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May 2011

Interoperability Specification (IOS) for cdma2000 Access Network Interfaces - Part 6 (A8 and A9 Interfaces)

(3G-IOS v5.1.2)

Revision History		
Date	**Publication**	**Description**
June 2007	A.S0016-D v1.0	For features supported, refer to the Overview [11], section 1.1.
August 2009	A.S0016-D v2.0	Updates to support 1x air interface enhancements, EVRC-WB on A2p, EVRC-NW on A2 and A2p and bug fixes.
May 2011	A.S0016-D v3.0	Support for callback of an emergency call origination, EVRC-NW capacity operating point 0, and bug fixes.

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Foreword

This foreword is not part of this standard.

This document was produced by TSG-A of the Third Generation Partnership Project 2. This document was developed in accordance with the procedural guidelines of 3GPP2 and its Organizational Partners, and represents the consensus position of these groups.

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1.0 Introduction

1.1 Overview

This document contains the message procedures, bitmaps, information elements and timers used to define the A9 interface.

1.1.1 Purpose

The purpose of this document is to provide the standard for interfacing a PCF with one or more BSs. This document defines the functional capabilities, including services and features, of the specified interface. 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 interface which coincides with the Reference Point "$A_{quinter}$" defined in the TR45 Network Reference Model shown in [I-2]. The scope of this standard includes the following topics:

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

1.2 References

References are either normative or informative. A normative reference is used to include another document as a mandatory part of a 3rd Generation Partnership Project 2 (3GPP2) specification. Documents that provide additional non-essential information are included in the informative references section.

1.2.1 Normative References

The following standards contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

[1] 3GPP2 C.S0001-E v3.0, *Introduction to cdma2000 Standards for Spread Spectrum Systems*, May 2011.

[2] 3GPP2 C.S0002-E v3.0, *Physical Layer Standard for cdma2000 Spread Spectrum Systems*, May 2011.

[3] 3GPP2 C.S0003-E v3.0, *Medium Access Control (MAC) Standard for cdma2000 Spread Spectrum Systems*, May 2011.

[4] 3GPP2 C.S0004-E v3.0, *Signaling Link Access Control (LAC) Standard for cdma2000 Spread Spectrum Systems*, May 2011.

[5] 3GPP2 C.S0005-E v3.0, *Upper Layer (Layer 3) Signaling Standard for cdma2000 Spread Spectrum Systems*, May 2011.

[6] 3GPP2 C.S0006-D v2.0, *Analog Signaling Standard for cdma2000 Spread Spectrum Systems*, September 2005.

[7] Reserved.

[8] 3GPP2 X.S0011-D v2.0, *Wireless IP Network Standard*, six parts, November 2008.
[9] 3GPP2 X.S0004-550-E v4.0, *Mobile Application Part (MAP) - Parameters Signaling Protocols*, January 2010.
[10] Reserved.
[11] 3GPP2 A.S0011-D v3.0, *Interoperability Specification (IOS) for cdma2000 Access Network Interfaces – Part 1 Overview*, May 2011.
[12] Reserved.
[13] 3GPP2 A.S0013-D v3.0, *Interoperability Specification (IOS) for cdma2000 Access Network Interfaces – Part 3 Features*, May 2011.
[14] 3GPP2 A.S0014-D v3.0, *Interoperability Specification (IOS) for cdma2000 Access Network Interfaces – Part 4 (A1, A1p, A2, and A5 Interfaces)*, May 2011.
[15] Reserved.
[16] Reserved.
[17] 3GPP2 A.S0017-D v3.0, *Interoperability Specification (IOS) for cdma2000 Access Network Interfaces – Part 7 (A10 and A11 Interfaces)*, May 2011.
[18] 3GPP2 C.S0017-0 v5.0, *Data Service Options for Spread Spectrum Systems*, February 2003.
[19] 3GPP2 N.S0017-B v1.0, *International Implementation of Wireless Telecommunication Systems Compliant with TIA/EIA-41*, December 2002.

1.2.2 Informative References

[I-1] 3GPP2 C.R1001-G v1.0, *Administration of Parameter Value Assignments for CDMA Spread Spectrum Standards*, June 2009.
[I-2] 3GPP2 S.R0005-B v2.0, *Network Reference Model for cdma2000 Spread Spectrum Systems*, May 2007.

1.3 Terminology

1.3.1 Acronyms

Acronym	Meaning
3GPP2	Third Generation Partnership Project 2
ADDS	Application Data Delivery Service
BS	Base Station
CCPD	Common Channel Packet Data
CDMA	Code Division Multiple Access
CON_REF	Connection Reference
CVSE	Critical Vendor/Organization Specific Extension
DRS	Data Ready to Send
EIA	Electronic Industries Alliance
ESN	Electronic Serial Number
GRE	Generic Routing Encapsulation
IEI	Information Element Identifier
IMSI	International Mobile Subscriber Identity

Acronym	Meaning
IOS	Interoperability Specification
IP	Internet Protocol
IS	Interim Standard
LSB	Least Significant Bit
MEID	Mobile Equipment Identifier
MS	Mobile Station
MSB	Most Significant Bit
MSC	Mobile Switching Center
MSCID	Mobile Station Connection Identifier
NID	Network Identification
OAM&P	Operations, Administration, Maintenance, and Provisioning
PCF	Packet Control Function
PDSI	Packet Data Service Instance
PDSN	Packet Data Serving Node
PPP	Point-to-Point Protocol
P-P	PDSN-PDSN Interface
PZID	Packet Zone Identifier
QoS	Quality of Service
RN-PDIT	Radio Network Packet Data Inactivity Timer
SDB	Short Data Burst
SID	System Identification
SR_ID	Session Reference ID
TIA	Telecommunications Industry Association
UZID	User Zone ID

1.3.2 Definitions

Refer to [11] for definitions.

1.4 Message Body, Coding, and Ordering of Elements

For each A9 interface message there are a number of information elements that are individually defined in section 4. Each information element in a given message is tagged with a reference in section 4, a direction indication (i.e., some elements within a message are bi-directional and others are not), and a mandatory/optional type (M/O) indicator. Information elements that are marked as optional carry an additional indication of being either required (R) or conditional (C) (as follows). Some information elements are reused in multiple messages.

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

Table 1.4-1 Element Flow DIRECTION Indication

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

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

M Information elements which are mandatory for the message.

O Information elements which are optional for the message.

R Required in the message whenever the message is sent.

C Conditionally required. The conditions for inclusion of this element are defined in the operation(s) where the message is used (refer to [13]) and in footnotes associated with the table defining the order of information elements in the message.

Information elements which are mandatory for a given message shall be present, and appear in the order shown in the message definitions in this chapter. Mandatory and Optional/Required IEs differ predominantly in error processing, refer to section 1.6.

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

An information element may be mandatory for some messages and optional for other messages.

The bitmap tables in the message subsections of 3.0 are patterned after the format for the information elements of section 4 and use the following conventions:

⇒ **Element Name{<# instances>:**

= Name of information element.

Different elements within a message are separated by double lines.

Fields within elements are separated by single lines.

Octets are renumbered at the beginning of every element.

[<values>] = Set of allowed values.

} Element Name The number of instances of an element is 1 by default. If the **Element Name{<# instances … }Element Name** notation is used, the <**# instances**> notation indicates:

n = exactly n occurrences of the element

n+ = n or more occurrences of the element

1..n = 1 to n inclusive occurrences of the element

label {<# instances>:

<octet 1>

<octet m>

} label = Number of instances of the bracketed set of fields where <**# instances**> notation indicates:

n = exactly n occurrences of the field

n+ = n or more occurrences of the field

1..n = 1 to n inclusive occurrences of the field

SSSS SSSS

• • • = Variable length field.

SSSS SSSS

1.5 Forward Compatibility Guidelines

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

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

It may happen that an entity receives unrecognized signaling information, i.e., messages, element types or element values. This can typically be caused by the upgrading of the protocol version used by other entities in the network. In these cases, the message processing guidelines detailed in section 1.6 are invoked to ensure predictable network behavior.

If the receiving entity is implemented to IOS v4.0 or greater, then the sending entity shall send messages that are correctly formatted for the version of the IOS declared to be implemented by the sending entity.

1.6 Message Processing Guidelines

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

In the guidelines in this section, "optional" includes both "optional – conditional" and "optional – required" information elements as indicated in the message tables in section 3.

1. If a message is received containing a Message Type value which is not defined for the revision level implemented then the message shall be discarded and ignored. There shall be no change in state or in timers due to receipt of an unknown message.
2. If a message is received without an expected mandatory information element for the revision level implemented then the message shall be discarded and ignored. There shall be no change in state or in timers due to receipt of the message.
3. If a message is received that contains an information element which is defined for the revision level implemented but contains invalid values in some fields, these fields shall be ignored and the remainder of the information element processed to the extent possible. The message and all other information elements shall be processed to the extent possible. Failure handling may be initiated if call processing cannot continue. Also refer to message processing guidelines 9 and 10.
4. If a message is received that contains an Information Element Identifier which is not defined for the revision level implemented then that element shall be discarded and ignored. The message shall be processed to the extent possible. Failure handling may be initiated if call processing cannot continue.

5. If a known but unexpected optional information element is received, that information element shall be ignored. The message and all other information elements shall be processed.

6. If a message is received without an expected optional information element the message shall be processed to the extent possible. Failure handling may be initiated if call processing cannot continue.

7. If a field within a received information element contains a value that is specified as "reserved" or is otherwise not defined in the revision level implemented, this field shall be ignored and the remainder of the information element processed to the extent possible. In this situation, all other information elements in the message shall be processed to the extent possible.

8. Octets and bits designated as "Reserved" or which are undefined for the revision implemented shall be set to zero by a sending entity and ignored by a receiving entity.

9. If an element is received containing a field that is larger than expected, i.e., is indicated as having more bits/octets than expected, then the expected bits/octets of that field shall be processed to the extent possible and the additional bits/octets shall be ignored.

10. If an element is received containing a field that is smaller than expected, i.e., is indicated as having fewer bits/octets than expected, then the length field or other indicator shall be considered correct and the bits/octets actually present in the element shall be processed to the extent possible. Failure handling may be initiated if call processing cannot continue.

1.7 Message Definition Guidelines

1. New messages shall have a Message Type that has never been previously used.

2. Information Element Identifiers may be reused in future revisions only when:

   - The old use of the element identifier is not used in the new revision, and
   - The new use of the element identifier is used only in new messages which were not defined in previous revisions.

   The old use of the element identifier shall be supported within the context of the old messages in which it was used.

3. Defined valid values of Information Elements may be changed in future revisions. The new version shall define the error handling when previously valid values are received.

4. Octets and bits which are undefined or which are defined as reserved may be used in future revisions.

5. The Mandatory/Optional designation of Information Elements within a message shall not change.

6. Mandatory Information elements shall be sent in the order specified in section 3.

7. New optional Information Elements in a message shall be defined after all previously defined optional Information Elements.

8. All new Information Elements shall be defined with a length field. Note that most existing Information Elements have 1 octet length fields but some existing Information Elements have 2 octet length fields. Information Element Identifier values in the range COH-DFH inclusive shall be defined to have a 2 octet length field. All other new Information Element Identifier values shall be defined to have a 1 octet length field.

9. New information may be added to the end of an existing Information Element, provided that the Information Element is defined with a length field.

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2.0 Message Procedures

2.1 A8/A9 Interface Setup Procedures

This section contains the messages used to set up an A8 connection.

2.1.1 A9-Setup-A8

This message is sent from the BS to the PCF to request the establishment of an A8 connection for a packet data service instance (PDSI) activation, hard or dormant handoff of a PDSI, or to initiate CCPD mode setup.

2.1.1.1 Successful Operation

When the BS receives a request for a PDSI activation from the MS (e.g., origination message with DRS bit set to 1) or when the BS receives a request for re-activation of a PDSI from the PCF (e.g., A9-BS Service Request) or MSC (e.g., Paging Request), and the MS has responded to a page (if not already on a traffic channel), it initiates service negotiation to put the PDSI onto radio traffic channels, sends an A9-Setup-A8 message indicating normal call setup (i.e., the Handoff Indicator field of the A9-Setup-A8 message is set to '0'), and starts timer $T_{A8\text{-}setup}$. If no other PDSI is active, the BS shall wait until the MSC has authorized the activation of the packet data session (e.g., the BS receives an Assignment Request message) before sending the A9-Setup-A8 message.

When the MS performs a hard handoff during packet data services, the target BS sends an A9-Setup-A8 message to the PCF to establish an A8 connection upon receipt of the Handoff Request message from the MSC and starts timer $T_{A8\text{-}setup}$. In this case, the BS sets the Handoff Indicator field of the A9-Setup-A8 message to '1' and the Data Ready Indicator to '1'.

When the BS receives a request for a dormant handoff from the MS (e.g., origination message with DRS bit set to 0 or including PREV_PZID, PREV_SID, or PREV_NID), the BS sends the A9-Setup-A8 message to the PCF and starts timer $T_{A8\text{-}setup}$. In this case, the BS sets the Handoff Indicator to '0'. If no other PDSI is active, the BS shall wait until the MSC has accepted the dormant handoff request (e.g., the BS receives an Assignment Request or ADDS Transfer Ack message) before sending the A9-Setup-A8 message.

To indicate that CCPD Mode will be used for the PDSI associated with the A8 connection being established, the BS sets the CCPD Mode bit to '1'. The BS shall wait until the MSC has accepted the service request (e.g., the BS receives an ADDS Transfer Ack message) before sending the A9-Setup-A8 message.

If the MS supports short data bursts and the BS allows short data bursts to be sent for the PDSI, the BS shall set the SDB Supported field in the message to '1'. Otherwise this field shall be set to '0'.

2.1.1.2 Failure Operation

If the BS fails to receive an A9-Connect-A8 message or an A9-Release-A8 Complete message in response to an A9-Setup-A8 message before the expiration of timer $T_{A8\text{-}setup}$, the BS may resend the A9-Setup-A8 message to the PCF and restart timer $T_{A8\text{-}setup}$ a configurable number of times. If the BS fails to receive an A9-Connect-A8 message or an A9-Release-A8 Complete message before timer $T_{A8\text{-}setup}$ expires after a configurable number of tries or the BS does not resend the A9-Setup-A8 message, the BS shall initiate

release of the MS or service negotiation to remove the PDSI from the traffic channel (if required).

2.1.2 A9-Connect-A8

This A9 message is used to respond to an A9-Setup-A8 message.

2.1.2.1 Successful Operation

The PCF sends an A9-Connect-A8 message to the BS in response to an A9-Setup-A8 message. If establishment of an A10 connection is needed (e.g., during normal call setup), this message shall be sent after the connection establishment is successful. If the Handoff Indicator field of the A9-Setup-A8 message is set to '1', the PCF starts timer $T_{waitho9}$ after sending the first A9-Connect-A8 message. The PCF stops timer $T_{waitho9}$ upon receipt of the A9-AL (Air Link) Connected or the A9-Release-A8 messages. Upon receiving the A9-Connect-A8 message, the BS stops the timer $T_{A8\text{-}setup}$.

2.1.2.2 Failure Operation

If the timer $T_{waitho9}$ expires, the PCF should initiate clearing of the A8 connection by sending an A9-Disconnect-A8 message to the BS. The PCF starts timer $T_{discon9}$.

2.1.3 A9-BS Service Request

This A9 interface message is sent from the PCF to the BS to begin a network initiated call setup.

2.1.3.1 Successful Operation

To initiate the reactivation of a dormant service instance, the PCF sends an A9-BS Service Request message to the BS. The PCF starts timer T_{bsreq9} and awaits the reception of the A9-BS Service Response message.

2.1.3.2 Failure Operation

If an A9-BS Service Response message is not received at the PCF before the expiration of timer T_{bsreq9}, then the PCF may resend the A9-BS Service Request message and restart timer T_{bsreq9} a configurable number of times.

2.1.4 A9-BS Service Response

This A9 interface message is sent from the BS to the PCF in response to an A9-BS Service Request.

2.1.4.1 Successful Operation

The BS shall send an A9-BS Service Response message to the PCF originating the A9-BS Service Request message. Upon receiving the A9-BS Service Response Message, the PCF stops timer T_{bsreq9}.

2.1.4.2 Failure Operation

None.

2.2 A8/A9 Interface Clearing Procedures

Procedures for clearing the A8 connection are described in this section. A8 connection clearing is initiated whenever the PDSI state changes from active to dormant or null. Clearing the A8 connection does not necessarily correspond to clearing of the traffic channel or the packet data service session.

A8 connection(s) clearing occurs:

- When a packet data inactivity timer in the BS expires for a PDSI. If it is the only active PDSI for the MS, the BS requests the MSC to clear the service, sends an A9-Release-A8 message to the PCF and starts timer T_{rel9}. Otherwise, if it is not the only active PDSI, the BS sends an A9-Release-A8 message to the PCF and starts timer T_{rel9}. For either case, the PCF responds with an A9-Release-A8 Complete message and the BS stops timer T_{rel9}. The two scenarios are illustrated by the "*BS Initiated PDSI Release to Dormant State when no other PDSI is active"* and the "*BS Initiated PDSI Release to Dormant State when other PDSIs are active"* in [13].
- When the BS receives a Release Order requesting the transition to dormant of a PDSI, the BS performs the same procedures as in the BS initiated scenarios. The two scenarios are illustrated by the "*MS Initiated PDSI Release to Dormant State when no other PDSI is active"* and the "*MS Initiated PDSI Release to Dormant State when other PDSIs are active"* in [13].
- When the MS releases the packet data session. When the BS receives a Release Order, the BS requests the MSC to clear the service, sends an A9-Release-A8 message to the PCF with a cause value set to normal release if only one A8 connection is active and starts timer T_{rel9}. If this is not the only active PDSI, the cause value is set to packet data session release and sent for only one of the A8 connections. The PCF responds with an A9-Release-A8 Complete message. The BS stops timer T_{rel9}. The "Active *MS Power Down"* and "*MS Initiated Call Release to Null State"* scenarios are shown in [13].
- When the A10 connection is released by the PDSN. When the PCF detects that an A10 connection is released, the PCF sends an A9-Disconnect-A8 message to the BS and starts timer $T_{discon9}$. The BS initiates release of the A8 connection by sending an A9-Release-A8 message and starts timer T_{rel9}. The PCF responds with an A9-Release-A8 Complete message and stops timer $T_{discon9}$. If this is the last PDSI, the BS clears any terrestrial resources and releases the air resources. Otherwise if this is not for the last PDSI, the BS renegotiates the traffic channel. The two scenarios are illustrated by the "*PDSN Initiated Release of an active PDSI - Packet data session becomes dormant or inactive*" and the "*PDSN Initiated Release of an active PDSI - Packet data session remains active*" in [13].

2.2.1 A9-Release-A8

This A9 interface message is sent from the BS to the PCF to request the release of the associated dedicated resource.

2.2.1.1 Successful Operation

When the BS needs to release an A8 connection, it sends an A9-Release-A8 message to the PCF.

When the BS releases an A8 connection for the case where the MS has powered down, the BS sends an A9-Release-A8 message to the PCF with the cause value Packet Data Session Release included. This message triggers the PCF to release all A10 connections associated with the MS.

When the BS releases an A8 connection for the case where a service instance is transitioning to the Dormant State, the BS sends an A9-Release-A8 message to the PCF with the Cause value "Packet data call going dormant" included. This message does not trigger the PCF to release any A10 connections.

The BS starts timer T_{rel9} and waits for the A9-Release-A8 Complete message from the PCF.

When the PCF receives the A9-Release-A8 message, it stops timer $T_{discon9}$, T_{aldak}, or $T_{waitho9}$ if active and performs the appropriate procedure to release the associated dedicated resources.

2.2.1.2 Failure Operation

If an A9-Release-A8 Complete message is not received from the PCF before timer T_{rel9} expires, the BS may resend the A9-Release-A8 message to the PCF and restart timer T_{rel9} a configurable number of times. If the A9-Release-A8 Complete message is not received from the PCF, the BS shall cease further supervision of this PDSI, release the dedicated resources associated with this PDSI, and release the A8 connection.

2.2.3 A9-Release-A8 Complete

This A9 interface message is sent from the PCF to the BS to acknowledge completion of the request to release the A8 connection or to indicate to the BS that an A8 connection has not been established due to either PCF (or PDSN) resources being unavailable, during dormant handoffs if the PDSN has no data to send, or during a CCPD Mode call setup.

2.2.3.1 Successful Operation

Upon receipt of the A9-Release-A8 message from the BS, the PCF closes the A8 connection and sends an A9-Release-A8 Complete message to notify the BS of the outcome. Alternatively, if upon receipt of the A9-Setup-A8 message the PCF determines that the A8 connection either does not need to be or cannot be set up, the PCF shall send an A9-Release-A8 Complete message to the BS. Upon receipt of this message the BS stops timer $T_{A8\text{-}setup}$ if the message was sent in response to an A9-Setup-A8 message. The BS stops timer T_{rel9} if the message was sent in response to an A9-Release-A8 message.

2.2.3.2 Failure Operation

None.

2.2.4 A9-Disconnect-A8

This A9 interface message is sent from the PCF to the BS to request the release of the associated dedicated resource.

2.2.4.1 Successful Operation

When the PCF needs to release an A8 connection, it sends an A9-Disconnect-A8 message to the BS. The PCF starts timer $T_{discon9}$.

2.2.4.2 Failure Operation

If an A9-Release-A8 message is not received from the BS before timer $T_{discon9}$ expires, the PCF may resend the A9-Disconnect-A8 message to the BS and restart timer $T_{discon9}$ a

configurable number of times. If the A9-Release-A8 message is not received from the BS, the PCF shall cease further supervision of this A8 connection, send the A9-Release-A8 Complete message, and release the resources associated with the A8 connection.

2.3 A8/A9 Interface Handoff Procedures

This section contains the messages used during handoff procedures.

2.3.1 A9-Air Link (AL) Connected

This message is sent from the target BS to the PCF after the MS performs hard handoff. This message notifies the PCF that the handoff is successfully completed (i.e. that the air link has been established between the MS and the target BS) and that the PCF can send packets on the established A8 connection. The message may also be sent from the source BS to the PCF in the case of handoff with return on failure. In this situation, the message notifies the PCF that the MS has re-established the air link with the source BS, and the PCF can resume sending packets to the source BS.

2.3.1.1 Successful Operation

After the MS performs hard handoff including the case of return on failure, the BS managing the active air link sends the A9-AL Connected message to the PCF and starts timer T_{alc9}. In the case of handoff with return on failure the PCF stops timer T_{aldak} upon receipt of this message.

Upon the receipt of the A9-AL Connected message, the PCF updates its routing table to route packet data sent from the PDSN to the BS managing the active air link, and stops the timers $T_{waitho9}$ for all established A8 connections. The A9-AL Connected message triggers the PCF to establish A10 connections for all established A8 connections if needed (inter-PCF handoff). If the PCF is unable to establish an A10 connection, it sends an A9-Disconnect-A8 message to the BS for the corresponding A8 connection.

If the PCF supports fast handoff, and the A10 connections have already been established if needed for all A8 connections, when the PCF receives the A9-AL Connected message it starts to forward the data from the PDSN to the BS on all A8 connections.

2.3.1.2 Failure Operation

If timer T_{alc9} expires, the BS may resend the A9-AL-Connected message and restart timer T_{alc9} a configurable number of times. If the A9-AL-Connected message is not resent or resending of this message also results in failure, the BS shall initiate release of the packet data session.

If timer $T_{waitho9}$ expires, the PCF shall send an A9-Disconnect-A8 message for the associated A8 connection to the BS. The PCF shall start timer $T_{discon9}$.

2.3.2 A9-Air Link (AL) Connected Ack

The A9-AL Connected Ack message is sent from the PCF to the BS to indicate the result of processing the A9-AL Connected message.

2.3.2.1 Successful Operation

Upon receipt of an A9-AL Connected message from the BS, the PCF shall transmit an A9-AL Connected Ack message to the BS to indicate the outcome of processing the received message. The target BS shall stop timer T_{alc9}.

2.3.2.2 Failure Operation

None.

2.3.3 A9-Air Link (AL) Disconnected

When the MS performs hard handoff, the A9-AL Disconnected message is sent from the source BS to the source PCF. This message is sent to notify the source PCF that the air link is temporarily disconnected. An A9-AL Disconnected Ack message is expected in response.

2.3.3.1 Successful Operation

When the source BS receives the Handoff Command message which instructs it to perform hard handoff, the source BS shall send an A9-AL Disconnected message to the PCF and start timer T_{ald9}.

Upon receipt of an A9-AL Disconnected message from the source BS, the PCF shall stop transmitting packet data to the BS for all PDSIs and start buffering packets from the PDSN.

2.3.3.2 Failure Operation

If timer T_{ald9} expires, the BS may resend the A9-AL Disconnected message and restart timer T_{ald9} a configurable number of times.

2.3.4 A9-Air Link (AL) Disconnected Ack

The A9-AL Disconnected Ack message is sent from the PCF to the BS to indicate the result of processing the A9-AL Disconnected message.

2.3.4.1 Successful Operation

Upon receipt of an A9-AL Disconnected message from the BS, the PCF shall transmit an A9-AL Disconnected Ack message to the BS to indicate the outcome of processing the received message. The source BS shall stop timer T_{ald9} upon receipt of the A9-AL Disconnected Ack message. The PCF starts timer T_{aldak}.

2.3.4.2 Failure Operation

If timer T_{aldak} expires, the PCF may resend the A9-AL Disconnected Ack message to the BS and restart timer T_{aldak} a configurable number of times.

2.4 A8/A9 Interface Maintenance Procedures

This section describes the A9 version control messages.

2.4.1 A9-Version Info

This A9 interface message is sent from the PCF to the BS, or the BS to the PCF, when the sending entity requires the software version information of the receiving entity. The message may also be sent as a result of a BS or PCF reset. The sending entity includes its software version information in the message and a cause value if the message is sent as the result of a reset.

2.4.1.1 Successful Operation

The sending entity starts timer T_{vers9} after the message is sent. The receiving entity responds with the A9-Version Info Ack message, and includes its software version information in the message.

2.4.1.2 Failure Operation

If the receiving entity fails to respond with an A9-Version Info Ack message prior to the expiration of timer T_{vers9} the sending entity may resend the A9-Version Info message and restart timer T_{vers9} a configurable number of times.

2.4.2 A9-Version Info Ack

This A9 interface message is sent from the PCF to the BS, or the BS to the PCF, in response to the A9-Version Info message. The message includes the software version information of the entity sending the message.

2.4.2.1 Successful Operation

The BS or PCF that receives the A9-Version Info Ack message stops timer T_{vers9} upon reception of the message.

2.4.2.2 Failure Operation

If a BS or PCF receives the A9-Version Info Ack message without initiating the procedure with an A9-Version Info message, the message shall be ignored.

2.5 A9 Session Update Procedures

This section contains message procedures for passing update information over the A9 interface. The A8 connection may or may not be established prior to sending an update on the A9 interface.

2.5.1 A9-Update-A8

The A9-Update-A8 message is sent from the PCF to the BS to update the BS with new or updated parameters for a PDSI or packet data session. The packet data session shall be active when this message is sent to the BS.

The A9-Update-A8 message is sent from the BS to the PCF to convey accounting information to the PCF if the A8 connection is established before traffic channel establishment (in which case the PCF resumes data transmission on the A8 connection only after it receives the A9-Update-A8 message) or while a PDSI is active following accounting parameter changes which need to be conveyed to the PDSN indirectly via the PCF.

The BS may send an A9-Update-A8 message to the PCF to indicate if short data bursts may be sent to the MS. The PCF may send an A9-Update-A8 message to the BS if the MS's SDB capability is cached at the PCF so the BS does not need to query the MS for its SDB capability. The BS may also send the A9-Update-A8 message to the PCF to indicate a successful Short Data Burst delivery to the MS if the PCF was not informed previously that the SDB was delivered successfully to the MS.

The A9-Update-A8 message is also used to inform the PCF of an authentication failure at the MSC following an access attempt by an MS undergoing dormant handoff. The BS can also use this message to inform the PCF that a dormant MS has powered down. In

these two cases, the PCF initiates the release of all A10 connections associated with the MS.

2.5.1.1 Successful Operation

If the A9-Update-A8 message is sent from the PCF to the BS to update packet data session parameters, the PCF includes the Cause element set to 'Session parameter update' upon reception of any new or updated session parameters from the PDSN. After sending the message to the BS, the PCF starts timer T_{upd9} and waits for an A9-Update-A8 Ack message from the BS.

If the message is sent from the BS to the PCF to pass accounting or authentication information, the BS shall set the Cause field to the appropriate value (1CH or 1EH), start timer T_{upd9}, and wait for an A9-Update-A8 Ack message from the PCF.

If the message is sent from the BS to the PCF or from the PCF to the BS to indicate if short data bursts may be sent to the MS, the sending entity shall set the SDB Supported bit to '1', set the Cause field to 'Capability update' (1BH), start timer T_{upd9} and wait for an A9-Update-A8 Ack message from the receiving entity.

If the message is sent from the BS to the PCF to indicate a successful short data burst delivery to the MS, the BS shall set the Cause field to 'SDB successfully delivered' (17H), start T_{upd9} and wait for an A9-Update-A8 Ack message from the PCF.

2.5.1.2 Failure Operation

When the message is sent from the PCF to the BS to update parameters for a PDSI, if T_{upd9} expires, the PCF may resend the A9-Update-A8 message to the BS and restart timer T_{upd9} a configurable number of times. If the A9-Update-A8-Ack message is not received from the BS, the session update procedure is considered failed and the PCF notifies the PDSN. In the event of a failure, if an A8 connection was active prior to the session update procedure, it shall remain connected.

When the message is sent from the BS to the PCF to pass accounting or authentication information, if an A9-Update-A8 Ack message is not received from the PCF before timer T_{upd9} expires, the BS may resend the A9-Update-A8 message and restart timer T_{upd9} a configurable number of times. If the acknowledgment is not received from the PCF, the BS ceases sending this message, and commences PDSI clearing.

When the message is sent from the BS to the PCF or from the PCF to the BS to indicate that short data bursts may be sent to the MS, if an A9-Update-A8 Ack message is not received before timer T_{upd9} expires, the sending entity may resend the A9-Update-A8 message and restart timer T_{upd9} a configurable number of times.

When the message is sent from the BS to the PCF to indicate a successful short data burst delivery to the MS, if an A9-Update-A8 Ack message is not received by the BS before timer T_{upd9} expires, the BS may resend the A9-Update-A8 message and restart timer T_{upd9} a configurable number of times.

2.5.2 A9-Update-A8 Ack

This A9 interface message is sent to indicate the result of processing the A9-Update-A8 message.

2.5.2.1 Successful Operation

Upon receipt of an A9-Update-A8 message, the receiving entity shall transmit the A9-Update-A8 Ack message to indicate the result of processing the received message. The sending entity shall stop timer T_{upd9} upon receipt of the A9-Update-A8 Ack message.

2.5.2.2 Failure Operation

None.

2.6 A8/A9 Interface Data Delivery Procedures

2.6.1 A9-Short Data Delivery

This A9 interface message is sent from the BS to the PCF when it receives a short data burst from the MS. If short data bursts are supported for the PDSI, this message may also be sent from the PCF to the BS when there is a small amount of packet data to be sent from the PDSN to an MS, and the PCF determines that a short data burst should be used to transmit this data. This message is used when the MS's PDSI is dormant. The data is encapsulated in the ADDS user part element in SDB format as specified in [18].

When used in the PCF to BS direction, the PCF retains a copy of the data sent in the message. The message also contains a count of the number of additional bytes of data remaining at the PCF for the PDSI. This information may be used by the BS, for example in determining whether short data bursts could be used to deliver the data to the MS.

2.6.1.1 Successful Operation

The BS sends the A9-Short Data Delivery message to the PCF after receiving a short data burst from the MS and after optionally authenticating the MS. Upon receipt of this message by the PCF, the packet data is sent to the PDSN on the A10 connection associated with service instance indicated in the A9-Short Data Delivery.

The PCF sends the A9-Short Data Delivery message to the BS when it determines that there is a small amount of data to be sent to a dormant PDSI at the MS or if the packet data service is operating in CCPD Mode. The PCF shall send this message only if short data bursts are supported for the PDSI. The PCF starts timer T_{sdd9} and waits for an A9-Short Data Ack message from the BS. If the BS decides that the data can be sent to the MS as a Short Data Burst, an A9-Short Data Ack message is sent to the PCF with a successful cause value. If the BS does not initiate the ADDS Page procedure to deliver the SDB, the BS may alternatively send the A9-Short Data Ack message to the PCF, with the cause value indicating if the data was successfully delivered, after the data has been sent to the MS. The BS may also reject the PCF's request for a short data burst delivery via the A9-Short Data Ack message.

2.6.1.2 Failure Operation

If timer T_{sdd9} expires before the PCF receives an A9-Short Data Ack message from the BS, the buffered data at the PCF is discarded.

2.6.2 A9-Short Data Ack

This message is sent from the BS to the PCF to acknowledge the receipt of the A9-Short Data Delivery message from the PCF. It also indicates to the PCF whether the data

received is to be sent to the MS as a short data burst or alternatively whether the data was successfully delivered to the MS.

2.6.2.1 Successful Operation

If the BS decides to send the data received from the PCF to the MS as a short data burst, it shall indicate this to the PCF in the A9-Short Data Ack message. Upon receiving this indication, the PCF stops timer T_{sdd9} and discards its copy of the buffered data. Note that acceptance of the data is independent of the mechanism the BS chooses to send the data to the MS over the air interface. The BS may send this data directly to the MS via a short data burst, or it may forward the data to the MSC using the BS Service Request/Response procedure. If the BS is unsuccessful in delivering the data to the MS on its own, it may choose to send the data to the MSC for delivery to the MS via the ADDS Page procedure.

If the BS decides against delivering the data to the MS as an SDB, it shall respond to the PCF with an A9-Short Data Ack message with a reject indication. Upon reception of this message, the PCF shall stop timer T_{sdd9} and then initiate re-activation of the PDSI from the dormant state by sending an A9-BS Service Request message to the BS. Refer to [13] for more details.

The BS may also try to send the SDB data to the MS before sending the A9-Short-Data Ack message to the PCF. In this case, the A9-Short-Data Ack message contains a cause value indicating if the data was successfully delivered. If the SDB data was successfully delivered to the MS, the PCF proceeds to flush the data from its buffer. If the data could not be delivered to the MS, the PCF may initiate a re-activation of the packet data session to deliver the packet data.

2.6.2.2 Failure Operation

None.

3.0 Message Formats

3.1 A8/A9 Interface Setup Messages

3.1.1 A9-Setup-A8

This message is sent from the BS to the PCF to request the establishment of an A8 connection.

Information Element	Section Reference	Element Direction	Type	
A9 Message Type	4.2.13	BS -> PCF	M	
Call Connection Reference	4.2.10	BS -> PCF	O	R
Correlation ID	4.2.11	BS -> PCF	O[a]	C
Mobile Identity (IMSI)	4.2.2	BS -> PCF	O	R
Mobile Identity (ESN)	4.2.2	BS -> PCF	O[b]	C
CON_REF	4.2.14	BS -> PCF	O	R
Quality of Service Parameters	4.2.7	BS -> PCF	O[c]	C
A9 Cell Identifier	4.2.15	BS -> PCF	O	R
A8 Traffic ID	4.2.16	BS -> PCF	O	R
Service Option	4.2.8	BS -> PCF	O	R
A9 Indicators	4.2.17	BS -> PCF	O	R
User Zone ID	4.2.6	BS -> PCF	O[d]	C
IS-2000 Service Configuration Record	4.2.20	BS -> PCF	O[e]	C
Access Network Identifiers	4.2.19	BS -> PCF	O[f]	C
PDSN Address	4.2.5	BS -> PCF	O[g]	C
Anchor PDSN Address	4.2.22	BS -> PCF	O[h]	C
Anchor P-P Address	4.2.12	BS -> PCF	O[i]	C
SR_ID	4.2.4	BS -> PCF	O[j]	R
Mobile Identity (MEID)	4.2.2	BS -> PCF	O[b]	C

a. If this element is included in this message, its value shall be returned in the corresponding element in the A9-Connect-A8 or A9-Release-A8 Complete message sent in response to this message.

b. If an additional occurrence of the Mobile Identity information element (in addition to the Mobile Identity Type, IMSI) is included, it shall contain the indicated Mobile Identity Type of the MS. Inclusion of ESN, MEID or both in this message is a network operator decision.

c. This information element is included if QoS information is available at the BS. In this version of this standard, this element is used to carry the current non-assured mode priority of the packet data session.

d. The User Zone ID is included if received from the MS.

e. This information element may be omitted if the BS does not possess this information at the time the message is created.

f. The Previous Access Network Identifiers are included if received from the MS or the MSC.

g. This is the A11 interface IP address of the source PDSN. This element is only present if the BS received this information from the source BS as part of a hard or fast handoff request.

h. This is the A11 interface IP address of the anchor PDSN. This element is only present if the BS received this information from the source BS as part of a fast handoff request.

i. This is the P-P interface IP address of the anchor PDSN. This element is only present if the BS received this information from the source BS as part of a fast handoff request.

j. This element specifies the SR_ID of the service instance in the Service Option element.

The following table shows the bitmap layout for the A9-Setup-A8 message.

3.1.1 A9-Setup-A8

7	6	5	4	3	2	1	0	Octet
⇒ **A9 Message Type** = [01H]								1
⇒ **Call Connection Reference:** A9 Element Identifier = [3FH]								1
Length = [08H]								2
(MSB)	Market ID = <any value>							3
							(LSB)	4
(MSB)	Generating Entity ID = <any value>							5
							(LSB)	6
(MSB)	Call Connection Reference = <any value>							7
								8
								9
							(LSB)	10
⇒ **Correlation ID:** A9 Element Identifier = [13H]								1
Length = [04H]								2
(MSB)	Correlation Value = <any value>							3
								4
								5
							(LSB)	6
⇒ **Mobile Identity (IMSI):** A9 Element Identifier = [0DH]								1
Length = [06H-08H] (10-15 digits)								2
Identity Digit 1 = [0H-9H] (BCD)				Odd/even Indicator = [1,0]	Type of Identity = [110] (IMSI)			3
Identity Digit 3 = [0H-9H] (BCD)				Identity Digit 2 = [0H-9H] (BCD)				4

3.1.1 A9-Setup-A8

7	6	5	4	3	2	1	0	Octet
…								…
Identity Digit N+1 = [0H-9H] (BCD)				Identity Digit N = [0H-9H] (BCD)				n
Identity Digit N+3 = [0H-9H] (BCD) (if odd number of digits) = [1111] (if even number of digits)				Identity Digit N+2 = [0H-9H] (BCD)				n+1
⇒ **Mobile Identity (ESN):** A9 Element Identifier = [0DH]								1
Length = [05H]								2
Identity Digit 1 = [0000]				Odd/even Indicator = [0]	Type of Identity = [101] (ESN)			3
(MSB)	ESN = <any value>							4
								5
								6
							(LSB)	7
⇒ **CON_REF:** A9 Element Identifier = [01H]								1
Length = [01H]								2
IS-2000 CON_REF = [00H – FFH]								3
⇒ **Quality of Service Parameters:** A9 Element Identifier = [07H]								1
Length = [01H]								2
Reserved = [0000]				Non-Assured Mode Packet Priority = [0000 – 1101]				3
⇒ **A9 Cell Identifier:** A9 Element Identifier = [06H]								1
Length = [06H]								2
Cell Identification Discriminator = [07H]								3
(MSB)	MSCID = <any value>							4
								5
							(LSB)	6
(MSB)	Cell = [001H-FFFH]							7
			(LSB)	Sector = [0H-FH] (0H = Omni)				8
⇒ **A8 Traffic ID:** A9 Element Identifier = [08H]								1
Length = [0CH]								2
A8 transport protocol stack = [01H] (GRE/IP)								3
(MSB)	Protocol Type = [88 81H] (Unstructured byte stream)							4
							(LSB)	5
(MSB)	Key = <any value>							6
								7

3.1.1 A9-Setup-A8

7	6	5	4	3	2	1	0	Octet
								8
							(LSB)	9
Address Type = [01H] (IPv4)								10
(MSB)	IP Address = <any value>							11
								12
								13
							(LSB)	14
⇒ **Service Option:** A9 Element Identifier = [03H]								1
(MSB)	Service Option							2
= [00 21H (3G High Speed Packet Data), 00 3CH (Link Layer Assisted Header Removal) 00 3DH (Link Layer Assisted RObust Header Compression)]							(LSB)	3
⇒ **A9 Indicators:** A9 Element Identifier = [05H]								1
Length = [01H]								2
Reserved = [0]	Packet Boundary Supported = [0] (ignored)	GRE Segment Supported = [0,1]	SDB Supported = [0,1]	CCPD Mode = [0,1]	Reserved = [0]	Data Ready Indicator = [0,1]	Handoff Indicator = [0, 1]	3
⇒ **User Zone ID:** A9 Element Identifier = [02H]								1
Length = [02H]								2
(MSB)	UZID = <any value>							3
							(LSB)	4
⇒ ***IS-2000* Service Configuration Record:** A9 Element Identifier = [0EH]								1
Bit-Exact Length – Octet Count = <variable>								2
Reserved = [0000 0]							Bit-Exact Length – Fill Bits = [000 – 111]	3
(MSB)	*IS-2000* Service Configuration Record Content = <any value>							4
…								…
	Seventh Fill Bit – if needed = [0 (if used as a fill bit)]	Sixth Fill Bit – if needed = [0 (if used as a fill bit)]	Fifth Fill Bit – if needed = [0 (if used as a fill bit)]	Fourth Fill Bit – if needed = [0 (if used as a fill bit)]	Third Fill Bit – if needed = [0 (if used as a fill bit)]	Second Fill Bit – if needed = [0 (if used as a fill bit)]	First Fill Bit – if needed = [0 (if used as a fill bit)]	k
⇒ **Access Network Identifiers:** A9 Element Identifier = [20H]								1
Length = [05H]								2
Reserved = [0]	(MSB)	SID = <any value>						3

3.1.1 A9-Setup-A8

7	6	5	4	3	2	1	0	Octet
							(LSB)	4
(MSB)	NID = <any value>							5
							(LSB)	6
PZID = <any value>								7
⇒ **PDSN Address:** A9 Element Identifier = [14H]								1
Length = [04H]								2
(MSB)	PDSN Address = <any value>							3
								4
								5
							(LSB)	6
⇒ **Anchor PDSN Address:** A9 Element Identifier = [30H]								1
Length = [04H]								2
(MSB)	Anchor PDSN Address = <any value>							3
								4
								5
							(LSB)	6
⇒ **Anchor P-P Address:** A9 Element Identifier = [40H]								1
Length = [04H]								2
(MSB)	Serving P-P IP Address = <any value>							3
								4
								5
							(LSB)	6
⇒ **SR_ID:** A9 Element Identifier = [0BH]								1
Length = [01H]								2
Reserved = [0000 0]						IS-2000 SR_ID = [001 - 110]		3
⇒ **Mobile Identity (MEID):** A9 Element Identifier = [0DH]								1
Length = [08H]								2
MEID Hex Digit 1 = [0H-FH]				Odd/Even Indicator = '0'	Type of Identity = [001] (MEID)			3
MEID Hex Digit 3 = [0H-FH]				MEID Hex Digit 2 = [0H-FH]				4
MEID Hex Digit 5 = [0H-FH]				MEID Hex Digit 4 = [0H-FH]				5
MEID Hex Digit 7 = [0H-FH]				MEID Hex Digit 6 = [0H-FH]				6
MEID Hex Digit 9 = [0H-FH]				MEID Hex Digit 8 = [0H-FH]				7
MEID Hex Digit 11 = [0H-FH]				MEID Hex Digit 10 = [0H-FH]				8
MEID Hex Digit 13 = [0H-FH]				MEID Hex Digit 12 = [0H-FH]				9

3.1.1 A9-Setup-A8

7	6	5	4	3	2	1	0	Octet
Fill = [FH]				MEID Hex Digit 14 = [0H-FH]				10

1

3.1.2 A9-Connect-A8

This message is sent from the PCF to the BS to complete the setup of the A8 connection.

Information Element	Section Reference	Element Direction	Type	
A9 Message Type	4.2.13	PCF -> BS	M	
Call Connection Reference	4.2.10	PCF -> BS	O	R
Correlation ID	4.2.11	PCF -> BS	O[a]	C
Mobile Identity (IMSI)	4.2.2	PCF -> BS	O	R
Mobile Identity (ESN)	4.2.2	PCF -> BS	O[b]	C
CON_REF	4.2.14	PCF -> BS	O	R
A8 Traffic ID	4.2.16	PCF -> BS	O	R
Cause	4.2.3	PCF -> BS	O	R
PDSN Address	4.2.5	PCF -> BS	O[c]	C
Anchor PDSN Address	4.2.22	PCF -> BS	O[d]	C
Anchor P-P Address	4.2.12	PCF -> BS	O[e]	C
SR_ID	4.2.4	PCF -> BS	O[f]	R
Service Instance Info	4.2.25	PCF -> BS	O[g]	C
Mobile Identity (MEID)	4.2.2	PCF -> BS	O[b]	C
A9 Indicator	4.2.17	PCF -> BS	O[h]	C

a. This element shall only be included if it was also included in the A9-Setup-A8 message. This element shall be set to the value received in that message.

b. If an additional occurrence of the Mobile Identity information element (in addition to the Mobile Identity Type, IMSI) is included, it shall contain the indicated Mobile Identity Type of the MS. Inclusion of ESN, MEID or both in this message is a network operator decision.

c. This is the A11 interface IP address of the target PDSN that terminates the A10 connection corresponding to the just-established A8 connection. If an A10 connection has been established, this element is included in this message and saved by the BS, and included in the Handoff Required message in the event of a hard handoff.

d. This is the A11 interface IP address of the anchor PDSN. This element shall be included if the Anchor P-P Address is included. During a fast handoff, it shall contain the same value as the Anchor PDSN Address received in the A9-Setup-A8 message; otherwise it shall be set to the same value as the PDSN Address. It is saved by the BS and included in the Handoff Required message in the event of a fast handoff. During a fast handoff, inclusion of this field indicates acceptance of the fast handoff.

e. This is the IP address for establishing P-P connections to the serving PDSN . This element shall be included if fast handoff is supported and if the value was received from the PDSN. It is saved by the BS and included in the Handoff Required message in the event of a fast handoff. During a fast handoff, inclusion of this field indicates acceptance of the fast handoff.

f. This element specifies the SR_ID of the connected service instance.

g. This element identifies all service instances for which the PCF has an A10 connection, excluding the service instance identified by the SR_ID information element. This element shall be included on transition of the packet data session to the Active State, i.e., when the first A8 connection of a packet data session is being established, but not during handoff (i.e., the Handoff Indicator in the A9-Setup-A8 message was set to '1').

h. This element shall be included if the PCF has enabled packet boundary indications.

The following table shows the bitmap layout for the A9-Connect-A8 message.

3.1.2 A9-Connect-A8

7	6	5	4	3	2	1	0	Octet
⇒ **A9 Message Type** = [02H]								1
⇒ **Call Connection Reference:** A9 Element Identifier = [3FH]								1
Length = [08H]								2
(MSB)	Market ID = <any value>							3
							(LSB)	4
(MSB)	Generating Entity ID = <any value>							5
							(LSB)	6
(MSB)	Call Connection Reference = <any value>							7
								8
								9
							(LSB)	10
⇒ **Correlation ID:** A9 Element Identifier = [13H]								1
Length = [04H]								2
(MSB)	Correlation Value = <any value>							3
								4
								5
							(LSB)	6
⇒ **Mobile Identity (IMSI):** A9 Element Identifier = [0DH]								1
Length = [06H-08H] (10-15 digits)								2
Identity Digit 1 = [0H-9H] (BCD)				Odd/even Indicator = [1,0]	Type of Identity = [110] (IMSI)			3
Identity Digit 3 = [0H-9H] (BCD)				Identity Digit 2 = [0H-9H] (BCD)				4
…								…
Identity Digit N+1 = [0H-9H] (BCD)				Identity Digit N = [0H-9H] (BCD)				n
Identity Digit N+3 = [0H-9H] (BCD) (if odd number of digits) = [1111] (if even number of digits)				Identity Digit N+2 = [0H-9H] (BCD)				n+1
⇒ **Mobile Identity (ESN):** A9 Element Identifier = [0DH]								1
Length = [05H]								2

3.1.2 A9-Connect-A8

7	6	5	4	3	2	1	0	Octet
Identity Digit 1 = [0000]				Odd/even Indicator = [0]	Type of Identity = [101] (ESN)			3
(MSB)	ESN = <any value>							4
								5
								6
							(LSB)	7
⇒ **CON_REF:** A9 Element Identifier = [01H]								1
Length = [01H]								2
IS-2000 CON_REF = [00H – FFH]								3
⇒ **A8 Traffic ID:** A9 Element Identifier = [08H]								1
Length = [0CH]								2
A8 transport protocol stack = [01H] (GRE/IP)								3
(MSB)	Protocol Type = [88 81H] (Unstructured byte stream)							4
							(LSB)	5
(MSB)	Key = <any value>							6
								7
								8
							(LSB)	9
Address Type = [01H] (IPv4)								10
(MSB)	IP Address = <any value>							11
								12
								13
							(LSB)	14
⇒ **Cause:** A9 Element Identifier = [04H]								1
Length = [01H]								2
ext = [0]	Cause Value = [13H (Successful operation), 7AH (Data ready to send)]							3
⇒ **PDSN Address:** A9 Element Identifier = [14H]								1
Length = [04H]								2
(MSB)	PDSN Address = <any value>							3
								4
								5
							(LSB)	6
⇒ **Anchor PDSN Address:** A9 Element Identifier = [30H]								1

3.1.2 A9-Connect-A8

7	6	5	4	3	2	1	0	Octet
Length = [04H]								2
(MSB)	Anchor PDSN Address = <any value>							3
								4
								5
							(LSB)	6
⇒ **Anchor P-P Address:** A9 Element Identifier = [40H]								1
Length = [04H]								2
(MSB)	Anchor P-P Address = <any value>							3
								4
								5
							(LSB)	6
⇒ **SR_ID:** A9 Element Identifier = [0BH]								1
Length = [01H]								2
Reserved = [0000 0]					IS-2000 SR_ID = [001 - 011]			3
⇒ **Service Instance Info:** A9 Element Identifier = [41H]								1
Length = [00-0FH]								2
SR_ID-8 = [0]	SR_ID-7 = [0]	SR_ID-6 = [0]	SR_ID-5 = [0]	SR_ID-4 = [0]	SR_ID-3 = [0,1]	SR_ID-2 = [0,1]	SR_ID-1 = [0,1]	3
(MSB)	Service Option – 1 = [0021H (3G High Speed Packet Data) 003CH (Link Layer Assisted Header Removal) 003DH (Link Layer Assisted Robust Header Compression (LLA-ROHC))]							4
							(LSB)	5
…								…
(MSB)	Service Option – n = [0021H (3G High Speed Packet Data) 003CH (Link Layer Assisted Header Removal) 003DH (Link Layer Assisted Robust Header Compression (LLA-ROHC))]							n
							(LSB)	n+1
⇒ **Mobile Identity (MEID):** A9 Element Identifier = [0DH]								1
Length = [08H]								2
MEID Hex Digit 1 = [0H-FH]				Odd/Even Indicator = ‘0’	Type of Identity = [001] (MEID)			3
MEID Hex Digit 3 = [0H-FH]				MEID Hex Digit 2 = [0H-FH]				4
MEID Hex Digit 5 = [0H-FH]				MEID Hex Digit 4 = [0H-FH]				5
MEID Hex Digit 7 = [0H-FH]				MEID Hex Digit 6 = [0H-FH]				6
MEID Hex Digit 9 = [0H-FH]				MEID Hex Digit 8 = [0H-FH]				7

3.1.2 A9-Connect-A8

7	6	5	4	3	2	1	0	Octet
MEID Hex Digit 11 = [0H-FH]				MEID Hex Digit 10 = [0H-FH]				8
MEID Hex Digit 13 = [0H-FH]				MEID Hex Digit 12 = [0H-FH]				9
Fill = [FH]				MEID Hex Digit 14 = [0H-FH]				10
⇒ **A9 Indicators:** A9 Element Identifier = [05H]								1
Length = [01H]								2
Reserved = [0]	Packet Boundary Supported = [0,1]	GRE Segment. Supported = [0] (ignored)	SDB Supported = [0] (ignored)	CCPD Mode = [0] (ignored)	Reserved = [0]	Data Ready Indicator = [0] (ignored)	Handoff Indicator = [0] (ignored)	3

3.1.3 A9-BS Service Request

This message is sent from the PCF to the BS to request re-activation of a dormant PDSI.

Information Element	Section Reference	Element Direction	Type	
A9 Message Type	4.2.13	PCF -> BS	M	
Correlation ID	4.2.11	PCF -> BS	O[a]	C
Mobile Identity (IMSI)	4.2.2	PCF -> BS	O	R
Mobile Identity (ESN)	4.2.2	PCF -> BS	O[b]	C
Service Option	4.2.8	PCF -> BS	O	R
Data Count	4.2.18	PCF -> BS	O[c]	C
SR_ID	4.2.4	PCF -> BS	O[d]	R
Mobile Identity (MEID)	4.2.2	PCF -> BS	O[b]	C

a. If this element is included in this message, its value shall be returned in the corresponding element in the A9-BS Service Response message sent in response to this message.

b. If an additional occurrence of the Mobile Identity information element (in addition to the Mobile Identity Type, IMSI) is included, it shall contain the indicated Mobile Identity Type of the MS. Inclusion of ESN, MEID or both in this message is a network operator decision.

c. This IE may be included by the PCF to indicate to the BS the amount of data remaining at the PCF that is to be transmitted.

d. This element specifies the SR_ID of the service instance in the Service Option element.

The following table shows the bitmap layout for the A9-BS Service Request message.

3.1.3 A9-BS Service Request

7	6	5	4	3	2	1	0	Octet
⇒ **A9 Message Type** = [06H]								1
⇒ **Correlation ID:** A9 Element Identifier = [13H]								1
Length = [04H]								2
(MSB)	Correlation Value = <any value>							3
								4
								5
							(LSB)	6
⇒ **Mobile Identity (IMSI):** A9 Element Identifier = [0DH]								1
Length = [06H-08H] (10-15 digits)								2
Identity Digit 1 = [0H-9H] (BCD)				Odd/even Indicator = [1,0]	Type of Identity = [110] (IMSI)			3
Identity Digit 3 = [0H-9H] (BCD)				Identity Digit 2 = [0H-9H] (BCD)				4
…								…

3.1.3 A9-BS Service Request

7	6	5	4	3	2	1	0	Octet
Identity Digit N+1 = [0H-9H] (BCD)				Identity Digit N = [0H-9H] (BCD)				n
Identity Digit N+3 = [0H-9H] (BCD) (if odd number of digits) = [1111] (if even number of digits)				Identity Digit N+2 = [0H-9H] (BCD)				n+1
⇒ **Mobile Identity (ESN):** A9 Element Identifier = [0DH]								1
Length = [05H]								2
Identity Digit 1 = [0000]				Odd/even Indicator = [0]	Type of Identity = [101] (ESN)			3
(MSB)	ESN = <any value>							4
								5
								6
							(LSB)	7
⇒ **Service Option:** A9 Element Identifier = [03H]								1
(MSB)	Service Option							2
= [00 21H (3G High Speed Packet Data)]							(LSB)	3
⇒ **Data Count:** A9 Element Identifier = [09H]								1
Length = [02H]								2
Count = <any value>								3
								4
⇒ **SR_ID:** A9 Element Identifier = [0BH]								1
Length = [01H]								2
Reserved = [0000 0]						IS-2000 SR_ID = [001 - 011]		3
⇒ **Mobile Identity (MEID):** A9 Element Identifier = [0DH]								1
Length = [08H]								2
MEID Hex Digit 1 = [0H-FH]				Odd/Even Indicator = '0'	Type of Identity = [001] (MEID)			3
MEID Hex Digit 3 = [0H-FH]				MEID Hex Digit 2 = [0H-FH]				4
MEID Hex Digit 5 = [0H-FH]				MEID Hex Digit 4 = [0H-FH]				5
MEID Hex Digit 7 = [0H-FH]				MEID Hex Digit 6 = [0H-FH]				6
MEID Hex Digit 9 = [0H-FH]				MEID Hex Digit 8 = [0H-FH]				7
MEID Hex Digit 11 = [0H-FH]				MEID Hex Digit 10 = [0H-FH]				8
MEID Hex Digit 13 = [0H-FH]				MEID Hex Digit 12 = [0H-FH]				9
Fill = [FH]				MEID Hex Digit 14 = [0H-FH]				10

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3.1.4 A9-BS Service Response

This message is sent from the BS to the PCF to acknowledge the receipt and processing of the A9-BS Service Request message.

Information Element	Section Reference	Element Direction	Type	
A9 Message Type	4.2.13	BS -> PCF	M	
Correlation ID	4.2.11	BS -> PCF	O[a]	C
Cause	4.2.3	BS -> PCF	O[b]	C
SR_ID	4.2.4	BS -> PCF	O[c]	R

a. This element shall only be included if it was also included in the A9-BS Service Request message. This element shall be set to the value received in that message.

b. This element shall only be included if the BS does not grant the A9-BS Service Request.

c. This element indicates the SR_ID of the service instance that was set up.

The following table shows the bitmap layout for the A9-BS Service Response message.

3.1.4 A9-BS Service Response

7	6	5	4	3	2	1	0	Octet
⇒ **A9 Message Type** = [07H]								1
⇒ **Correlation ID:** A9 Element Identifier = [13H]								1
Length = [04H]								2
(MSB)	Correlation Value = <any value>							3
								4
								5
							(LSB)	6
⇒ **Cause:** A9 Element Identifier = [04H]								1
Length = [01H]								2
ext = [0]	Cause Value = [08H (MS busy), 11H (Service option not available)]							3
⇒ **SR_ID:** A9 Element Identifier = [0BH]								1
Length = [01H]								2
Reserved = [0000 0]					IS-2000 SR_ID = [001 - 011]			3

3.2 A8/A9 Interface Clearing Messages

3.2.1 A9-Release-A8

This message is sent from the BS to the PCF to release an A8 connection.

Information Element	Section Reference	Element Direction	Type	
A9 Message Type	4.2.13	BS -> PCF	M	
Call Connection Reference	4.2.10	BS -> PCF	O	R
Correlation ID	4.2.11	BS -> PCF	O[a]	C
Mobile Identity (IMSI)	4.2.2	BS -> PCF	O	R
Mobile Identity (ESN)	4.2.2	BS -> PCF	O[b]	C
CON_REF	4.2.14	BS -> PCF	O	R
A8 Traffic ID	4.2.16	BS -> PCF	O	R
Cause	4.2.3	BS -> PCF	O[c]	R
Active Connection Time in Seconds	4.2.1	BS -> PCF	O[d]	R
SR_ID	4.2.4	BS -> PCF	O[e]	R
Mobile Identity (MEID)	4.2.2	BS -> PCF	O[b]	C

a. This element shall be included if it was also included in the A9-Disconnect-A8 message. This element shall be set to the value received in that message. If this element was not included in that message, it may be included in this message.

b. If an additional occurrence of the Mobile Identity information element (in addition to the Mobile Identity Type, IMSI) is included, it shall contain the indicated Mobile Identity Type of the MS. Inclusion of ESN, MEID or both in this message is a network operator decision.

c. The cause value Normal Call Release indicates that the PDSI has been released and therefore the A10 resources associated with this service instance should be dropped. If the cause value indicates Packet Data Session Release, all services have been released by the MS and therefore all A10 connections associated with the MS shall be released. If the cause value indicates a hard handoff failure, the PCF shall not release any A10 connection associated with the packet data session (intra-PCF hard handoff failure).

d. This element shall be included to indicate the active connection time for a traffic channel.

e. This element specifies the SR_ID of the service instance to be released.

The following table shows the bitmap layout for the A9-Release-A8 message.

3.2.1 A9-Release-A8

7	6	5	4	3	2	1	0	Octet
⇒ **A9 Message Type** = [04H]								1
⇒ **Call Connection Reference:** A9 Element Identifier = [3FH]								1
Length = [08H]								2
(MSB)	Market ID = <any value>							3

3.2.1 A9-Release-A8

7	6	5	4	3	2	1	0	Octet
							(LSB)	4
(MSB)	Generating Entity ID = <any value>							5
							(LSB)	6
(MSB)	Call Connection Reference = <any value>							7
								8
								9
							(LSB)	10
⇒ **Correlation ID:** A9 Element Identifier = [13H]								1
Length = [04H]								2
(MSB)	Correlation Value = <any value>							3
								4
								5
							(LSB)	6
⇒ **Mobile Identity (IMSI):** A9 Element Identifier = [0DH]								1
Length = [06H-08H] (10-15 digits)								2
Identity Digit 1 = [0H-9H] (BCD)				Odd/even Indicator = [1,0]	Type of Identity = [110] (IMSI)			3
Identity Digit 3 = [0H-9H] (BCD)				Identity Digit 2 = [0H-9H] (BCD)				4
…								…
Identity Digit N+1 = [0H-9H] (BCD)				Identity Digit N = [0H-9H] (BCD)				n
Identity Digit N+3 = [0H-9H] (BCD) (if odd number of digits) = [1111] (if even number of digits)				Identity Digit N+2 = [0H-9H] (BCD)				n+1
⇒ **Mobile Identity (ESN):** A9 Element Identifier = [0DH]								1
Length = [05H]								2
Identity Digit 1 = [0000]				Odd/even Indicator = [0]	Type of Identity = [101] (ESN)			3
(MSB)	ESN = <any value>							4
								5
								6
							(LSB)	7
⇒ **CON_REF:** A9 Element Identifier = [01H]								1
Length = [01H]								2
IS-2000 CON_REF = [00H – FFH]								3
⇒ **A8 Traffic ID:** A9 Element Identifier = [08H]								1

3.2.1 A9-Release-A8

7	6	5	4	3	2	1	0	Octet
Length = [0CH]								2
A8 transport protocol stack = [01H] (GRE/IP)								3
(MSB)	Protocol Type = [88 81H] (Unstructured byte stream)							4
							(LSB)	5
(MSB)	Key = <any value>							6
								7
								8
							(LSB)	9
Address Type = [01H] (IPv4)								10
(MSB)	IP Address = <any value>							11
								12
								13
							(LSB)	14
⇒ **Cause:** A9 Element Identifier = [04H]								1
Length = [01H]								2
ext = [0]	Cause Value = [0BH (Handoff successful), 0FH (Packet data session release) 10H (Packet call going dormant), 14H (Normal call release), 1AH (Authentication failure) 1DH (Hard handoff failure) 20H (Equipment failure)]							3
⇒ **Active Connection Time in Seconds:** A9 Element Identifier = [0AH]								1
Length = [04H]								2
(MSB)	Active Connection Time = [00 00 00 00H – FF FF FF FFH]							3
								4
…								5
							(LSB)	6
⇒ **SR_ID:** A9 Element Identifier = [0BH]								1
Length = [01H]								2
Reserved = [0000 0]					IS-2000 SR_ID = [001 - 011]			3
⇒ **Mobile Identity (MEID):** A9 Element Identifier = [0DH]								1
Length = [08H]								2
MEID Hex Digit 1 = [0H-FH]				Odd/Even Indicator = ‘0’	Type of Identity = [001] (MEID)			3

3.2.1 A9-Release-A8

7	6	5	4	3	2	1	0	Octet
MEID Hex Digit 3 = [0H-FH]				MEID Hex Digit 2 = [0H-FH]				4
MEID Hex Digit 5 = [0H-FH]				MEID Hex Digit 4 = [0H-FH]				5
MEID Hex Digit 7 = [0H-FH]				MEID Hex Digit 6 = [0H-FH]				6
MEID Hex Digit 9 = [0H-FH]				MEID Hex Digit 8 = [0H-FH]				7
MEID Hex Digit 11 = [0H-FH]				MEID Hex Digit 10 = [0H-FH]				8
MEID Hex Digit 13 = [0H-FH]				MEID Hex Digit 12 = [0H-FH]				9
Fill = [FH]				MEID Hex Digit 14 = [0H-FH]				10

3.2.2 A9-Release-A8 Complete

This message is sent from the PCF to the BS either to acknowledge the release of an A8 connection or to indicate that an A8 does not need to be or cannot be set up.

Information Element	Section Reference	Element Direction	Type	
A9 Message Type	4.2.13	PCF -> BS	M	
Call Connection Reference	4.2.10	PCF -> BS	O	R
Correlation ID	4.2.11	PCF -> BS	O[a]	C
Cause	4.2.3	PCF -> BS	O[b]	C
A9 PDSN Code	4.2.23	PCF -> BS	O[c]	C
SR_ID	4.2.4	PCF -> BS	O[d]	R

a. This element shall only be included if it was also included in the A9-Release-A8 or A9-Setup-A8 message. This element shall be set to the value received in that message.

b. This information element is present in the case where an A8 connection is not established during a setup request. The element contains a release cause.

c. This information element may be present if a code is received from the PDSN. If this element is present the Cause element shall be coded to 'PCF resources are not available', 'PDSN resources are not available', or 'Packet call going dormant'.

d. This element indicates the SR_ID of the service instance that was released.

The following table shows the bitmap layout for the A9-Release-A8 Complete message.

3.2.2 A9-Release-A8 Complete

7	6	5	4	3	2	1	0	Octet
⇒ **A9 Message Type** = [05H]								1
⇒ **Call Connection Reference:** A9 Element Identifier = [3FH]								1
Length = [08H]								2
(MSB)	Market ID = <any value>							3
							(LSB)	4
(MSB)	Generating Entity ID = <any value>							5
							(LSB)	6
(MSB)	Call Connection Reference = <any value>							7
								8
								9
							(LSB)	10
⇒ **Correlation ID:** A9 Element Identifier = [13H]								1
Length = [04H]								2
(MSB)	Correlation Value = <any value>							3
								4
								5

3.2.2 A9-Release-A8 Complete

7	6	5	4	3	2	1	0	Octet
							(LSB)	6
⇒ **Cause:** A9 Element Identifier = [04H]								1
Length = [01H]								2
ext = [0]	Cause Value = [79H (PDSN resources are not available), 32H (PCF resources are not available), 20H (Equipment failure), 10H (Packet call going dormant), 07H (OAM&P intervention)]							3
⇒ **A9 PDSN Code:** A9 Element Identifier = [0CH]								1
Length = [01H]								2
PDSN Code = [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 data in the CVSE)]								3
⇒ **SR_ID:** A9 Element Identifier = [0BH]								1
Length = [01H]								2
Reserved = [0000 0]					IS-2000 SR_ID = [001 - 011]			3

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3.2.3 A9-Disconnect-A8

This message is sent from the PCF to the BS to request the release of an A8 connection.

Information Element	Section Reference	Element Direction	Type	
A9 Message Type	4.2.13	PCF -> BS	M	
Call Connection Reference	4.2.10	PCF -> BS	O	R
Correlation ID	4.2.11	PCF -> BS	O[a]	C
Mobile Identity (IMSI)	4.2.2	PCF -> BS	O	R
Mobile Identity (ESN)	4.2.2	PCF -> BS	O[b]	C
CON_REF	4.2.14	PCF -> BS	O	R
A8 Traffic ID	4.2.16	PCF -> BS	O	R
Cause	4.2.3	PCF -> BS	O	R
A9 PDSN Code	4.2.23	PCF -> BS	O[c]	C
SR_ID	4.2.4	PCF -> BS	O[d]	R
Mobile Identity (MEID)	4.2.2	PCF -> BS	O[b]	C

a. If this element is included in this message, its value shall be returned in the corresponding element in the A9-Release-A8 message sent in response to this message.

b. If an additional occurrence of the Mobile Identity information element (in addition to the Mobile Identity Type, IMSI) is included, it shall contain the indicated Mobile Identity Type of the MS. Inclusion of ESN, MEID or both in this message is a network operator decision.

c. This information element may be present if a release code is received from the PDSN. If this element is present, the Cause element shall be coded to 'PCF (or PDSN) resources unavailable'.

d. This element specifies the SR_ID of the service instance to be disconnected.

The following table shows the bitmap layout for the A9-Disconnect-A8 message.

3.2.3 A9-Disconnect-A8

7	6	5	4	3	2	1	0	Octet
⇒ **A9 Message Type** = [03H]								1
⇒ **Call Connection Reference:** A9 Element Identifier = [3FH]								1
Length = [08H]								2
(MSB)	Market ID = <any value>							3
							(LSB)	4
(MSB)	Generating Entity ID = <any value>							5
							(LSB)	6
(MSB)	Call Connection Reference = <any value>							7
								8
								9
							(LSB)	10

3.2.3 A9-Disconnect-A8

7	6	5	4	3	2	1	0	Octet
⇒ **Correlation ID:** A9 Element Identifier = [13H]								1
Length = [04H]								2
(MSB)	Correlation Value = <any value>							3
								4
								5
							(LSB)	6
⇒ **Mobile Identity (IMSI):** A9 Element Identifier = [0DH]								1
Length = [06H-08H] (10-15 digits)								2
Identity Digit 1 = [0H-9H] (BCD)				Odd/even Indicator = [1,0]	Type of Identity = [110] (IMSI)			3
Identity Digit 3 = [0H-9H] (BCD)				Identity Digit 2 = [0H-9H] (BCD)				4
…								…
Identity Digit N+1 = [0H-9H] (BCD)				Identity Digit N = [0H-9H] (BCD)				n
Identity Digit N+3 = [0H-9H] (BCD) (if odd number of digits) = [1111] (if even number of digits)				Identity Digit N+2 = [0H-9H] (BCD)				n+1
⇒ **Mobile Identity (ESN):** A9 Element Identifier = [0DH]								1
Length = [05H]								2
Identity Digit 1 = [0000]				Odd/even Indicator = [0]	Type of Identity = [101] (ESN)			3
(MSB)	ESN = <any value>							4
								5
								6
							(LSB)	7
⇒ **CON_REF:** A9 Element Identifier = [01H]								1
Length = [01H]								2
IS-2000 CON_REF = [00H – FFH]								3
⇒ **A8 Traffic ID:** A9 Element Identifier = [08H]								1
Length = [0CH]								2
A8 transport protocol stack = [01H] (GRE/IP)								3
(MSB)	Protocol Type = [88 81H] (Unstructured byte stream)							4
							(LSB)	5
(MSB)	Key = <any value>							6
								7
								8

3.2.3 A9-Disconnect-A8

7	6	5	4	3	2	1	0	Octet
							(LSB)	9
Address Type = [01H] (IPv4)								10
(MSB)	IP Address = <any value>							11
								12
								13
							(LSB)	14
⇒ **Cause:** A9 Element Identifier = [04H]								1
Length = [01H]								2
ext = [0]	Cause Value = [14H (Normal call release), 20H (Equipment failure), 07H (OAM&P intervention), 32H (PCF resources are not available), 79H (PDSN resources are not available)]							3
⇒ **A9 PDSN Code:** A9 Element Identifier = [0CH]								1
Length = [01H]								2
PDSN Code = [C1H (Connection Release - reason unspecified), C2H (Connection Release - PPP time-out), C3H (Connection Release - registration time-out), C4H (Connection Release - PDSN error), C5H (Connection Release - inter-PCF handoff), C6H (Connection Release - inter-PDSN handoff), C7H (Connection Release - PDSN OAM&P intervention), C8H (Connection Release - accounting error) CAH (Connection Release - user (NAI) authentication failure)]								3
⇒ **SR_ID:** A9 Element Identifier = [0BH]								1
Length = [01H]								2
Reserved = [0000 0]					IS-2000 SR_ID = [001 - 011]			3
⇒ **Mobile Identity (MEID):** A9 Element Identifier = [0DH]								1
Length = [08H]								2
MEID Hex Digit 1 = [0H-FH]				Odd/Even Indicator = '0'	Type of Identity = [001] (MEID)			3
MEID Hex Digit 3 = [0H-FH]				MEID Hex Digit 2 = [0H-FH]				4
MEID Hex Digit 5 = [0H-FH]				MEID Hex Digit 4 = [0H-FH]				5
MEID Hex Digit 7 = [0H-FH]				MEID Hex Digit 6 = [0H-FH]				6
MEID Hex Digit 9 = [0H-FH]				MEID Hex Digit 8 = [0H-FH]				7
MEID Hex Digit 11 = [0H-FH]				MEID Hex Digit 10 = [0H-FH]				8

3.2.3 A9-Disconnect-A8

7	6	5	4	3	2	1	0	Octet
MEID Hex Digit 13 = [0H-FH]				MEID Hex Digit 12 = [0H-FH]				9
Fill = [FH]				MEID Hex Digit 14 = [0H-FH]				10

1

2

3.3 A8/A9 Interface Handoff Messages

3.3.1 A9-AL (Air Link) Connected

This message is sent from the BS to the PCF to indicate that a traffic channel has been established to the MS during hard or fast handoff.

Information Element	Section Reference	Element Direction	Type	
A9 Message Type	4.2.13	BS -> PCF	M	
Call Connection Reference	4.2.10	BS -> PCF	O	R
Correlation ID	4.2.11	BS -> PCF	O[a]	C
A8 Traffic ID	4.2.16	BS -> PCF	O	R
PDSN Address	4.2.5	BS -> PCF	O[b,c]	C
IS-2000 Service Configuration Record	4.2.20	BS -> PCF	O	R
Service Option	4.2.8	BS -> PCF	O	R
User Zone ID	4.2.6	BS -> PCF	O[e]	C
Quality of Service Parameters	4.2.7	BS -> PCF	O	R
Access Network Identifiers	4.2.19	BS -> PCF	O[c,d]	C

a. If this element is included in this message, its value shall be returned in the corresponding element in the A9-AL Connected Ack message sent in response to this message.

b. This is the IP address for the A11 interface of the source PDSN.

c. This element shall be omitted if this message is sent as part of a fast handoff because the corresponding A10 connection has already been established. Otherwise, this element shall be included.

d. The Access Network Identifiers are those of the source PCF communicated by the source BS via the MSC (Handoff Required, Handoff Requested messages).

e. This information element is included if available to the BS.

The following table shows the bitmap layout for the A9-AL Connected message.

3.3.1 A9-AL (Air Link) Connected

7	6	5	4	3	2	1	0	Octet
⇒ **A9 Message Type** = [08H]								1
⇒ **Call Connection Reference:** A9 Element Identifier = [3FH]								1
Length = [08H]								2
(MSB)	Market ID = <any value>							3
							(LSB)	4
(MSB)	Generating Entity ID = <any value>							5
							(LSB)	6
(MSB)	Call Connection Reference = <any value>							7
								8

3.3.1 A9-AL (Air Link) Connected

7	6	5	4	3	2	1	0	Octet
								9
							(LSB)	10
⇒ **Correlation ID:** A9 Element Identifier = [13H]								1
Length = [04H]								2
(MSB)	Correlation Value = <any value>							3
								4
								5
							(LSB)	6
⇒ **A8 Traffic ID:** A9 Element Identifier = [08H]								1
Length = [0CH]								2
A8 transport protocol stack = [01H] (GRE/IP)								3
(MSB)	Protocol Type = [88 81H] (Unstructured byte stream)							4
							(LSB)	5
(MSB)	Key = <any value>							6
								7
								8
							(LSB)	9
Address Type = [01H] (IPv4)								10
(MSB)	IP Address = <any value>							11
								12
								13
							(LSB)	14
⇒ **PDSN Address:** A9 Element Identifier = [14H]								1
Length = [04H]								2
(MSB)	PDSN Address = <any value>							3
								4
								5
							(LSB)	6
⇒ **IS-2000 Service Configuration Record:** A9 Element Identifier = [0EH]								1
Bit-Exact Length – Octet Count = [00H to FFH]								2
Reserved = [0000 0]							Bit-Exact Length – Fill Bits = [000 to 111]	3
(MSB)	*IS-2000* Service Configuration Record Content = <any value>							4
…								…

3.3.1 A9-AL (Air Link) Connected

7	6	5	4	3	2	1	0	Octet
	Seventh Fill Bit – if needed = [0 (if used as a fill bit)]	Sixth Fill Bit – if needed = [0 (if used as a fill bit)]	Fifth Fill Bit – if needed = [0 (if used as a fill bit)]	Fourth Fill Bit – if needed = [0 (if used as a fill bit)]	Third Fill Bit – if needed = [0 (if used as a fill bit)]	Second Fill Bit – if needed = [0 (if used as a fill bit)]	First Fill Bit – if needed = [0 (if used as a fill bit)]	k
⇒ **Service Option:** A9 Element Identifier = [03H]								1
(MSB)	Service Option							2
= [00 21H (3G High Speed Packet Data), 00 3CH (Link Layer Assisted Header Removal), 00 3DH (Link Layer Assisted RObust Header Compression)]							(LSB)	3
⇒ **User Zone ID:** A9 Element Identifier = [02H]								1
Length = [02H]								2
(MSB)	UZID = <any value>							3
							(LSB)	4
⇒ **Quality of Service Parameters:** A9 Element Identifier = [07H]								1
Length = [01H]								2
Reserved = [0000]				Non-Assured Mode Packet Priority = [0000 – 1101]				3
⇒**Access Network Identifiers:** A9 Element Identifier = [20H]								1
Length = [05H]								2
Reserved = [0]	(MSB)	SID = <any value>						3
							(LSB)	4
(MSB)	NID = <any value>							5
							(LSB)	6
PZID = <any value>								7

3.3.2 A9-AL (Air Link) Connected Ack

This message is sent from the PCF to the BS to acknowledge reception of an A9-AL Connected message. In the case of inter-PCF hard handoff without fast handoff, this message is sent after establishment of the A10 connection.

Information Element	Section Reference	Element Direction	Type	
A9 Message Type	4.2.13	PCF -> BS	M	
Call Connection Reference	4.2.10	PCF -> BS	O	R
Correlation ID	4.2.11	PCF -> BS	O[a]	C
PDSN Address	4.2.5	PCF -> BS	O[b]	C
Anchor PDSN Address	4.2.22	PCF -> BS	O[c]	C
Anchor P-P Address	4.2.12	PCF -> BS	O[d]	C

a. This element shall only be included if it was also included in the A9-AL Connected message. This element shall be set to the value received in that message.

b. This is the IP address of the A11 interface of the target PDSN. It shall be included in this message unless the information was sent previously in an A9-Connect-A8 message. It is saved by the BS, and included in the Handoff Required message in the event of a hard handoff.

c. This is the IP address for the A11 interface of the anchor PDSN. This element shall be included if the Anchor P-P Address is included. If included, it shall be set to the same value as the PDSN Address. It is saved by the BS and included in the Handoff Required message in the event of a fast handoff.

d. This is the IP address for establishing P-P connections to the anchor PDSN. This element shall be included if fast handoff is supported and if the value was received from the PDSN, unless the information was sent previously in an A9-Connect-A8 message. It is saved by the BS and included in the Handoff Required message in the event of a fast handoff.

The following table shows the bitmap layout for the A9-AL Connected Ack message.

3.3.2 A9-AL (Air Link) Connected Ack

7	6	5	4	3	2	1	0	Octet
⇒ **A9 Message Type** = [09H]								1
⇒ **Call Connection Reference:** A9 Element Identifier = [3FH]								1
Length = [08H]								2
(MSB)	Market ID = <any value>							3
							(LSB)	4
(MSB)	Generating Entity ID = <any value>							5
							(LSB)	6
(MSB)	Call Connection Reference = <any value>							7
								8
								9
							(LSB)	10

3.3.2 A9-AL (Air Link) Connected Ack

7	6	5	4	3	2	1	0	Octet
⇒ **Correlation ID:** A9 Element Identifier = [13H]								1
Length = [04H]								2
(MSB)	Correlation Value = <any value>							3
								4
								5
							(LSB)	6
⇒ **PDSN Address:** A9 Element Identifier = [14H]								1
Length = [04H]								2
(MSB)	PDSN Address = <any value>							3
								4
								5
							(LSB)	6
⇒ **Anchor PDSN Address:** A9 Element Identifier = [30H]								1
Length = [04H]								2
(MSB)	Anchor PDSN Address = <any value>							3
								4
								5
							(LSB)	6
⇒ **Anchor P-P Address:** A9 Element Identifier = [40H]								1
Length = [04H]								2
(MSB)	Serving P-P IP Address = <any value>							3
								4
								5
							(LSB)	6

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3.3.3 A9-AL Disconnected

This message is sent from the BS to the PCF to indicate that the traffic channel has been released following a hard handoff.

Information Element	Section Reference	Element Direction	Type	
A9 Message Type	4.2.13	BS -> PCF	M	
Call Connection Reference	4.2.10	BS -> PCF	O	R
Correlation ID	4.2.11	BS -> PCF	O[a]	C
A8 Traffic ID	4.2.16	BS -> PCF	O	R

a. If this element is included in this message, its value shall be returned in the corresponding element in the A9-AL Disconnected Ack message sent in response to this message.

The following table shows the bitmap layout for the A9-AL Disconnected message.

3.3.3 A9-AL Disconnected

7	6	5	4	3	2	1	0	Octet
⇒ **A9 Message Type** = [0AH]								1
⇒ **Call Connection Reference:** A9 Element Identifier = [3FH]								1
Length = [08H]								2
(MSB)	Market ID = <any value>							3
							(LSB)	4
(MSB)	Generating Entity ID = <any value>							5
							(LSB)	6
(MSB)	Call Connection Reference = <any value>							7
								8
								9
							(LSB)	10
⇒ **Correlation ID:** A9 Element Identifier = [13H]								1
Length = [04H]								2
(MSB)	Correlation Value = <any value>							3
								4
								5
							(LSB)	6
⇒ **A8 Traffic ID:** A9 Element Identifier = [08H]								1
Length = [0CH]								2
A8 transport protocol stack = [01H] (GRE/IP)								3
(MSB)	Protocol Type = [88 81H] (Unstructured byte stream)							4
							(LSB)	5
(MSB)	Key = <any value>							6

3.3.3 A9-AL Disconnected

7	6	5	4	3	2	1	0	Octet
								7
								8
							(LSB)	9
Address Type = [01H] (IPv4)								10
(MSB)	IP Address = <any value>							11
								12
								13
							(LSB)	14

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3.3.4 A9-AL Disconnected Ack

This message is sent from the PCF to the BS to acknowledge reception of the A9-AL Disconnect message.

Information Element	Section Reference	Element Direction	Type	
A9 Message Type	4.2.13	PCF -> BS	M	
Call Connection Reference	4.2.10	PCF -> BS	O	R
Correlation ID	4.2.11	PCF -> BS	O[a]	C

a. This element shall only be included if it was also included in the A9-AL Disconnected message. This element shall be set to the value received in that message.

The following table shows the bitmap layout for the A9-AL Disconnected Ack message.

3.3.4 A9-AL Disconnected Ack

7	6	5	4	3	2	1	0	Octet
⇒ **A9 Message Type** = [0BH]								1
⇒ **Call Connection Reference:** A9 Element Identifier = [3FH]								1
Length = [08H]								2
(MSB)	Market ID = <any value>							3
							(LSB)	4
(MSB)	Generating Entity ID = <any value>							5
							(LSB)	6
(MSB)	Call Connection Reference = <any value>							7
								8
								9
							(LSB)	10
⇒ **Correlation ID:** A9 Element Identifier = [13H]								1
Length = [04H]								2
(MSB)	Correlation Value = <any value>							3
								4
								5
							(LSB)	6

3.4 A8/A9 Interface Maintenance Messages

3.4.1 A9-Version Info

This message is sent from the PCF to the BS, or the BS to the PCF, when the sending entity requires software version information from the receiving entity.

Information Element	Section Reference	Element Direction	Type	
A9 Message Type	4.2.13	BS<->PCF	M	
Correlation ID	4.2.11	BS<->PCF	O[a]	C
Cause	4.2.3	BS<->PCF	O[b]	C
Software Version	4.2.21	BS<->PCF	O	R

a. If this element is included in this message, its value shall be returned in the corresponding element in the A9-Version Info Ack message sent in response to this message.

b. This element shall be included if the message is being sent as the result of a reset at the sending entity.

The following table shows the bitmap layout for the A9-Version Info message:

3.4.1 A9-Version Info

7	6	5	4	3	2	1	0	Octet
⇒ **A9 Message Type** = [10H]								1
⇒ **Correlation ID:** A9 Element Identifier = [13H]								1
Length = [04H]								2
(MSB)	Correlation Value = <any value>							3
								4
								5
							(LSB)	6
⇒ **Cause:** A9 Element Identifier = [04H]								1
Length = [01H]								2
ext = [0]	Cause Value = [07H (OAM&P intervention), 20H (Equipment failure)]							3
⇒ **Software Version:** A9 Element Identifier = [31H]								1
Length = <variable>								2
IOS Major Revision Level (X) = [05H]								3
IOS Minor Revision Level (Y) = [01H]								4
IOS Point Release Level (Z) = [02H]								5
Manufacturer/Carrier Software Information = <printable ASCII character>								6
…								…

3.4.1 A9-Version Info

7	6	5	4	3	2	1	0	Octet
Manufacturer/Carrier Software Information = <printable ASCII character>								n

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3.4.2 A9-Version Info Ack

This message is sent from the PCF to the BS, or BS to PCF, in response to the A9-Version Info message. The message includes the software version information from the receiving entity.

Information Element	Section Reference	Element Direction	Type	
A9 Message Type	4.2.13	BS<->PCF	M	
Correlation ID	4.2.11	BS<->PCF	O[a]	C
Software Version	4.2.21	BS<->PCF	O	R

a. This element is included in this message if it was sent in the A9-Version Info message. Its value shall be set to the same value as in the A9-Version Info message.

The following table shows the bitmap layout for the A9-Version Info Ack message:

3.4.2 A9-Version Info Ack

7	6	5	4	3	2	1	0	Octet
⇒ **A9 Message Type** = [11H]								1
⇒ **Correlation ID:** A9 Element Identifier = [13H]								1
Length = [04H]								2
(MSB)	Correlation Value = <any value>							3
								4
								5
							(LSB)	6
⇒ **Software Version:** A9 Element Identifier = [31H]								1
Length = <variable>								2
IOS Major Revision Level (X) = [05H]								3
IOS Minor Revision Level (Y) = [01H]								4
IOS Point Release Level (Z) = [02H]								5
Manufacturer/Carrier Software Information = <printable ASCII character>								6
…								…
Manufacturer/Carrier Software Information = <printable ASCII character>								n

3.5 A9 Session Update Procedures

3.5.1 A9-Update-A8

This message is sent from the BS to the PCF to indicate a change to the session airlink parameters, whether SDBs may be sent to an MS, whether an SDB was successfully delivered to an MS, or to indicate an authentication failure. This message is also sent from the PCF to the BS to transfer new or updated packet data session parameters to the BS.

Information Element	Section Reference	Element Direction	Type	
A9 Message Type	4.2.13	BS <-> PCF	M	
Call Connection Reference	4.2.10	BS <-> PCF	O	R
Correlation ID	4.2.11	BS <-> PCF	O[a]	C
Mobile Identity (IMSI)	4.2.2	BS <-> PCF	O	R
Mobile Identity (ESN)	4.2.2	BS -> PCF	O[b]	C
IS-2000 Service Configuration Record	4.2.20	BS -> PCF	O[c]	C
Service Option	4.2.8	BS -> PCF	O[c]	C
User Zone ID	4.2.6	BS -> PCF	O[c]	C
Quality of Service Parameters	4.2.7	BS -> PCF	O[c]	C
Cause	4.2.3	BS <-> PCF	O	R
RN-PDIT	4.2.24	BS <- PCF	O[d]	C
SR_ID	4.2.4	BS <-> PCF	O[e]	R
Mobile Identity (MEID)	4.2.2	BS -> PCF	O[b]	C
A9 Indicators	4.2.17	BS <-> PCF	O[f]	C
PDSN Address	4.2.5	BS <- PCF	O[g]	C
Anchor PDSN Address	4.2.22	BS <- PCF	O[h]	C
Anchor P-P Address	4.2.12	BS <- PCF	O[h]	C

a. If this element is included in this message, its value shall be returned in the corresponding element in the A9-Update-A8-Ack message sent in response to this message.

b. If an additional occurrence of the Mobile Identity information element (in addition to the Mobile Identity Type, IMSI) is included, it shall contain the indicated Mobile Identity Type of the MS. Inclusion of ESN, MEID or both in this message is a network operator decision.

c. These elements are required when the message is sent from the BS to the PCF unless the message is used to indicate Dormant Power down or Authentication Failure.

d. This element is included in the message when the PDSN has sent the parameter to the PCF.

e. This element specifies the SR_ID of the service instance in the Service Option element.

f. This element is included when used to indicate if the PDSI supports Short Data bursts.

g. This element contains the A11 IP address of the PDSN terminating the A10 connection. This element is included when A10 connections were established with a new PDSN during an active packet data session.

h. These IEs are included if this information is received from the PDSN.

The following table shows the bitmap layout for the A9-Update-A8 message.

3.5.1 A9-Update-A8

7	6	5	4	3	2	1	0	Octet
⇒ **A9 Message Type** = [0EH]								1
⇒ **Call Connection Reference:** A9 Element Identifier = [3FH]								1
Length = [08H]								2
(MSB)	Market ID = <any value>							3
							(LSB)	4
(MSB)	Generating Entity ID = <any value>							5
							(LSB)	6
(MSB)	Call Connection Reference = <any value>							7
								8
								9
							(LSB)	10
⇒ **Correlation ID:** A9 Element Identifier = [13H]								1
Length = [04H]								2
(MSB)	Correlation Value = <any value>							3
								4
								5
							(LSB)	6
⇒ **Mobile Identity (IMSI):** A9 Element Identifier = [0DH]								1
Length = [06H-08H] (10-15 digits)								2
Identity Digit 1 = [0H-9H] (BCD)				Odd/even Indicator = [1,0]	Type of Identity = [110] (IMSI)			3
Identity Digit 3 = [0H-9H] (BCD)				Identity Digit 2 = [0H-9H] (BCD)				4
…								…
Identity Digit N+1 = [0H-9H] (BCD)				Identity Digit N = [0H-9H] (BCD)				n
Identity Digit N+3 = [0H-9H] (BCD) (if odd number of digits) = [1111] (if even number of digits)				Identity Digit N+2 = [0H-9H] (BCD)				n+1
⇒ **Mobile Identity (ESN):** A9 Element Identifier = [0DH]								1
Length = [05H]								2

3.5.1 A9-Update-A8

7	6	5	4	3	2	1	0	Octet
Identity Digit 1 = [0000]				Odd/even Indicator = [0]	Type of Identity = [101] (ESN)			3
(MSB)	ESN = <any value>							4
								5
								6
							(LSB)	7
⇒ ***IS-2000* Service Configuration Record:** A9 Element Identifier = [0EH]								1
Bit-Exact Length – Octet Count = <variable>								2
Reserved = [0000 0]					Bit-Exact Length – Fill Bits = [000 – 111]			3
(MSB)	*IS-2000* Service Configuration Record Content = <any value>							4
…								…
	Seventh Fill Bit – if needed = [0 (if used as a fill bit)]	Sixth Fill Bit – if needed = [0 (if used as a fill bit)]	Fifth Fill Bit – if needed = [0 (if used as a fill bit)]	Fourth Fill Bit – if needed = [0 (if used as a fill bit)]	Third Fill Bit – if needed = [0 (if used as a fill bit)]	Second Fill Bit – if needed = [0 (if used as a fill bit)]	First Fill Bit – if needed = [0 (if used as a fill bit)]	k
⇒ **Service Option:** A9 Element Identifier = [03H]								1
(MSB)	Service Option							2
= [00 21H (3G High Speed Packet Data) 00 3CH (Link Layer Assisted Header Removal) 00 3DH (Link Layer Assisted RObust Header Compression)]							(LSB)	3
⇒ **User Zone ID:** A9 Element Identifier = [02H]								1
Length = [02H]								2
(MSB)	UZID = <any value>							3
							(LSB)	4
⇒ **Quality of Service Parameters:** A9 Element Identifier = [07H]								1
Length = [01H]								2
Reserved = [0000]				Non-Assured Mode Packet Priority = [0000 – 1101]				3
⇒ **Cause:** A9 Element Identifier = [04H]								1
Length = [01H]								2

3.5.1 A9-Update-A8

7	6	5	4	3	2	1	0	Octet
Ext= [0]	Cause Value = [17H (SDB successfully delivered), 19H (Power down from dormant state), 1AH (Authentication failure), 1BH (Capability update), 1CH (Update accounting: late traffic channel setup), 1EH (Update accounting: parameter change), 7BH (Session parameter update)]							3
⇒ **RN-PDIT:** A9 Element Identifier = [0FH]								1
Length = [01H]								2
RN-PDIT = [01H-FFH]								3
⇒ **SR_ID:** A9 Element Identifier = [0BH]								1
Length = [01H]								2
Reserved = [0000 0]					IS-2000 SR_ID = [001 - 011]			3
⇒ **Mobile Identity (MEID):** A9 Element Identifier = [0DH]								1
Length = [08H]								2
MEID Hex Digit 1 = [0H-FH]				Odd/Even Indicator = '0'	Type of Identity = [001] (MEID)			3
MEID Hex Digit 3 = [0H-FH]				MEID Hex Digit 2 = [0H-FH]				4
MEID Hex Digit 5 = [0H-FH]				MEID Hex Digit 4 = [0H-FH]				5
MEID Hex Digit 7 = [0H-FH]				MEID Hex Digit 6 = [0H-FH]				6
MEID Hex Digit 9 = [0H-FH]				MEID Hex Digit 8 = [0H-FH]				7
MEID Hex Digit 11 = [0H-FH]				MEID Hex Digit 10 = [0H-FH]				8
MEID Hex Digit 13 = [0H-FH]				MEID Hex Digit 12 = [0H-FH]				9
Fill = [FH]				MEID Hex Digit 14 = [0H-FH]				10
⇒ **A9 Indicators:** A9 Element Identifier = [05H]								1
Length = [01H]								2
Reserved = [0]	Packet Boundary Supported = [0,1]	GRE Segment Supported = [0] (ignored)	SDB Supported = [0,1]	CCPD Mode = [0] (Ignored)	Reserved = [0]	Data Ready Indicator = [0] (Ignored)	Handoff Indicator = [0] (Ignored)	3
⇒ **PDSN Address:** A9 Element Identifier = [14H]								1
Length = [04H]								2
(MSB)	PDSN Address = <any value>							3
								4
								5
							(LSB)	6

3.5.1 A9-Update-A8

7	6	5	4	3	2	1	0	Octet
⇒ **Anchor PDSN Address:** A9 Element Identifier = [30H]								1
Length = [04H]								2
(MSB)	Anchor PDSN Address = <any value>							3
								4
								5
							(LSB)	6
⇒ **Anchor P-P Address:** A9 Element Identifier = [40H]								1
Length = [04H]								2
(MSB)	Serving P-P IP Address = <any value>							3
								4
								5
							(LSB)	6

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3.5.2 A9-Update-A8 Ack

This message is sent from the PCF to the BS to acknowledge a change to the session airlink parameters. This message is also sent from the BS to the PCF to acknowledge the processing of any new or updated session parameters.

Information Element	Section Reference	Element Direction	Type	
A9 Message Type	4.2.13	BS<->PCF	M	
Call Connection Reference	4.2.10	BS<->PCF	O	R
Correlation ID	4.2.11	BS<->PCF	O[a]	C
Cause	4.2.3	BS -> PCF	O[b]	C

a. This element shall only be included if it was also included in the A9-Update-A8 message. This element shall be set to the value received in that message.

b. The Cause element shall be included when the message is sent by the BS to the PCF to indicate if the updated session parameter(s) was accepted by the BS.

The following table shows the bitmap layout for the A9-Update-A8 Ack message.

3.5.2 A9-Update-A8 Ack

7	6	5	4	3	2	1	0	Octet
⇒ **A9 Message Type** = [0FH]								1
⇒ **Call Connection Reference:** A9 Element Identifier = [3FH]								1
Length = [08H]								2
(MSB)	Market ID = <any value>							3
							(LSB)	4
(MSB)	Generating Entity ID = <any value>							5
							(LSB)	6
(MSB)	Call Connection Reference = <any value>							7
								8
								9
							(LSB)	10
⇒ **Correlation ID:** A9 Element Identifier = [13H]								1
Length = [04H]								2
(MSB)	Correlation Value = <any value>							3
								4
								5
							(LSB)	6
⇒ **Cause:** A9 Element Identifier = [04H]								1
Length = [01H]								2
Ext= [0]	Cause Value = [13H (Successful operation), 36H (Session parameter/option not supported at BS)]							3

3.6 A8/A9 Interface Data Delivery Messages

3.6.1 A9-Short Data Delivery

This message is sent from the BS to the PCF when a short data burst is received from an MS. It may be sent from the PCF to the BS when a small amount of data is received for a dormant PDSI.

Information Element	Section Reference	Element Direction	Type	
A9 Message Type	4.2.13	PCF <-> BS	M	
Correlation ID	4.2.11	PCF -> BS	O[a]	C
Mobile Identity (IMSI)	4.2.2	PCF <-> BS	O	R
Mobile Identity (ESN)	4.2.2	PCF <-> BS	O[b]	C
SR_ID	4.2.4	PCF <-> BS	O	R
Data Count	4.2.18	PCF -> BS	O[c]	C
ADDS User Part	4.2.9	PCF <-> BS	O[d]	R
A9 Indicators	4.2.17	PCF -> BS	O[e]	C
Mobile Identity (MEID)	4.2.2	PCF <-> BS	O[b]	C

a. If this element is included, its value shall be returned in the corresponding element in the A9-Short Data Ack message from the BS.

b. If an additional occurrence of the Mobile Identity information element (in addition to the Mobile Identity Type, IMSI) is included, it shall contain the indicated Mobile Identity Type of the MS. Inclusion of ESN, MEID or both in this message is a network operator decision.

c. This element is included in this message when sent from the PCF to the BS and indicates the number of additional bytes of data queued at the PCF and waiting to be sent to a specific MS.

d. This element contains the packet data received from the PDSN or an MS in a SDB format as specified in [18].

e. This information element is included when the PDSI is operating in CCPD Mode.

The following table shows the bitmap layout for the A9-Short Data Delivery message.

3.6.1 A9-Short Data Delivery

7	6	5	4	3	2	1	0	Octet
⇒ **A9 Message Type** = [0CH]								1
⇒ **Correlation ID:** A8/A9 Element Identifier = [13H]								1
Length = [04H]								2
(MSB)	Correlation Value = <any value>							3
								4
								5

3.6.1 A9-Short Data Delivery

7	6	5	4	3	2	1	0	Octet
							(LSB)	6
⇒ **Mobile Identity (IMSI):** A9 Element Identifier = [0DH]								1
Length = [06H-08H] (10-15 digits)								2
Identity Digit 1 = [0H-9H] (BCD)				Odd/even Indicator = [1,0]	Type of Identity = [110] (IMSI)			3
Identity Digit 3 = [0H-9H] (BCD)				Identity Digit 2 = [0H-9H] (BCD)				4
…								…
Identity Digit N+1 = [0H-9H] (BCD)				Identity Digit N = [0H-9H] (BCD)				n
Identity Digit N+3 = [0H-9H] (BCD) (if odd number of digits) = [1111] (if even number of digits)				Identity Digit N+2 = [0H-9H] (BCD)				n+1
⇒ **Mobile Identity (ESN):** A9 Element Identifier = [0DH]								1
Length = [05H]								2
Identity Digit 1 = [0000]				Odd/even Indicator = [0]	Type of Identity = [101] (ESN)			3
(MSB)	ESN = <any value>							4
								5
								6
							(LSB)	7
⇒ **SR_ID:** A9 Element Identifier = [0BH]								1
Length = [01H]								2
Reserved = [0000 0]						IS-2000 SR_ID = [001 - 011]		3
⇒ **Data Count:** A9 Element Identifier = [09H]								1
Length = [02H]								2
Count = <any value>								3
								4
⇒ **ADDS User Part:** A9 Element Identifier = [3DH]								1
Length = <variable>								2
Reserved = [00]			Data Burst Type = [06H (Short Data Burst)]					3
(MSB)	Application Data Message = <any value>							4
…								…
							(LSB)	n
⇒ **A9 Indicators:** A9 Element Identifier = [05H]								1
Length = [01H]								2

3.6.1 A9-Short Data Delivery

7	6	5	4	3	2	1	0	Octet
Reserved = [0]	Packet Boundary Supported = [0,1]	GRE Segment Supported = [0] (ignored)	SDB Supported = [1]	CCPD Mode = [1]	Reserved = [0]	Data Ready Indicator = [0] (ignored)	Handoff Indicator = [0] (ignored)	3
⇒ **Mobile Identity (MEID):** A9 Element Identifier = [0DH]								1
Length = [08H]								2
MEID Hex Digit 1 = [0H-FH]				Odd/Even Indicator = '0'	Type of Identity = [001] (MEID)			3
MEID Hex Digit 3 = [0H-FH]				MEID Hex Digit 2 = [0H-FH]				4
MEID Hex Digit 5 = [0H-FH]				MEID Hex Digit 4 = [0H-FH]				5
MEID Hex Digit 7 = [0H-FH]				MEID Hex Digit 6 = [0H-FH]				6
MEID Hex Digit 9 = [0H-FH]				MEID Hex Digit 8 = [0H-FH]				7
MEID Hex Digit 11 = [0H-FH]				MEID Hex Digit 10 = [0H-FH]				8
MEID Hex Digit 13 = [0H-FH]				MEID Hex Digit 12 = [0H-FH]				9
Fill = [FH]				MEID Hex Digit 14 = [0H-FH]				10

3.6.2 A9-Short Data Ack

This message is sent from the BS to the PCF to acknowledge reception of the A9-Short Data Delivery message and to indicate to the PCF whether the data was accepted for delivery to the MS.

Information Element	Section Reference	Element Direction	Type	
A9 Message Type	4.2.13	BS -> PCF	M	
Correlation ID	4.2.11	BS -> PCF	O[a]	C
Mobile Identity (IMSI)	4.2.2	BS -> PCF	O	R
Mobile Identity (ESN)	4.2.2	BS -> PCF	O[b]	C
Cause	4.2.3	BS -> PCF	O[c]	R
Mobile Identity (MEID)	4.2.2	BS -> PCF	O[b]	C

a. This element shall be included if it was included in the A9-Short Data Delivery message sent from the PCF. This element shall be set to the value of the corresponding element received in that message.

b. If an additional occurrence of the Mobile Identity information element (in addition to the Mobile Identity Type, IMSI) is included, it shall contain the indicated Mobile Identity Type of the MS. Inclusion of ESN, MEID or both in this message is a network operator decision.

c. If the BS rejects the SDB, it includes the cause value '16H' (Initiate re-activation of packet data call). If the BS agrees to deliver the SDB to the MS and sends this message before it attempts to deliver the SDB, the BS includes the cause value '13H' (Successful operation).

If the BS attempts to deliver the SDB before sending this message, it includes either cause value '17H' (SBD successfully delivered) or cause value '18H' (SDB couldn't be delivered) depending on the outcome of that attempt.

The following table shows the bitmap layout for the A9-Short Data Ack message.

3.6.2 A9-Short Data Ack

7	6	5	4	3	2	1	0	Octet
⇒ **A9 Message Type** = [0DH]								1
⇒ **Correlation ID:** A8/A9 Element Identifier = [13H]								1
Length = [04H]								2
(MSB)	Correlation Value = <any value>							3
								4
								5
							(LSB)	6
⇒ **Mobile Identity (IMSI):** A9 Element Identifier = [0DH]								1
Length = [06H-08H] (10-15 digits)								2
Identity Digit 1 = [0H-9H] (BCD)				Odd/even Indicator = [1,0]	Type of Identity = [110] (IMSI)			3
Identity Digit 3 = [0H-9H] (BCD)				Identity Digit 2 = [0H-9H] (BCD)				4

3.6.2 A9-Short Data Ack

7	6	5	4	3	2	1	0	Octet
…								…
Identity Digit N+1 = [0H-9H] (BCD)				Identity Digit N = [0H-9H] (BCD)				n
Identity Digit N+3 = [0H-9H] (BCD) (if odd number of digits) = [1111] (if even number of digits)				Identity Digit N+2 = [0H-9H] (BCD)				n+1
⇒ **Mobile Identity (ESN):** A9 Element Identifier = [0DH]								1
Length = [05H]								2
Identity Digit 1 = [0000]				Odd/even Indicator = [0]	Type of Identity = [101] (ESN)			3
(MSB)	ESN = <any value>							4
								5
								6
							(LSB)	7
⇒ **Cause:** A9 Element Identifier = [04H]								1
Length = [01H]								2
ext = [0]	Cause Value = [13H (Successful operation), 16H (Initiate re-activation of packet data call) 17H (SDB successfully delivered) 18H (SDB couldn't be delivered)]							3
⇒ **Mobile Identity (MEID):** A9 Element Identifier = [0DH]								1
Length = [08H]								2
MEID Hex Digit 1 = [0H-FH]				Odd/Even Indicator = '0'	Type of Identity = [001] (MEID)			3
MEID Hex Digit 3 = [0H-FH]				MEID Hex Digit 2 = [0H-FH]				4
MEID Hex Digit 5 = [0H-FH]				MEID Hex Digit 4 = [0H-FH]				5
MEID Hex Digit 7 = [0H-FH]				MEID Hex Digit 6 = [0H-FH]				6
MEID Hex Digit 9 = [0H-FH]				MEID Hex Digit 8 = [0H-FH]				7
MEID Hex Digit 11 = [0H-FH]				MEID Hex Digit 10 = [0H-FH]				8
MEID Hex Digit 13 = [0H-FH]				MEID Hex Digit 12 = [0H-FH]				9
Fill = [FH]				MEID Hex Digit 14 = [0H-FH]				10

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4.0 Information Element Definitions

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

The following subsections define information element formats and ranges for parameter values. In the event that text in this section conflicts with text in section 3, the text in section 3 shall take precedence. 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

4.1.1 Conventions

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

- Each bit position is marked as 0 to 7. 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.

The definition of whether an information element is mandatory or optional is specified in section 3.0.

The Information Element Identifier is included for all cases of signaling messages on the A9 interface.

All reserved bits are set to 0, unless otherwise indicated.

For future expansion purposes, some information elements have fields that have been reserved.

4.1.2 Information Element Identifiers

The following table contains a list of all information elements that make up the messages defined in section 3.0. The table is sorted by the Information Element Identifier (IEI) coding which distinguishes one information element from another. The table also includes a reference to the section where the element coding can be found.

A listing of information elements, sorted by name, is included in Table 4.1.4-1, which also specifies the messages in which each information element is used.

Table 4.1.2-1 A9 Information Element Identifiers Sorted by Identifier Value

Element Name	Identifier	Reference
CON_REF	01H	4.2.14
User Zone ID	02H	4.2.6
Service Option	03H	4.2.8
Cause	04H	4.2.3
A9 Indicators	05H	4.2.17
A9 Cell Identifier	06H	4.2.15
Quality of Service Parameters	07H	4.2.7
A8 Traffic ID	08H	4.2.16
Data Count	09H	4.2.18
Active Connection Time in Seconds	0AH	4.2.1
SR_ID	0BH	4.2.4
A9 PDSN Code	0CH	4.2.23
Mobile Identity	0DH	4.2.2
IS-2000 Service Configuration Record	0EH	4.2.20
RN-PDIT	0FH	4.2.24
Correlation ID	13H	4.2.11
PDSN Address	14H	4.2.5
Access Network Identifiers	20H	4.2.19
Anchor PDSN Address	30H	4.2.22
Software Version	31H	4.2.21
ADDS User Part	3DH	4.2.9
Call Connection Reference	3FH	4.2.10
Anchor P-P Address	40H	4.2.12
Service Instance Info	41H	4.2.25

4.1.3 Additional Coding and Interpretation Rules for Information Elements

Information elements shall always use the same Information Element Identifier for all occurrences on a specific IOS 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 of the IOS interface.

The order of appearance for each information element which is mandatory or optional in a message is laid down in the definition of the message.

Where the description of the information element in this standard contains reserved bits, these bits are indicated as being set to '0'. To allow compatibility with future implementation, messages shall not be rejected simply because a reserved bit is set to '1'.

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.

Some existing elements make use of an extension bit mechanism that allows the size of the information element to be increased. This mechanism consists of the use of the high order bit (bit 7) of an octet as an 'extension bit'. When an octet within an information element has bit 7 defined as an extension bit, then the value '0' in that bit position indicates that the following octet is an extension of the current octet. When the value is '1', there is no extension.

4.1.4 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 4.1.4-1 Cross Reference of Information Elements with Messages

Information Element	Reference	IEI	Used in These Messages	Reference
A8 Traffic ID	4.2.16	08H	A9-Setup-A8	3.1.1
			A9-AL Connected	3.3.1
			A9-AL Disconnected	3.3.3
			A9-Connect-A8	3.1.2
			A9-Disconnect-A8	3.2.3
			A9-Release-A8	3.2.1
A9 Cell Identifier	4.2.15	06H	A9-Setup-A8	3.1.1
A9 Indicators	4.2.17	05H	A9-Connect-A8	3.1.2
			A9-Setup-A8	3.1.1
			A9-Short Data Delivery	3.6.1
			A9-Update-A8	3.5.1
A9 Message Type	4.2.13	None	A9-Setup-A8	3.1.1
			A9-AL Connected	3.3.1
			A9-AL Connected Ack	3.3.2
			A9-AL Disconnected	3.3.3
			A9-AL Disconnected Ack	3.3.4
			A9-BS Service Request	3.1.3
			A9-BS Service Response	3.1.4
			A9-Connect-A8	3.1.2
			A9-Disconnect-A8	3.2.3
			A9-Release-A8	3.2.1
			A9-Release-A8 Complete	3.2.2
			A9-Short Data Delivery	3.6.1
			A9-Short Data Ack	3.6.2
			A9-Update-A8	3.5.1
			A9-Update-A8 Ack	3.5.2
			A9-Version Info	3.4.1
			A9-Version Info Ack	3.4.2
A9 PDSN Code	4.2.23	0CH	A9-Disconnect-A8	3.2.3
			A9-Release-A8 Complete	3.2.2
Access Network Identifier	4.2.19	20H	A9-Setup-A8	3.1.1
			A9-AL Connected	3.3.1

Table 4.1.4-1 Cross Reference of Information Elements with Messages

Information Element	Reference	IEI	Used in These Messages	Reference
Active Connection Time in Seconds	4.2.1	0AH	A9-Release-A8	3.2.1
ADDS User Part	4.2.9	3DH	A9-Short Data Delivery	3.6.1
Anchor P-P Address	4.2.12	40H	A9-Setup-A8	3.1.1
			A9-Connect-A8	3.1.2
			A9-AL Connected Ack	3.3.2
			A9-Update-A8	3.5.1
Anchor PDSN Address	4.2.22	30H	A9-Setup-A8	3.1.1
			A9-Connect-A8	3.1.2
			A9-AL Connected Ack	3.3.2
			A9-Update-A8	3.5.1
Call Connection Reference	4.2.10	3FH	A9-AL Connected	3.3.1
			A9-AL Connected Ack	3.3.2
			A9-AL Disconnected	3.3.3
			A9-AL Disconnected Ack	3.3.4
			A9-Connect-A8	3.1.2
			A9-Disconnect-A8	3.2.3
			A9-Setup-A8	3.1.1
			A9-Release-A8	3.2.1
			A9-Release-A8 Complete	3.2.2
			A9-Update-A8	3.5.1
			A9-Update-A8 Ack	3.5.2
Cause	4.2.3	04H	A9-Connect-A8	3.1.2
			A9-Disconnect-A8	3.2.3
			A9-Release-A8	3.2.1
			A9-Release-A8 Complete	3.2.2
			A9-BS Service Response	3.1.4
			A9-Short Data Ack	3.6.2
			A9-Update-A8	3.5.1
			A9-Update-A8 Ack	3.5.2
			A9-Version Info	3.4.1
CON_REF	4.2.14	01H	A9-Setup-A8	3.1.1
			A9-Connect-A8	3.1.2
			A9-Disconnect-A8	3.2.3
			A9-Release-A8	3.2.1
Correlation ID	4.2.11	13H	A9-AL Disconnected Ack	3.3.4
			A9-Short Data Delivery	3.6.1

Table 4.1.4-1 Cross Reference of Information Elements with Messages

Information Element	Reference	IEI	Used in These Messages	Reference
			A9-Short Data Ack	3.6.2
			A9-Setup-A8	3.1.1
			A9-Connect-A8	3.1.2
			A9-Disconnect-A8	3.2.3
			A9-Release-A8	3.2.1
			A9-Release-A8 Complete	3.2.2
Data Count	4.2.18	09H	A9-BS Service Request	3.1.3
			A9-Short Data Delivery	3.6.1
IS-2000 Service Configuration Record	4.2.20	0EH	A9-Setup-A8	3.1.1
			A9-AL Connected	3.3.1
			A9-Update-A8	3.5.1
Mobile Identity	4.2.2	0DH	A9-Setup A8	3.1.1
			A9-Connect A8	3.1.2
			A9-Disconnect-A8	3.2.3
			A9-Release-A8	3.2.1
			A9-BS Service Request	3.1.3
			A9-Short Data Delivery	3.6.1
			A9-Short Data Ack	3.6.2
			A9-Update-A8	3.5.1
PDSN Address	4.2.5	14H	A9-Setup-A8	3.1.1
			A9-Connect-A8	3.1.2
			A9-AL Connected	3.3.1
			A9-AL Connected Ack	3.3.2
			A9-Update-A8	3.5.1
Quality of Service Parameters	4.2.7	07H	A9-Setup-A8	3.1.1
			A9-AL Connected	3.3.1
			A9-Update-A8	3.5.1
RN-PDIT	4.2.24	0FH	A9-Update-A8	3.5.1
Service Instance Info	4.2.25	41H	A9-Connect-A8	3.1.2
Service Option	4.2.8	03H	A9-BS Service Request	3.1.3
			A9-Setup-A8	3.1.1
			A9-AL Connected	3.3.1
			A9-Update-A8	3.5.1
Software Version	4.2.21	31H	A9-Version Info	3.4.1
			A9-Version Info Ack	3.4.2
SR_ID	4.2.4	0BH	A9-Setup-A8	3.1.1

Table 4.1.4-1 Cross Reference of Information Elements with Messages

Information Element	Reference	IEI	Used in These Messages	Reference
			A9-Connect-A8	3.1.2
			A9-Disconnect-A8	3.2.3
			A9-Release-A8	3.2.1
			A9-Release-A8 Complete	3.2.2
			A9-BS Service Request	3.1.3
			A9-BS Service Response	3.1.4
			A9-Short Data Delivery	3.6.1
			A9-Update-A8	3.5.1
User Zone ID	4.2.6	02H	A9-Setup-A8	3.1.1
			A9-AL Connected	3.3.1
			A9-Update-A8	3.5.1

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4.2 Information Elements

4.2.1 Active Connection Time in Seconds

This element indicates the duration of traffic channel connection. It is coded as follows.

4.2.1 Active Connection Time in Seconds

7	6	5	4	3	2	1	0	Octet
A9 Element Identifier								1
Length								2
(MSB)	Active Connection Time							3
								4
								5
							(LSB)	6

Length:

This field indicates the number of octets in this element following the Length field. This field shall be set to 04H.

Active Connection Time:

This field indicates the duration of time the traffic channel was established in seconds.

4.2.2 Mobile Identity

The purpose of the mobile identity information element is to provide the MS Electronic Serial Number (ESN), the International Mobile Subscriber Identity (IMSI) or Mobile Equipment Identifier (MEID) for cdma2000®[1].

The IMSI does not exceed 15 digits and the ESN is a 32 bit field separated into a Manufacturer code, the Serial Number and a Reserved field. The MEID consists of 14 hexadecimal digits.

Warning: Prior to IOS v3.0, the length limit for this IE was 10 octets. Care needs to be exercised for interoperability with implementations based on the previous standard.

This element is coded as specified in [1]~[6].

4.2.2 Mobile Identity

7	6	5	4	3	2	1	0	Octet
A9 Element Identifier								1
Length								2
MSID Value								variable

Length:

This field is defined as the number of octets following the Length field.

MSID Value:

The MSID value is determined by the Type of Identity field, included within the value, as follows.

Type of Identity:

This field is defined as follows:

Table 4.2.2-1 Mobile Identity - Type of Identity Coding

Binary Values	Meaning
000	No Identity Code
001	MEID
101	ESN
110	IMSI
All other values are reserved.	

If the MSID Type is ‘001’ (MEID), the MSID Value is coded as follows.

4.2.2 Mobile Identity

7	6	5	4	3	2	1	0	Octet
MEID Hex Digit 1				Odd/even Indicator	Type of Identity			3

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

4.2.2 Mobile Identity

7	6	5	4	3	2	1	0	Octet
MEID Hex Digit 3				MEID Hex Digit 2				4
MEID Hex Digit 5				MEID Hex Digit 4				5
MEID Hex Digit 7				MEID Hex Digit 6				6
MEID Hex Digit 9				MEID Hex Digit 8				7
MEID Hex Digit 11				MEID Hex Digit 10				8
MEID Hex Digit 13				MEID Hex Digit 12				9
Fill				MEID Hex Digit 14				10

Odd/Even Indicator (octet 3; bit 3):

The Odd/Even Indicator is set to ‘0’.

MEID Hex Digits:

The MEID Identity Digit fields are coded using 14 hexadecimal digits. The Odd/Even Indicator is set to ‘0’ and bits 4 to 7 of the last octet shall be filled with ‘1111’.

If the MSID Type is ‘110’ (IMSI), the MSID Value is coded as follows.

4.2.2 Mobile Identity

7	6	5	4	3	2	1	0	Octet
Identity Digit 1				Odd/Even Indicator	Type of Identity			3
Identity Digit 3				Identity Digit 2				4
…								…
Identity Digit N+1				Identity Digit N				k

Odd/Even Indicator (octet 3; bit 3):

This field is set to ‘0’ for an even number of digits and to ‘1’ for an odd number of identity digits.

Identity Digits N (octet 3 etc.):

The IMSI Identity Digit fields are coded using BCD coding format with the leftmost digit of IMSI in the Identity Digit 1 field. If the number of identity digits is even then bits 4 to 7 of the last octet shall be filled with ‘1111’.

If the MSID Type is ‘101’ (ESN), the MSID Value is coded as follows.

4.2.2 Mobile Identity

7	6	5	4	3	2	1	0	Octet
Identity Digit 1				Odd/even Indicator	Type of Identity			3
(MSB)	ESN							4
								5
								6
							(LSB)	7

Odd/Even Indicator (octet 3; bit 3):

The Odd/Even Indicator is set to ‘0’.

Identity Digit 1:

Identity Digit 1 in octet 3 is unused and coded as ‘0000’.

ESN:

The ESN is not separated into digits, and occupies octets 4-7 with the most significant bit in octet 4 bit 7.

Note: ESN may be the true ESN, UIM_ID or the pseudo ESN (derived from the MEID or received in a Status Response Message from the MS).

4.2.3 Cause

This element is used to indicate the reason for occurrence of a particular event and is coded as shown below.

4.2.3 Cause

7	6	5	4	3	2	1	0	Octet
A9 Element Identifier								1
Length								2
0/1	Cause Value							3

Length:

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

Cause Value:

This field is a single octet field if the extension bit (bit 7) is set to '0'. If bit 7 of octet 3 is set to '1' then the cause value is a two octet field. If the value of the first octet of the cause field is '1XXX 0000' then the second octet is reserved for national applications, where 'XXX' indicates the Cause Class as indicated in the table below.

Table 4.2.3-1 Cause Class

Binary Values	Meaning
000	Normal event
001	Normal event
010	Resource unavailable
011	Service or option not available
100	Service or option not implemented
101	Invalid message (e.g., parameter out of range)
110	Protocol error
111	Interworking

Table 4.2.3-2 Cause Values

6	5	4	3	2	1	0	Hex Value	Cause
Normal Event Class (000 xxxx and 001 xxxx)								
0	0	0	0	1	1	1	07	OAM&P intervention
0	0	0	1	0	0	0	08	MS busy
0	0	0	1	0	1	1	0B	Handoff successful
0	0	0	1	1	1	1	0F	Packet data session release
0	0	1	0	0	0	0	10	Packet call going dormant
0	0	1	0	0	0	1	11	Service option not available
0	0	1	0	0	1	1	13	Successful operation
0	0	1	0	1	0	0	14	Normal call release
0	0	1	0	1	1	0	16	Initiate re-activation of packet data call
0	0	1	0	1	1	1	17	SDB successfully delivered
0	0	1	1	0	0	0	18	SDB couldn't be delivered
0	0	1	1	0	0	1	19	Power down from dormant state
0	0	1	1	0	1	0	1A	Authentication failure
0	0	1	1	0	1	1	1B	Capability update
0	0	1	1	1	0	0	1C	Update Accounting: late traffic channel setup
0	0	1	1	1	0	1	1D	Hard handoff failure
0	0	1	1	1	1	0	1E	Update Accounting: parameter change
Resource Unavailable Class (010 xxxx)								
0	1	0	0	0	0	0	20	Equipment failure
Service or Option Not Available Class (011 xxxx)								
0	1	1	0	0	1	0	32	PCF resources are not available
0	1	1	0	1	1	0	36	Session parameter/option not supported at BS
Service or Option Not Implemented Class (100 xxxx)								
Invalid Message Class (101 xxxx)								
Protocol Error (110 xxxx)								
Interworking (111 xxxx)								
1	1	1	1	0	0	1	79	PDSN resources are not available
1	1	1	1	0	1	0	7A	Data ready to send
1	1	1	1	0	1	1	7B	Session parameter update
All other values								Reserved for future use.

4.2.4 SR_ID

This information element identifies the service reference identifier for a particular service instance.

4.2.4 SR_ID

7	6	5	4	3	2	1	0	Octet
A9 Element Identifier								1
Length								2
Reserved					IS-2000 SR_ID			3

Length:

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

IS-2000 SR_ID:

This field is used to uniquely identify a PDSI in the MS. This field contains the Session Reference Identifier value (sr_id) as defined in [3].

4.2.5 PDSN Address

When sent from a PCF to a BS, this element contains an A11 interface IPv4 IP Address for the PDSN that terminates the A10 connection corresponding to the just-established A8 connection.

When sent from a target BS to a target PCF, this element contains an A11 interface IPv4 IP Address for the source PDSN during a hard or fast handoff.

4.2.5 PDSN Address

7	6	5	4	3	2	1	0	Octet
A9 Element Identifier								1
Length								2
(MSB)	PDSN Address							3
								4
								5
							(LSB)	6

Length:

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

PDSN Address:

This field contains an A11 interface IPv4 address for the PDSN.

4.2.6 User Zone ID

This element uniquely identifies a particular User Zone.

4.2.6 User Zone ID

7	6	5	4	3	2	1	0	Octet
A9 Element Identifier								1
Length								2
(MSB)	UZID							3
							(LSB)	4

Length:

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

UZID:

This field contains a User Zone ID value as sent by the MSC or MS. The MSC is responsible for any mapping of this 16-bit value to the 24-bit value defined in [9].

4.2.7 Quality of Service Parameters

This element identifies the Quality of Service for a given PDSI. In this version of this standard the only information carried is non-assured mode packet priority.

4.2.7 Quality of Service Parameters

7	6	5	4	3	2	1	0	Octet
A9 Element Identifier								1
Length								2
Reserved				Non-Assured Mode Packet Priority				3

Length:

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

Non-Assured Mode Packet Priority:

This field indicates the priority of a non-assured packet data service as a binary value. Value ‘0000’ is the lowest priority. Value ‘1101’ is the highest priority. Values ‘1110’ and ‘1111’ are reserved.

4.2.8 Service Option

This element indicates the service option requested by the MS, or by the network. It is coded as follows:

4.2.8 Service Option

7	6	5	4	3	2	1	0	Octet
A9 Element Identifier								1
(MSB)	Service Option							2
							(LSB)	3

The service options supported are given in Table 4.2.8-1.

Table 4.2.8-1 Service Option Values

Service Option Value (hex)	Description
0021H	3G High Speed Packet Data
003CH	Link Layer Assisted Header Removal
003DH	Link-Layer Assisted Robust Header Compression (LLA-ROHC)

4.2.9 ADDS User Part

This element contains the application data message.

4.2.9 ADDS User Part

7	6	5	4	3	2	1	0	Octet
A9 Element Identifier								1
Length								2
Reserved			Data Burst Type					3
Application Data Message								4-n

The Length field is defined as the number of octets following the Length field and has a value greater than zero.

The Data Burst Type field is coded as follows:

For CDMA: the 6-bit Data Burst Type defined in [I-1] is contained in bits 5 through 0, with bits 6 and 7 set to zero.

The Application Data Message field has variable length and is encoded as follows:

For Short Data Burst, the Application Data Message is the SDB as specified in [18].

4.2.10 Call Connection Reference

This information element contains a globally unique identification for a call connection.

4.2.10 Call Connection Reference

7	6	5	4	3	2	1	0	Octet
A9 Element Identifier								1
Length								2
(MSB)	Market ID							3
Market ID (continued)							(LSB)	4
(MSB)	Generating Entity ID							5
Generating Entity ID (continued)							(LSB)	6
(MSB)	Call Connection Reference Value							7
								8
								9
							(LSB)	10

Length:

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

Market ID:

This field represents a unique market ID that is specified by the service provider (refer to [19]).

Generating Entity ID:

This two octet field represents a unique code assigned by the operator to the entity that generates this Call Connection Reference value.

Call Connection Reference Value:

This four octet field may contain any value. It is assigned by the generating entity whose responsibility it is to guarantee its uniqueness.

4.2.11 Correlation ID

This information element is used to correlate request and response messages.

4.2.11 Correlation ID

7	6	5	4	3	2	1	0	Octet
A9 Element Identifier								1
Length								2
(MSB)	Correlation Value							3
								3
								5
							(LSB)	6

Length:

This field indicates the number of octets in this element following the Length field and is set to a value of 4.

Correlation Value:

This field contains a value that allows the network entity to correlate a request-response pair of messages. The value is a manufacturer concern. In this revision of this standard, this value shall be exactly 4 octets in length.

4.2.12 Anchor P-P Address

This element contains the P-P interface IPv4 address of the anchor PDSN for fast handoff.

4.2.12 Anchor P-P Address

7	6	5	4	3	2	1	0	Octet
A9 Element Identifier								1
Length								2
(MSB)	Anchor P-P Address							3
								4
								5
							(LSB)	6

Length:

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

Anchor P-P Address:

This field contains a P-P interface (refer to [8]) IPv4 address for an anchor PDSN. Refer to [17].

4.2.13 A9 Message Type

The A9 Message Type element is used to indicate the type of a message on the A9 interface.

A9 Message Name	A9 Message Type	Section Reference
A9-Setup-A8	01H	3.1
A9-Connect-A8	02H	3.2
A9-Disconnect-A8	03H	3.3
A9-Release-A8	04H	3.4
A9-Release-A8 Complete	05H	3.5
A9-BS Service Request	06H	3.6
A9-BS Service Response	07H	3.7
A9-AL Connected	08H	3.8
A9-AL Connected Ack	09H	3.9
A9-AL Disconnected	0AH	3.10
A9-AL Disconnected Ack	0BH	3.11
A9-Short Data Delivery	0CH	3.12
A9-Short Data Ack	0DH	3.13
A9-Update-A8	0EH	3.14
A9-Update-A8-Ack	0FH	3.15
A9-Version Info	10H	3.16
A9-Version Info Ack	11H	3.17

4.2.14 CON_REF

This information element identifies the connection instance between the MS and the source BS.

4.2.14 CON_REF

7	6	5	4	3	2	1	0	Octet
A9 Element Identifier								1
Length								2
IS-2000 CON_REF								3

Length:

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

IS-2000 CON_REF:

This field contains the connection reference value defined in [5].

4.2.15 A9 Cell Identifier

This element uniquely identifies a particular cell:

4.2.15 A9 Cell Identifier

7	6	5	4	3	2	1	0	Octet
A9 Element Identifier								1
Length								2
Cell Identification Discriminator								3
Cell Identifier								4-8

Length:

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

Cell Identification Discriminator:

This field shall be set to 7.

Cell Identifier:

This field includes a unique identification number for the cell being referenced. The fields shall be coded as shown below:

Table 4.2.15-1 Cell Identifier

7	6	5	4	3	2	1	0	Octet
MSB	MSCID							4
MSCID								5
MSCID							LSB	6
MSB	Cell							7
Cell				Sector			LSB	8

MSCID:

The MSCID is coded as defined in [9]. MSCID is 3 octets long where the first two octets (octets 4 and 5) represent Market ID and the last octet represents the Switch Number. In the MSCID field, bit 7 of octet 4 is the most significant bit and bit 0 of octet 5 is the least significant bit of the Market ID field. In the MSCID field bit 7 of octet 6 is the most significant bit of the Switch Number field.

Cell/Sector:

In the Cell/Sector value field bit 7 of octet 7 is the most significant bit and bit 0 of octet 8 is the least significant bit. Bits 3 to 0 of octet 8 contain the sector number (0H = omni). The coding of the cell identity is the responsibility of each administrator. Coding using full hexadecimal representation may be used. The cell identity consists of 2 octets maximum. If an administrator has chosen N bits for the cell identity where N <16 then the additional bits up to 16 are coded with a '0' in each in the following way:

If 8 <N<16 the bits N-8 through 7 of octet 8 are coded with a '0' in each.

If N=8 then octet 8 is coded with a '0' in each bit.

If N<8 then octet 8 is coded with a '0' in each bit and bits N through 7 of octet 7 are coded with a '0' in each.

4.2.16 A8 Traffic ID

This information element identifies the connection used by the MS for packet data service.

4.2.16 A8 Traffic ID

7	6	5	4	3	2	1	0	Octet
A9 Element Identifier								1
Length								2
A8 transport protocol stack								3
(MSB)	Protocol Type							4
							(LSB)	5
(MSB)	Key							6
								7
								8
							(LSB)	9
Address Type								10
(MSB)	IP Address							11
…								…
							(LSB)	k

Length:

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

A8 transport protocol stack:

This field is used to identify the A8 transport protocol stack to be used for the A8 connection.

Table 4.2.16-1 A8 Traffic ID - A8 Transport Protocol Stack

Values	Meaning
01H	GRE/IP
All Others	Reserved

Protocol Type:

This field is used to indicate the protocol type to be tunneled across the A8 interface, and contains the same value that is used in the Protocol Type field in the GRE header on the associated A8 connection. This field is set to 0x88 81H (Unstructured Byte Stream).

Key:

This is a four octet field. This field is used to indicate the A8 connection identification, and contains the same value that is used in the Key field in the GRE header on the associated A8 connection.

Address Type:

This field indicates the type and format of the IP Address that follows.

Table 4.2.16-2 A8 Traffic ID - Address Type

Value	Address Type	Length of IP Address
01H	Internet Protocol IPv4	4 octets
02H	Internet Protocol IPv6	variable
All other values reserved		

IP Address:

This field has a variable length that is dependent on the Type field. This field is used to indicate the IP address of the A8 bearer port on the sending entity. That is, when the BS sends the A9-Setup-A8 message containing this element, this field contains the IP address at the BS where the A8 user traffic connection terminates.

4.2.17 A9 Indicators

This information element indicates properties of the A8 connection and of the MS.

4.2.17 A9 Indicators

7	6	5	4	3	2	1	0	Octet
A9 Element Identifier								1
Length								2
Reserved	Packet Boundary Supported	GRE Segment Supported	SDB Supported	CCPD Mode	Reserved	Data Ready Indicator	Handoff Indicator	3

Length:

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

Handoff Indicator:

This field indicates whether or not a handoff was performed. Refer to [13]. When this IE is included in the A9-Setup-A8 message, the following conditions hold:

- The field is set to '0' to indicate normal call setup
- The field is set to '1' to indicate that a hard handoff is to be performed, and that is not necessary to establish the A10 connection immediately
- The field is set to '0' for dormant handoffs
- The field is set to '0' for fast handoffs, because an A10 connection needs to be set up immediately

When this IE is included in the A9-Short Data Delivery message, this field is ignored.

When this IE is included in the A9-Update-A8 message, this field is ignored.

Data Ready Indicator:

This field indicates whether there is data ready to be sent from the MS to the network. It reflects the value of the DRS bit of the air interface. If this field is set to '0', it indicates that data is not ready to be sent and the A9-Setup-A8 message is reporting a mobility event. Otherwise (set to '1') it indicates that data is ready to be sent.

CCPD Mode:

This field indicates that an MS has requested CCPD Mode. The PCF is not required to allocate an A8 connection when this bit is set. Any signaling or data exchanged between the PCF and BS is sent over the A9 signaling channel.

SDB Supported:

This field indicates if Short Data Bursts can be sent for the PDSI.

Table 4.2.17-1 A9 Indicators – SDB Supported

Values	Meaning
0	Short Data Bursts not supported for the PDSI
1	Short Data Bursts supported for the PDSI

GRE Segmentation Supported:

This field is set to ‘1’ if the BS is capable of receiving the GRE segmentation attribute in the GRE header for the corresponding A8 connection, for packets fragmented over one or more GRE frames. Otherwise this field is set to ‘0’.

Packet Boundary Supported:

This field is set to ‘1’ if the PCF guarantees IP packet boundaries. The PCF guarantees packet boundaries either by encapsulating one packet in one GRE frame or by supplying GRE segmentation indication in the GRE frame (if supported by the BS) for the corresponding A8 connection. Otherwise this field is set to ‘0’.

4.2.18 Data Count

This element contains a count of the number of bytes to be transmitted.

4.2.18 Data Count

7	6	5	4	3	2	1	0	Octet
A9 Element Identifier								1
Length								2
Count - Octet 1								3
Count - Octet 2								4

Length:

This field indicates the number of octets in this element following the Length field, and shall be set to 02H.

Count:

This element indicates the number of bytes remaining in the PCF. The value FF FFH means that the number of bytes remaining is greater than or equal to FF FFH bytes (65536 bytes).

4.2.19 Access Network Identifiers

The Access Network Identifiers information element identifies the PCF from which an MS is handing off.

4.2.19 Access Network Identifiers

7	6	5	4	3	2	1	0	Octet
A9 Element Identifier								1
Length								2
Reserved	(MSB)	SID						3
							(LSB)	4
(MSB)	NID							5
							(LSB)	6
PZID								7

Length:

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

SID:

This two octet field is coded to the value that uniquely identifies the cellular or PCS system.

NID:

This two octet field is coded to the value that uniquely identifies the network within a cellular or PCS system.

PZID:

This one octet field is coded to the value that uniquely identifies the PCF coverage area within a particular SID/NID area. The combined SID/NID/PZID triplet is unique to a PCF.

4.2.20 IS-2000 Service Configuration Record

This information element contains the service configuration record as defined in [5].

4.2.20 IS-2000 Service Configuration Record

7	6	5	4	3	2	1	0	Octet
A9 Element Identifier								1
Bit-Exact Length – Octet Count								2
Reserved					Bit-Exact Length – Fill Bits			3
(MSB)	*IS-2000* Service Configuration Record Content							4
…								…
	Seventh Fill Bit – if needed	Sixth Fill Bit – if needed	Fifth Fill Bit – if needed	Fourth Fill Bit – if needed	Third Fill Bit – if needed	Second Fill Bit – if needed	First Fill Bit – if needed	k

Bit-Exact Length – Octet Count:

This field indicates the number of octets in this element following the Bit-Exact Length – Octet Count field.

Bit-Exact Length – Fill Bits:

This field contains a binary value indicating the number of fill bits contained in the last octet of this element. If this field contains a non-zero value, the indicated number of fill bits are set to '0' and occupy the low order bit positions of the last octet of this element.

IS-2000 Service Configuration Record Content:

This field contains a Service Configuration Record coded according to [5]. The value begins in the high order bit position of octet 4 of this element and extends into the last octet of this element. Bit positions in the last octet that are not used, if any, are considered fill bits, are set to '0', and occupy the low order bit positions of the last octet.

4.2.21 Software Version

This element provides software version information about the sub-system originating the message. Its definition is a BS and PCF manufacturer concern.

4.2.21 Software Version

7	6	5	4	3	2	1	0	Octet
A9 Element Identifier								1
Length								2
IOS Major Revision Level (X)								3
IOS Minor Revision Level (Y)								4
IOS Point Release Level (Z)								5
Manufacturer/Carrier Software Information								6-n

Each version of this standard is published with a version number in the form X.Y.Z. These three values shall be placed in octets 3, 4, and 5 respectively as binary values.

Each separate software load from a manufacturer shall have some software load identity. In addition, the carrier may require the exchange of specific information between entities in their network. This information shall be placed in octets 6-n in ASCII format as agreed between the carrier and the manufacturer.

4.2.22 Anchor PDSN Address

This element contains the A11 interface IPv4 address of the anchor PDSN address and is used for fast handoff.

4.2.22 Anchor PDSN Address

7	6	5	4	3	2	1	0	Octet
A9 Element Identifier								1
Length								2
(MSB)	Anchor PDSN Address							3
								4
								5
							(LSB)	6

Length:

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

Anchor PDSN Address:

This field contains an A11 interface IPv4 address of the anchor PDSN.

4.2.23 A9 PDSN Code

This element contains the PDSN failure code sent from the PDSN to the PCF in the A11-Registration Reply and A11-Registration Update messages. It is used to convey the PDSN failure code from the PCF to the BS.

4.2.23 A9 PDSN Code

7	6	5	4	3	2	1	0	Octet
A9 Element Identifier								1
Length								2
PDSN Code								3

Length:

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

PDSN Code:

This field contains the Code sent from the PDSN to the PCF. The supported Code values are listed in Table 4.2.23-1.

Table 4.2.23-1 PDSN Code Values

Hex Value	Decimal Value	Code
00H	0	Registration Accepted
80H	128	Registration Denied – reason unspecified
81H	129	Registration Denied – administratively prohibited
82H	130	Registration Denied – insufficient resources
83H	131	Registration Denied – PCF 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 data in the CVSE
C1H	193	Connection Release – Reason unspecified
C2H	194	Connection Release – PPP time-out
C3H	195	Connection Release – Registration time-out
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
CAH	202	Connection Release – User (NAI) failed authentication
All other values reserved		

4.2.24 RN-PDIT

This element contains the Realm Configured Packet Data Session Dormancy Timer.

4.2.24 RN-PDIT

7	6	5	4	3	2	1	0	Octet
A9 Element Identifier								1
Length								2
RN-PDIT								3

Length:

This field indicates the number of octets in this element following the Length field, and shall be set to 01H.

RN-PDIT:

This field contains the Realm Configured Packet Data Session Dormancy Timer and has a range of 1-255 seconds (Refer to [17]).

4.2.25 Service Instance Info

This element indicates a list of the service option instances requested by the MS, or by the network. It is coded as follows:

4.2.25 Service Instance Info

7	6	5	4	3	2	1	0	Octet
A9 Element Identifier								1
Length								2
SR_ID-8	SR_ID-7	SR-ID-6	SR-ID-5	SR-ID-4	SR-ID-3	SR-ID-2	SR-ID-1	3
(MSB)	Service Option – 1							4
							(LSB)	5
…								…
(MSB)	Service Option – n							n
							(LSB)	n+1

Length:

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

SR_ID-n:

This field is set to 1 if the packet data session contains a service instance with SR_ID=n.

Service Option – n:

This field indicates the service option requested by the MS, or by the network. Refer to section 4.2.8 for the encoding of this field. The first service option is associated with the service instance with the smallest SR_ID value and the last Service Option in the list is associated with the service instance with the largest SR_ID.

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5.0 Timer Definitions

5.1 Timer Values

Table 5.1-1 Timer Values and Ranges Sorted by Name

Timer Name	Default Value (seconds)	Range of Values (seconds)	Granularity (seconds)	Section Reference
$T_{A8\text{-}setup}$	4	0-99	1	5.2.1
T_{alc9}	0.5	0 – 1.0	0.1	5.2.4
T_{ald9}	0.5	0 – 1.0	0.1	5.2.7
T_{aldak}	1	0 – 5	0.1	5.2.10
T_{bsreq9}	1.5	0 – 5	0.1	5.2.6
$T_{discon9}$	1	0-5	0.1	5.2.2
T_{rel9}	1	0-5	0.1	5.2.3
T_{sdd9}	1.5	0-5	0.1	5.2.8
T_{upd9}	1	0-5	0.1	5.2.9
$T_{waitho9}$	Refer to section 5.2.5			5.2.5
T_{ver9}	1	0-5	0.1	5.2.11

5.2 Timer Definitions

5.2.1 $T_{A8\text{-}setup}$

This is a BS timer. The timer is started when an A9-Setup-A8 message is sent and stopped when an A9-Connect-A8 or an A9-Release-A8 Complete message is received.

5.2.2 $T_{discon9}$

This is a PCF timer. The timer is started when an A9-Disconnect-A8 message is sent and stopped when an A9-Release-A8 message is received.

5.2.3 T_{rel9}

This is a BS timer. The timer is started when an A9-Release-A8 message is sent and stopped when an A9-Release-A8 Complete message is received.

5.2.4 T_{alc9}

This is a BS timer. The timer is started when an A9-AL Connected message is sent and stopped when an A9-AL Connected Ack message is received.

5.2.5 $T_{waitho9}$

This is a PCF timer. The timer is started when an A9-Connect-A8 message is sent and stopped when an A9-AL Connected or an A9-Release-A8 message is received. The value of this timer shall be greater than that of the BS timer T_{waitho}. Refer to [14].

5.2.6 T_{bsreq9}

This is a PCF timer. The timer is started when an A9-BS Service Request message is sent and stopped when an A9-BS Service Response message is received.

5.2.7 T_{ald9}

This is a BS timer. The timer is started when an A9-AL Disconnected message is sent and stopped when an A9-AL Disconnected Ack message is received.

5.2.8 T_{sdd9}

This PCF timer is started after the A9-Short Data Delivery message is sent to the BS and stopped when the A9-Short Data Ack message is received.

5.2.9 T_{upd9}

This is a BS and PCF timer. The timer is started after the A9-Update-A8 message is sent and stopped when the A9-Update-A8 Ack message is received.

5.2.10 T_{aldak}

This is a PCF timer. The timer is started when an A9-AL Disconnected Ack message is sent and stopped when an A9-Release-A8 message or A9-AL Connected message is received.

5.2.11 T_{vers9}

This is a BS and PCF timer. The timer is started when an A9-Version Info message is sent and stopped when an A9-Version Info Ack message is received.