 4.2.13 for  
18 further details.

#### 19 **2.4.1 A10 Connection Setup Airlink Record**

---

20 The A10 Connection Setup Airlink record shall be included in the A11-Registration  
21 Request message at the time of establishment of a new A10 connection. It is also  
22 included in the A11-Registration Request message if an A10 connection is pre-setup  
23 during Fast Handoff.

#### 24 **2.4.2 Active-Start Airlink Record**

---

25 The Active-Start Airlink record shall be included in the A11-Registration Request  
26 message under the following circumstances:

- 27 1. When a traffic channel is assigned to a packet data service instance: during initial  
28 service instance setup when the service instance becomes associated with the air  
29 interface, on transition from dormant to active state or during handoff. The Active-  
30 Start Airlink record may follow the connection Setup Airlink record in the same  
31 A11-Registration Request message (assuming that all the parameters required in the  
32 Active-Start Airlink record are made available at the PCF at the time the message is  
33 sent).
- 34 2. Following an Active-Stop Airlink record when any of the parameters (QoS, User  
35 Zone, Forward/Reverse Mux Option) currently defined in the Active Start Airlink  
36 Record are changed. The Active Start Airlink Record shall contain the new set of  
37 parameters.

#### 38 **2.4.3 Active-Stop Airlink Record**

---

39 The Active Stop Airlink Record shall be included in the A11-Registration Request  
40 message under the following circumstances:

- 41 1. When the traffic channel is disassociated from the packet data service instance:  
42 during service instance release, on transition from active state to dormant, or during  
43 handoff.
- 44 2. When any of the parameters (QoS, User Zone, Forward/Reverse Mux Option)  
45 currently defined in the Active Start Airlink Record are changed.

1 In the case of (2), the Active Stop Airlink Record shall be sent and followed by an Active  
2 Start Airlink Record that shall contain the new set of parameters.

#### 3 **2.4.4 SDB Airlink Record**

---

4 The SDB Airlink Record is used by the PCF to report to the PDSN the transfer of Short  
5 Data Burst information to and from the user.

6 The PCF should be notified when a successful SDB is delivered to the MS or  
7 successfully received by the BS.

#### 8 **2.4.5 Accounting at Re-registration**

---

9 Reception by the PCF of new accounting information shall trigger an A11-Registration  
10 Request message to transfer this accounting information to the PDSN.

#### 11 **2.4.6 Airlink Sequence Numbers**

---

12 All the airlink records include a sequence number initialized to zero at A10 connection  
13 setup for each identification triplet (PCF session ID, MSID, PCF ID). When transmitting  
14 an airlink record to the PDSN, the PCF shall increment the sequence number (modulo  
15 256) and insert it into the airlink record.

16 In the event of retransmission of the Air Link Record, the PCF shall retransmit with the  
17 same sequence number.

#### 18 **2.4.7 Accounting update due to parameter changes**

---

19 During an active connection, if any of the following parameters are changed:

- 20 • User Zone
- 21 • Airlink Priority
- 22 • Forward/Reverse Mux Option

23 the PCF shall convey an “Active Stop” airlink record, and an “Active Start” airlink  
24 record with a new set of parameters to the PSDN, via an A11-Registration Request  
25 message.

#### 26 **2.5 A10 Connection Update Procedures**

---

27 The PDSN initiates the update of new or additional packet data session parameters on an  
28 existing A10 connection with by using the messages described in this section.

#### 29 **2.5.1 A11-Session Update**

---

30 The A11-Session Update message is sent from the PDSN to the PCF to add new, change  
31 or update session parameters for an A10 connection.

---

### 1 2.5.1.1 Successful Operation

---

2 The PDSN may update session parameters of an A10 connection by sending an A11-  
3 Session Update to the PCF. The Home Agent field in A11-Session Update is the PDSN-  
4 Address and the Home Address is set to zero. The PCF Session Identifier and other  
5 session specific information are sent within the Session Specific Extension.

6 The A11-Session Update message includes the session parameter(s) in NVSE(s). The  
7 PCF either updates its session parameters or relay the parameters to the BS.

8 After sending the A11-Session Update message, the PDSN starts timer  $T_{\text{sesupd}}$ .

### 9 2.5.1.2 Failure Operation

---

10 If the PDSN does not receive an A11-Session Update Acknowledge message before timer  
11  $T_{\text{sesupd}}$  expires, the PDSN may retransmit the A11-Session Update message a  
12 configurable number of times to PCF.

13 If the PDSN has not received an A11-Session Update Acknowledge after a configurable  
14 number of retransmissions, the PDSN shall consider the update failed and connection  
15 shall remain without any change.

## 16 2.5.2 A11-Session Update Acknowledge

---

17 The A11-Session Update Acknowledge message is sent from PCF to PDSN to  
18 acknowledge an A11-Session Update message.

### 19 2.5.2.1 Successful Operation

---

20 When the PCF receives an A11-Session Update with session parameter(s) in NVSE(s)  
21 and the PCF accepts the update, the PCF shall send an A11-Session Update Acknowledge  
22 to PDSN with an 'accept' indication. If the PCF does not accept the update it shall send a  
23 'denied' indication. When the PDSN receives this message it stops timer  $T_{\text{sesupd}}$ .

### 24 2.5.2.2 Failure Operation

---

25 None.

26

## 3.0 Message Formats

### 3.1 A11-Registration Request

This A11 interface message is sent from the PCF to the PDSN for:

- establishing an A10 connection (and identifying the associated service option value and MN Session Reference ID);
- periodic re-registration of an A10 connection;
- clearing an A10 connection;
- passing accounting related information,
- indicating that all packet data service instances have gone dormant.
- passing fast handoff related information.

Information Element	Section Reference	Element Direction	Type	
A11 Message Type	4.2.1	PCF -> PDSN	M	
Flags	4.2.2	PCF -> PDSN	O	R
Lifetime	4.2.3	PCF -> PDSN	O	R
Home Address	4.2.4	PCF -> PDSN	O	R
Home Agent	4.2.5	PCF -> PDSN	O	R
Care-of-Address	4.2.6	PCF -> PDSN	O	R
Identification	4.2.7	PCF -> PDSN	O	R
Session Specific Extension	4.2.12	PCF -> PDSN	O	R
Critical Vendor/Organization Specific Extension(s)	4.2.13	PCF -> PDSN	O <sup>a</sup>	C
Normal Vendor/Organization Specific Extension	4.2.14	PCF -> PDSN	O <sup>a,b,c,d</sup>	C
Mobile-Home Authentication Extension	4.2.10	PCF -> PDSN	O	R

- a. One or more instances of this element may be included in the A11-Registration Request message.
- b. During a Fast Handoff, this element is used to provide the Anchor P-P Address to the target PDSN when the PCF supports Fast Handoff.
- c. If this message contains the Active Stop Airlink Record for the last service instance going dormant (i.e., all packet data service instances for the user are dormant) in the CVSE, then an instance of this element containing the All Dormant Indicator shall be included in this message.
- d. This element shall be included when this message is sent for A10 connection setup and the PCF is capable of supporting concurrent services. It conveys the Service Option and MN Session Reference ID values received from the PCF.

1

The following table shows the bitmap layout for the A11-Registration Request message.

0	1	2	3	4	5	6	7	Octet
⇒ <b>A11 Message Type</b> = [01H]								1
⇒ <b>Flags</b> = [0AH, 8AH]								1
(MSB)	⇒ <b>Lifetime</b> = [00 00H to FF FEH]							1
							(LSB)	2
(MSB)	⇒ <b>Home Address</b> = [00 00 00 00 H]							1
⇒ <b>Home Address</b> = [00 00 00 00 H]								2
								3
							(LSB)	4
(MSB)	⇒ <b>Home Agent</b> = <any value>							1
⇒ <b>Home Agent</b> = <any value>								2
								3
							(LSB)	4
(MSB)	⇒ <b>Care-of-Address</b> = <any value>							1
⇒ <b>Care-of-Address</b> = <any value>								2
								3
							(LSB)	4
(MSB)	⇒ <b>Identification</b> = <any value>							1
⇒ <b>Identification</b> = <any value>								2
								3
⇒ <b>Identification</b> = <any value>								4
								5
								6
								7
							(LSB)	8
⇒ <b>Session Specific Extension:</b> = [27H]								1
Length = [13H–15H]								2
(MSB)	Protocol Type = [ 88 0BH, 88 81H ]							3
							(LSB)	4
(MSB)	Key = <any value>							5
								6
								7
							(LSB)	8
Reserved = [00H]								9
Reserved = [0000 00]					Session ID Ver = [ '00' (Version 0), '01' (Version 1)]			10

(MSB)	MN Session Reference Id = [00 01H – 00 06H]	11
	(LSB)	12
(MSB)	MSID Type = [00 06 H] (IMSI)	13
	(LSB)	14
	MSID Length = [06-08H] (10-15 digits)	15
Identity Digit 1 = [0H-9H] (BCD)	Odd/Even Indicator = [0000, 0001]	16
Identity Digit 3 = [0H-9H] (BCD)	Identity Digit 2 = [0H-9H] (BCD)	17
...	...	...
If (Odd/Even Indicator = 0000 (even)) {Identity Digit N+1 = [FH] (BCD)}	Identity Digit N = [0H-9H] (BCD)	k
Else If (Odd/Even Indicator = 0001 (odd)) {Identity Digit N+1 = [0H-9H] (BCD)}		
<b>⇒ Critical Vendor/Organization Specific Extension: Type = [ 26H]</b>		1
Reserved = [0000 0000]		2
(MSB)	Length = <variable>	3
	(LSB)	4
(MSB)	3GPP2 Vendor ID = 00 00 15 9FH	5
		6
		7
	(LSB)	8
Application Type = [01H, 02H]		9
<b><i>IF (Application Type = 01H (Accounting)) {1:</i></b>		
Application Sub Type = [01 H]		10
(MSB)	Application Data (contains accounting information)	11
		...
	(LSB)	k
<b><i>} Application Type = 01H; ELSE IF (Application Type = 02H (Mobility Event Indicator)) {1:</i></b>		
Application Sub Type = [01H]		m
<b><i>} Application Type = 02H</i></b>		
<b>⇒ Normal Vendor/Organization Specific Extension: Type = [ 86H]</b>		1
Length = [0CH, 12H, 0AH]		2
(MSB)	Reserved = [00 00H]	3
	(LSB)	4
(MSB)	3GPP2 Vendor ID = [00 00 15 9FH]	5
		6
		7
	(LSB)	8

Application Type = [04H-06H,09H] (Access Network Identifiers, PDSN Identifier, Indicators)		9
<b><i>IF (Application Type = 04H (Access Network Identifiers)) {1:</i></b>		
Application Sub Type = [01H]		10
(MSB)	Application Data = <any value> (contains PANID and CANID)	11
		...
		(LSB)
		20
<b><i>} Application Type = 04H, ELSE IF (Application Type = 05H (PDSN Identifier)) {1:</i></b>		
Application Sub Type = [01H (Anchor P-P Address)]		10
(MSB)	Application Data (contains an IPv4 address)	11
		12
		13
		(LSB)
		14
<b><i>} Application Type = 05H; ELSE IF (Application Type = 06H (Indicators)) {1</i></b>		
Application Sub Type = [01H (All Dormant Indicator)]		10
(MSB)	Application Data = 00 00H	11
		(LSB)
		12
<b><i>} Application Type = 06H; ELSE IF (Application Type = 09H (Service Option)) {1:</i></b>		
Application Sub Type = [01H]		10
(MSB)	Application Data (contains Service Option and MN Session Reference ID)	11
		(LSB)
		12
<b><i>} Application Type = 09H</i></b>		
<b>⇒ Mobile-Home Authentication Extension: Type = [20H]</b>		1
Length = [14 H ]		2
(MSB)	SPI = [00 00 01 00H to FF FF FF FF H]	3
		4
		5
		(LSB)
		6
(MSB)	Authenticator = <any value > (keyed-MD-5 authentication)	7
		8
		9
...		...
		(LSB)
		22

1

## 3.2 A11-Registration Reply

This A11 interface message is sent from the PDSN to the PCF in response to an A11-Registration Request message.

Information Element	Section Reference	Element Direction	Type	
A11 Message Type	4.2.1	PDSN -> PCF	M	
Code	4.2.8	PDSN -> PCF	M	
Lifetime	4.2.3	PDSN -> PCF	M	
Home Address	4.2.4	PDSN -> PCF	M	
Home Agent	4.2.5	PDSN -> PCF	M <sup>a</sup>	
Identification	4.2.7	PDSN -> PCF	M	
Session Specific Extension	4.2.12	PDSN -> PCF	M	
Critical Vendor/Organization Specific Extension	4.2.13	PDSN -> PCF	O <sup>d</sup>	C
Normal Vendor/Organization Specific Extension	4.2.14	PDSN -> PCF	O <sup>b,c,e</sup>	C
Mobile-Home Authentication Extension	4.2.10	PDSN -> PCF	O	R

- a. This element can also be used to identify the IPv4 address of an alternative PDSN.
- b. One or more instances of this element may be included in the A11-Registration Reply message.
- c. This element is used by the Anchor PDSN to provide Anchor P-P Address when the PDSN supports Fast Handoff.
- d. This element is included if the PDSN has data available.
- e. During a Fast Handoff, the target PDSN includes the Anchor P-P Address to indicate that the Fast Handoff request was accepted.

1

The following table shows the bitmap layout for the A11-Registration Reply message.

0	1	2	3	4	5	6	7	Octet	
⇒ <b>A11 Message Type</b> = [03H]								1	
⇒ <b>Code</b> =								1	
[ 00H (Registration Accepted), 80H (Registration Denied – reason unspecified), 81H (Registration Denied – administratively prohibited), 82H (Registration Denied – insufficient resources), 83H (Registration Denied – mobile node failed authentication), 85H (Registration Denied – identification mismatch), 86H (Registration Denied – poorly formed request), 88H (Registration Denied – unknown PDSN address), 89H (Registration Denied – requested reverse tunnel unavailable), 8AH (Registration Denied – reverse tunnel is mandatory and ‘T’ bit not set), 8DH (Registration Denied – unsupported vendor ID or unable to interpret Application Type or Application Sub Type in the CVSE sent by the PCF to the PDSN.) ]									
(MSB)	⇒ <b>Lifetime</b> = [00 00 H to FF FEH]								1
							(LSB)	2	
(MSB)									1
⇒ <b>Home Address</b> = [00 00 00 00 H]								2	
								3	
							(LSB)	4	
(MSB)									1
⇒ <b>Home Agent</b> = <any value>								2	
								3	
							(LSB)	4	
(MSB)									1
								2	
								3	
⇒ <b>Identification</b> = <any value>								4	
								5	
								6	
								7	
							(LSB)	8	
⇒ <b>Session Specific Extension: Type</b> = [27H]								1	
Length = [13H – 15H]								2	
(MSB)	Protocol Type = [ 88 0BH, 88 81H ]								3
							(LSB)	4	

(MSB)	Key = <any value>		5
			6
			7
		(LSB)	8
	Reserved = [00 H]		9
	Reserved = [0000 00]	Session ID Ver = [ '00' (Version 0), '01' (Version 1)]	10
(MSB)	MN Session Reference Id = [00 01H – 00 06H]		11
		(LSB)	12
(MSB)	MSID Type = [00 06 H] (IMSI)		13
		(LSB)	14
	MSID Length = [06-08H] (10-15 digits)		15
	Identity Digit 1 = [0H - 9H] (BCD)	Odd/Even Indicator = [0000, 0001]	16
	Identity Digit 3 = [0H - 9H] (BCD)	Identity Digit 2 = [0H - 9H] (BCD)	17
	...	...	...
	If (Odd/Even Indicator = 0000 (even)) { Identity Digit N+1 = [FH] (BCD)} Else If (Odd/Even Indicator = 0001 (odd)) { Identity Digit N+1 = [0H - 9H] (BCD)}	Identity Digit N = [0H - 9H] (BCD)	21-23
	<b>⇒ Critical Vendor/Organization Specific Extension: Type = [ 26H]</b>		1
	Reserved = [0000 0000]		2
(MSB)	Length = [00 06H]		3
		(LSB)	4
(MSB)	3GPP2 Vendor ID = [00 00 15 9FH]		5
			6
			7
		(LSB)	8
	Application Type = [03H] (Data Availability Indicator)		9
	Application Sub Type = [01H]		10
	<b>⇒ Normal Vendor/Organization Specific Extension: Type = [86H]</b>		1
	Length = 0CH		2
	Reserved = [0000 0000]		3
			4
(MSB)	3GPP2 Vendor ID = [00 00 15 9FH]		5
			6
			7
		(LSB)	8

Application Type = [05H (PDSN Identifier)]		9
Application Sub Type = [01H (Anchor P-P Address)]		10
(MSB)	Application Data (contains an IPv4 address)>	11
		12
		13
		(LSB)
⇒ Mobile-Home Authentication Extension: Type = [20H]		1
Length = [ 14H ]		2
(MSB)	SPI = [00 00 01 00H to FF FF FF FF H]	3
		4
		5
		(LSB)
(MSB)	Authenticator = <any value > (keyed-MD-5 authentication)	7
		8
		9
...		...
		(LSB)
		22

1

### 3.3 A11-Registration Update

This A11 interface message is sent from the PDSN to the PCF to update the status of an A10 connection. The PDSN also uses this message to send new or updated session parameters.

Information Element	Section Reference	Element Direction	Type	
A11 Message Type	4.2.1	PDSN -> PCF	M	
Reserved <3 octets>	None	PDSN -> PCF	M <sup>a</sup>	
Home Address	4.2.4	PDSN -> PCF	M	
Home Agent	4.2.5	PDSN -> PCF	M	
Identification	4.2.7	PDSN -> PCF	M	
Session Specific Extension	4.2.12	PDSN -> PCF	M	
Normal Vendor/Organization Specific Extension(s)	4.2.14	PDSN -> PCF	O <sup>b</sup>	C
Registration Update Authentication Extension	4.2.11	PDSN -> PCF	M	

a. This field is set to zero by the PDSN and ignored by the PCF.

b. One or more instances of this element may be present in this message.

The following table shows the bitmap layout for the A11-Registration Update message.

0	1	2	3	4	5	6	7	Octet
⇒ Message Type = [14H]								1
								1
⇒ Reserved = [00 00 00 H]								2
								3
(MSB)								1
⇒ Home Address = [00 00 00 00 H]								2
								3
							(LSB)	4
(MSB)								1
⇒ Home Agent = <any value>								2
								3
							(LSB)	4
(MSB)								1
								2
								3
⇒ Identification = <any value>								4
								5
								6

		7
	(LSB)	8
<b>⇒ Session Specific Extension: Type = [27H]</b>		1
Length = [13H – 15H]		2
(MSB)	Protocol Type = [ 88 0BH, 88 81H]	3
	(LSB)	4
(MSB)	Key = <any value>	5
		6
		7
	(LSB)	8
Reserved = [00 H]		9
Reserved = [0000 00]		10
Session ID Ver = [ '00' (Version 0), '01' (Version 1)]		
(MSB)	MN Session Reference Id = [00 01H – 00 06H]	11
	(LSB)	12
(MSB)	MSID Type = [00 06 H] (IMSI)	13
	(LSB)	14
MSID Length = [06-08H] (10-15 digits)		15
Identity Digit 1 = [0H-9H] (BCD)		16
Odd/Even Indicator = [0000, 0001]		
Identity Digit 3 = [0H-9H] (BCD)		17
Identity Digit 2 = [0H-9H] (BCD)		
...		...
If (Odd/Even Indicator = 0000 (even)) { Identity Digit N+1 = [FH] (BCD) } ELSE (If Odd/Even Indicator = 0001 (odd)) { Identity Digit N+1 = [0H-9H] (BCD) }		k
<b>⇒ Normal Vendor/Organization Specific Extension: Type = [86H]</b>		1
Length - <variable>		2
(MSB)	Reserved = [00 00H]	3
	(LSB)	4
(MSB)	3GPP2 Vendor ID = 00 00 15 9FH	5
		6
		7
	(LSB)	8
Application Type = [07H, 08H]		9
<b><i>IF (Application Type = 07H (PDSN Code)){1:</i></b>		
Application Sub Type = [01H]		10
Application Data (PDSN CODE)		11
<b><i>}Application Type = 07H; ELSE IF (Application Type = 08H (Session Parameter)) {1+:</i></b>		

Application Sub Type = [01H]		10
Application Data (RN-PDIT)		K
<i>} Application Type = 08H;</i>		
⇒ <b>Registration Update Authentication Extension: Type = [28H]</b>		1
Length = [14H ]		2
(MSB)	SPI = [00 00 01 00H to FF FF FF FF H]	3
-----		4
-----		5
-----		6
----- (LSB)		6
(MSB)	Authenticator = <any value > (keyed-MD-5 authentication)	7
-----		8
-----		9
-----		...
-----		...
----- (LSB)		22

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### 3.4 A11-Registration Acknowledge

This A11 interface message is sent from the PCF to the PDSN in response to an A11-Registration Update message.

Information Element	Section Reference	Element Direction	Type
A11 Message Type	4.2.1	PCF -> PDSN	M
Reserved <2 octets>	None	PCF -> PDSN	M <sup>a</sup>
Status	4.2.9	PCF -> PDSN	M
Home Address	4.2.4	PCF -> PDSN	M
Care-of-Address	4.2.6	PCF -> PDSN	M
Identification	4.2.7	PCF -> PDSN	M
Session Specific Extension	4.2.12	PCF -> PDSN	M
Registration Update Authentication Extension	4.2.11	PCF -> PDSN	M

a. This field is set to zero by the PCF and ignored by the PDSN.

The following table shows the bitmap layout for the A11-Registration Acknowledge message.

0	1	2	3	4	5	6	7	Octet
⇒ Message Type = [15H]								1
⇒ Reserved = [00 00 H]								1
								2
⇒ Status = [00H (Update Accepted) 80H (Update Denied – reason unspecified) 83H (Update Denied – sending node failed authentication) 85H (Update Denied – identification mismatch) 86H (Update Denied – poorly formed registration update) ]								1
(MSB)								1
⇒ Home Address = [00 00 00 00 H]								2
								3
							(LSB)	4
(MSB)								1
⇒ Care-of-Address = <any value>								2
								3
							(LSB)	4
(MSB)								1
								2
								3

<b>⇒ Identification = &lt;any value&gt;</b>		4
		5
		6
		7
	(LSB)	8
<b>⇒ Session Specific Extension: Type = [27H]</b>		1
Length = [13H – 15H]		2
(MSB)	Protocol Type = [ 88 0BH, 88 81H]	3
	(LSB)	4
(MSB)	Key = <any value>	5
		6
		7
	(LSB)	8
Reserved = [00 H]		9
Reserved = [0000 00]		10
Session ID Ver = [ '00' (Version 0), '01' (Version 1)]		
(MSB)	MN Session Reference Id = [00 01H – 00 06H]	11
	(LSB)	12
(MSB)	MSID Type = [00 06 H] (IMSI)	13
	(LSB)	14
MSID Length = [06-08H] (10-15 digits)		15
Identity Digit 1 = [0H-9H] (BCD)	Odd/Even Indicator = [0000, 0001]	16
Identity Digit 3 = [0H-9H] (BCD)	Identity Digit 2 = [0H-9H] (BCD)	17
...	...	...
If (Odd/Even Indicator = 0000 (even)) { Identity Digit N+1 = [FH] (BCD)} Else If (Odd/Even Indicator = 0001 (odd)) { Identity Digit N+1 = [0H-9H] (BCD)}	Identity Digit N = [0H-9H] (BCD)	k
<b>⇒ Registration Update Authentication Extension: Type = [28H]</b>		1
Length = [14H ]		2
(MSB)	SPI = [00 00 01 00H to FF FF FF FF H]	3
		4
		5
	(LSB)	6
(MSB)	Authenticator = <any value > (keyed-MD-5 authentication)	7
		8
		9
...		...



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### 3.5 A11-Session Update

This A11 interface message is sent from the PDSN to the PCF to add new or update any parameters of an A10 connection.

Information Element	Section Reference	Element Direction	Type	
A11 Message Type	4.2.1	PDSN -> PCF	M	
Reserved <3 octets>	None	PDSN -> PCF	M <sup>a</sup>	
Home Address	4.2.4	PDSN -> PCF	M	
Home Agent	4.2.5	PDSN -> PCF	M	
Identification	4.2.7	PDSN -> PCF	M	
Session Specific Extension	4.2.12	PDSN -> PCF	M	
Normal Vendor/Organization Specific Extension	4.2.14	PDSN ->PCF	O <sup>b</sup>	C
Registration Update Authentication Extension	4.2.11	PDSN -> PCF	M	

- a. This field is set to zero by the PDSN and ignored by the PCF.
- b. One or more instances of this element may be included in the A11-Session Update message.

The following table shows the bitmap layout for the A11-Session Update message.

0	1	2	3	4	5	6	7	Octet
⇒ Message Type = [16H]								1
(MSB)								1
⇒ Reserved = [00 00 00H]								2
							(LSB)	3
(MSB)								1
⇒ Home Address = [00 00 00 00 H]								2
							(LSB)	3
							(LSB)	4
(MSB)								1
⇒ Home Agent = <any value>								2
							(LSB)	3
							(LSB)	4
(MSB)								1
							(LSB)	2
							(LSB)	3
⇒ Identification = <any value>								4
							(LSB)	5
							(LSB)	6

		7
		(LSB)
⇒ <b>Session Specific Extension: Type = [27H]</b>		1
Length = [13H – 15H]		2
(MSB)	Protocol Type = [ 88 81H]	3
		(LSB)
(MSB)		5
Key = <any value>		6
		7
		(LSB)
Reserved = [00 H]		9
Reserved = [0000 00]		Session ID Ver = [ '00' (Version 0), '01' (Version 1)]
(MSB)	MN Session Reference Id = <any value>	11
		(LSB)
(MSB)	MSID Type = [00 06 H] (IMSI)	13
		(LSB)
MSID Length = [06-08H] (10-15 digits)		15
Identity Digit 1 = [0H-9H] (BCD)	Odd/Even Indicator = [0000, 0001]	16
Identity Digit 3 = [0H-9H] (BCD)	Identity Digit 2 = [0H-9H] (BCD)	17
...	...	...
If (Odd/Even Indicator = 0000 (even)) { Identity Digit N+1 = [FH] (BCD) }	Identity Digit N = [0H-9H] (BCD)	k
ELSE (If Odd/Even Indicator = 0001 (odd)) { Identity Digit N+1 = [0H-9H] (BCD) }		
⇒ <b>Normal Vendor/Organization Specific Extension: Type = [ 86H]</b>		1
Length = <any value>		2
(MSB)	Reserved = [00 00H]	3
		(LSB)
(MSB)		5
3GPP2 Vendor ID = [00 00 15 9FH]		6
		7
		(LSB)
Application Type = [08H]		9
Application Sub Type = [01H]		10
(MSB)		11
Application Data = <RN-PDIT>		...
		(LSB)
		20

⇒ <b>Registration Update Authentication Extension: Type = [28H]</b>		1
Length = [14H ]		2
(MSB)		3
SPI = [00 00 01 00H to FF FF FF FF H]		4
		5
		(LSB)
(MSB)		7
		8
<b>Authenticator</b> = <any value > (keyed-MD-5 authentication)		9
...		...
		(LSB)
		22

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### 3.6 A11-Session Update Acknowledge

This A11 interface message is sent in response to an A11-Session Update message.

Information Element	Section Reference	Element Direction	Type
A11 Message Type	4.2.1	PCF -> PDSN	M
Reserved <2 octets>	None	PCF -> PDSN	M <sup>a</sup>
Status	4.2.9	PCF -> PDSN	M
Home Address	4.2.4	PCF -> PDSN	M
Care-of-Address	4.2.6	PCF -> PDSN	M
Identification	4.2.7	PCF -> PDSN	M
Session Specific Extension	4.2.12	PCF -> PDSN	M
Registration Update Authentication Extension	4.2.11	PCF -> PDSN	M

a. This field is set to zero by the PCF and ignored by the PDSN.

The following table shows the bitmap layout for the A11-Session Update Acknowledge message.

0	1	2	3	4	5	6	7	Octet
⇒ <b>Message Type</b> = [15H]								1
(MSB)	⇒ <b>Reserved</b> = [00 00 H]							1
								2
⇒ <b>Status</b> =								1
[00H (Update Accepted) 80H (Update Denied – reason unspecified) 83H (Update Denied – sending node failed authentication) 85H (Update Denied – identification mismatch) 86H (Update Denied – poorly formed registration update) C9H (Update Denied – Session parameters not updated)]								
(MSB)								1
⇒ <b>Home Address</b> = [00 00 00 00 H]								2
								3
							(LSB)	4
(MSB)								1
⇒ <b>Care-of-Address</b> = <any value>								2
								3
							(LSB)	4
(MSB)								1
								2
								3

<b>⇒ Identification = &lt;any value&gt;</b>		4
		5
		6
		7
	(LSB)	8
<b>⇒ Session Specific Extension: Type = [27H]</b>		1
Length = [13H – 15H]		2
(MSB)	Protocol Type = [ 88 81H]	3
	(LSB)	4
(MSB)		5
Key = <any value>		6
		7
	(LSB)	8
Reserved = [00 H]		9
Reserved = [0000 00]		10
		10
Session ID Ver = [ '00' (Version 0), '01' (Version 1)]		
(MSB)	MN Session Reference Id = <any value>	11
	(LSB)	12
(MSB)	MSID Type = [00 06 H] (IMSI)	13
	(LSB)	14
MSID Length = [06-08H] (10-15 digits)		15
Identity Digit 1 = [0H-9H] (BCD)	Odd/Even Indicator = [0000, 0001]	16
Identity Digit 3 = [0H-9H] (BCD)	Identity Digit 2 = [0H-9H] (BCD)	17
...	...	...
If (Odd/Even Indicator = 0000 (even)) {Identity Digit N+1 = [FH] (BCD)} Else If (Odd/Even Indicator = 0001 (odd)) {Identity Digit N+1 = [0H-9H] (BCD)}	Identity Digit N = [0H-9H] (BCD)	k
<b>⇒ Registration Update Authentication Extension: Type = [28H]</b>		1
Length = [14H ]		2
(MSB)		3
SPI = [00 00 01 00H to FF FF FF FF H]		4
		5
	(LSB)	6
(MSB)		7
		8
Authenticator = <any value > (keyed-MD-5 authentication)		9
...		...

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## 4.0 Information Element Definitions

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This section contains the coding of the information elements used in the messages defined in section 3.0.

The definitions in the following subsections are for informational purposes only. Parameter usage may vary per message in that only a subset of the defined values may be applicable in a particular message. Therefore, the allowed values are specified per message in the subsections of section 3.0.

## 4.1 Generic Information Element Encoding

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### 4.1.1 Conventions, Coding, and Interpretation Rules for Information Elements

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The following conventions are assumed for the sequence of transmission of bits and bytes:

- Each bit position is marked as 0 to 7. For the A10/A11 interface, bit 0 is the most significant bit and is transmitted first. Note that for all other interfaces, bit 0 is the **least** significant bit and is transmitted first.
- In a message, octets are identified by number. Octet 1 is transmitted first, then octet 2, etc.

For variable length elements, a length indicator is included. This indicates the number of octets following in the element.

Information elements shall always use the same Information Element Identifier for all occurrences on a specific A11 Interface. Insofar as possible, the same Information Element Identifier shall be used for a given information element when it is used on more than one interface.

The order of appearance for each information element and the definition of whether an information element is mandatory or optional is specified in section 3.0.

An optional variable length information element may be present, but empty. For example, a message may contain an information element, the content of which is zero length. This shall be interpreted by the receiver as equivalent to that information element being absent.

The Information Element Identifier is included for all signaling messages on the A11 Interface.

For future expansion purposes, some of these information elements have fields within them that have been reserved. All reserved bits are set to 0, unless otherwise indicated. To allow compatibility with future implementation, messages shall not be rejected simply because a reserved bit is set to '1'. The **extensions** for the A11 interface messages are defined in the TLV (Type-Length-Value) format. The Type field indicates the type of the extension. Length field indicates the length (in octets) of the extension, not including the Type and Length fields. The value field contains the information specific to the Type of the extension.

**4.1.2 Information Element Identifiers**

The following tables contain lists of all elements that make up the messages defined in section 3.0. The tables include the Information Element Identifier (IEI) coding which distinguishes one element from another. The tables also include a reference to the section where the element coding can be found.

A11 interface information elements, other than the extensions, are position specific, hence do not include the Information Element Identifier (IEI). The A11 interface extensions are, however, identified by a Type field, which distinguishes one extension from the others.

**Table 4.1.2-1 A11 Information Element Identifiers Sorted by Name**

<b>Element Name</b>	<b>Identifier</b>	<b>Reference</b>
A11 Message Type	None	4.2.1
Care-of-Address	None	4.2.6
Code	None	4.2.8
Flags	None	4.2.2
Home Address	None	4.2.4
Home Agent	None	4.2.5
Identification	None	4.2.7
Lifetime	None	4.2.3
Mobile-Home Authentication Extension	20H	4.2.10
Registration Update Authentication Extension	28H	4.2.11
Session Specific Extension	27H	4.2.12
Status	None	4.2.9
Normal Vendor/Organization Specific Extension	86H	4.2.14
Critical Vendor/Organization Specific Extension	26H	4.2.13
All other values are reserved.		

1

**Table 4.1.2-2 A11 Information Element Identifiers Sorted by Value**

<b>Element Name</b>	<b>Identifier</b>	<b>Reference</b>
A11 Message Type	None	4.2.1
Care-of-Address	None	4.2.6
Code	None	4.2.8
Flags	None	4.2.2
Home Address	None	4.2.4
Home Agent	None	4.2.5
Identification	None	4.2.7
Lifetime	None	4.2.3
Status	None	4.2.9
Mobile-Home Authentication Extension	20H	4.2.10
Normal Vendor/Organization Specific Extension	86H	4.2.14
Critical Vendor/Organization Specific Extension	26H	4.2.13
Session Specific Extension	27H	4.2.12
Registration Update Authentication Extension	28 H	4.2.11
All other values are reserved.		

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### 4.1.3 Cross Reference of Information Elements With Messages

The following table provides a cross reference between the elements defined in this specification and the messages defined herein.

**Table 4.1.3-1 Cross Reference of Information Elements With Messages**

<b>Information Element</b>		<b>Used in These Messages</b>	
A11 Message Type	4.2.1	A11-Registration Request	3.1
		A11-Registration Reply	3.2
		A11-Registration Update	3.3
		A11-Registration Acknowledge	3.4
		A11-Session Update	3.5
		A11-Session Update Acknowledge	3.6
Care-of-Address	4.2.6	A11-Registration Request	3.1
		A11-Registration Acknowledge	3.4
		A11-Session Update Acknowledge	3.6
Code	4.2.8	A11-Registration Reply	3.2
Flags	4.2.2	A11-Registration Request	3.1
Home Address	4.2.4	A11-Registration Request	3.1
		A11-Registration Reply	3.2
		A11-Registration Update	3.3
		A11-Registration Acknowledge	3.4
		A11-Session Update	3.5
		A11-Session Update Acknowledge	3.6
Home Agent	4.2.5	A11-Registration Request	3.1
		A11-Registration Reply	3.2
		A11-Registration Update	3.3
		A11-Session Update	3.5

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**Table 4.1.3-1 (Cont.) Cross Reference of Information Elements With Messages**

Identification	4.2.7	A11-Registration Request	3.1
		A11-Registration Reply	3.2
		A11-Registration Update	3.3
		A11-Registration Acknowledge	3.4
		A11-Session Update	3.5
		A11-Session Update Acknowledge	3.6
Lifetime	4.2.3	A11-Registration Request	3.1
		A11-Registration Reply	3.2
Mobile-Home Authentication Extension	4.2.10	A11-Registration Request	3.1
		A11-Registration Reply	3.2
Registration Update Authentication Extension	4.2.11	A11-Registration Update	3.3
		A11-Registration Acknowledge	3.4
		A11-Session Update	3.5
		A11-Session Update Acknowledge	3.6
Session Specific Extension	4.2.12	A11-Registration Request	3.1
		A11-Registration Reply	3.2
		A11-Registration Update	3.3
		A11-Registration Acknowledge	3.4
		A11-Session Update	3.5
		A11-Session Update Acknowledge	3.6
Status	4.2.9	A11-Registration Acknowledge	3.4
		A11-Session Update Acknowledge	3.6
Critical Vendor/Organization Specific Extension	4.2.13	A11-Registration Request	3.1
		A11-Registration Reply	3.2
Normal Vendor/Organization Specific Extension	4.2.14	A11-Registration Request	3.1
		A11-Registration Reply	3.2
		A11-Registration Update	3.3
		A11-Session Update	3.5

2

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## 4.2 Information Elements

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### 4.2.1 A11 Message Type

---

This one octet element identifies the type of the A11 interface message. The structure of the element conforms to as specified in [20], and is shown below.

<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>Octet</b>
A11 Message Type								1

The A11 interface message types are listed in Table 4.2.1-1. These values shall remain coordinated with the values assigned by the IETF for the Mobile IP protocol.

**Table 4.2.1-1 A11 Interface Message Types**

<b>A11 Interface Message Name</b>	<b>A11 Message Type Value</b>	<b>Section Reference</b>
A11-Registration Request	01H	3.1
A11-Registration Reply	03H	3.2
A11-Registration Update	14H	3.3
A11-Registration Acknowledge	15H	3.4
A11-Session Update	16H	3.5
A11-Session Update Acknowledge	17H	3.6

## 4.2.2 Flags

The structure of this element is as specified in [20], and is shown below. The setting of the Flags bits determines how an A11 interface message is interpreted by the receiving entity, and also the characteristics of the A10 connection.

0	1	2	3	4	5	6	7	Octet
S	B	D	M	G	V	T	Reserved	1

For the A11-Registration Request message, the Flag bits are set as specified in Table 4.2.2-1. The 'S' bit is used for Fast Handoff. It is coded as specified in [8].

**Table 4.2.2-1 Setting of A11-Registration Request Message Flags**

0	1	2	3	4	5	6	7	Bit Position
S	B	D	M	G	V	T	RES	Bit Identifier
0/1								Simultaneous Bindings
	0							Broadcast Datagrams
		0						Decapsulation by mobile node
			0					Minimal Encapsulation
				1				GRE Encapsulation
					0			V.J. Compression
						1		Reverse Tunneling
							0	Reserved Bit

## 4.2.3 Lifetime

This two octet element indicates the number of seconds remaining before registration for an A10 connection is considered expired. The structure of the element conforms to [20] and is shown below.

0	1	2	3	4	5	6	7	Octet	
(MSB)	Lifetime								1
							(LSB)	2	

1 **4.2.4 Home Address**

2 This information element does not carry valid information for this interface and is  
 3 ignored. However, it shall be included in all A11 messages as specified in [20].

<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>Octet</b>
(MSB)								1
Home Address								2
								3
							(LSB)	4

4 Table 4.2.4-1 shows the setting of the Home Address field for various A11 interface  
 5 messages.

6 **Table 4.2.4-1 Setting of Home Address Field**

<b>A11 Interface Message</b>	<b>Home Address</b>
A11-Registration Request	00 00 00 00 H
A11-Registration Reply	00 00 00 00 H
A11-Registration Update	00 00 00 00 H
A11-Registration Acknowledge	00 00 00 00 H
A11-Session Update	00 00 00 00 H
A11-Session Update Acknowledge	00 00 00 00 H

1 **4.2.5 Home Agent**

---

2 This element identifies the IPv4 address of the PDSN that terminates the A10 connection.  
3 The structure of the element conforms to [20] and is shown below.

0	1	2	3	4	5	6	7	Octet
(MSB)								1
Home Agent								2
								3
							(LSB)	4

## 1 4.2.6 Care-of-Address

---

2 This element identifies the IPv4 address of the PCF that terminates the A10 connection.  
3 The structure of the element conforms to [20] and is shown below.

0	1	2	3	4	5	6	7	Octet
(MSB)								1
Care-of-Address								2
								3
							(LSB)	4

4

## 4.2.7 Identification

This element is used by the PCF and the PDSN for matching the A11-Registration Request messages with A11-Registration Reply messages, A11-Registration Update messages with A11-Registration Acknowledge messages and A11-Session Update messages with A11-Session Update Acknowledge messages. It also protects against replay attacks (section 5.6, [20]). The structure of the element conforms to [20] and is shown below.

This information element shall carry time stamps (as specified in [20]). The PCF and the PDSN should have access to an accurate time-of-day clock. The margin of error should be a configurable parameter. Refer to [20] for more details.

0	1	2	3	4	5	6	7	Octet
(MSB)	Identification							1
								2
								3
								4
								5
								6
								7
							(LSB)	8

**4.2.8 Code**

This element identifies the result of processing an A11-Registration Request message. The element includes codes from [20] and is shown below.

<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>Octet</b>
Code								1

The supported Code values are listed in Table 4.2.8-1.

**Table 4.2.8-1 A11 Code Values**

Hex Value	Decimal Value	Code
00H	0	Registration Accepted
09H	9	Connection Update
80H	128	Registration Denied – reason unspecified
81H	129	Registration Denied – administratively prohibited
82H	130	Registration Denied – insufficient resources
83H	131	Registration Denied – mobile node failed authentication
85H	133	Registration Denied – identification mismatch
86H	134	Registration Denied – poorly formed request
88H	136	Registration Denied – unknown PDSN address
89H	137	Registration Denied – requested reverse tunnel unavailable
8AH	138	Registration Denied – reverse tunnel is mandatory and ‘T’ bit not set
8DH	141	Registration Denied – unsupported Vendor ID or unable to interpret Application Type or Application Sub Type in the CVSE sent by the PCF to the PDSN
C1H	193	Connection Release - reason unspecified
C2H	194	Connection Release - PPP timeout
C3H	195	Connection Release - registration timeout
C4H	196	Connection Release - PDSN error
C5H	197	Connection Release - inter-PCF handoff
C6H	198	Connection Release - inter-PDSN handoff
C7H	199	Connection Release - PDSN OAM&P intervention
C8H	200	Connection Release - accounting error
All other values reserved		

## 4.2.9 Status

This element identifies the result of processing an A11-Registration Update message or an A11-Session Update message.

<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>Octet</b>
Status								1

The supported Status values are listed in Table 4.2.9-1.

**Table 4.2.9-1 A11 Status Values**

<b>Hex Value</b>	<b>Decimal Value</b>	<b>A11 Status</b>
0	0	Update Accepted
80H	128	Update Denied – reason unspecified
83H	131	Update Denied – sending node failed authentication
85H	133	Update Denied – identification mismatch
86H	134	Update Denied – poorly formed Registration Update
C9H	193	Update Denied – Session parameters not updated
All other values reserved		

**4.2.10 Mobile-Home Authentication Extension**

This element is present in all A11-Registration Request and A11-Registration Reply messages. This element marks the end of the authenticated data in these messages. The structure of the extension conforms to [20] and is shown below.

0	1	2	3	4	5	6	7	Octet
A11 Element Identifier (Type)								1
Length								2
(MSB)								3
SPI								4
								5
							(LSB)	6
(MSB)								7
Authenticator								...
							(LSB)	22

Type: 20H.

Length: This field is set to 4 plus the number of bytes in the authenticator.

SPI: This four octet field is set to the Security Parameter Index, as described in section 1.6, [20].

Authenticator: For keyed-MD-5 authentication, the Authenticator field is set to the 128-bit “message digest” value obtained by applying the keyed-MD-5 algorithm in the “prefix+suffix” mode on the protected fields. Refer to section 3.5.1, [20] for details. In addition to the protected fields listed in [20], the default authenticator algorithm shall also protect the SPI value.

## 4.2.11 Registration Update Authentication Extension

This element is present in all A11-Registration Update, A11-Registration Acknowledge, A11-Session Update and A11-Session Update Acknowledge messages. This element marks the end of the authenticated data in these messages.

0	1	2	3	4	5	6	7	Octet
A11 Element Identifier (Type)								1
Length								2
(MSB)								3
SPI								4
								5
							(LSB)	6
(MSB)								7
Authenticator								...
							(LSB)	22

Type:

28H

Length:

This field is set to 4 plus the number of bytes in the authenticator.

SPI:

This four octet field is set to the Security Parameter Index, as described in section 1.6, [20].

Authenticator:

For keyed-MD-5 authentication, the Authenticator field is set to the 128-bit “message digest” value obtained by applying the keyed-MD-5 algorithm in the “prefix+suffix” mode on the protected fields. Refer to section 3.5.1, [20] for details. In addition to the protected fields listed in [20], the default authenticator algorithm shall also protect the SPI value.

**4.2.12 Session Specific Extension**

This element is present in all A11-Registration Request, A11-Registration Reply, A11-Registration Update, A11-Registration Acknowledge, A11-Session Update and A11-Session Update Acknowledge messages. This element includes the mobile identity and session specific information.

0	1	2	3	4	5	6	7	Octet
A11 Element Identifier (Type)								1
Length								2
(MSB)	Protocol Type						(LSB)	3
								4
(MSB)	Key						(LSB)	5
								6
								7
								8
Reserved								9
Reserved					Session ID Ver			10
(MSB)	MN Session Reference Id						(LSB)	11
								12
(MSB)	MSID Type						(LSB)	13
								14
MSID Length								15
Identity Digit 1				Odd/Even Indicator				16
Identity Digit 3				Identity Digit 2				17
...				...				...
Identity Digit N+1				Identity Digit N				Variable

Type:

27H

Length:

This one octet field indicates the length (in bytes) of the extension, NOT including the Type and Length fields.

Protocol Type:

This two octet field identifies the type of the link layer protocol/network layer protocol in use at the mobile node. The supported 'Protocol Type' values are listed below:

**Table 4.2.12-1 A11 Protocol Type Values**

Protocol Type	Value
PPP	88 0BH
Unstructured Byte Stream	88 81H

1	<b>Key:</b>	
2		This field indicates to the receiver the value to use in the GRE header
3		Key field when sending traffic frames on the A10 connection.
4	<b>Reserved:</b>	
5		This field is not used at present. It is set to zero by the sending entity
6		and ignored by the receiving entity.
7	<b>Session ID Ver:</b>	
8		This field is used to negotiate the Session Identifier Version to be used.
9		A one step negotiation is used where the initiating entity (the PCF)
10		indicates the highest version it supports, and the replying entity (the
11		PDSN) indicates the highest version it supports that is less than or
12		equal to the version received from the initiating entity.
13		If the negotiated Session Identifier Version is 0, the replying entity
14		shall send the same Key value received by the initiating entity.
15		If the negotiated Session Identifier Version is 1, the replying entity may
16		select a Key value different from the one received from the initiating
17		entity.
18		Values greater than 1 are reserved.
19	<b>MN Session Reference ID:</b>	
20		This field is used to uniquely identify a packet data service instance in
21		the mobile. The PCF shall set the MN Session Reference ID to the
22		SR_ID value received from the mobile for a particular packet data
23		service instance.
24	<b>MSID Type:</b>	
25		This field indicates the type of the address used by the mobile node.
26		The field is coded as shown in Table 4.2.12-2. Note only the least
27		significant bits are shown, all other bits are set to zero.

**Table 4.2.12-2 Mobile Identity - Type of Identity Coding**

Binary Values	Meaning
000	No Identity Code
010	Broadcast Address
101	ESN
110	IMSI

29  
30

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13

**MSID Length:**

This one octet field identifies the number of octets following the MSID Length field.

**Odd/Even Indicator:**

This field is set to '0000' for an even number of identity digits and to '0001' for an odd number of identity digits.

**Identity Digits:**

The identity digits are coded as follows:

The International Mobile Subscriber Identifier fields are coded using BCD coding format. If the number of identity digits is even then bits 0 to 3 of the last octet shall be filled with an end mark coded as '1111'.

The Broadcast Address is encoded as specified in [18].

### 4.2.13 Critical Vendor/Organization Specific Extension (CVSE)

This element may be present in the A11-Registration Request message to convey the accounting information from the PCF to the PDSN. This element may also be present in the A11-Registration Request message to convey the Mobility Event Indicator from the PCF to the PDSN during dormant handoffs and active/hard handoffs. The coding format of the CVSE defined herein conforms to [23].

This element may be present in the A11-Registration Reply message to convey the Data Available Indicator (DAI) from the PDSN to the PCF during handoff.

This element reflects Application Type and Application Sub-Types supported in IOS v4.0. New Application Type or Application Sub-Types shall be added to the Normal Vendor/Organization Specific Extension (NVSE) (refer to section 4.2.14).

When used to convey the accounting information, the accounting records are contained within the Application Data field of this element. The accounting records conveyed from the PCF to the PDSN conform to the specifications in [8]. Each application type 01H (Accounting) CVSE contains one and only one airlink record. For transmission of multiple airlink records in the same A11-Registration Request message, multiple instances of accounting type CVSEs are used.

0	1	2	3	4	5	6	7	Octet
A11 Element Identifier (Type)								1
Reserved								2
(MSB)	Length						(LSB)	3
								4
(MSB)	3GPP2 Vendor ID						(LSB)	5
								6
								7
								8
Application Type								9
Application Sub Type								10
(MSB)	Application Data						(LSB)	11
								12
								...
								...
								k

Note that the Application Type and the Application Sub Type together correspond to the Vendor- CVSE-Type as defined in [23].

Type:

26H

Length:

This field indicates the number of octets in this element following this field.

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22

3GPP2 Vendor ID:  
00 00 15 9FH

Application Type:  
This field indicates the type of application to which the extension relates. The supported values are:

**Table 4.2.13-1 Vendor/Organization Specific Extension - Application Type**

Hex Value	Description
01H	Accounting
02H	Mobility Event Indicator
03H	Data Available Indicator
All other values reserved.	

Application Sub Type:  
This one octet field indicates the Application sub-type within the Application Type. The supported values are listed in Table 4.2.13-2.

**Table 4.2.13-2 Application Sub Type**

Application Type		Application Sub Type	
Application Type Name	HEX Value	Application Sub Type Name	HEX Value
Accounting	01 H	RADIUS	01H
		DIAMETER	02H
		All other values are reserved	
Mobility Event Indicator	02H	Mobility	01H
		All other values are reserved	
Data Available Indicator	03H	Data Ready to Send	01H
		All other values are reserved	
All other values are reserved			

Application Data:  
For Application Type 01H (Accounting), this field contains all the accounting parameters contained in one airlink record conveyed from the PCF to the PDSN as specified in [8]. In this version of this standard, only Application Sub Type = RADIUS is used. Each of the accounting parameters is structured in the format of RADIUS attributes specified in [21] and [22], refer to the following text for more details.  
For Application Type 02H (Mobility Event Indicator), this field is zero bytes in length.  
For Application Type 03H (Data Available Indicator), this field is zero bytes in length.

1  
2

For Application Type 01H (Accounting), all 3GPP2 specific Accounting Parameters are coded using RADIUS Vendor-Specific-Attribute format as follows:

1	2	3	4	5	6	7	8	Octet
Type								1
Length								2
(MSB)	3GPP2 Vendor-Id							3
								4
								5
							(LSB)	6
Vendor-Type								7
Vendor-Length								8
(MSB)	Vendor-Value (variable number of octets)							9
								10
								...
							(LSB)	k

3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19

Type:  
1AH

Length:  
Type (1 octet) + Length (1 octet) + 3GPP2 Vendor Id (4 octets) + { Vendor-Type (1 octet), Vendor-Length (1 octet), Vendor-Value (variable octets) of the 3GPP2 specific parameter comprising the airlink record being coded. }

Vendor ID:  
00 00 15 9F H

Vendor Type:  
Sub-Type value from the Airlink Record tables below.

Vendor-Length:  
Vendor-Type (1 octet) + Vendor-Length (1 octet) + Payload Length (in octets) from the Airlink Record tables below.

Vendor-Value:  
Payload of the accounting parameter.

1 For Application Type 01 H (Accounting) all RADIUS specific Airlink Record  
 2 Parameters are coded as follows:

1	2	3	4	5	6	7	8	Octet
Type								1
Length								2
(MSB)	Value (variable number of octets)							3
								4
								...
							(LSB)	k

3 Type:  
 4 Type value from the Airlink Record tables below.  
 5 Length:  
 6 Type (1 octet) + Length (1 octet) + Payload Length (in octets) from the  
 7 Airlink Record tables below.  
 8 Value:  
 9 Payload of the accounting parameter.  
 10 Airlink Record Fields Tables:

11 **Table 4.2.13-3 R-P Session Setup Airlink Record (Connection Setup)**

Parameter	Type	Sub-Type	Max. Payload Length (octet)	Format
Airlink Record Type = 1 (Setup)	26	40	4	Integer
R-P Session ID	26	41	4	Integer
Airlink Sequence number	26	42	4	Integer
MSID	31	N/A	15	String
Serving PCF	26	9	4	Ip-addr
BSID	26	10	12	String <sup>1</sup>
ESN	26	52	4	Integer

<sup>1</sup> A number formed from the concatenation of SID+NID+ Cell Identifier (Type 2), where each item is encoded using four hexadecimal upper case ASCII characters.

1

**Table 4.2.13-4 Active Start Airlink Record**

Parameter	Type	Sub-Type	Max. Payload Length (octet)	Format
Airlink record type = 2 (START)	26	40	4	Integer
R-P Session ID	26	41	4	Integer
Airlink Sequence number	26	42	4	Integer
User Zone	26	11	4	Integer
Forward Mux Option	26	12	4	Integer
Reverse Mux Option	26	13	4	Integer
Service Option	26	16	4	Integer
Forward Traffic Type	26	17	4	Integer
Reverse Traffic Type	26	18	4	Integer
Fundamental Frame Size	26	19	4	Integer
Forward Fundamental RC	26	20	4	Integer
Reverse Fundamental RC	26	21	4	Integer
DCCH Frame Size (0/5/20 ms)	26	50	4	Integer
Airlink Priority	26	39	4	Integer

2

3

**Table 4.2.13-5 Active Stop Airlink Record**

Parameter	Type	Sub-Type	Max. Payload Length (octet)	Format
Airlink record type = 3 (STOP)	26	40	4	Integer
R-P Session ID	26	41	4	Integer
Airlink Sequence number	26	42	4	Integer
Active Connection Time in Seconds	26	49	4	Integer

4

5

**Table 4.2.13-6 SDB Airlink Record**

Parameter	Type	Sub-Type	Max. Payload Length (octet)	Format
Airlink record type = 4 (SDB)	26	40	4	Integer
R-P Session ID	26	41	4	Integer
Airlink Sequence number	26	42	4	Integer
Mobile Orig./Term. Indicator	26	45	4	Integer
SDB Octet Count	26	31/32 <sup>2</sup>	4	Integer

<sup>2</sup> Subtype 31 is for terminating SDB octet count, subtype 32 is for originating SDB octet count.

1  
2

An example coding of the Active Stop Airlink Record within the critical Vendor/Organization Specific Extension element is illustrated below:

0	1	2	3	4	5	6	7	Octet	
A11 Element Identifier = 26H								1	
Reserved								2	
(MSB)	Length = 36H							(LSB)	3
								4	
(MSB)	3GPP2 Vendor ID = 00 00 15 9F H							(LSB)	5
								6	
								7	
								8	
Application Type = 01 H								9	
Application Sub Type = 01 H								10	
<b>Parameter Name: Airlink Record Type = 3 (Active Stop)</b>									
Type = 1A H								11	
Length = 0C H								12	
(MSB)	3GPP2 Vendor-Id = 00 00 15 9F H							(LSB)	13
								14	
								15	
								16	
Vendor-Type = 28 H								17	
Vendor-Length = 06 H								18	
MSB	Vendor-Value = 3 (Active Stop)							(LSB)	19
								20	
								21	
								22	
<b>Parameter Name: R-P-Session ID</b>									
Type = 1A H								23	
Length = 0C H								24	
(MSB)	3GPP2 Vendor-Id = 00 00 15 9F H							(LSB)	25
								26	
								27	
								28	
Vendor-Type = 29 H								29	
Vendor-Length = 06 H								30	
(MSB)	Vendor-Value = PCF Session Identifier							(LSB)	31
								32	
								33	

	(LSB)	34
<b>Parameter Name: Airlink Sequence Number</b>		
	Type = 1A H	35
	Length = 0C H	36
(MSB)	3GPP2 Vendor-Id = 00 00 15 9F H	37
		38
		39
	(LSB)	40
	Vendor-Type = 2A H	41
	Vendor-Length = 06 H	42
(MSB)	Vendor-Value = Sequence Number	43
		44
		45
	(LSB)	46
<b>Parameter Name: Active Connection Time</b>		
	Type = 1AH	47
	Length = 0CH	48
(MSB)	3GPP2 Vendor-Id = 00 00 15 9FH	49
		50
		51
	(LSB)	52
	Vendor Type = 31H	53
	Length = 06 H	54
(MSB)	Value = Active Connection Time (in seconds)	55
		56
		57
	(LSB)	58

1

**4.2.14 Normal Vendor/Organization Specific Extension (NVSE)**

This element may be included in the A11-Registration Request, A11-Registration Reply, A11-Registration Update, and A11-Session Update messages to convey information between the PCF and the PDSN. Any new Application Types or Application Sub-Types supported after IOS v4.0 shall be added to this element. The coding format of the NVSE defined herein conforms to [23].

This element may be included in the A11-Registration Request message to convey the Previous and Current Access Network Identifiers (PANID, CANID) and fast handoff information to the PDSN.

This element may be included in A11-Registration Reply or A11-Registration Request messages when the PCF establishes the A10 connection with the selected PDSN. If the receiver does not recognize the NVSE Vendor-ID or the NVSE Application Type or Application Sub Type, it shall ignore the NVSE and process the remainder of the message to the extent possible.

This element may be included in the A11-Registration Request message to send the All Dormant Indicator for the case of an MS in fast handoff. The serving PCF shall send the All Dormant Indicator to its supporting PDSN when all service instances for the MS become dormant. The PCF shall send this indication in the same message as the Active Stop Airlink Record for the last service instance that becomes dormant.

This element may be included in the A11-Registration Update message to indicate the reason the PDSN initiated the release of the packet data session.

0	1	2	3	4	5	6	7	Octet
A11 Element Identifier (Type)								1
Length								2
(MSB)	Reserved						(LSB)	3
								4
(MSB)	3GPP2 Vendor ID						(LSB)	5
								6
								7
								8
Application Type								9
Application Sub Type								10
(MSB)	Application Data						(LSB)	11
								12
								...
								...
								k

Note that the Application Type and the Application Sub Type together correspond to the Vendor- NVSE-Type as defined in [23].

Type:

86H

Length:

This field indicates the number of octets in this element following this field.

3GPP2 Vendor ID:

00 00 15 9FH.

Application Type:

This field indicates the type of application to which the extension relates. The supported values are:

**Table 4.2.14-1 Normal Vendor/Organization Specific Extension - Application Type**

Hex Value	Description
04H	Access Network Identifiers
05H	PDSN Identifier
06H	Indicators
07H	PDSN Code
08H	Session Parameter
09H	Service Option
All other values reserved.	

14

15

Application Sub Type:

This one octet field indicates the Application sub-type within the Application Type. The supported values are listed in Table 4.2.14-2.

**Table 4.2.14-2 Application Sub Type**

Application Type		Application Sub Type	
Application Type Name	HEX Value	Application Sub Type Name	HEX Value
Access Network Identifiers (ANID)	04H	ANID	01H
		All other values are reserved	
PDSN Identifier	05H	Anchor P-P Address	01H
		All other values are reserved	
Indicators	06H	All Dormant Indicator	01H
		All other values are reserved	
PDSN Code	07H	PDSN CODE	01H
		All other values are reserved	
Session Parameter	08H	RN-PDIT	01H
		All other values are reserved	
Service Option	09H	Service Option Value	01H
		All other values reserved	
All other values are reserved			

Application Data:

For Application Type 04H (Access Network Identifiers), this field contains the PANID of the source PCF in octets 11-15 and CANID of the target PCF in octets 16-20. The PANID and CANID are formatted as specified for the Access Network Identifiers element (refer to [16]) from octet 3-7. If PANID or CANID information is not available, it shall be coded as all zeros. The PANID and CANID information is included only in the first A11-Registration Request message following a handoff.

For Application Type 05H (PDSN Identifier), this field contains an IPv4 address in octets 11-14. This is the Anchor P-P Address. The Anchor P-P Address is the P-P interface address (refer to [8]) of the Anchor PDSN.

For Application Type 06H (Indicators), this field contains the All Dormant Indicator in octets 11-12. A value of '00 00H' indicates that all MS packet data service instances are dormant. All other values are reserved.

For Application Type 07H (PDSN CODE), the field contains a PDSN Code indicating the reason the packet data connection is being released by the PDSN. The Code values and their meanings are the same as for the Code element shown in section 4.2.8.

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
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For Application Type 08H (Session Parameter) and Application Sub-Type 01H, the Application Data field contains the Radio Network Packet Data Inactivity Timer (RN-PDIT) value in seconds. The valid range for this timer is 1-255 (seconds).

For Application Type 09H (Service Option), this field contains the Service Option value and associated MN Session Reference ID of the service instance associated with the A10 connection.

For Application Type 09H, the Application Data field is coded as follows:

0	1	2	3	4	5	6	7	Octet
(MSB)	Service Option							1
						(LSB)	Reserved	2
(MSB)	MN Session Reference ID							3
						(LSB)	4	

Service Option:

**Table 4.2.14-3 Service Option Values**

Service Option Value (hex)	Description
0021H	(3G High Speed Packet Data)
003DH	(Link Layer Assisted RObust Header Compression)

MN Session Reference ID:

This field is used to uniquely identify a packet data service instance in the mobile. The PCF shall set the MN Session Reference ID to the SR\_ID value received from the mobile for a particular packet data service instance.

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## 5.0 Timer Definitions

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### 5.1 Timer Values

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The following table is in units of seconds unless otherwise noted.

**Table 5.1-1 Timer Values and Ranges Sorted by Name**

Timer Name	Default Value (seconds)	Range of Values (seconds)	Granularity (seconds)	Section Reference
$T_{\text{presetup}}$	10	0-255	1	5.2.4
$T_{\text{regreq}}$	1	1 – 5	1	5.2.1
$T_{\text{regupd}}$	1	1 – 5	1	5.2.2
$T_{\text{rp}}$	1800	60 – 65,534	60	5.2.3
$T_{\text{sesupd}}$	3	1-10	1	5.2.5

## 5.2 Timer Definitions

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### 5.2.1 $T_{\text{regreq}}$

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The PCF timer  $T_{\text{regreq}}$  is started when the Registration Request message is sent, and stopped when the Registration Reply message is received.

### 5.2.2 $T_{\text{regupd}}$

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The PDSN timer  $T_{\text{regupd}}$  is started when the Registration Update message is sent, and stopped when the Registration Acknowledge message is received.

### 5.2.3 $T_{\text{rp}}$

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The A10 connection registration Lifetime timer is started at the establishment of an A10 connection and updated during periodic re-registrations of the A10 connection. The A10 connection is cleared on expiration of this timer.

### 5.2.4 $T_{\text{presetup}}$

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The  $T_{\text{presetup}}$  is a pre-registration Lifetime timer to support fast handoff. It has a configurable value such as that it allows sufficient time for air-interface traffic channel handoff to occur between the source and target radio network.

1 **5.2.5** **T<sub>sesupd</sub>**

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2 Timer T<sub>sesupd</sub> is used when a packet data session update occurs. It is set when the PDSN  
3 sends the A11-Session Update message with any new or updated packet data session  
4 parameters, and stopped when an A11-Session Update Acknowledge message is received  
5 from the PCF indicating the results of processing the new session parameters.